Managerial Finance in the Corporate Economy

Edited by
Dilip K. Ghosh
and Shahriar Khaksari

ROUTLEDGE

Managerial finance in the corporate economy

In most countries the economic structure and financial landscape are dominated by corporations. A critical examination of the various facets of the corporate economy is thus vitally important. In *Managerial Finance in the Corporate Economy* the authors use new theoretical apparatus and empirical evaluations to present such a study.

The book, divided into five sections, brings together new research on the major issues. These include mutual and pension funds and portfolio diversification; market volatility, credit availability, tax structure and the dividend reinvestment plan; financial institutions; corporate behavior in the context of the international economy. *Managerial Finance in the Corporate Economy* presents a comprehensive analysis of corporate culture within the international economy.

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Preface

Managerial Finance in the Corporate Economy is a collection of new pieces of research, first presented in The Inaugural International Conference on Financial Management held at Parker House in Boston. Looking at the depressing and chaotic situation in the ambit of managerial finance we initially chose to bring experts in the subject to examine and discuss various facets of the issues. Many discussions and deliberations led us to organize a conference under the rubric "Financial structure, corporate performance and attendant risk in the market economy". Finally, however, we simplified the title of the conference, and held the conference on November 12–13, 1992. A large number of articles were submitted to us for presentation. Upon two peer reviews of each paper, we accepted a limited few of those works. After the conclusion of the conference, we made another selection, and asked the selected authors to revise their work in light of the discussants' comments. Some of the papers that appear in this volume, however, were never presented at the Conference. At the end, we made our editorial judgment on which articles should be included, and thus we came out with this book.

The whole process involved a lot of commitment and hard work. We hope our efforts and enterprise will make a contribution to the literature. As always, it is impossible to thank everyone associated with the project, and so we shall not even try to do so in this brief space. Yet we must express our sincere appreciation to each contributor without whom we could not have had this outcome. President David Sargent of Suffolk University and our colleague Edward Bubnys deserve a special note of thanks for their help toward the success of the Conference that essentially produced the foundation for this book. We record our gratitude to Alan Jarvis, Alison Kirk, Ruth Jeavons of Routledge and Christine Sharrock of Omega Scientific for their continuous help. Finally, we express our appreciation to our families for their constant support and moral guidance.

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Part I

Introduction

Managerial finance in the corporate economy

Dilip K.Ghosh and Shahriar Khaksari

An economy is an infrastructure with interactions of economic agents out of the constellation of consumers and producers and the intermediaries in a defined society. In such an economic society in modern days, producers appear in the structure of proprietorships, partnerships or corporations. Overwhelming, however, is the operational importance of corporate entities catering to the consumers' side of the exchange setup. Proprietorships and partnerships, although they are legally quite distinguishable on the supply side of the equation, behave with the same norms of corporate conduct in business deals and financial matters. So, loosely speaking, in modern times corporate economy means the supply side of the economy. Corporations in that general sense provide goods and services, make investments for themselves and create investment opportunities for others with excess savings, develop various financing designs, and in the process induce the growth of financial engineering.

The management of the corporate economy rests squarely with many facets of the profitable existence and competition of corporations coexisting side by side in the market economy under various constraints and regulations. The constraints are often both financial and legal. Corporations, when they are public, raise capital either in the way of floating bonds and other debt instruments (under written indentures specifying terms and conditions for loan repayments) or by issuing equity shares in the marketplace. The individual investors decide where to put their money—in fixed income securities or in variable income securities—depending on their assessments of risk and returns. It is often considered to be relatively safe to diversify their assets in such a fashion that diversification yields a reduction in risk and an acceptable rate of return. From the issuers of debt and equity capital, the question is: what should be the optimal mix—that is, what is the optimal capital structure? The answer obviously is intimately connected to the cost of capital and the consequent valuation of the firm. Beyond this question or issue, several other factors become important in managerial finance in the corporate economy. What drives the market, how an economic agent reacts to volatility in the prices of securities, how sensitive prices are to interest rates, how the tax structure affects the behavior of corporate management and investors in corporate securities appear to factor in to decide the parameters of managerial finance.

All these issues and questions are intimately connected with the institutional structure and *modus operandi* of those institutions—financial and otherwise. Money moves through financial institutions and intermediaries because of the integrity and trust created for these conduits via monitoring mechanisms, regulatory constraints and safety valves through insurance and the like. Institutional structures, in many cases, provide loss-cover conditions through hedging mechanisms, and allow scope for arbitrage, and beyond hedging speculation also drives the system. It is the corporations and/or investors who should decide what positions to take at what points, and with how much integrity the process admits of changes, sometimes expected and sometimes not.

The corporate economy is not necessarily local anymore. It is very much a global framework. Many multinational corporations exist nowadays, and hence their operations—production, sales, financing and investment—are truly transnational. Coca-Cola does everything in almost every country of the world, and thus exposes itself to foreign exchange markets and diverse tax laws. This is the picture of the modern corporate structure.

Against the backdrop of such economic structures and financial systems, economic agents are moving forward with their regular activities. Many issues and problems arise in a theoretical as well as in a practical context in real life. To deal with some of these issues or questions we have divided this book in five parts. This introduction, which forms the first part, develops the unifying structure and presents the theme of each article presented in the book. Part II brings out some recent studies in the area of mutual funds, pension funds and portfolio management. The section begins with the article “The long-run gains from international equity diversification: Australian evidence from cointegration tests”, by Allen and MacDonald. The chapter analyzes the benefits for Australian investors from international diversification in the equity market for the period from 1970 through 1992 by using monthly data. The authors utilize the cointegration technique and compare their results with those obtainable from the standard two-step ordinary least squares procedure and the maximum likelihood procedure. Their results, among others, suggest that for most pairwise portfolios there exist potential long-run gains to Australian investors in the sense that there is no evidence of cointegrating relationships. In the second chapter, “Shareholder portfolio decisions in spinoffs”, Russell Gregory-Allen and Wallace Davidson examine the changes in the long-run risk structure of the common stock of firms involved in spinoffs. They compare the market model parameters of the pre-spinoff parent firm to a homemade portfolio of post-spinoff firm and post-spinoff parent firm. The study shows that very little evidence exists to demonstrate that market model parameters shift to benefit shareholders. However, it is concluded that the spinoff transaction allows shareholders to adjust their portfolio, and the authors demonstrate that this possibility can yield rewards to shareholders in some instances. Next, Paul van Aalst and Guus Boender in their chapter "A one-period model for asset-liability matching problem for pension funds" investigate the financial position and risk of pension funds with further examination of underlying interest rate risk, inflation and real wage growth risk, actuarial risk and pension system risk. In the fourth chapter, "An empirical study of the correlation between mutual funds' selectivity and timing performance", Zakri Bello evaluates the performance of domestic and US-based international funds quoted in the over-the-counter market by using two return-generating models and three benchmark portfolios. He asserts that the negative correlation between market timing and stock selection performance, reported earlier in several studies on mutual fund performance, is associated with the particular model used in those studies and not with the leverage characteristics of the mutual fund asset holdings. It is contended that for each of the six investment objective groups, average market timing performance and stock selection performance are either zero or negative.

Part III is an analysis of credit, security volatility and cyclicality. This part begins with the chapter "Finding the factors associated with stock price volatility" by Ariff, Kuhan, Nassir and Shamsher. In this eclectic piece, the authors attempt to find factors that may account for the stock price volatility in both developed markets such as Tokyo and developing markets such as Kuala Lumpur and Singapore. It appears that the factors that drive the volatility are dividend-related variables such as dividend yield or payout ratio, earnings-related variables, debt usage, asset growth rates of the firm, and firm size. These authors finally conclude that their results are consistent with market efficiency and leverage effects on firm value. In the second chapter in this section, "The short-term return structure of rationally (?) priced cyclical securities", John Woods throws into clear relief the recent studies that argue against the possibility of irrational bubbles in security prices and thus call into question the conventional assumption that risk-adjusted required returns are time invariant. He contends that if returns are conditional upon the economic environment, short-term return structures are induced in security prices, which casts doubt upon the rationality of the hypothesized long-term price structures for cyclical securities. Reexamining the concept of constancy of discount rate over time (discussed earlier by Fama, Fama and French, and Chen) as inconsistent with the intertemporal asset pricing model as well as uniform rational risk aversion, Woods considers that valuation analysis yields unforeseen results. He suggests that in an economic downswing funds for current consumption become scarce and time value analysis will then place a higher than normal discount rate on future cash flows; thus in the opposite situation a lower discount rate will appear appropriate. In the next chapter, "Black Monday: what burst the bubble?", Ali Parhizgari, Krishnan Dandapani and Arun Prakash look into the determinants of variability of stock market prices in the wake of the infamous October crash of 1987. In addition to examining the standard economic factors that affect the prices of securities they investigate the effects of market mechanisms and behavioral factors. It is claimed that the build-up of all these factors in tandem and their combined effects can be held responsible for the plummeting conditions in securities in the markets. Keith Chan, Damien McCulough and Michael Skully, in their piece “Australian imputation tax system and dividend reinvestment plans”, use a clinical study to ascertain the effects of dividend reinvestment plans on shareholders returns in the pre- and post-imputation environment. They establish that the daily share return behavior indicates that the announcement to introduce a dividend reinvestment plan is received indifferently by the market before imputation, but is valued positively afterwards. It is also shown that the simple market-adjusted returns model performs as potently as the market model in detecting abnormal returns in the Australian context. Finally, in this part, in “The credit availability theory: a non-monetarist test”, Paul Kutaslovic and Conway Lackman test the non-monetarist aspects of credit availability as it relates to the US commercial loan market. The representations of commercial loan rates and volumes thereof are developed from the data for the period from 1967 through 1988. Credit availability effects are postulated to be stronger during monetary ease than during tight money conditions. It is pointed out that loan rates respond rapidly to changes in the yields of government securities, and hence banks rarely restrict government securities at the expense of private securities.

The fourth part is a highly warranted examination of financial institutions in the wake of several developments in the recent past. Edward Kane starts off with a serious examination of the issue of establishing an efficient private-public partnership for deposit insurance. His chapter, “Establishing an efficient private-federal partnership in deposit insurance”, points to the incentive conflicts inherent in the political and bureaucratic environment, information asymmetry and taxpayer losses, and then highlights deposit insurance as consisting of six components. Through an exhaustive analysis of the deposit insurance mess, a discussion of the benefits from partial privatization, and by exploring a four-parameter partnership plan, he analyzes incentives affected by contract design. Finally, he calls for the unmangling of regulator and ex-regulator assertions. The next chapter is written by Hua Yu, and the title of the chapter is “Bank risk-taking, risk-hedging and the effects of the risk-based bank capital regulation”. In his research, the author develops a model to analyze the impact of bank capital regulation on bank portfolio decision in the presence of interest rate risk and tax. It is demonstrated that both tax liabilities and deposit insurance subsidies are contingent, and they may induce value-maximizing banks to hedge interest rate risk exposure and take positions in their investment portfolios simultaneously. It is argued that the recent risk-based bank capital regulation concentrates on default risk while ignoring interest rate risk. Rama Koundinya, in his chapter “Financial Institutions Reform, Recovery, and Enforcement Act (FIRREA) 1989 and the management of thrifts in the 1990s”, reviews, as the title suggests, the reform, recovery and managerial structures of savings institutions (essentially savings and loan associations). Starting off with a sketch of the events leading to the thrift institutions’ debacles, the author examines the viability of such financial institutions based on the *terra firma* of the FIRREA and the performance strategies in the last decade of the century. The next chapter, "Bank failure and capital adequacy regulation in commercial banks", by Jiachu Song and William Rayburn, uses bank failure prediction models through multiple discriminant analysis, logit analysis and classification trees to test the effectiveness of risk-based capital standards and uniform capital norms in forecasting future bank failures. The authors have chosen a sample of 500 banks closed by the Federal Deposit Insurance Corporation (FDIC) during 1984–9, and examining the data on those banks one and two years prior to their bankruptcies collected from the Call Report they predict bank failures. Their empirical findings also suggest that the risk-based capital ratio is a better indicator of financial distress in commercial banks than the uniform capital ratio. In the last chapter in this section, "Capital regulation and bank portfolio adjustment", Tseng-Chuan, Soushan Wu and Mei-Ying Liu study the impact of capital regulation on bank equity portfolio risk. The analysis is conducted by first examining the effects of both the uniform capital ratio requirement and the new risk-based capital plan in bank portfolio adjustment and its probability of default. Utilizing the mean-variance approach, the analysis shows that traditional uniform capital regulation is an ineffective method for controlling the probability of bank insolvency. The reason is that it ignores the different risk preferences of individual banks and the banks may choose asset portfolios with high risk to retard the efforts of the regulators, whereas the risk-based capital plan can redress this bias toward risk and thus be potentially more effective. This work theoretically corroborates the empirical results of the previous chapter by Song and Rayburn.

The fifth part is the final section of this book. It deals with international investment and corporate finance. Seven articles in this segment cover various facets of issues involving open economies and international finance. Tribhuvan Puri and George Philippatos, in their work "A general equilibrium model of international asset pricing", construct a continuous-time general equilibrium model for multi-good production-exchange open economies with floating exchange rates for pricing international assets by integrating production decisions with portfolio choices. It is shown that the endogenously derived interest rates may exceed or fall short of the average return on world technologies by the amount of a premium determined by productivity, technology, exchange rate, systematic risks and foreign investment. Excess returns on contingent claims in some currency are a linear combination of wealth and some state variable elasticities of the price of a contingent claim, domestic or foreign, in that currency weighted by factor risk premia which are common to all claims. The authors derive a valuation equation for contingent claims. The second chapter in this final part is "The relative valuation of Japanese and US stock markets". Jay Choi investigates the determinants of the relative valuation of Japanese and US stocks within a simple comparative valuation model. The work estimates the impact of fundamental economic variables on a broad range of relative valuation measures including relative stock prices, price-earnings ratios, price-cash flow ratios and price-book value ratios. Among the notable findings is the role of exchange rate and regulatory changes as a determinant of relative stock valuation between the two countries. Mitchell Ratner and Belmont Haydel then present their research under the title of "Cointegration and the relationship between inflation and stock prices in the emerging markets of Latin America: Argentina, Brazil, Chile, Mexico". The chapter uses regression analysis and a cointegration procedure to test for the international Fisher effect in the emerging markets of Latin America. The tests examine the stochastic relationship between inflation and common stock in the countries cited from January 1988 through October 1991. Their results indicate that the Fisher effect is unobservable in those countries, and, in addition, they find a negative relationship between inflation and common stock returns. The next chapter, "From *banca* to *bolsa:* corporate governance and equity financing in Latin America", is by Klaus Fischer, Edgar Ortiz and A.P.Palasvirta. These authors present three basic propositions on the relationship between government intervention, corporate governance, corporate financing and capital market development in Latin America. The propositions are as follows: (i) a necessary but not sufficient condition for the development of an efficient equities market is the existence of an adequate supply of risk-bearing securities with a suitable information set on returns and risk; (ii) the supply of risk-bearing securities and the information set on their values will be sufficient to allow the development of an efficient equities market if the public corporation is the preferred mode of corporate governance for a significant number of firms; (iiia) in the presence of competitive real and financial markets, separation of ownership and control is the preferred form of corporate governance, and (iiib) under market conditions characterized by the presence of government-induced rent opportunities and lack of competition in financial markets, corporate technological innovation is limited, and closed ownership is the preferred form of corporate governance. In the next piece, "Patterns of corporate leverage in selected industrialized countries", Rama Seth reviews the pattern of leveraging by firms across different sectors in selected industrial countries. The author here examines the extent of and the change in leverage of firms sensitive to economic fluctuations. Although this study confirms the earlier finding in the case of the United States that highly indebted firms are concentrated in non-cyclical sectors, it further establishes that the US firms that have been increasing their leverage most rapidly have been concentrated in cyclical sectors. In this study, the relationship between firms' leverage and the earnings sensitivity to output in the United States, Germany, Canada, Australia, Japan and the United Kingdom is spelled out. The sixth chapter in this section is by Lonie, Sinclair, Power and Michaelson, and the title is "External financial pressures on UK companies, 1978–91: an examination of the impact of interest rates in two recessions". The chapter examines the discriminatory effects of high interest rates on UK industries and companies. At the heart of this analysis is a distinction between "interest-sensitive" and "non-interest-sensitive" companies based upon differences in the impact of interest rates on the profits and cash flows of each category of company and further reflected in differences in dividend policies, capital structure, working capital strategies and patterns of capital expenditure over the same time period. In the last chapter, “Financial accounting statements and foreign exchange risk management”, Krishna Kasibhatla, John Malindretos and Luis Rivera-Solis examine the Financial Accounting Standards Board’s Statement Numbers 8 and 52 (FAS 8 and FAS 52) with a view to determining their effects on foreign currency translation, transaction and economic risk exposures of multinational firms. Along with their review of the earlier works in this area, they conduct their own survey of corporate executives, and attempt to ascertain to what extent the executives in fact understand these financial statement rules, and how effectively they hedge their positions against different risk exposures.

It is practically impossible to cover every aspect and every issue on any chosen subject. We do not even pretend to make an attempt to do so. Given the constraints of space and time, we have selected some interesting and useful researches in the area of managerial finance within the framework of the corporate economy. The chapters selected in this book should supplement the existing literature, and hopefully will induce new research for further sharpening our thinking and resolving new issues that may appear on the way.

Part II

Mutual funds, pension funds and portfolio management

1
The long-run gains from international equity diversification
Australian evidence from cointegration tests

D.E.Allen and G.MacDonald

1
INTRODUCTION

The trend towards market deregulation and the greater integration of world capital markets has led to an increased focus on the potential benefits available from the international diversification of investment portfolios.

The formal analysis of the benefits of diversification was pioneered by Markowitz (1952) and Tobin (1958). Grubel (1968) pioneered the application of this analysis to international markets and stimulated a series of further studies such as those of Levy and Sarnat (1970), Solnik (1974) and Lessard (1976).

Work on international diversification from an Australian viewpoint was initiated by Watson and Dickinson (1981) followed by Mitchell *et al.* (1988). Both studies confirmed the benefits of international diversification to Australian investors.

These early studies used *ex post* analysis in which it is assumed that the required inputs (expected returns, variances and covariances) estimated to form internationally diversified portfolios, are known with certainty. This approach ignores the fact that the weights utilized in forming the optimal portfolios may be subject to estimation risk. Variations in expected returns can result from the extension of the sample period and the addition of further observations. Jorion (1985, 1986) proposed the utilization of the Bayes-Stein estimator to control for estimation risk and Eun and Resnick (1988) also applied it in a study of the gains from international diversification in a US context. Izan *et al.* (1991) undertook an Australian study which controls for both estimation risk and foreign currency risk. They concluded that diversification strategies which include the controls dominate those that do not.

A feature of the above approaches is that the windows used to estimate the covariance structures of returns are usually relatively short (maximum length a few years). The Bayes-Stein approach suggests the shrinkage of past averages towards a common value. The evidence suggests that this reduces estimation risk in the case of the minimum variance portfolios but the grand mean may be sample specific and dependent on the sample window. This will not be such a problem for short holding periods but could be misleading if the national indices utilized for the studies are trending together over time and the investor has a long-term investment horizon.

This chapter uses a method which examines the longer term time series behavior of various national market indices in a study of the benefits of international equity diversification. It is of particular relevance to institutions such as superannuation funds and life insurance companies who would wish to hold long-term investment portfolios and may be adopting a policy of passive diversification.

Modern portfolio theory demonstrates that the gains from international portfolio diversification are inversely connected to the correlations in security returns. If national equity markets have a long-term tendency to trend together, the apparent gains from international diversification, as suggested by the previously mentioned studies, may overstate the case for the long-term investor. The increasing tendency towards the globalization and deregulation of world capital markets may have reduced segmentation between the various national markets. This could have led to increased correlation between these markets. Grubel and Fadner (1971), Panton *et al.* (1976) and Taylor and Tonks (1989) have reported a "high" degree of correlation between world equity markets.

Another set of studies which have implications for portfolio analysis analyze the extent to which common factors drive returns in international markets. Cho *et al.* (1986) in an international study of arbitrage pricing theory (APT) report that there may be three or four factors driving equity returns. Campbell and Hamao (1992) use monthly data from the US and Japanese markets in a study of the integration of the two markets using an observable factor model and a single latent variable model. They report that similar variables, including the dividend-price ratio and interest rate variables, help to forecast excess returns in each country. They report some evidence of common movement in expected excess returns across the two countries which is indicative of integration of long-term capital markets. Further evidence is provided by Roll (1992), in a study using daily data from April 1988 through to March 1991. He reports that three separate influences appear to drive national indices in a sample of twenty-four countries: technical aspects of index construction, each country's industrial structure and exchange rate behavior. The relative composition of national industrial structures appears to have the strongest influence on market behavior.

This chapter reports the results of a study of sixteen of the world's financial markets: Australia, Austria, Belgium, Canada, France, Germany, Hong Kong, Italy, Japan, Norway, Singapore and Malaysia, Spain, Sweden, Switzerland, the United Kingdom and the United States. The study is conducted from the viewpoint of an Australian investor. It uses the monthly data taken from the accumulation indices in each of these fifteen external markets which are converted into Australian dollar terms. The degree of integration between these markets is examined using the techniques of cointegration analysis which has had an enormous impact on applied finance and economics in recent years.

Many time series are not stationary in their levels and require differencing once (or more) before they are stationary. Such variables are often referred to as integrated of order one and are denoted I(1) (or I(2) if they require differencing twice for stationarity etc.). The level of these variables can become arbitrarily large or small because there is no tendency for them to revert to their mean level. The finding in economics that many macro-economic time series are I(1) has had a profound impact on applied work since standard techniques such as ordinary least squares require stationarity conditions to be satisfied. The "problem" of unit roots in time series, however, has had its benefits. Economic theory often requires that there should be a stable long-run relationship between the levels of certain economic variables. This means that they cannot wander too far away from each other. The variables may be individually integrated of order one but jointly may be "cointegrated". The existence of cointegration means that even though the variables are not individually stationary one or more linear combinations of them are. Thus, the existence of cointegration between two variables means that they are linked together whilst lack of cointegration suggests the absence of any long-run association. This finding means that I(1) variables which are found to cointegrate have a valid error correcting representation and it has provided a firm basis for the specification and estimation of this popular form of model.

The existence of cointegration between two financial markets suggests that in the long run their returns will be highly correlated, even though they may diverge in the short run. It thus implies that diversifying between them over the long run is not likely to lead to large benefits in risk reduction. Taylor and Tonks (1989) report cointegration between the UK and various international equity markets after 1979. However, Andrade *et al.* (1991) report a lack of cointegration in the same markets suggesting the potential for long-run gains from international diversification.

A potential reason for the disagreement between these two UK studies is the difference in research methods adopted. Taylor and Tonks (1989) use the Engle and Granger (1987) two-step procedure for testing for cointegration whilst Andrade *et al.* use the Johansen (1988) procedure. The latter has the advantage of being more general since it allows the inclusion of deterministic variables (such as dummies etc.) in the cointegrating vector. Furthermore, the Engle and Granger method involves an arbitrary normalizing of the cointegrating vector on one of the variables, therefore implicitly making the assumption that that variable takes a non-zero value. It also has the disadvantages of assuming that the cointegrating vector is unique. The Johansen procedure imposes no such priors and permits an estimation of the number of cointegrating vectors in the system.

If cointegration exists between two financial markets it suggests that one of the markets will help predict the other since a valid error correcting representation will exist. This is a violation of the weak form of the efficient markets hypothesis. Keim and Stambaugh (1986) and Campbell and Hamao (1992) have reported results which imply that certain variables can be used to predict stock returns. Thus, tests for the existence of cointegration can also be interpreted as tests of market efficiency.

2
TIME SERIES PROPERTIES AND COINTEGRATION

The first step in our analysis is to test the data for the presence of unit roots. The most popularly applied test for a unit root is the augmented Dickey—Fuller (ADF) test. This involves running one of the regressions

$$\Delta x_t = \alpha x_{t-1} + \sum_{i=1}^{k} c_i \, \Delta x_{t-i} \tag{1.1}$$

$$\Delta x_t = \mu + \alpha x_{t-1} + \sum_{i=1}^{k} c_i \, \Delta x_{t-i} \tag{1.2}$$

$$\Delta x_t = \mu + \beta t + \alpha x_{t-1} + \sum_{i=1}^{k} c_i \, \Delta x_{t-i} \tag{1.3}$$

and testing the null hypothesis that α=0 in the regression using tabulated values from Fuller (1976). There are several practical problems, however, with the implementation of such tests.

First there is some question as to the correct specification of the equation. If the time series has non-zero drift then estimation should include both a constant and a trend term in the specification (model (1.3)) since, as noted by Perron (1988), in such cases non-inclusion of a trend term will bias the test in favor of non-rejection of the unit root null. However, as pointed out by Dickey *et al.* (1986), if model (1.2) is the correct specification then tests based on (1.2) will have greater power.

A second problem arises owing to the fact that Dickey-Fuller (DF) tests assume error homogeneity and hence may require the introduction of lagged first difference terms on the right-hand side to whiten the residuals. This introduces the question of the required lag order (the size of k). In what follows we carry out the test for a wide range of lags to check the robustness of the statistics. Where there is some doubt we carried out tests to establish the required lag order. This was done by estimating the model with twelve lags initially and then carrying out a sequential reduction of the lag order by testing the model with n lags against the model with n–1 lags. If we were unable to reject the restriction we then tested the model with n–1 lags against n–2 lags until a restriction was rejected.

Table 1.1 reports DF and ADF tests based on both models (1.2) and (1.3) above. Table 1.2 presents Φ2 and Φ3 tests. These are joint hypothesis tests: Φ3 tests the restriction $(\mu, \beta, \alpha)=(\mu, 0, 0)$ in model (1.3) whilst Φ2 tests $(\mu, \beta, \alpha)=(0, 0, 0)$. Our testing procedure here was firstly to look at the Φ3

Table 1.1 ADF tests based on equations (1.2) and (1.3)

	Australia	*Austria*	*Belgium*	*Canada*	*France*	*Germany*	*Hong Kong*	*Italy*	*Japan*	*Norway*	*Singapore and Malaysia*	*Spain*	*Sweden*	*Switzerland*	*UK*	*USA*
Equation (1.21)																
Levels																
DF	0.40	−0.00	0.47	−0.42	0.53	0.19	−0.71	0.07	−0.92	−0.65	−1.16	0.34	0.36	0.07	0.37	0.77
ADF (1)	0.34	−0.20	0.37	−0.42	0.41	0.12	−0.75	−0.03	−0.96	−0.71	−1.23	0.24	0.22	−0.02	0.26	0.57
ADF (2)	0.42	−0.28	0.35	−0.31	0.40	0.05	−0.65	0.01	−0.96	−0.72	−1.20	0.31	0.18	−0.07	0.37	0.61
ADF (3)	0.44	−0.32	0.36	−0.37	0.25	−0.01	−0.64	−0.08	−0.94	−0.76	−1.23	0.35	0.15	−0.10	0.28	0.64
ADF (4)	0.28	−0.34	0.30	−0.51	0.13	−0.21	−0.62	−0.17	−1.15	−0.72	−1.35	0.18	0.06	−0.29	0.12	0.56
ADF (8)	0.40	−0.40	0.05	−0.59	0.15	−0.44	−0.54	−0.50	−1.31	−0.57	−1.42	−0.19	−0.04	−0.38	0.20	0.27
ADF (12)	0.15	0.60	−0.16	−0.26	−0.04	−0.73	−0.64	−0.83	−1.50	−0.64	−1.52	0.63	0.21	−0.67	0.01	0.47
First difference																
DF	−15.85**	13.90**	−15.08**	−15.63**	−14.73**	−16.24**	−14.77**	−14.98**	−15.80**	−14.17**	−14.26**	−15.10**	−15.04**	−15.59**	−14.95**	−15.25**
AD	−11.	−10.	−10.	−12.	−11.	−11.	−11.	−11.	−10.	−11.	−11.	−11.	−11.	−11.	−12.	−10.

	Australia	*Austria*	*Belgium*	*Canada*	*France*	*Germany*	*Hong Kong*	*Italy*	*Japan*	*Norway*	*Singapore and Malaysia*	*Spain*	*Sweden*	*Switzerland*	*UK*	*USA*
F (1)	96**	09**	98**	02**	05**	17**	61**	31**	83**	19**	26**	33**	45**	11**	40**	94**
ADF (2)	−9.79**	−8.39**	9.19**	−9.00**	−8.32**	−8.77**	−9.39**	−8.65**	−8.40**	−8.22**	−10.27**	−9.60**	−8.93**	−8.98**	−9.10**	−9.24**
ADF (3)	−8.02**	−7.16**	7.78**	−8.35**	−7.11**	−6.92**	−8.45**	−7.17**	−7.14**	−8.24**	−8.11**	−7.71**	−8.10**	−7.65**	−7.71**	−8.23**
ADF (4)	−7.56**	−5.88**	7.21**	−6.92**	−6.42**	−6.83**	−7.54**	−6.05**	−6.00**	−7.16**	−7.34**	−6.67**	−7.15**	−6.68**	−7.41**	−6.78**
ADF (8)	−4.91**	4.62**	−4.10**	−4.69**	−4.71**	−4.57**	−5.20**	−3.98**	−3.70**	−5.00**	−5.70**	−4.32**	−5.18**	−4.41**	−4.83**	−4.75**
ADF (12)	−4.11**	−3.98**	−3.20**	−5.21**	−3.59**	−3.46**	−4.03**	−2.96**	−3.12**	−4.24**	−4.26**	−3.16**	−4.07**	−3.13**	−4.44**	−4.07**
Equation (1.3)																
Levels																
DF	−2.93	−1.48	−1.38	−2.28	−1.96	−2.36	−2.80	−1.98	−0.94	−2.03	−2.72	−0.95	−2.20	−2.21	−2.29	−2.11
ADF (1)	−2.92	−1.73	−1.47	−2.42	−2.13	−2.28	−3.12	−2.09	−0.98	−2.35	−3.17	−1.04	−2.20	−2.24	−2.38	−2.00
ADF (2)	−2.88	−1.79	−1.46	−2.35	−2.07	−2.26	−2.95	−2.05	−1.04	−2.24	−3.05	−1.04	−2.05	−2.23	−2.15	−2.15
AD	−2.89	−1.82	−1.44	−2.50	−2.18	−2.35	−2.99	−2.16	−1.15	−2.54	−2.8	−0.97	−2.14	−2.26	−2.29	−2.13

	Australia	*Austria*	*Belgium*	*Canada*	*France*	*Germany*	*Hong Kong*	*Italy*	*Japan*	*Norway*	*Singapore and Malaysia*	*Spain*	*Sweden*	*Switzerland*	*UK*	*USA*
F (3)																
ADF (4)	−2.67	−1.90	−1.45	−2.20	−2.15	−2.47	−2.90	−2.19	−1.09	−2.25	−3.09	−0.97	−1.93	−2.19	−2.15	−1.90
ADF (8)	−2.91	−2.11	−1.69	−2.63	−2.14	−2.69	−2.96	−2.23	−1.46	−2.37	−2.96	−1.19	−2.00	−2.59	−2.13	−2.11
ADF (12)	−2.76	−2.46	−2.00	−2.48	−2.38	−3.01	−3.74**	−2.38	−1.89	−2.78	−3.74**	−1.50	−1.97	−3.03	−2.41	−2.38

Notes: All variables in natural logs.
*, significant at the 10 percent level; **, significant at the 5 percent level.

Table 1.2 Φ2 and Φ3 tests based on equation (1.3)

	Australia	*Austria*	*Belgium*	*Canada*	*France*	*Germany*	*Hong Kong*	*Italy*	*Japan*	*Norway*	*Singapore and Malaysia*	*Spain*	*Sweden*	*Switzerland*	*UK*	*USA*
Levels																
Φ2 (0)	4.90**	3.67	5.33**	4.11*	4.21*	4.62*	4.71*	2.63	4.53*	3.24	4.54*	2.28	5.59**	4.89**	4.53*	5.54**
Φ2 (1)	4.73*	3.06	4.55*	4.03	3.87	4.43*	4.91**	2.61	4.18*	3.21	4.96**	2.04	4.89**	4.58*	4.23*	4.80**
Φ2 (2)	4.85**	2.93	4.36*	4.11*	3.80	4.23*	4.69*	2.59	3.78	3.18	4.82**	2.13	4.87**	4.44*	4.46*	4.79**

	Australia	*Austria*	*Belgium*	*Canada*	*France*	*Germany*	*Hong Kong*	*Italy*	*Japan*	*Norway*	*Singapore and Malaysia*	*Spain*	*Sweden*	*Switzerland*	*UK*	*USA*
Φ2 (3)	4.92**	2.86	4.29*	4.00	3.54	4.07*	4.70*	2.62	3.28	3.28	4.74**	2.19	4.56*	4.30*	4.18*	4.81**
Φ2 (4)	4.28*	2.78	4.01	3.94	3.34	3.83	4.63*	2.54	3.31	3.15	5.13**	1.91	4.50*	4.13*	3.84	4.62*
Φ2 (8)	4.80**	2.69	2.92	3.80	3.28	3.79	4.58*	2.20	2.55	3.08	5.18**	1.45	3.83	3.90	3.80	3.62
Φ2 (12)	4.15*	2.88	2.62	3.91	3.20	4.17*	5.82**	2.23	2.54	3.43	6.27**	1.31	3.35	4.32*	3.51	4.00
Φ3 (0)	5.39*	1.27	1.47	2.61	2.77	3.16	3.92	3.11	0.70	2.06	3.82	1.28	2.91	2.66	3.26	3.38
Φ3 (1)	5.21	1.61	1.52	2.93	3.04	2.89	4.87	3.24	0.76	2.77	5.15	1.32	2.77	2.67	3.37	2.80
Φ3 (2)	5.19	1.70	1.49	2.78	2.86	2.801	4.36	3.16	0.81	2.52	4.77	1.46	2.39	2.62	2.90	3.22
Φ3 (3)	5.24	1.74	1.47	3.16	2.96	2.98	4.47	3.33	0.89	3.22	4.09	1.38	2.58	2.67	3.14	3.22
Φ3 (4)	4.29	1.89	1.42	2.43	2.75	3.16	4.20	3.27	1.02	2.52	4.98	1.11	2.04	2.43	2.65	2.55
Φ3 (8)	5.17	2.32	1.67	3.47	2.75	3.67	4.40	2.89	1.57	2.83	5.18	1.06	2.12	3.38	2.64	2.71
Φ3 (12)	4.35	3.08	2.17	3.12	3.16	4.53	7.05**	2.99	2.54	3.88	7.27**	1.28	2.00	4.60	3.18	3.63

Notes: All variables in natural logs.
*, significant at the 10 percent level; **, significant at the 5 percent level.

statistic—if it was significant and indicated rejection of the unit root null testing could end here. Note that this tests the unit root against the alternative of trend stationarity. If, however, the statistic was not significant we observed the Φ2 test. If this was significant, we took this as indicating non-zero drift in which case model (1.3) is probably the correct model and we looked at the DF and ADF tests based on this model. If the test was not significant we looked at the DF and ADF tests based on model (1.2) which would have greater power in the absence of drift.

Looking first at the Φ3 tests in Table 1.2 we can see that there are only three significant statistics, for Australia at lag 0, for Hong Kong at lag 12 and for Singapore/Malaysia at lag 12. In the case of Australia this was the only significant statistic and was only just significant at 10 percent. However, for Hong Kong and for Singapore/Malaysia all of the Φ3 test statistics were significant at lags 10–12. In both cases several of the test statistics were significant at the 5 percent level and above. Since the Φ2 statistic was significant for Singapore/Malaysia and Hong Kong at all lags the relevant DF and ADF tests are those based on model (1.3). In the case of Hong Kong the ADFs based on model (1.3) were significant at the 5 percent level with lag orders of 10, 11 and 12, and at lag orders 11 and 12 for Singapore and Malaysia. Carrying out tests on the lag order suggested a lag length of 10 for Hong Kong and a lag length of 11 for Singapore/Malaysia.[1] Thus for these two series we are inclined to reject the unit root null and classify them as an I(0), trend stationary process.

For all the other series none of the Φ3 tests was significant. In the case of Australia, Belgium, Germany, Sweden, Switzerland, the United Kingdom and the United States there was some evidence of non-zero drift. However, looking at DF and ADF tests based on either model (1.2) or (1.3) in Table 1.1 none of the series can reject the unit root in levels. On taking first differences all the series strongly reject the unit root at all lags at the 5 percent level. Thus the tests appeared very robust to the lag length selection (and indeed the model selected). Our conclusion is therefore that the series are integrated of order 1 (I(1)) giving support to the assumption of weak form efficiency in these markets.

Having established that most of the series are I(1) we now move on to test for cointegration amongst these series. Johansen estimation has the advantage of providing estimates of all the cointegrating vectors which exist among a set of time series and is based on the error correction representation of the VAR(p) model:

$$\Delta x_t = \mu + \Gamma_1 \Delta x_{t-1} + \Gamma_2 \Delta x_{t-2} + \cdots + \Gamma_{p-1} \Delta x_{t-p+1} + \Pi x_{t-p} + B z_t + u_t \tag{1.4}$$

where x_t is an $m\times1$ vector of I(1) variables, z_t is an $s\times1$ vector of I(0) variables Γ_1, ..., Γ_{p-1}, Π are $m\times m$ matrices of unknown parameters, B is an $m\times s$ matrix and $u_t \sim N(0, \Sigma)$. The Johansen procedure is based on maximum likelihood estimation of this equation and centres on consideration of the matrix Π. The right-hand side of the equation will be stationary only if the components of Πx_{t-p} are stationary (the left-hand side will be stationary since we are considering the case where x contains only I(l) variables). Three cases of interest arise: (i) if Π is of full rank m then all the elements of x are stationary; (ii) if rank Π=0 then there are no combinations of the x which are stationary, that is, there are no cointegrating vectors, (iii) if rank Π is r such that $0<r<m$ then the x variables do cointegrate and there exist r cointegrating vectors.

Table 1.3 reports the results of tests for cointegration between Australia and each of the other countries. Prior testing of the vector autoregression (VAR) was carried out to ensure that the residuals were reasonably white.[2] In most cases a high order of lags (up to 8) was required, and a dummy variable was introduced for the October 1987 crash. The Bera-Jarque test typically proved marginally significant even after introducing the October 1987 crash dummy but the residuals were symmetric around zero and the non-normality was the result of a few outliers. Since most of the series have an upward trend we estimated the model under the assumption of a trend in the variables but no trend in the data generating process. As noted by Hall (1991) the choice of the lag order in the VAR is of some importance in the sense that too low an order is likely to lead to problems with serial correlation whereas too high an order could potentially lead to small sample problems. In tests on UK consumption and income data he finds that the Johansen test statistics are sensitive to the lag length chosen and suggests that applied researchers either report test statistics for a range of lags or choose the lag length in the VAR using the minimum test statistic as a lag length selection criterion. We follow his suggestion of reporting results for a range of lags.

As can be seen from Table 1.3 there is some evidence of cointegration between Australia and Canada, France, Germany, Switzerland and the United Kingdom. In the case of the United Kingdom and Canada the test statistics are significant at the 5 percent level or higher at all lags; Germany and Switzerland produce test statistics which are significant at the 10 percent level or better at all lags. The weakest case is that of France which produces test statistics which are significant at the 10 percent level or better at most lags, however, lag 6 produces test statistics which are not significant. In all other cases there are either no significant test statistics (Austria, Belgium, Italy, Spain, Sweden) or significant test statistics at only one or two lags (Japan, United States). Thus we suggest that these pairwise portfolios show no evidence of cointegration.

The implications of these results are that there are no gains to the Australian investor from pairwise portfolio diversification in the five countries (France, Germany, Switzerland, the United Kingdom and Canada). However it must be noted that this result must be taken in context. The finding of a cointegrating vector between the two series

Table 1.3 Johansen estimation results for pairwise portfolios

k (length of lag in VAR)	*Austria*	*Belgium*	*Canada*	*France*	*Germany*	*Italy*	*Japan*	*Norway*	*Spain*	*Sweden*	*Switzerland*	*UK*	*USA*
Levels													

k (length of lag in VAR)		*Austria*	*Belgium*	*Canada*	*France*	*Germany*	*Italy*	*Japan*	*Norway*	*Spain*	*Sweden*	*Switzerland*	*UK*	*USA*
8	*E*	7.66	8.02	21.92**	15.44**	19.42**	7.42	14.4*	13.69*	5.45	9.17	21.62**	23.96**	10.80
	T	8.54	8.82	21.92**	16.03*	19.46**	8.83	14.67	15.04*	6.13	9.62	21.65**	24.32**	11.30
7	*E*	6.77	7.64	20.38**	13.46*	17.26**	7.80	13.33*	13.26*	5.94	8.94	20.21**	20.42**	10.74
	T	8.07	8.62	20.39**	13.91	12.27*	9.20	13.54	14.48	6.51	9.42	20.22**	20.76**	11.27
6	*E*	6.20	6.83	16.33**	11.98	16.05**	6.66	11.39	12.13	6.82	8.82	18.58**	23.76**	10.53
	T	7.27	7.74	16.33**	12.20	16.05*	7.88	11.75	13.20	7.42	9.40	18.61**	24.05	11.01
5	*E*	6.05	6.85	16.37**	13.21*	15.95**	8.21	11.36	11.99	6.74	8.42	17.58**	23.76**	10.54
	T	7.08	7.73	16.41**	13.69	15.97*	9.25	11.86	13.11	7.22	8.96	17.66*	24.03**	11.14
4	*E*	7.63	9.70	20.95**	15.58**	18.18**	7.55	12.53	14.18*	6.79	8.80	21.11**	26.11**	13.67*
	T	8.68	10.31	21.04**	15.96*	18.24**	8.75	13.11	15.54	7.27	9.29	21.26**	26.32**	14.34
3	*E*	7.18	10.21	21.38**	15.65**	16.90**	8.62	12.22	13.53	7.44	8.79	19.67**	23.92**	14.38*
	T	8.42	10.87	21.53**	16.31*	16.92*	9.67	12.63	15.01	7.80	9.12	19.77**	24.27**	14.95
2	*E*	6.03	9.29	19.83**	14.74*	15.72**	8.22	11.91	12.05	6.50	8.02	16.98**	21.37**	13.63*
	T	7.09	9.76	19.93**	15.29	15.76**	9.39	12.37	13.32	6.99	8.24	17.15*	21.72**	14.15

k (length of lag in VAR)		*Austria*	*Belgium*	*Canada*	*France*	*Germany*	*Italy*	*Japan*	*Norway*	*Spain*	*Sweden*	*Switzerland*	*UK*	*USA*
1	*E*	6.46	12.01	23.86**	19.57**	20.28**	8.53	13.33*	12.08	7.16	10.66	23.54**	25.00**	17.86**
	T	7.72	12.53	23.90**	20.10**	20.29**	10.22	13.69	13.51	7.81	10.89	23.65**	25.35**	18.57**

Notes: For each lag length we present test statistics based on the maximal eigenvalue *E* and trace *T* of the stochastic matrix *Π* in equation (1.4) (see Johansen 1988). All variables are in natural logs.

*, significant at the 10 percent level; **, significant at the 5 percent level.

demonstrates that over the sample the two series have moved together in an equilibrium relationship. The term equilibrium in the cointegration literature simply means that the two series have maintained a constant relationship to each other which has been maintained throughout the sample. It does not mean that there have not been subperiods during which the two indices have moved apart. Also since cointegration implies causality these markets must be seen as violating weak form efficiency since one of the markets can help forecast the other. In all of the other cases the rejection of cointegration between the pairs of series implies that there are sufficient long-run differences between the markets for an Australian investor to gain by portfolio diversification in Austria, Belgium, Italy, Japan, Norway, Spain, Sweden and the United States.

As a further test on the robustness of the results we carried out tests for cointegration between the pairs which the Johansen estimation showed to be cointegrated using the more familiar Granger-Engle two-step procedure. This involved running a "cointegrating" regression of the form

$$X_t = \alpha + \beta Y_t + u_t \tag{1.5}$$

and then carrying out DF and ADF tests on the residuals u_t. If they could reject a unit root the conclusion would be that the series *X* and *Y* were cointegrated. As can be seen from Table 1.4, there is clear evidence of cointegration between the Australian market and those of the United Kingdom and Canada. In the other cases the evidence is less clear cut with France able to reject the null of non-cointegration at the 10 percent level. For Switzerland and Germany the applied researcher would be unable to reject the null of no cointegration at the 10 percent level. Thus these examples provide a source of disagreement between the two techniques since both Switzerland and Germany showed reasonably strong and robust evidence of cointegration in the Johansen framework. We therefore find that the fact that Andrade *et al.* (1991) and Taylor and Tonks (1989) came to different conclusions regarding the cointegration between the UK and

Table 1.4 Unit root tests on residuals from "cointegrating regressions"

	Canada	*France*	*Germany*	*Switzerland*	*UK*
Estimate of β	1.04	0.83	0.85	0.91	0.78
DF	−4.0 (12.5)	−3.5 (10.5)	−2.7 (15.4)	−2.9 (10.1)	−4.2 (6.6)
ADF(1)	−3.6 (9.7)	−3.3 (10.2)	−2.5 (13.4)	−2.7 (7.7)	−4.1 (8.5)
ADF(2)	−3.5 (9.6)	−3.3 (10.1)	−2.5 (13.4)	−2.7 (7.3)	−4.1 (7.4)
ADF(3)	−3.5 (13.7)	−3.2 (13.7)	−2.4 (18.5)	−2.7 (10.6)	−4.0(12.2)
ADF(4)	−3.4 (12.9)	−3.1 (12.5)	−2.7 (6.4)	−2.9 (8.7)	−4.2 (13.3)
ADF(8)	−3.5 (6.0)	−3.0 (9.3)	−2.9(6.2)	−2.8 (6.9)	−4.3 (14.1)
ADF(12)	−2.8 (7.8)	−3.1 (9.9)	−3.1 (7.7)	−2.9 (9.9)	−4.7 (9.7)

Notes: 5 percent significant level: −3.36.
Figures in parentheses are LM[$\chi^2(12)$] test for residual correlation.

other markets is reflected in our study when we apply the two techniques used in the different papers.

Given the weakness of the Johansen results for France (insignificant test statistics at lag 6) and the fact that the ADF results in Table 1.4 suggest that it can only reject the null of no cointegration at the 10 percent level we are inclined to reject cointegration between the Australian market and the French market. Thus Hall's (1991) warning regarding the sensitivity of the tests and the need to establish robust results appears to be valid in this case.

In the cases of Germany and Switzerland, given the relative strength and robustness of the Johansen estimation results we are inclined to accept that these markets do cointegrate with the Australian market and suggest that the conflict with the result above, in Table 1.4, lies with the power of the test procedure in the Granger-Engle methodology.

One potential problem with the results thus far is that they only consider bivariate portfolios and clearly the Australian investor would be likely to consider a wider portfolio in making investment decisions. Our response to this is twofold. In the first instance the bivariate results do yield useful information in the consideration of wider portfolios as they demonstrate which series are moving together in the long run. Thus our results suggest that a portfolio including Australia, the United Kingdom and Canada would make little sense since the Australian market moves in a cointegrating relationship with both the UK and Canadian markets. Second and from a more practical point of view given our data set the arbitrary selection of a portfolio and the carrying-out of cointegration tests might lead to mistaken inferences being drawn. To illustrate the point we select three simple portfolios. The first portfolio (portfolio A) included Australia, Japan and the United States, the three major markets from the perspective of an Australian investor. The second portfolio (B) included Australia, Japan, the United States and the United Kingdom, whilst the third portfolio (C) included Australia, the United Kingdom, the United States and Canada.

The results, in Table 1.5, show that there is no evidence of cointegration in the case of portfolio A, suggesting gains for the Australian investor from a three-country diversification. Portfolios B and C did show evidence of

Table 1.5 Johansen cointegration test results for three sample portfolios

	Portfolio A	*Portfolio B*	*Portfolio C*
r=0	16.17 (21.07)	30.91 (27.14)	28.08 (27.14)
r=1	7.66 (14.9)	10.96 (21.07)	22.37 (21.07)
r=2	0.45(8.18)	8.55 (14.9)	5.86 (14.9)
r=3		0.58 (8.18)	0.04(8.18)
r=4			

*Notes: T*ests based on maximum eigenvalue of stochastic matrix Π in equation (1.4). Figures in parentheses are 95 percent critical values.

cointegration with the tests suggesting a single cointegrating vector in portfolio B and two cointegrating vectors in portfolio C. The estimates of *β,* the cointegrating parameters for portfolio B, based on the largest eigenvalue (normalized on Australia) were

$$\text{AUS} = 0.949\text{UK} - 0.276\text{US} + 0.069\text{JAP} \tag{1.6}$$

For portfolio C the two vectors were

$$\text{AUS} = 1.074\text{UK} - 0.027\text{CANADA} - 0.326\text{US} \tag{1.7}$$

and

$$\text{AUS} = -0.675\text{UK} + 1.516\text{CANADA} + 0.546\text{US} \tag{1.8}$$

Thus both sets of results might be interpreted to imply that there were no gains from portfolio diversification in these portfolios. However, for portfolio B a likelihood ratio test for the exclusion of Japan and the United States (i.e. imposing zero restrictions on their parameters) yielded LR(χ^2(2))=1.97 which is not significant, suggesting that the restriction cannot be rejected and that the vector was simply picking up the cointegration between Australia and the United States. A similar test for a zero restriction on the United Kingdom yielded LR(χ^2(1))=14.65 which is clearly significant and hence rejects the restriction.

In the case of portfolio C tests based on the hypothesis that the two cointegrating vectors were subject to zero restrictions on the parameters yielded the result that we could reject zero restrictions on Australia, Canada and the United Kingdom but could not reject a zero restriction on the United States (LR (χ^2(2))=3.61). Thus drawing the conclusion that portfolio diversification would not be profitable in this case would be invalid: the US market shows no evidence of cointegration with the Australian market and the test is picking up cointegration between Australia and Canada and the United Kingdom.

Thus we make the point that finding that a set of say n variables exists which yields a cointegrating relationship does not imply that a subset $n–k$ of these variables will also cointegrate. In the case of portfolio diversification where we are using the technique simply to test for long-run relationships in data and are imposing no theory on the relationships, then simple observation of the result that a number of variables cointegrate may suggest that there are no gains from portfolio diversification. However, the results above show that the dropping of one or more of the variables may lead to a rejection of cointegration and hence imply gains from diversification. Thus analysis of more extensive portfolios and the drawing of conclusions regarding portfolio diversification must be carried out with great care.

3
CONCLUSIONS

Our results suggest that for most pairwise portfolios there exist potential long-run portfolio diversification gains to the Australian investor in the sense that there is no evidence of cointegrating relationships. Two clear exceptions to this appear to be the pairwise portfolios of Australia and Canada and Australia and the United Kingdom which show robust evidence of cointegration over the sample period, hence indicating that diversification in these two cases would not be profitable and that the markets are weakly inefficient. The Johansen estimation results also suggest that the Australian market is cointegrated with the markets of Germany and Switzerland. Our results show that the potential exists for conflicting results from the traditional Granger-Engle two-step cointegrating methodology and the more recently developed Johansen estimation procedure with the possible source of conflict being the power of the unit root tests in the two-step procedure.

In one other case, that of France, we are inclined to reject cointegration and suggest that Hall's (1991) warning that the Johansen estimation results should be tested for robustness by estimating cointegrating regressions over a range of lag lengths in the VAR, or indeed using the minimum test statistic VAR length, is one that the applied researcher note. Our results demonstrate the need to test the cointegrating regressions over a range of lags using the Johansen procedure as the results in some cases did seem to be sensitive to the lag chosen.

Finally we note that in the consideration of portfolios containing a range of assets care needs to be taken in drawing conclusions regarding the benefits or otherwise of portfolio diversification using cointegration techniques. Our suggested procedure would be to use the information from bivariate portfolios in building larger portfolios and to carry out tests for zero restrictions at each stage.

NOTES

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1 For Hong Kong a Lagrange multiplier test for a zero restriction on lag 10 was significant at the 5 percent level and for Singapore/Malaysia the test for a zero restriction at lag 11 was significant at 8 percent.
2 We used Lagrange multiplier tests for residual correlation and a Bera-Jarque test for normality of the residuals.

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2
Shareholder portfolio decisions in spinoffs

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1
INTRODUCTION

Business combinations through merger and acquisition have been widely studied for a number of years, but business divestiture has received relatively less attention. A number of studies demonstrate that shareholder wealth is created when corporate spinoffs, selloffs and divestitures occur for other than regulatory reasons (Boudreaux 1975; Kudla and McInish 1981; Hite and Owers 1983; Miles and Rosenfeld 1983; Schipper and Smith 1983; Alexander *et al.* 1984; Hearth and Zaima 1984; Hite *et al.* 1984; Montgomery *et al.* 1984; Jain 1985; Davidson and McDonald 1987, and Tehranian *et al.* 1987). These results seem to indicate that spinoffs, selloffs and divestiture cause the market to revalue firms.

Most spinoff research focuses on shareholder returns on the parent firm, ignoring the spinoff firm. Cusatis *et al.* (1993) take an approach similar to ours: they combine parents and spinoffs into portfolios after the actual spinoff date. However, they examine abnormal returns whereas we examine structural shifts. In related research, Choi and Philippatos (1983) evaluated mergers and acquisitions by considering the bidder and target as a portfolio and by measuring the abnormal returns of this portfolio to determine if the changes in corporate control were synergistic. Davidson *et al.* (1987) utilized a similar portfolio approach to measure changes in the portfolio's market model parameters. Our chapter treats spinoff companies in a similar manner: prior to spinoff there is one company; following spinoff there is a portfolio.

In addition, the previously mentioned divestiture studies examine the announcement period effects, which is a short-run phenomenon. We test whether the spinoff changes the longer run risk-return relationship. Since a shareholder owns the parent firm before spinoff and both the parent and the spinoff firm after the spinoff, the assets they own are the same but the ownership structure is different. If the shareholder makes no changes in his/her newly created portfolio (i.e. simply holds the two new firms in the same weights as specified by the company), any change in the risk-return relationship would imply that the spinoff had somehow affected value. Theoretically, there should be no change if the firm does not change its economic activity following the spinoff.

However, it is also possible that the shareholder may be able to affect portfolio return by altering the structure of the portfolio. We also test whether return can be increased, holding risk constant, by reshuffling the weights of the two firms after the spinoff and creating a different portfolio. So we are testing whether or not ownership structure influences the overall risk of essentially the same assets.

2
RESEARCH HYPOTHESIS

Sharpe (1964) developed the capital asset pricing model (CAPM) to describe the positive implications of modern portfolio theory; that is, what are the equilibrium conditions if investors use normative models such as his diagonal model. If individual securities are correlated with the market, then the only relevant risk of a security is its market risk—its beta. The response of a portfolio to changes in the market is a weighted average of the responsiveness of the securities in the portfolio. Therefore the beta coefficient of the portfolio is the weighted average of the betas of the individual securities:

$$\beta_{\mathrm{p}} = \sum_{i=1}^{n} \beta_i w_i \tag{2.1}$$

where β_{p} is the portfolio beta; β_i is the beta of security *i;* and w_i is the proportion of the portfolio in security *i*.

A spinoff may be viewed as one company dividing to form two. Assuming no change in risk, the beta of the pre-spinoff firm should equal the beta of a homemade portfolio of the parent and spinoff firms.

Presumably spinoffs are made for the benefit of the firm's shareholders. Spinoffs may result in a transfer of wealth from bondholders to shareholders (Galai and Masulis 1976) but empirical evidence (Schipper and Smith 1983) does not support this hypothesis. While Hite and Owers (1983) find different levels of excess returns across groups classified by stated reasons for spinoff, they conclude that spinoffs cause a revaluation of the firms' shares.

These studies have considered only the short-run impact of spinoff announcements, rather than their long-run impact. In addition, these studies only examined the effect on parent firms. Our approach is different in that we examine the risk of both the parent firm and the spinoff firm in a portfolio. Since the post-spinoff shareholder owns shares in both firms, this approach measures the total impact on risk.

3
METHODOLOGY

Sample

We located a sample of spinoffs over the years 1978–1987 by reviewing *Moody's Dividend Record* to determine which companies issued stock dividends of other firms. We then traced this list to *Wall Street Journal* (WSJ) announcements to ensure that the activity described in the *Record* was a spinoff.

Firms included in the sample must have been listed on the New York Stock Exchange or the American Stock Exchange for a period of at least 130 days before the first announcement to 130 days after the actual spinoff, with no more than five days of missing returns. This restriction permits the use of the CRSP tapes.

We divided the total sample into two groups. Group 1 includes firms whose parent and spinoff firms are both listed on the CRSP tapes. This is the group for which we form portfolios. There are thirty-five parent and spinoff firms in this group, which we call the portfolio group. The portfolio group has a relatively small sample size, but few spinoff firms are actually large enough to be listed on one of the major exchanges. Group 2 includes sixty-nine firms that did not show a CRSP-listed spinoff company but instead only listed the parent firm. We designate these firms to be the parent-only group.

Control sample

For each parent firm in both groups, we identified a matched control firm: a company in the same industry (based on the three-digit Standard Industrial Classification code), of the same approximate total equity size and similarly financed. Where possible, we identified controls using COMPUSTAT data for comparable total market value of equity and book value of debt-to-equity. This was possible for ninety-five firms. For the remaining nine firms we used a slightly different, although consistent, procedure. For those firms, we used the *Value Line* "Industry Survey" preceding the spinoff announcement to identify a control firm with similar size and debt characteristics.

Portfolio approach

As group 2 contains only parent firms, both pre- and post-spinoff returns come exclusively from the parent. For group 1, the portfolio group, pre-spinoff returns come from the parent and post-spinoff returns come from a portfolio of parent firm and spinoff firm returns.

The homemade post-spinoff portfolio returns are weighted in two ways: (i) in proportion to the actual spinoff weights established by the firm at the time of the spinoff, and (ii) in the weight that maximizes return while leaving variance unchanged. These approaches are useful in examining spinoffs because pre-spinoff shareholders own shares in both the parent firm and the spinoff firm after the spinoff. Each shareholder may keep shares in both companies in the proportion established by the company in the spinoff or may adjust the portfolio in some other proportion.

Event date

We define the first WSJ announcement date as t=0, and the actual spinoff date as t=n. To reduce heuristic noise we windowed 30 days before day 0 until 30 days after day n. Since the time period between day 0 and day n varies in each case, the length of our test period varies from firm to firm. The announcement-to-spinoff lag averaged 84 trading days but ranged from 14 days to 253 days. The pre-spinoff period regressions were estimated from t=−130 to t=−30 and the post-spinoff regressions from t=n+30 to t=n+130.

Detecting parameter shifts

To determine whether there is a change in the long-run risk-return relationship when the post-spinoff portfolio is weighted as specified by the firm, we estimate regressions using the market model for firm i in periods 1 and 2 as

$$\begin{aligned} R_{i_t} &= \alpha_{i_1} + \beta_{i_1} R_{m_t} + \varepsilon_{i_t} \qquad t = -130, \ldots, -30 \\ R_{i_t} &= \alpha_{i_2} + \beta_{i_2} R_{m_t} + \varepsilon_{i_t} \qquad t = n + 30, \ldots, n + 130 \end{aligned} \tag{2.2}$$

and our hypotheses are

$$H_0^1\colon\ \beta_{i_2} - \beta_{i_1} = 0$$

versus

$$H_1^1\colon\ \beta_{i_2} - \beta_{i_1} \neq 0$$

and

$$H_0^2\colon\ \alpha_{i_2} - \alpha_{i_1} = 0$$

versus

$$H_1^2\colon\ \alpha_{i_2} - \alpha_{i_1} \neq 0$$

If is significantly different from zero, then the underlying risk structure of the firm has changed substantially. If $\alpha_{i_2} - \alpha_{i_1}$ is significantly different from zero, then the market model line would shift up or down and may be interpreted similarly to the concept of an abnormal return. However, in our tests, we found few instances in which $\alpha_{i_2} - \alpha_{i_1}$ was different from zero.

We estimate the regressions using a special case of Zellner's (1962) seemingly unrelated regressions (SUR), and test H_0 using a related F test, both of which allow the variance of the residuals to change across the event date.[1] Using these procedures, as opposed to, say, the often used Chow (1960) or Gujarati (1970) methods, frees us from the restrictive assumption that firm-specific risk (residual variance) has not changed as a result of the spinoff.[2]

Once we have determined which firms exhibit beta shifts, we need to know whether the number of shifts observed is significant. To illustrate this, consider what it means when we use a 5 percent significance level to "count" the beta shifts: we would *expect* to see five significant shifts out of 100 firms, just as a result of pure chance. Therefore we test whether the proportion of observed shifts is significant using a normal approximation to the binomial distribution (Wyatt and Bridges 1967). The statistic is

$$Z = \frac{p - p'}{[p'q'/(n-1)]^{1/2}} \tag{2.3}$$

where p is the proportion of observed shifts, p' is the expected proportion (we used p'=5 percent), q' is $1-p'$ and n is number of firms in the sample. Z is distributed standard normal.

This procedure makes an implicit assumption of beta stationarity, that is,

$$E(p - p') = 0 \tag{2.4}$$

Since there is sufficient evidence against beta stationarity, especially given the sometimes quite long lags between our announcement and spinoff dates, we adjust for possible nonstationarity. To this end, we compare the proportion of observed shifts in the sample (for each of the parent-only and portfolio groups) to the proportion of shifts in the matched sample of control firms. Since the control firms are as similar as possible to the sample firms, except that they did *not* have a spinoff, we let the control firms define the expected deviation from the expected number of beta shifts, or

$$E(p - p') = p^* \tag{2.5}$$

where p^* is the proportion of control beta shifts less the expected proportion. Since there are now two separate populations, the test statistic must be modified. The resulting statistic is

$$Z = p_s - p_c \left(\frac{p'_s q'_s}{n_s - 1} - \frac{p'_c q'_c}{n_c - 1} \right)^{-1/2} \tag{2.6}$$

where subscripts s and c refer to the sample and controls.

Simply examining the number of beta shifts is revealing; however, there are implications regarding the direction of the shift about whether the firm has increased or decreased systematic risk. Since a positive shift implies that the firm has become riskier and a negative shift implies that the firm has become less risky, we apply the above tests to the number of positive and negative beta shifts as well as the totals.

Reweighting portfolio to maximize returns

Since after the spinoff there are two firms, the shareholder can hold those firms in any weights desired—not just those specified by the company. It may be possible to hold the firms in some other set of weights such that variance is held constant and return increases. If so, shareholders benefit from the spinoff due to the ability to reweight.

To test for this, for each firm we perform the following steps.

1 Find the variance ${\sigma^2}^*$ and return r^* of the post-spinoff portfolio with weights w_p^* and w_s^* specified by the firm at the time of the spinoff.

2 The equation for the variance of a two-asset portfolio,

$$ {\sigma^2}^* = w_p^2 \sigma_p^2 + w_s^2 r_s^2 + 2 w_p w_s \sigma_{p,s} \tag{2.7} $$

where ${\sigma^2}^*$ is the variance of the post-spinoff portfolio with weights specified by the firm (w_p^* and w_s^*), is the variance of the parent firm returns, $\sigma_{p,s}$ is the covariance between the parent and spinoff firms' returns, w_p is the weight of the parent firm in a "new" portfolio and $w_s=1-w_p$ is the weight of the spinoff firm, can be rewritten as

$$ {\sigma^2}^* = w_p^2(\sigma_p^2 + \sigma_s^2 - 2\sigma_{p,s}) + w_p(2\sigma_{p,s} - 2\sigma_s^2) + \sigma_s^2 \tag{2.8} $$

In this form it is easy to solve for the weights. Since this is a quadratic equation, there will be two solutions for w_p (and w_s). One of the solutions for w_p will, of course, be equal to w_p^*.

3 Using the two w_ps, find the portfolio returns for each set of weights. For any given firm *i,* call these r_a and r_b.

4 If max$(r_a, r_b) > r^*$, then the investor can improve the return by reweighting the portfolio.

5 For each firm where max$(r_a, r_b) \neq r^*$ (i.e. $r^*=\min(r_a, r_b)$), let $\Delta r=\text{abs}(r_a-r_a)$. Then Δr is the improvement in terms of return that the shareholder could realize by reweighting the portfolio without any change in risk.

4
RESULTS

Results for firm-specified portfolios

Table 2.1 shows the number of significant shifts and the *z* scores for how different those shifts are from what would be expected from pure chance (at 5 percent significance level). All beta shifts for both the portfolio and parent groups are significant ($p<5$ percent). The controls appear to have

Table 2.1 Number of significant beta shifts at the 5 percent level and the z score of the proportions

	Sample			*Control*		
	Negative	*Positive*	*Total*	*Negative*	*Positive*	*Total*
Parent only	6	5	11	3	1	4
n=69	3.27^{**}	2.5^{*}	4.14^{**}	0.97	−0.055	0.3

	Sample			*Control*		
	Negative	*Positive*	*Total*	*Negative*	*Positive*	*Total*
Portfolios	3	3	6	1	3	4
n=35	2.27*	2.27*	3.24**	0.13	2.27*	1.72

Notes: **, significant at 1 percent; *, significant at 5 percent.

fewer significant shifts, but Table 2.1 does not indicate whether this difference is statistically significant.

Table 2.2 is of primary interest because here we have adjusted for possible size and industry effects by using control firms to define what is the expected deviation from the pure statistical significance level. Here we see a marked difference between the parent-only and the portfolio groups. For the parent-only group, total shifts are significant at the 1 percent level and positive shifts are significant at the 5 percent level. Even the negative shifts approach significance at the 10 percent level. For the portfolio group, there are no significant differences. Complete company by company results appear in Appendix 2A for the parent-only sample and matching control firm and in Appendix 2B for the parent firm and spinoff firm portfolios with their control firms.

This implies that the spinoff firm does have a long-term impact on the parent, and when it is left out of the shareholder's portfolio the beta of the portfolio may change significantly. Conversely, if the spinoff is left in, the portfolio does not change. This is precisely what we would expect when examining a firm before and after slicing off a portion of the firm.

Looking at the numbers of negative and positive shifts in the parent-only group (six and five respectively), it would appear that management is not consistently spinning off either high- or low-risk divisions. There appears to be a slight tendency to spin off low-risk divisions, but the difference between positive and negative beta changes is not statistically significant.

Table 2.2 z scores for differences between proportions of beta shifts for sample control

	Negative	*Positive*	*Total*
Parent only, *n*=69	1.62	2.17*	2.71**
Portfolios, *n*=35	1.51	0	1.08

Notes: **, significant at 1 percent, *, significant at 5 percent.

Results for investor specified portfolios

Solving equation (2.8) for w_p for each set of firms, we find the two weights for the parent firm which would result in a parent-spinoff portfolio with the same variance as the firm-specified portfolio. Since one of these w_ps *is* the weight for the parent firm in the firm-specified portfolio, the task is merely one of determining whether the firm-specified portfolio is the one with the higher return.

Out of the thirty-five pairs of firms in our portfolio group, there are eleven where return could be increased without changing variance. These results appear in Table 2.3. This increase ranged from 7.63 percent annually to 16.14 percent with an average increase in annualized return of 8.06 percent. For the remaining twenty-four firms, the firm-specified portfolio was already the return-maximizing portfolio.

5
CONCLUSIONS

In this study we examine the long-run risk-return characteristics of firms that engage in spinoff transactions. We find very little evidence of an overall change in companies' long-run risk-return structure when we assume that shareholders hold both the parent and the spinoff firm in the proportion specified in the spinoff transaction. Previous research has documented significant wealth increases following spinoff announcements. There are at least two possible explanations for these differences. The first is that most previous studies found the positive market reaction to be centered on or near announcement day (see Hite and Owers 1983). Following announcement, these same studies show a period of negative abnormal returns that are insignificant. This negative return is large enough to offset the positive announcement effects, but since it occurs gradually over several individual days, it is statistically insignificant. Our procedure is centered around two event dates, the announcement day and the spinoff day, and nets out the individual days' market reactions. By leaving out the event window, our procedure ignores the reaction and subsequent reversal, and demonstrates that spinoffs do not appear to create long-run changes in risk measures.

Another possible explanation for why our results differ from those in previous studies lies in our portfolio approach. Past studies have ignored the spinoff firm and instead analyzed only parent firms. By creating a homemade portfolio of parent and spinoff firm, we find proportionately fewer winners and losers than with the parent-only firms. Since pre-spinoff shareholders own both parent and spinoff after the divestiture, ignoring results for the spinoff firms does not accurately represent the total risk-return relationship of these firms.

However, we do demonstrate that spinoffs may allow shareholders to gain in another way. If the spinoff does not occur, the shareholder holds the assets in the proportion specified by the firm. When a spinoff takes

Table 2.3 Weights and returns for portfolio group during the post-spinoff period, with alternative weights found holding variance constant

		Portfolio as defined by announcement		*Portfolio with alternative weights*	
Firm name: parent, spinoff	*IPERM*	*Weight (%)*	*Average daily return*	*Weight (%)*	*Average daily return*
Adams Russell Inc.	47650	50.00	0.00279	35.16	0.00183
Adams Russell Electronics Co.	71247	50.00		64.84	
American General Corp.	48397	98.33	0.00215	−43.13	0.00193
Texas Comm. Bancshares Inc.	58093	1.67		143.13	
American Nat. Res. Co	24141	80.00	−0.00048	41.89	−0.00001[a]
Primark Corp.	64071	20.00		58.11	
Borg Warner Corp.	17590	90.91	0.00298	−24.34	0.00214
York Intl. Corp.	69745	9.09		124.34	
Clabir Corp.	60417	50.00	0.00068	44.17	0.00063
General Defense Corp.	63183	50.00		55.83	
Coastal Corp.	38893	50.00	0.00129	69.53	0.00081
Valero Energy Corp.	61671	50.00		30.47	
Continental Corp.	46658	85.71	−0.00015	84.83	−0.00012[a]
Dataproducts Corp.	47116	14.29		15.17	
Cooper Labs Inc.	52388	50.00	0.00541	60.47	0.00574[a]
Cooper Cos Inc.	65541	50.00		39.53	
Damson Oil Corp.	57701	97.56	0.00139	−16.30	−0.00561
Damson Energy Co.L.P.	67475	2.44		116.30	
Datapoint Corp.	59707	50.00	0.00437	79.09	0.00218
Intelogic Trace Inc.	67985	50.00		20.91	

		Portfolio as defined by announcement		*Portfolio with alternative weights*	
Firm name: parent, spinoff	*IPERM*	*Weight (%)*	*Average daily return*	*Weight (%)*	*Average daily return*
Maxus Energy Corp.	24715	98.89	0.00312	−12.99	0.00059
Diamond Shamrock Offshore Ptn.	67870	1.11		112.99	
Edison Bros Stores Inc.	21039	80.00	0.00181	19.68	0.00206[a]
Handyman Corp.	67950	20.00		80.32	
Enserch Corp.	25056	99.01	0.00035	41.70	0.00027
Enserch Expl Partners Ltd	67491	0.99		58.30	
Freeport McMoran Inc.	62877	83.33	0.00244	45.30	0.00262[a]
Freeport McMoran Oil & Gas Rty	65592	16.67		54.70	
Heizer Corp.	63204	98.04	0.00237	−20.90	−0.00255
Computer Consoles Inc.	63116	1.96		120.90	
I U Intl Corp.	24045	50.00	0.00029	105.94	−0.00274
Echo Bay Mines Ltd	65568	50.00		−5.94	
Kansas City Southn Inds Inc.	12650	97.85	0.00196	36.92	−0.00049
Mapco Inc.	43668	2.15		63.08	
Kay Corp.	33347	50.96	0.00443	7.76	0.00439
Kay Jewelers Inc.	67627	49.04		92.24	
Lucky Stores Inc.	40053	75.00	−0.00170	65.47	−0.00181
Hancock Fabrics Inc.	75066	25.00		34.53	
Mesa Pete Co.	45065	50.00	0.00109	10.58	0.00074
Mesa Rty Tr.	62922	50.00		89.42	
Panhandle Eastn Corp.	22082	50.00	0.00232	115.30	0.00198
Anadarko Pete Corp.	70332	50.00		−15.30	
Peabody Intl Corp.	35166	50.00	−0.00018	80.09	−0.00027
Geo Intl Corp.	62615	50.00		19.91	
Peoples Energy Corp.	13821	50.00	−0.00055	74.90	0.00009[a]
Midcon Corp.	63685	50.00		25.10	

Pier 1 Imports	51692	66.67	0.00139	28.47	−0.00084
Sunbelt Nursery Group	69120	33.33		71.53	
RLC Corp.	46893	66.67	0.00423	62.20	0.00453[a]
Rollins Environmental Svcs Inc.	64477	33.33		37.80	
Southland Rty Co.	36679	50.00	−0.00264	17.83	−0.00331
San Juan Basin Rty Tr.	62391	50.00		82.17	
Sterling Cap Corp.	53946	97.09	−0.00154	4.03	−0.00118[a]
Golden Nuggett Inc.	60441	2.91		95.97	
Texas Intl Co.	54682	66.67	0.00300	76.49	0.00251
Regal Intl Inc.	64354	33.33		23.51	
Transworld Corp. Liquidating Tr.	19617	51.81	0.00196	121.47	0.00112
Trans World Airls Inc.	64821	48.19		−21.47	
Transco Energy Co.	58472	94.12	−0.00002	25.69	0.00037[a]
Transco Expl Partners	65437	5.88		74.31	
Standard Shs Inc.	36783	97.75	−0.00110	101.13	−0.00123
Johnson E F Co.	59336	2.25		−1.13	
Standard Shs Inc.	36783	93.57	−0.00056	88.41	−0.00059
Waste Mgmt Inc.	57381	6.43		11.59	
Standard Shs Inc.	36783	99.01	−0.00020	102.61	−0.00017[a]
Pennzoil Co.	35211	0.99		−2.61	
Standard Shs Inc.	36783	92.76	0.00102	79.84	0.00086
Rohm & Haas Co.	23990	7.24		20.16	
Standard Shs Inc.	36783	97.56	−0.00025	70.71	0.00028[a]
Viacom Intl Inc.	51617	2.44		29.29	

Note: [a]Portfolio with alternative weights results in higher return.

place, the shareholder can adjust his/her portfolio of the two firms in many proportions. We show that new portfolio weights may be obtained, in some cases, that increase shareholders' wealth, while holding total portfolio variance constant. Eleven of our thirty-five sample firms improved their return by adjusting their portfolios.

Note that we do not claim that investors can *a priori* identify wealth-creating opportunities, nor that such opportunities can systematically be exploited. Rather, we show that, in nearly one-third of our sample, shareholders might have benefited. In a CAPM world, the reason for an investor to rebalance would probably be to alter beta and increase (or decrease) return, but without the chance to rebalance their portfolio through the spinoff investors would have no such opportunity. In this sense, "value" is created by virtue of the shareholders' ability to rebalance.

We conclude that shareholders' wealth may be increased following spinoff transactions by allowing shareholders to adjust their portfolios. Without the adjustment, we find no evidence of long-run changes in firm risk-return parameters.

APPENDIX 2A
PARENT-ONLY GROUP

Firm name: parent, control	*IPERM*	*Announcement date*	*Effective date*	*Change in alpha*	*Change in beta*	*Var 1*	*Var 2*
Action Corp.	43967	810923	820118	−0.001522 (0.6519)	−1.02408 (0.0441)*	0.000572	0.00074 (0.1019)
Viacom Intl Inc.	51617			−0.001175 (0.7158)	0.548111 (0.2574)	0.000578	0.000605 (0.4112)
Alleghany Corp.	17400	840112	840910	−0.001164 (0.7645)	−0.631414 (0.2386)	0.001144	0.000289 (0.0000)*
SPS Technologies Inc.	27780			0.001714 (0.6143)	−0.030348 (0.9519)	0.000478	0.0007 (0.0304)*
Allied Signal Inc.	67811	860429	860527	−6.37E-04 (0.7393)	0.316935 (0.1817)	0.000153	0.000176 (0.2407)
United Technologies Corp.	17830			−0.001245 (0.5722)	0.107574 (0.6890)	0.000178	0.000258 (0.0320)
Orange Co. Inc. New	51190	781019	790615	−0.001187 (0.8384)	0.70556 (0.3941)	0.002029	0.001201 (0.0050)*
Connelly Containers Inc.	30760			−0.003627 (0.3937)	−0.023093 (0.9699)	0.00073	0.001368 (0.0011)*
Amoco Corp.	19553	850529	850730	−0.00251 (0.1617)	0.159835 (0.5520)	0.000133	0.00018 (0.0650)
Atlantic Richfield Co.	10604			−0.002039 (0.2491)	−0.021559 (0.9330)	0.000135	0.000145 (0.3540)
Anta Corp.	63458	840323	840611	−0.00465	−0.469171	0.001155	9.71E-05

Firm name: parent, control	*IPERM*	*Announcement date*	*Effective date*	*Change in alpha*	*Change in beta*	*Var 1*	*Var 2*
				(0.1989)	(0.4098)		(0.0000)*
Global Marine Inc.	45428			0.000849 (0.8493)	−0.494812 (0.4235)	0.000421	0.001506 (0.0000)*
Archer Daniels Midland Co.	10516	801016	801219	0.000602 (0.8643)	−0.209271 (0.6109)	0.000566	0.000501 (0.2749)
Anderson Clayton & Co.	22277			−2.16E-04 (0.9304)	0.293975 (0.3322)	0.000176	0.000367 (0.0002)*

Firm name: parent, control	*IPERM*	*Announcement date*	*Effective date*	*Change in alpha*	*Change in beta*	*Var 1*	*Var 2*
Astrex Inc.	29276	820108	820611	0.001366 (0.7984)	−0.169983 (0.7109)	0.000826	0.002115 (0.0000)*
Sterling Electrs Corp.	45882			0.01499 (0.1506)	−0.528213 (0.5584)	0.004207	0.006254 (0.0255)*
Beard Co.	63466	831121	840103	−0.007389 (0.1468)	−1.2437 (0.0692)	0.002124	0.000594 (0.0000)*
Prairie Oil Rtys Ltd	35510			0.003623 (0.0546)	0.139773 (0.6397)	0.00027	0.000316 (0.2162)
BSN Corp.	64717	840306	840312	0.005678 (0.2500)	−0.655255 (0.3970)	0.001537	0.001175 (0.0929)
Lumex Inc.	62906			0.005514 (0.2163)	−0.367323 (0.5312)	0.000788	0.000864 (0.3252)
Canal Randolph Corp.	30314	830926	840601	−6.49E-04 (0.7074)	0.062221 (0.7847)	0.0001	0.000206

Firm name: parent, control	*IPERM*	*Announcement date*	*Effective date*	*Change in alpha*	*Change in beta*	*Var 1*	*Var 2*
							(0.0002)*
Grubb & Ellis Co.	62885			−2.64E-04 (0.9528)	−0.876862 (0.1270)	0.00152	0.000504 (0.0000)*
Centex Corp.	53831	840223	841012	−0.002533 (0.3609)	0.721611 (0.1021)	0.000268	0.000464 (0.0035)*
Morrison Knudsen Corp.	55079			0.002114 (0.2882)	0.493188 (0.1063)	0.000203	0.000147 (0.0565)
Centronics Corp.	58173	790115	790619	0.000469 (0.9055)	−1.36192 (0.0034)**	0.000996	0.000608 (0.0076)
Dataproducts Corp.	47116			0.004174 (0.1680)	−1.91038 (0.0000)**	0.000382	0.000518 (0.0666)
Cenvill Invs Inc.	56610	830722	831014	−0.00255 (0.1478)	0.229571 (0.3379)	0.000196	0.00014 (0.0485)*
Property Cap Tr.	55490			−0.001884 (0.1853)	0.117766 (0.5060)	0.000127	6.00E-05 (0.0001)*
Cenvill Invs Inc.	56610	800923	810731	−0.002228 (0.4959)	−0.835156 (0.0126)*	0.000617	0.0004 (0.0167)*
Property Cap Tr.	55490			−0.001588 (0.4949)	0.027643 (0.9102)	0.000297	0.00025 (0.1949)

Firm name: parent, control	*IPERM*	*Announcement date*	*Effective date*	*Change in alpha*	*Change in beta*	*Var 1*	*Var 2*
Florida Rock Inds Inc.	56784	860630	860715	−0.001423 (0.6361)	−0.442582 (0.1930)	0.000254	0.000603 (0.000)*

Firm name: parent, control	*IPERM*	*Announcement date*	*Effective date*	*Change in alpha*	*Change in beta*	*Var 1*	*Var 2*
Atlas Corp.	20458			0.003363 (0.3928)	0.079485 (0.8756)	0.001131	0.000542 (0.0002)*
Fuqua Inds Inc.	25961	801001	801114	0.002389 (0.4460)	−0.633436 (0.0718)	0.000574	0.000349 (0.0071)*
Mattel Inc.	39538			−0.002733 (0.5374)	−0.389229 (0.4440)	0.000777	0.001073 (0.0560)
GATX Corp.	12036	820729	830316	0.003132 (0.2576)	0.886534 (0.0094)**	0.000134	0.000583 (0.0000)*
Emery Air Fght Corp.	31659			0.00596 (0.1018)	0.399638 (0.3913)	0.000607	0.000791 (0.0956)
Grow Group Inc.	32440	870127	870622	−0.004811 (0.2456)	−0.13307 (0.6111)	0.000408	0.001176 (0.0000)*
Essex Chem. Corp.	31720			0.000541 (0.8819)	0.142696 (0.5436)	0.000303	0.001085 (0.0000)*
Hazleton Labs Corp.	64581	851210	860102	−0.00125 (0.6927)	0.879576 (0.0369)*	0.000237	0.000689 (0.0000)*
Alza Corp.	64856			0.002206 (0.4955)	−0.718153 (0.1867)	0.000572	0.00073 (0.1140)
Hi Shear Inds Inc.	50382	840529	840620	−9.99E-04 (0.7039)	0.333228 (0.3418)	0.000237	0.000405 (0.0043)*
Penn Engr & Mfg Corp.	44353			0.00053 (0.7262)	−0.333859 (0.1093)	0.000152	5.94E-05 (0.0000)*
Imperial Corp. Amer.	27000	810731	811230	−0.002945 (0.3997)	0.852778 (0.0890)	0.000397	0.001109

Firm name: parent, control	*IPERM*	*Announcement date*	*Effective date*	*Change in alpha*	*Change in beta*	*Var 1*	*Var 2*
							(0.0000)*
Golden West Finl Corp. Del.	53479			−0.001429 (0.7754)	0.477631 (0.4638)	0.000863	0.001499 (0.0034)*
Kaneb Svcs Inc.	42067	810617	811202	0.002988 (0.3453)	0.044151 (0.9081)	0.000472	0.000526 (0.2969)
Ocean Drilling & Expl Co.	61604			0.000527 (0.8828)	−0.656241 (0.1366)	0.000716	0.000626 (0.2539)
Champion Enterprises	41419	870629	870630	−0.001154 (0.8402)	0.280195 (0.5313)	0.001635	0.001659 (0.4717)
Pope & Talbot Inc.	56143			−0.002503 (0.6400)	−0.551804 (0.0926)	0.000701	0.002206 (0.0000)*
Charter Co.	53364	790226	790402	0.005504 (0.4397)	2.38276 (0.0325)*	0.001008	0.003644 (0.0000)*
National Intergroup Inc.	19019			0.000814 (0.5468)	−0.174217 (0.3306)	8.39E-05	7.61E-05 (0.3142)
Chelsea Inds Inc.	40715	820125	820716	0.004408 (0.2538)	0.140655 (0.6840)	0.000535	0.000923 (0.0036)*
Pantasote Inc.	38340			0.006609 (0.3301)	−0.475163 (0.4066)	0.001271	0.002842 (0.0000)*
Coca Cola Bottling Co. NY Inc.	27510	791112	800428	0.00144 (0.6899)	0.598846 (0.1942)	0.000338	0.00092 (0.0000)*
Pepsico Inc.	13856			−0.001316 (0.4844)	−0.344196 (0.1800)	0.000136	0.000208 (0.0182)*

Consolidated Oil & Gas Inc.	30816	790307	790524	0. 001457 (0.6690)	0. 511905 (0.2390)	0. 001134	0. 000571 (0.0004)*
Patrick Pete Co.	57509			−0. 003036 (0.4821)	−0. 921906 (0.0543)	0. 001384	0. 000494 (0.0000)*
Copperweld Corp.	21258	870122	870220	0. 004022 (0.3938)	0. 090661 (0.8674)	0.00091	0. 001354 (0.0252)*
Bundy Corp.	44257			0. 000251 (0.9118)	−0. 315725 (0.2271)	0. 000339	0. 000181 (0.0011)*
Crane Co.	20204	850516	850531	0. 000603 (0.7310)	0. 305531 (0.2552)	0. 000128	0. 000149 (0.2221)
Keyston e Intl Inc.	60521			−4. 57E-04 (0.8803)	0. 316653 (0.5306)	0. 000417	0. 000548 (0.0882)
ESI Inds Inc.	63159	860715	861107	0. 002017 (0.6655)	−0. 51318 (0.3629)	0. 001083	0. 001054 (0.4464)
Summit Energy Inc.	61858			0. 006091 (0.4131)	−1. 32479 (0.1760)	0. 002838	0. 004183 (0.0281)*
Fedders Corp.	23552	861216	870127	0. 000964 (0.8284)	−1. 11704 (0. 00127)*	0. 001013	0. 000634 (0.0107)*
LSB Inds Inc.	49488			0. 000615 (0.9246)	−0. 069851 (0.9203)	0. 002218	0. 001701 (0.0952)

Keystone Cons. Inds Inc.	19975	840222	840302	−9. 13E-04 (0.8260)	0.20346 (0.7397)	0. 000726	0. 001144 (0.0127)*
Bundy Corp.	44257			−0. 003705 (0.2113)	0.117525 (0.7788)	0. 000408	0. 000415 (0.4667)
Keystone Intl Inc.	60521	830721	830815	−0.00259 (0.4494)	−0.3683 (0.4022)	0. 000541	0. 000435 (0.1406)

Customedix Corp.	62527			0.002354 (0.6595)	−1.08776 (0.1458)	0.001237	0.001416 (0.2527)
KN Energy Inc.	51596	831003	831212	−0.001776 (0.5648)	0.721928 (0.0850)	0.000532	0.000495 (0.3591)
Southwest Gas Corp.	61188			5.90E-05 (0.9761)	0.376888 (0.1486)	0.000195	0.000198 (0.4759)
KN Energy Inc.	51596	850726	851001	0.003577 (0.3987)	−0.935821 (0.1298)	0.000281	0.001425 (0.0000)*
Southwest Gas Corp.	61188			−0.001244 (0.5405)	0.066456 (0.8430)	0.000189	0.000228 (0.1767)
Louisiana Ld & Expl Co.	33814	830601	830628	−0.001187 (0.6955)	−0.747273 (0.0628)	0.000465	0.000393 (0.2051)
Mitchell Energy & Dev. Corp.	55191			−0.002244 (0.5444)	−1.01341 (0.0363)*	0.000978	0.000458 (0.0001)*
LTV Corp.	25507	810430	810731	−0.004305 (0.2689)	−0.038555 (0.9204)	0.000998	0.000471 (0.0001)*
Bethlehem Stl Corp.	10786			−0.001752 (0.5053)	−9.76E-04 (0.9970)	0.000427	0.000246 (0.0034)*
Masco Corp.	34032	840312	840702	−0.001039 (0.6689)	−0.171712 (0.6686)	0.000339	0.000238 (0.0415)*
LSB Inds Inc.	49488			0.002891 (0.7546)	−0.874459 (0.5767)	0.004258	0.004881 (0.2501)
Masonite Corp.	20386	820726	820827	0.004154 (0.3141)	0.141024 (0.7702)	0.001352	0.000559 (0.0000)*
Dennison Mfg Co.	31181			0.004053 (0.1588)	0.135022 (0.6226)	0.000338	0.000375 (0.3069)
Mass Merchandi	34438	840410	840511	0.005174 (0.0393)*	1.12653 (0.0034)**	0.000291	0.000499

sers Inc. Ind.							(0.0041)*
Myers Inds Inc.	65365			0.001496 (0.6044)	−0.2504 (0.5173)	0.000371	0.000377 (0.4715)

Firm name: parent, control	*IPERM*	*Announcement date*	*Effective date*	*Change in alpha*	*Change in beta*	*Var 1*	*Var 2*
MCA Inc.	27086	820303	820802	−0.001938 (0.3617)	0.055783 (0.7999)	0.000335	0.000195 (0.0038)*
Warner Communications Inc.	38551			−0.007441 (0.1022)	0.072089 (0.8515)	0.000303	0.001827 (0.0000)*
Nexus Inds Inc.	34681	800725	810204	−0.015496 (0.0124)*	1.33069 (0.0543)	0.002078	0.001429 (0.0327)*
Hartmarx Corp.	22250			0.002537 (0.2882)	0.23431 (0.4556)	0.000339	0.000352 (0.4237)
Noble Affiliates Inc.	61815	870608	870623	−0.004197 (0.4007)	−0.273081 (0.3660)	0.000692	0.001433 (0.0002)*
Adobe Res. Corp.	68216			−0.008405 (0.1162)	−0.669909 (0.0545)	0.000867	0.001852 (0.0001)*
Penncorp Finl Inc.	61006	820210	820310	0.003281 (0.5210)	−0.768077 (0.1139)	0.001203	0.001079 (0.2951)
Paine Webber Group Inc.	54463			−0.002869 (0.6013)	−1.32049 (0.0155)*	0.001502	0.001285 (0.2202)
Pennzoil Co.	35211	850612	850812	−0.002005 (0.6517)	1.58023 (0.0146)*	0.000165	0.001578 (0.0000)*
Mapco Inc.	43668			−0.002297 (0.1445)	−0.149617 (0.5372)	0.000129	0.000103 (0.1377)

Firm name: parent, control	*IPERM*	*Announcement date*	*Effective date*	*Change in alpha*	*Change in beta*	*Var 1*	*Var 2*
Perini Corp.	50550	840319	840615	0.000762 (0.7308)	−0.745497 (0.0245)*	0.000258	0.000209 (0.1491)
Blount Inc.	55108			0.003001 (0.4276)	−0.230991 (0.7019)	0.001028	0.000431 (0.0000)*
Plantronics Inc.	52628	840328	840329	0.00031 (0.9122)	0.058935 (0.8816)	0.000318	0.000455 (0.0395)*
Lynch Communications Sys Inc.	53823			0.002752 (0.4181)	0.016604 (0.9733)	0.000543	0.000644 (0.2015)
Reliance Group Inc.	43836	781208	790514	0.000568 (0.8224)	0.518914 (0.1559)	0.000374	0.000399 (0.3738)
Petro Lewis Corp.	57728			0.006184 (0.1677)	0.181322 (0.7547)	0.001019	0.000825 (0.1494)
RJR Nabisco Inc.	14218	840217	840619	−3.48E-04 (0.7987)	−0.113415 (0.5556)	9.76E-05	7.19E-05 (0.0663)
Seagram Ltd	19916			−0.001543 (0.3213)	0.383344 (0.0707)	9.69E-05	0.000119 (0.1517)
Scope Inds	36257	820510	820716	0.004037 (0.0945)	−0.028805 (0.9017)	0.000276	0.000265 (0.4220)
Tootsie Roll Inds Inc.	14816			0.000601 (0.8670)	−0.02416 (0.9440)	0.000622	0.000544 (0.2525)
Singer Co.	27473	860219	861017	−1.16E-04 (0.9636)	−0.437188 (0.2285)	0.000387	0.000211 (0.0015)*
E Sys Inc.	43342			5.58E-05 (0.9834)	−0.230205 (0.4920)	0.000311	0.000271 (0.2486)

Sperry & Hutchinson Co.	43473	780515	790430	0.001365 (0.5540)	0.338137 (0.3055)	0.000164	0.000365 (0.0000)*
American Std Inc.	10372			−6.39E-04 (0.7452)	0.245685 (0.3705)	0.000177	0.00016 (0.3097)
Squibb Corp.	45604	861231	870123	0.000401 (0.8550)	0.273089 (0.2209)	0.000186	0.000217 (0.2226)
Smithkline Beckman Corp.	26390			0.002256 (0.1662)	0.052711 (0.7563)	0.000103	0.000128 (0.1340)
Standex Intl Corp.	43481	810707	820105	0.000602 (0.8330)	−0.820926 (0.0232)*	0.000419	0.000359 (0.2259)
Fedders Corp.	23552			−0.002062 (0.6959)	−0.778303 (0.2378)	0.001254	0.001333 (0.3809)
Tandy Corp.	15560	861231	870116	−0.003196 (0.2013)	−0.451976 (0.1099)	0.0003	0.000332 (0.3102)
Control Data Corp. Del.	38914			−0.002043 (0.5363)	0.049078 (0.8911)	0.000545	0.000474 (0.2436)
Tandycrafts Inc.	58704	780524	790410	−7.19E-04 (0.9056)	0.568856 (0.5466)	0.000514	0.003796 (0.0000)*
Fabri Ctrs Amer. Inc.	53196			−0.005961 (0.1287)	0.401145 (0.5293)	0.000695	0.000877 (0.1268)
Teledyne Inc.	43123	840127	840508	0.001703 (0.4281)	−0.015176 (0.9578)	0.000119	0.00031 (0.0000)*
Raytheon Co.	24942			−4.30E-04 (0.8461)	−0.115759 (0.6873)	0.000252	0.000158 (0.0111)*

Firm name: parent, control	*IPERM*	*Announcement date*	*Effective date*	*Change in alpha*	*Change in beta*	*Var 1*	*Var 2*
Teledyne Inc.	43123	860725	861112	−4.59E-04 (0.7835)	−0.032404 (0.8523)	0.000106	0.000119 (0.2896)

Firm name: parent, control	*IPERM*	*Announcement date*	*Effective date*	*Change in alpha*	*Change in beta*	*Var 1*	*Var 2*
Raytheon Co.	24942			−5.28E-04 (0.7720)	0.070627 (0.7480)	0.000208	0.000129 (0.0096)*
Time Inc.	40483	830520	840126	−0.001891 (0.4466)	0.335938 (0.3050)*	0.000324	0.000335 (0.4335)
Meredith Corp.	42796			−8.57E-04 (0.5822)	0.469674 (0.0315)*	0.000108	0.000167 (0.0159)*
Torchmark Corp.	62308	860312	860806	0.000161 (0.9594)	−0.071878 (0.8603)	0.000547	0.000292 (0.0010)*
Uslife Corp.	46594			−6.40E-05 (0.9736)	−0.087707 (0.7371)	0.000189	0.000163 (0.2389)
Transway Intl Corp.	18200	810209	810320	−0.002536 (0.2679)	0.023779 (0.9189)	0.000305	0.000184 (0.0067)*
Fruehauf Corp.	21522			−4.94E-04 (0.7963)	−0.128576 (0.5325)	0.000197	0.000163 (0.1732)
Univar Corp.	47917	840223	840330	−0.004534 (0.1063)	−0.203446 (0.6162)	0.000405	0.000345 (0.2120)
Di Giorgio Corp.	27350			0.001232 (0.6288)	−0.159111 (0.6154)	0.000177	0.000355 (0.0003)
University Patents Inc.	66368	860508	860602	−0.002682 (0.5534)	0.029599 (0.9595)	0.001166	0.000705 (0.0067)*
Gelman Sciences Inc.	60935			−0.001262 (0.6452)	0.433862 (0.2224)	0.000379	0.000345 (0.3235)

Firm name: parent, control	*IPERM*	*Announcement date*	*Effective date*	*Change in alpha*	*Change in beta*	*Var 1*	*Var 2*
Thortec International Inc.	50278	840202	840305	0.001804 (0.5558)	0.366423 (0.4295)	0.000676	0.000255 (0.0000)*
Greiner Engr Inc.	49197			0.00538 (0.2721)	−0.917105 (0.1903)	0.001448	0.000742 (0.0005)*
Wheelabrator Frye Inc.	38041	811221	820219	0.001083 (0.6729)	0.092208 (0.7302)	0.000314	0.000303 (0.4269)
Ferro Corp.	21135			−0.002031 (0.4357)	0.326962 (0.2464)	0.00037	0.000319 (0.2324)
Wilshire Oil Co. Tex.	38172	821223	830218	0.002254 (0.4936)	0.178608 (0.5969)	0.00044	0.000549 (0.1384)
Galaxy Oil Co.	63175			0.007059 (0.4737)	−1.2124 (0.2421)	0.003068	0.005639 (0.0015)*
Philadelphia Subn Corp.	52898	810529	810701	0.004022 (0.1726)	−0.176601 (0.5892)	0.000362	0.000612 (0.0049)*
SJW Corp.	54199			0.001362 (0.4079)	0.194968 (0.23657)	0.000101	0.000143 (0.0401)*
Telecom Corp.	57736	850102	850128	−0.003285 (0.6213)	2.30947 (0.0508)	0.001756	0.002836 (0.0092)*
Arkansas Best Corp.	48004			0.001685 (0.5584)	−0.007227 (0.9868)	0.000457	0.000288 (0.0118)*

Significance is given in parentheses: **, significant at 1 percent level; *, significant at 5 percent level; for variances, this is the significance of the difference.

APPENDIX 2B
PORTFOLIO GROUP

Firm name: parent, control	*IPERM*	*Announcement date*	*Effective date*	*Change in alpha*	*Change in beta*	*Var 1*	*Var 2*
Adams Russell Inc.	47650	860619	870319	0.000255	−0.39748	0.000043	0.000249
Adams Russell Electronics Co.	71247			(0.9264)	(0.2299)		(0.0036)
Watkins Johnson Co.	46420			−0.001793 (0.5236)	−0.202255 (0.5678)	0.00042	0.000361 (0.2291)
American General Corp.	48397	800116	800327	3.87E-05	−0.45405	0.000165	0.000213
Texas Comm Bancshares Inc.	58093			(0.9842)	(0.0478)*		(0.1024)
American Heritage Life Invt	59643			0.002826 (0.3539)	−0.510269 (0.1284)	0.000419	0.000389 (0.3556)
American Nat. Res. Co.	24141	811208	811231	−0.00122	−0.23817	0.000195	0.00013
Primark Corp.	64071			(0.5194)	(0.2768)		(0.0235)
Consolidated Oil & Gas Inc.	30816			−0.003854 (0.2552)	−0.085441 (0.8391)	0.000322	0.000751 0.0000*

Firm name: parent, control	*IPERM*	*Announcement date*	*Effective date*	*Change in alpha*	*Change in beta*	*Var 1*	*Var 2*
Borg Warner Corp.	17590	860310	860410	0.002375	−0.21068	0.000275	0.000663
York Intl Corp.	69745			(0.4905)	(0.5641)		0.0000
Upjohn Co.	26681			7.37E-05	0.454274	0.000231	0.000305

Firm name: parent, control	*IPERM*	*Announcement date*	*Effective date*	*Change in alpha*	*Change in beta*	*Var 1*	*Var 2*
				(0.9744)	(0.1228)		(0.0841)
Clabir Corp.	60417	800911	810701	−0.00147	0.400836	0.00172	0.000784
General Defense Corp.	63183			(0.7775)	(0.4162)		(0.0001)*
Borden Inc.	16571			−7.33E-04 (0.6252)	−0.094102 (0.5753)	0.000177	0.000123 (0.0379)*
Coastal Corp.	38893	791112	800102	−4.51E-05	0.229773	0.000218	0.000452
Valero Energy Corp.	61671			(0.9866)	(0.4700)		(0.0002)*
Texas Eastn Corp.	27940			−0.003912 (0.0713)	0.244153 (0.3614)	0.000187	0.000215 (0.2445)
Continential Corp.	46658	790906	800801	−9.29E-04	0.092278	0.000122	0.000246
Dataproducts Corp.	47116			(0.6307)	(0.6990)		(0.0003)*
Beneficial Corp.	19377			−0.00119 (0.6442)	−0.546755 (0.0989)	0.000239	0.000456 (0.0008)*
Cooper Labs Inc.	52388	830916	831215	0.005772	−0.92154	0.000622	0.000967
Cooper Cos Inc.	65541			(0.1743)	(0.0767)		(0.0150)*
Abbott Labs	20482			0.000347 (0.8602)	0.282627 (0.2636)	0.000203	0.000175 (0.2306)
Damson Oil Corp.	57701	850422	850610	0.002643	−1.15843	0.001583	0.001746
Damson Energy Co. L.P.	67475			(0.6322)	(0.2068)		(0.3152)
MCO Hldgs Inc.	34067			0.001027 (0.5847)	−0.103614 (0.7121)	0.00024	9.21E-05 0.0000*

Firm name: parent, control	*IPERM*	*Announcement date*	*Effective date*	*Change in alpha*	*Change in beta*	*Var 1*	*Var 2*
Datapoint Corp.	59707	850712	850813	0.006564	1.31519	0.000716	0.000506
Intelogic Trace Inc.	67985			(0.0739)	(0.0235)*		(0.0432)*
Briggs & Stratton Corp.	17961			0.000655 (0.7150)	0.103088 (0.7197)	0.000134	0.00018 (0.0713)
Maxus Energy Corp.	24715	860117	860609	0.003919	0.201564	9.94E-05	0.000431
Diamond Shamrock Offshore Ptnr	67870			(0.0766)	(0.4871)		0.0000*
Air Prods & Chems Inc.	28222			−9.33E-05 (0.9663)	0.57327 (0.0415)*	0.000106	0.000369 0.0000*
Edison Bros Stores Inc.	21039	850419	850912	0.001436	0.007291	8.16E-05	6.61E-05
Handyman Corp.	67950			(0.2591)	(0.9677)		(0.1501)
Federated Dept Stores Inc.	18550			−3.47E-04 (0.8399)	−0.204883 (0.4212)	0.000131	0.000172 (0.0889)
Enserch Corp.	25056	851115	860402	0.002787	0.125394	0.000236	0.000355
Enserch Expl Partners Ltd.	67491			(0.2806)	(0.7137)		(0.0224)
Arkla Inc.	29196			0.002241 (0.3993)	1.3226 (0.0023)**	0.000501	0.00016 0.0000
Freeport McMoran Inc.	62877	830922	831011	0.003491	−0.7751	0.000419	0.00032
Freeport McMoran Oil & Gas Rty	65592			(0.1941)	(0.0359)*		(0.0933)
GAF Corp.	41953			0.001394 (0.6074)	−0.113824 (0.7593)	0.000536	0.000247

							(0.0001)*
Heizer Corp.	63204	830722	830831	0.003079	0.324677	0.000554	0.001104
Computer Consoles Inc.	63116			(0.4233)	(0.5758)		(0.0004)*
Datapoint Corp.	59707			0.003492 (0.3135)	0.668749 (0.1735)	0.000741	0.000567 (0.0928)
IU Intl Corp.	24045	830811	831212	−2.71E-04	0.073734	0.000203	0.000309
Echo Bay Mines Ltd	65588			(0.9061)	(0.8095)		(0.0194)*
Federal Express Corp.	60628			0.001921 (0.4980)	0.416847 (0.2823)	0.000306	0.00052 (0.0045)*
Kansas City Southn Inds Inc.	12650	820222	820329	−4.68E-04	−0.74378	0.000563	0.000281
Mapco Inc.	43668			(0.8751)	(0.0134)*		(0.0003)*
Soo Line Corp.	22138			−1.30E-05 (0.9947)	−0.267459 (0.1729)	0.000153	0.00022 (0.0359)*
Kay Corp.	33347	860408	861231	−0.0015	0.372194	0.000569	0.000331
Kay Jewelers Inc.	67627			(0.6541)	(0.3640)		(0.0039)*
Gordon Jewelry Corp.	32328			0.000379 (0.8756)	−0.434533 (0.1970)	0.000364	0.000216 (0.0051)*
Lucky Stores Inc.	40053	870317	870522	0.000716	0.553983	0.000469	0.000357
Hancock Fabrics Inc.	75066			(0.7876)	(0.0254)*		(0.0892)
Giant Food Inc.	32205			0.003261 (0.2894)	0.136588 (0.6645)	0.000372	0.000557 (0.0239)*
Mesa Pete Co.	45065	791012	791119	−000323	0.1365	0.000408	0.000240
Mesa Rty Tr.	62922			(0.1781)	(0.7316)		(0.0065)*

Bow Valley Inds Ltd	46383			0.000598 (0.8896)	1.47291 (0.0099)**	0.000642	0.001208 (0.0010)*

Firm name: parent, control	*IPERM*	*Announcement date*	*Effective date*	*Change in alpha*	*Change in beta*	*Var 1*	*Var 2*
Panhandle Eastn Corp.	22082	860725	861002	0.001154	0.142905	0.000315	0.000162
Anadarko Pete Corp.	70332			(0.6195)	(0.6014)		(0.0006)*
Sonat Inc.	21514			0.003614 (0.0979)	0.37158 (0.1508)	0.000229	0.000209 (0.3336)
Peabody Intl Corp.	35166	801217	810219	−0.00458	0.031258	0.000891	0.000285
Geo Intl Corp.	62615			(0.1803)	(0.9373)		0.0000*
Fluor Corp.	26382			−0.005771 (0.0255)*	−0.461431 (0.1825)	0.000285	0.000461 (0.0093)*
Peoples Energy Corp.	13821	810121	811221	−0.00121	−0.10517	0.000159	0.000162
Midcon Corp.	63685			(0.5034)	(0.6066)		(0.4582)
Pacific Ltg Corp.	16870			0.001766 (0.3037)	0.003878 (0.9827)	0.000156	0.000106 (0.0274)*
Pier 1 Imports	51692	850911	860108	−0.00106	0.115486	0.000319	0.000313
Sunbelt Nursery Group	69120			(0.6681)	(0.7790)		(0.4621)
Heilig Meyers	64979			0.001357 (0.6452)	−0.225093 (0.6154)	0.000338	0.000474 (0.0475)*
R L C Corp.	46893	820201	820803	0.003415	0.332152	0.000483	0.000475
Rollins Environmental Svcs Inc.	64477			(0.2678)	(0.2501)		(0.4689)

Firm name: parent, control	*IPERM*	*Announcement date*	*Effective date*	*Change in alpha*	*Change in beta*	*Var 1*	*Var 2*
Arkansas Best Corp.	48004			0.005492 (0.1705)	−0.484697 (0.1410)	0.000399	0.001048 0.0000*
Southland Rty Co.	36679	800618	801119	−0.00321	−0.30369	0.000595	0.000344
San Juan Basin Rty Tr.	62391			(0.2822)	(0.3374)		(0.0035)*
Mesa Pete Co.	45065			−0.001433 (0.6579)	0.007643 (0.9825)	0.000603	0.000474 (0.1175)
Sterling Cap Corp.	53946	831021	831220	−0.00452	−0.01681	0.000622	0.00056
Golden Nugget Inc.	60441			(0.2158)	(0.9695)		(0.3010)
Marriott Corp.	46703			0.000431 (0.7802)	−0.164042 (0.3996)	0.000124	0.000105 (0.2049)
Texas Intl Co.	54682	820223	820528	0.001297	−1.00496	0.002029	0.001964
Regal Intl Inc.	64354			(0.8354)	(0.0773)		(0.4362)
Chieftain Dev. Ltd	58384			0.001446 (0.6952)	−1.6835 0.0000**	0.000932	0.000286 0.0000*
Transworld Corp. Liquidating Tr.	19617	830929	840202	0.005277	0.527825	0.000433	0.000275
Trans World Airls Inc.	64821			(0.0567)	(0.1193)		(0.0129)*
Emery Air Fght Corp.	31659			−0.003509 (0.3001)	0.360551 (0.4277)	0.000707	0.000614 (0.2413)
Transco Energy Co.	58472	860109	860602	−0.00187	0.769188	0.000149	0.000824
Transco Expl Partners	65437			(0.5054)	(0.0308)*		0.0000*

Panhandle Eastn Corp.	22082			0.000812 (0.7129)	0.113969 (0.7265)	0.000214	0.000331 (0.0154)*
Standard Shs Inc.	36783	810605	811030	−0.00154	0.022629	4.28E-05	4.28E-05
Johnson EF Co.	59336			(0.0661)	(0.8238)		(0.4972)
La Barge Inc.	47255			−0.003182 (0.5103)	−0.206201 (0.7040)	0.001505	0.000864 (0.0033)*
Standards Shs Inc.	36783	810609	810708	−9.24E-05	0.143229	4.26E-05	5.64E-05
Waste Mgmt Inc.	57381			(0.3570)	(0.1760)		(0.0836)
La Barge Inc.	47255			−3.90E-04 (0.9404)	−0.0755 (0.8933)	0.001395	0.001413 (0.4746)
Standard Shs Inc.	36783	820312	820408	−1.66E-04	0.18347	6.12E-05	3.69E-05
Pennzoil Co.	35211			(0.8732)	(0.0622)		(0.0064)*
La Barge Inc.	47255			−0.005073 (0.2285)	−0.675969 (0.1625)	0.001526	0.001013 (0.0217)*
Standard Shs Inc.	36783	830124	840124	−4.78E-05	−0.00148	9.36E-05	3.89E-05
Rohm & Haas Co.	23990			(0.9648)	(0.9899)		0.0000*
La Barge Inc.	47255			0.001288 (0.7955)	−0.239718 (0.6357)	0.0012	0.000894 (0.0735)
Standard Shs Inc.	36783	790427	790628	−7.92E-04	0.137183	0.000269	8.99E-05
Viacom Intl Inc.	51617			(0.6788)	(0.5069)		0.0000*
La Barge Inc.	47255			6.86E-05 (0.9922)	0.140149 (0.8686)	0.00166	0.003571 (0.0001)*

Significance is given in parentheses: **, significant at 1 percent level; *, significant at 5 percent level; for variances, this is the significance of the difference.

NOTES

1 We assume that regression residuals in period 1 and period 2 are each individually homoskedastic, but allow . The test statistic is

$$L = \frac{(c\Gamma)'\{c[X'(\Sigma^{-1} \otimes I)X]^{-1}c'\}^{-1}(c\Gamma)}{(R - X\Gamma)'(\Sigma^{-1} \otimes I)(R - X\Gamma)}$$

where c is a constraint matrix (0–1 0 1), Γ is the generalized least squares coefficient estimator, X is a block diagonal matrix of X_i(i=1, 2), X_i=[1: vector of market returns], Σ is the estimate of the covariance matrix, R is the vector of firm returns and L is asymptotically distributed F.

2 We found that about 57 percent of the sample would have violated that assumption.

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3
A one-period model for the asset liability matching problem of pension funds

Paul C.van Aalst and C.Guus E.Boender

1
INTRODUCTION

In recent years there is a growing interest in the management of pension funds:

- The population in the developed countries is ageing. In countries where the pension rights are financed by means of a capitalization system, this implies for example that many pension funds, that did have a contribution cash inflow that was larger than the current pension benefits are now in the position that a part of the investment returns has to be used to pay the benefits. As a result a closer look at the contribution and pension benefit cash flows is necessary.
- The pension contributions are an important element of the total costs of the plan sponsor and of the difference between gross and net wage for employees. They both prefer low and stable contributions. In this field there is a growing role for dynamic contribution systems that try to smooth the contributions over time.
- Usually pension contributions are tax-deductible and this part of the income of employees is only taxed at the moment of the pension benefit: many years later and at a probably lower tax rate. Governments would like to accelerate this tax-levy, particularly in countries with a large public debt.

All these developments lead to the need for a more professional management of (the link between) the assets and liabilities of the pension fund. Besides the definition of risk[1] in an asset context, for example for the performance measurement of the portfolio manager, the risk of the whole fund should be taken into account. Risks of the liabilities that can be matched by an appropriate investment portfolio are not risks for the pension fund as a whole.

In this chapter we will give an overview of the relevant risk factors of pension fund liabilities and present a one-period linear factor model that can be used as a framework to estimate the influence of the risk factors and to describe the possibilities of matching.

The chapter starts with an overview of the relevant risks of the liabilities of a pension fund. Essentially these are the inflation rate, the growth rate of real wages and changes in the (long) interest rate. Besides this, there is a stochastic uncertainty in the liabilities because the actuarial calculations use probability tables for the process of dying, promotion, resignation etc. We then give an illustration of the relative importance of these risk factors using a simulation approach. Next we derive a linear factor model that summarizes the sensitivities of the liabilities for the mentioned economic risks. On the asset side a similar factor model has to be estimated: what are the sensitivities of different investment returns for the inflation rate, the growth rate of real wages and changes in the long interest rate? A one-period model is then described to match these sensitivities. The final section summarizes the chapter and concludes with some possibilities and difficulties of multi-period matching models.

2
ASSET-LIABILITY MATCHING

2.1
Starting-points

First we state that the primary function of a pension fund is insuring the pension rights of the (former) employees. The process of investing—in a fully funded system—is only a derived function. In other words, the liabilities are the *raison d'être* of the pension fund and the (long-term) investment strategy should be matched to this. This starting-point implies that fluctuations in the value or the return of the assets cannot be considered a risk as long as the value or the return of the liabilities shows a comparable pattern.

The published year accounts of many pension funds apply different accounting procedures for the assets and for the liabilities. Assets can be valued at historical cost, nominal, taxation or market value; actuaries use different methods for calculating the present value of the liabilities. Conclusions about asset-liability matching can only be useful when assets and liabilities are valued in the same way. This is our second starting-point.

Finally we define the liabilities of a pension fund as the present value of the accumulated rights of the present (active and non-active) participants. The asset—liability matching process tries to immunize the risks in the present liabilities, which will be discussed in the next section, as well as possible by the carefully considered selection of an asset mix. New years of service and new participants are new events that will have to be financed by new contributions at the moment of origin. In this way we try to finance changes in the value of former pension liabilities by asset returns and new pension liabilities by new contributions.

2.2
Liability risks

If the risks in the liabilities of a pension fund are the starting-point for the selection of the strategic asset mix, we have to inventory what kind of risks are related to pension liabilities. Essentially the following risks can be distinguished.

Interest rate risk

In many, particularly Anglo-Saxon, countries a variable discount rate is used for calculating the present value of the liabilities. This discount rate is in some way related to the (long-term) interest rate. In other countries a fixed discount rate is common. In the Netherlands, for example, a fixed discount rate of 4 percent has been used for many years, regardless of the pension scheme.

Following the requirement that assets and liabilities should be valued in a comparable way, there are two possibilities. In a system with a fixed discount rate, the assets should be valued at the present value of the expected future cash flows on the basis of that same discount rate. If we want to value the assets at market value, a variable discount rate for the liabilities is necessary. Only in the latter case can we identify an interest rate risk in the liabilities, which may be absorbed by the investment portfolio.

Inflation and real wage growth risk

Also in this case we can distinguish two approaches. In many countries a legal view of the pension liabilities would imply a liquidation approach: suppose that all employees leave the company today, what would be the accumulated value of their rights? First, in this way expected back-service liabilities because of future years of service are not taken into consideration. Second, the indexation of the rights of non-actives is in almost all countries conditional on the financial situation of the pension fund. The legal consequence of this is that the indexation is not part of the *liabilities* of the fund and the calculation of the expected liabilities cannot include the expected effect of the indexation.

From an economic point of view we consider the pension fund and the underlying company as a going concern. This implies an inflation and a real wage growth effect on the liabilities, resulting from the pension system (normally a final pay or an average pay system and affecting the rights of actives) and the indexation system (inflation or prosperity proof rights of non-actives). Depending on the exact pension and indexation system, the liabilities are more or less sensitive to changes in the inflation and real wage growth rate.

Actuarial risk

A pension fund applies several probability tables—related to death, marriage, resignation etc.—for the actuarial calculations. In general only the expected liabilities are presented. Implicitly it is assumed that the file of participants is large enough to neglect deviations from these expected values. Recently, doubt has been growing concerning this assumption. The deviations between the expected values and the realized values can be much larger than many pension fund managers expect. How can these risks be quantified and what is their role in the asset-liability matching process?

If one is interested in quantifying these statistical uncertainties of the pension liabilities, one can try to find an analytical solution. As long as only one class of participants (say 35-year-old female actives) and one transition probability (say dying) is taken into consideration, the solution is simple: the number of participants in the transition follows a binomial distribution. For a complete pension fund with all kinds of participants and transitions and several interdependences and conditions, an analytical solution has appeared to be impossible so far. In view of the lack of such an analytical solution we will apply a simulation technique in this chapter.

What is the use of quantifying these statistical/actuarial risks in the process of asset-liability matching? It is not possible to absorb these risks by selecting a suitable asset mix. But it is possible to use the statistical risk in the process of determining upper or lower bounds of the funding level of the pension fund or a minimum rate of return on the assets.

Pension system risk

In all developing countries discussion is growing about the fundamentals of the pension system. Equal treatment of males and females, a growing tendency towards individualization and flexibility in the pension system, the (uncertain) consequences of the ageing of the population and many other questions have an influence on the development of the (sensitivities of the) liabilities of pension funds. For example, more individualization means less solidarity in these schemes and more uncertainty in the outcomes of the liabilities. Changes from a final pay system to an average pay system affect the inflation and real wage growth sensitivities of the liabilities. It is rather questionable whether these (institutional) changes should play a role in the asset-liability matching process. For this reason we will not address ourselves to this question here.

3
RELATIVE IMPORTANCE OF RISK FACTORS; A SIMULATION MODEL APPLICATION

3.1
Why simulation?

As stated above pension funds have uncertain future liabilities. Even in a "sterile" world with no economic developments, there is the actuarial risk: the uncertainty of not knowing how long the participants will live, what kind of career the active participants will make until their retirement, whether there will be a widow/widower after the death of the participant or not etc. Further economic variables such as inflation and real wage growth—having an influence on the development of the pension rights of the actives and the indexation of the rights of the non-actives—affect the liabilities of a pension fund. Given a pension scheme and a fixed institutional background, the uncertainties for the *total* pension fund can be summarized as

- the course of the lives and careers of the participants,
- the development of inflation and wages and
- the development of the returns on the relevant asset categories.

Concerning the last two uncertainties Kingsland (1982:579) states:

> The task of developing a closed form solution to evaluate the potential state of a pension plan following a series of stochastic investment and inflation experiences would be extremely difficult, if not impossible.

But besides this there is the first-mentioned risk. Many actuarial models only determine the expected value of the liabilities given an economic scenario. These models implicitly assume that the number of participants is large enough to neglect deviations from the expected values. For smaller pension funds in particular and for pension schemes with different indexations of the rights of actives, sleepers and pensioners these deviations can be of considerable size.

More and more individual simulation models are used for pension fund research. Provided that these models are designed carefully, they can give some insight in the magnitude of the mentioned uncertainties. Further they often play a part as a decision support system to estimate the effect of changes in, for example, the pension scheme. In this chapter we will follow the line described by Kingsland (1982):

> In order to develop an accurate assessment of the range of potential uncertainties, it is necessary to repeat this simulation process by generating

dozens or hundreds of possible scenarios, consistent with statistical expectations.

3.2
Liability model

The microsimulation of the participants that is applied in this chapter tries to illustrate the uncertain development of the liabilities of a pension fund in a better way than the usual actuarial models do. The participants of the pension scheme are not classified by age and sex, but they are followed individually through time by means of simulation. Starting from the usual life, promotion and resignation tables a game of chance determines every year for every participant whether he dies, gets promotion, resigns etc. By allowing new employees it is possible to control the size of the underlying company. On the basis of the pension scheme and the economic scenario (inflation, real wage growth) the total liabilities[2] of the pension fund can be determined.

For the process of getting promotion in the company two approaches can be distinguished: the push approach and the pull approach.

- In the *push approach* every year every participant gets promotion with a certain conditional probability. This promotion probability of the active participant can be dependent on his age or his position within the company, but is independent of the positions of the other participants and the existence of vacancies: the employee is pushed upwards in the organization, independent of the circumstances. In this way the process of getting promotion is in fact modeled in the same way as the other transitions (death, resignation etc.) are modeled: all can be considered as Markov-chain transition probabilities.[3]
- In the *pull approach* first the process of leaving the company, because of death, retirement or resignation, is simulated for all individual participants. After that an employee gets promotion (is pulled upwards in the organization) as soon as one of the positions in the organization is vacant. The promotion probabilities are therefore dependent on the situation of the other active participants. In this chapter we apply the pull principle.

By simulating the liability model, given a certain pension scheme and a certain file of participants, many times, the uncertainties of the liabilities of the pension fund are illustrated and quantified.

We use a file of participants (generated by simulation) of a fictive pension fund. The relatively small file contains data of 100 actives, 58 sleepers, 65 pensioners and 40 widows/widowers. The 100 employees of the underlying company are divided over five function levels. Within every function level the employee starts at a basic wage and grows, disregarding promotion to the next function level, in 5 years to the maximum wage of that function level.

The pension scheme includes an old age pension, based on a final pay system with a pension of 70 percent of the final wage in the case of 40 active years. A correction for the State Pension, that every citizen receives, is built in. Apart from this the pension scheme contains a widow/widower pension for the partner of former employees. This pension is 70 percent of the old age pension. The accumulated rights of the non-actives are kept inflation proof. In other words they are indexed with the inflation rate.

3.3
Simulation of time series

For the determination of the liabilities of the pension fund we need time series describing the development of inflation, real wage growth and the interest rate during the simulation period. One possibility was to determine a set of fixed scenarios for these time series and to calculate the liabilities under these scenarios. Given the stochastic nature of the liability model our time series will be generated in a stochastic way. We did not choose a method that expresses a certain vision of the future (although this possibility can be built in), but a method that maintains the characteristics of the historic time series.

The method[4] estimates the means, (co)variances and auto(co)variances of the relevant time series during a certain (historic) period. Starting from the most recent values the method randomly extrapolates the time series such that the random future series converge to stationary time series with the same means, (co) variances and auto(co)variances as the historic estimates.

We will use the following notation: the estimated vector of means is μ, the matrix of estimated (co)variances is V and the matrix of estimated auto(co) variances is W. Define Ω as WV^{-1} and the vector x_t as the random series at (the future) time t. It is possible to prove that the series

$$x_t = \mu + \Omega(x_{t-1} - \mu) + \varepsilon_t \tag{3.1}$$

and

$$\varepsilon_t \sim \mathrm{N}(0, V - \Omega V \Omega^{\mathrm{T}}) \tag{3.2}$$

converges to series with the characteristics μ, V and W as described, from each vector with starting value x_0.

The method is not dependent on the vector μ. Assume that one wants to copy the volatility and mutual interdependence of the series from the historic data but wants to use other expectations on the basis of an own vision. The Markov chain

$$x_t = \xi + \Omega(x_{t-1} - \xi) + \varepsilon_t \tag{3.3}$$

with ε_t as in (3.2) converges to the self-defined vector ξ preserving the characteristics as summarized in the matrices V and W.

In addition it is possible to simulate different investment scenarios within one simulation run of the liabilities, with fixed series of inflation and real wage growth. Because of the mutual interdependence the return series that will be generated are conditioned on the already used inflation and real

Table 3.1 Interest rate, wage growth and inflation over the period 1960–91

		Standard deviation	*Correlation matrix*			*Autocorrelation matrix*		
	Average	*Interest*	*Wage*	*Inflation*	*Interest*	*Wage*	*Inflation*	
Interest rate	7.41%	1.80%	1			0.911	−0.008	0.461
Wage growth	6.21%	4.14%	−0.089	1		−0.190	0.734	0.661
Inflation	4.53%	2.66%	0.469	0.708	1	0.352	0.724	0.826

Source: CBS

wage growth series. Table 3.1 shows the input for the procedure used in this chapter.

3.4 Results

The results in this section are presented as an illustration of the relative importance of the different risks of section 2.2. We distinguish three variants.

1 In the base variant we consider a world without inflation or real wage growth. The discount rate for the actuarial calculations is fixed at 4 percent. The liabilities in this variant can vary only as a result of the unpredictable courses of life and career of the participants. This variant quantifies the earlier mentioned actuarial risk of the pension fund.
2 In the second variant the inflation and real wage growth are simulated as described in section 3.3. This has an influence on the rights of actives (because of general wage increases) and the rights of non-actives (because of the indexation system). The discount rate is still fixed at 4 percent.
3 In the third variant we introduce a variable discount rate, defined as the difference between the long interest rate and the inflation rate, with a minimum of 0 percent.

For all three variants simulations are executed 500 times for a period of 40 years from the fixed (present) starting file. We present the average liabilities (over 500 simulations) and the coefficient of variation (standard deviation divided by average) of the liabilities. We should emphasize the fact that the results are only meant as an illustration of the simulation principle. The outcomes depend very much on pension scheme, the file of participants and the chosen simulation method for the economic variables.

Figures 3.1 and 3.2 show the results for the liabilities of the original participants on the basis of their original number of years of service.

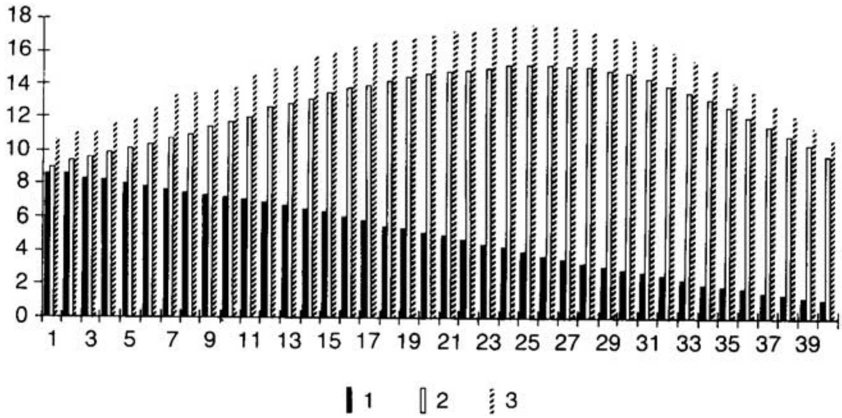

Figure 3.1 Average liabilities of original participants (in millions)

The liabilities increase as a result of inflation, wage growth, the career of the actives (backservice) and time (discount rate) and they decrease as a result of pension benefits and mortality. In variant 1, without inflation and real wage growth, this results in monotonically decreasing average liabilities. In variants 2 and 3 we notice first increasing liabilities and later decreasing liabilities. Variant 3 is based on a variable discount rate, the difference between the long interest rate and the inflation rate, with an average of 2.9 percent (see Table 3.1). Compared with variant 2 this results in the same economic scenario and, as a result of a discount rate that is 1.1 percentage point lower, in liabilities that are some 15 percent higher.

In the first year of the simulation period the coefficient of variation in variant 1 is 1.5 percent and in variant 2 1.8 percent: in the short run the largest part of the uncertainty in the liabilities stems from statistical/actuarial risks and only a small part stems from the economic risk of indexation! Introduction of a variable discount rate leads to a coefficient of variation of 18.6 percent in the first year. In the last (fortieth) year of the simulation period the coefficients of variation are 9. 5 percent, 62.5 percent and 66.5 percent respectively. Obviously, the uncertainty about the economic variables dominates in the long run. Notice the decreasing gap between 2 and 3 in Figure 3.2. Because we only consider the original participants (in fact a file of participants that is dying out), the average age of the participants increases substantially during the simulation period. The effect of changes in the discount rate is smaller for older people.[5]

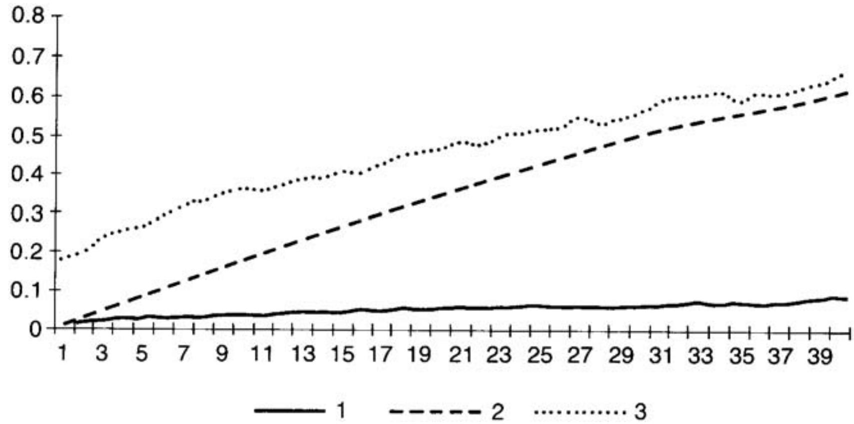

Figure 3.2 Coefficient of variation of original participants

4 THE LIABILITIES OF A PENSION FUND: A ONE-PERIOD MODEL

4.1 Factor models

We will present a factor model for the liabilities of a pension fund and use this model as a way of analyzing the possibilities of matching both sides of the pension fund balance sheet. This section gives a brief overview of (multi-) factor models. We refer to Haugen (1990) as an example of a more extensive introduction to factor models.

In general the growth rate of a stochastic variable can be described as

$$g_t = E_{t-1}(g_t) + e_t \tag{3.4}$$

where E_{t-1} is the expectations operator, conditional on the information set at time $t-1$. The growth rate equals the expected growth rate plus a residual, describing the error process. This unidimensional error process can be refined to a linear multidimensional version, where the errors are related to unexpected changes in some general factors:

$$g_t = E_{t-1}(g_t) + b_1 f_{1,t} + b_2 f_{2,t} + \cdots + b_k f_{k,t} + \varepsilon_t \tag{3.5}$$

where b_i is the sensitivity of the growth rate to changes in factor i, $f_{i,t}$ is the *unexpected* change of factor i in period t and ε_t is the idiosyncratic growth rate in period t.

Note that the expected changes in the factors are incorporated in the expected growth rate. The unexpected changes in factors 1 to k are then the single sources of factor risk, because these unexpected changes account for the discrepancy between the actual growth rate and the expected growth rate. The sensitivities b_i

determine the extent to which factor movements have an influence on the actual growth rate and can therefore be considered as factor risk measures. The idiosyncratic growth rate is the source of idiosyncratic risk. As the residual growth rates $\varepsilon_{i,t}$ are assumed to be mutually independent, the idiosyncratic risk can be diversified in a portfolio context.

In general it is possible to describe the growth rate of the liabilities and the growth rate of the assets (the return) as a one-period linear factor model like equation (3.5):

$$\begin{aligned} \ln\ L_t - \ln\ L_{t-1} &= a_l + b_{l,1}f_{1,t} + b_{l,2}f_{2,t} + \cdots + b_{l,k}f_{k,t} + \varepsilon_{l,t} \\ \ln\ A_t - \ln\ A_{t-1} &= a_a + b_{a,1}f_{1,t} + b_{a,2}f_{2,t} + \cdots + b_{a,k}f_{k,t} + \varepsilon_{a,t} \end{aligned} \tag{3.6}$$

In the next section we derive a linear factor model for the liabilities of a pension fund.

4.2 A one-period deterministic model

To illustrate the risks of a pension fund, we start with a simple one-period model. Consider a fund with a single inflation-proof pension benefit due in one period, say a year. B_1 is the expected real value of this benefit, i.e. the real value of the benefit, excluding the (at the moment unknown) indexation, multiplied by the probability that the benefit will be paid.

$$\begin{array}{ccc} \text{———}+\text{———} & & + \\ L_0 & & B_1 \end{array}$$

When using continuous discounting, the present value of this liability is

$$L_0 = B_1\ \exp(\mathrm{E}_0\mathrm{infl}_1 - {}_0r_1) \tag{3.7}$$

where $\mathrm{E}_0\mathrm{infl}_1$ is the expected inflation rate for period 1 (t_0 to t_1) at t_0 and ${}_0r_1$ is the (certain) one-year spot interest rate at t_0.

If we define the real one-year spot rate ${}_0\mathrm{rr}_1$ as ${}_0r_1$—$\mathrm{E}_0\mathrm{infl}_1$ equation (3.7) can be rewritten as

$$L_0 = B_1\ \exp(-{}_0\mathrm{rr}_1) \tag{3.8}$$

At the end of period 1 the benefit B_1 plus the actual inflation rate are paid to the participants, so

$$L_1 = B_1\ \exp(\mathrm{infl}) \tag{3.9}$$

When the pension fund invests the present value L_0 and generates a total return on the asset mix of ret_1, the value of the assets will match the value of the liabilities if

$$L_0\ \exp(\mathrm{ret}_1) = L_1 \tag{3.10}$$

Combining equations (3.8), (3.9) and (3.10) and taking natural logarithms, we get after rearranging

$$\mathrm{ret}_1 = {}_0\mathrm{rr}_1 + \mathrm{infl}_1 \tag{3.11}$$

$$\mathrm{ret}_1 = {}_0r_1 + \mathrm{UEinfl}_1 \tag{3.12}$$

where UEinfl_1 is the unexpected inflation over period 1 and

$$\text{UEinfl}_1 = \text{infl}_1 - \text{E}_0\text{infl}_1$$

In words: the assets and the liabilities are matched if the return on the asset mix moves in line with the one-period interest rate (the discount rate) and the unexpected inflation (the forecast error).

A multiperiod example can be illustrated as follows:

$$\begin{array}{cccc} L_0 & B_1 & B_2 & B_3 \quad \cdots \end{array}$$

The liabilities of the pension fund consist of a set of expected future benefits $\{B_t\}$ (for t=1, 2,…, n), that, again, include the real value of the benefits and the probability of payment but exclude the indexation. The present value of this liability is

$$L_0 = \sum_{t=1}^{n} B_t \exp\left(\sum_{i=1}^{t} \text{E}_0\text{infl}_i - t_0r_t\right) \tag{3.13}$$

where n is the year the last participant of the pension fund dies, E_0infl_i is the expected inflation rate for period $i(t_{i-1}$ to $t_i)$ at t_0 and ${}_0r_i$ is the (certain) i-year spot interest rate at t_0.

If we assume for simplicity a constant expected inflation rate for all future periods ($\text{E}_0\text{infl}_i = \text{E}_0\text{infl}$ for all i) and a flat term structure of interest rates (${}_0r_t = r_0$ for all t), equation (3.13) reduces to

$$L_0 = \sum_{t=1}^{n} B_t \exp[t(\text{E}_0\text{infl} - r_0)] \tag{3.14}$$

$$L_0 = \sum_{t=1}^{n} B_t \exp(-t\text{rr}_0) \tag{3.15}$$

where rr_0 is the real interest rate at t_0 and

$$\text{rr}_0 = r_0 - \text{E}_0\text{infl}$$

At t_1 the following happens. The indexed value of the first benefit is paid to the pensioners and a new expected level of future inflation rates E_1infl and a new level of the term structure of interest rates r_1 are defined.

$$L_1 = B_1 \exp(\text{infl}_1) + \sum_{t=2}^{n} B_t \exp[\text{infl}_1 + (t-1)(\text{E}_1\text{infl} - r_1)] \tag{3.16}$$

$$L_1 = B_1 \exp(\text{infl}_1) + \exp(\text{infl}_1) \sum_{t=2}^{n} B_t \exp[-(t-1)\text{rr}_1] \tag{3.17}$$

If we define

$$X = \sum_{t=2}^{n} B_t \exp[-(t-1)\text{rr}_1]$$

we can use the following first-order approximation of the liabilities at t_1 on the basis of the realized value of infl_1, the new inflation expectation and the new discount rate:

$$\begin{aligned} L_1 \approx{} & B_1 \exp(\text{infl}_1) + \exp(\text{infl}_1) \\ & \times \left\{\sum_{t=2}^{n} B_t \exp[-(t-1)\text{rr}_0]\right\}\left(1 + \frac{\partial X/X}{\partial \text{rr}_0}\Delta \text{rr}_0\right) \end{aligned} \tag{3.18}$$

Notice that $-(\partial X/X)/\partial \mathrm{rr}_0$ is the Macaulay duration D_1 of the remaining liabilities at t_1. So equation (3.18) can be rewritten as follows:

$$L_1 \approx B_1 \exp(\mathrm{infl}_1) + \exp(\mathrm{infl}_1) \times \left\{ \sum_{t=2}^{n} B_t \exp[-(t-1)\mathrm{rr}_0] \right\} (1 - D_1 \, \Delta \mathrm{rr}_0) \tag{3.19}$$

Again there is a match between the assets and liabilities if equation (3.10) holds.

$$\exp(\mathrm{ret}_1) \sum_{t=1}^{n} B_t \exp(-t\mathrm{rr}_0) = \exp(\mathrm{infl}_1)\left(B_1 + \left\{ \sum_{t=2}^{n} B_t \exp[-(t-1)\mathrm{rr}_0] \right\} (1 - D_1 \, \Delta \mathrm{rr}_0)\right) \tag{3.20}$$

Because B_t=B_t exp[–(t–1)rr$_0$] for t=1 we get

$$\exp(\mathrm{ret}_1)\exp(-\mathrm{rr}_0) \sum_{t=1}^{n} B_t \exp[-(t-1)\mathrm{rr}_0] = \exp(\mathrm{infl}_1)\left(\left\{ \sum_{t=1}^{n} B_t \exp[-(t-1)\mathrm{rr}_0] \right\} - D_1 \, \Delta \mathrm{rr}_0 \left\{ \sum_{t=2}^{n} B_t \exp[-(t-1)\mathrm{rr}_0] \right\}\right) \tag{3.21}$$

After dividing by and taking logarithms, we get

$$\mathrm{ret}_1 = \mathrm{rr}_0 + \mathrm{infl}_1 + \ln\left(1 - D_1 \left\{ \frac{\sum_{t=2}^{n} B_t \exp[-(t-1)\mathrm{rr}_0]}{\sum_{t=1}^{n} B_t \exp[-(t-1)\mathrm{rr}_0]} \right\} \Delta \mathrm{rr}_0 \right) \tag{3.22}$$

or

$$\mathrm{ret}_1 = \mathrm{rr}_0 + \mathrm{infl}_1 + \ln(1 - D_1\alpha \, \Delta \mathrm{rr}_0) \tag{3.23}$$

As a final step we take a first-order approximation of the logarithmic term

$$\mathrm{ret}_1 = \mathrm{rr}_0 + \mathrm{infl}_1 + \beta \, \Delta \mathrm{rr}_0 \tag{3.24}$$

or, in terms of observable variables,

$$\mathrm{ret}_1 = r_0 + \mathrm{UEinfl}_1 + \beta(\Delta r_0 - \Delta \mathrm{E}_0\mathrm{infl}) \tag{3.25}$$

As the result of all this arithmetic, we have a factor model for this pension fund which states that the assets and the liabilities match if the return on the assets moves in line with the one-period interest rate (the discount rate) and the unexpected inflation (the forecast error) and the change in the interest rate and the expected inflation (affecting the change in the present value of the future liabilities). It is important to note that the sensitivity coefficient ($D_1\alpha$ in (3.23) or its approximation β in (3.24)) is certain, i.e. can be calculated, at t_0.

Until now we have indexed all liabilities in the same way. In practice it is possible that different liabilities are indexed in different ways. For example, the rights of actives are prosperity proof, the rights of pensioners are inflation proof and the rights of sleepers are not indexed at all. In a general case the condition for asset liability matching can be summarized in the following factor model:

$$\begin{aligned}\mathrm{ret}_t = r_0 + b_{l,1}\,\Delta r_0 + b_{l,2}\mathrm{UEinfl}_t + b_{l,3}\Delta \mathrm{E}_{t-1}\mathrm{infl} \\ + b_{l,4}\mathrm{UErwg}_t + b_{l,5}\,\Delta \mathrm{E}_{t-1}\mathrm{rwg}\end{aligned} \tag{3.26}$$

4.3
A one-period stochastic model

In the last section we only described the influence of the economic variables on the pension liabilities. Actuarial risks are not taken into consideration yet. A simulation model, as introduced in section 2 and illustrated in section 3, makes it possible to add (and quantify) a stochastic error term to equation (3.26), which measures the actuarial risk. In this way we can complete the one-period multifactor model of the liabilities as

$$\begin{aligned}\mathrm{ret}_t = r_0 + b_{l,1}\,\Delta r_0 + b_{l,2}\mathrm{UEinfl}_t + b_{l,3}\,\Delta \mathrm{E}_{t-1}\mathrm{infl} \\ + b_{l,4}\mathrm{UErwg}_t + b_{l,5}\,\Delta \mathrm{E}_{t-1}\mathrm{rwg} + \varepsilon_t\end{aligned} \tag{3.27}$$

This factor model gives us the opportunity to quantify in section 2.2 mentioned risks and provides a framework for the matching of assets and liabilities, the problem we address next.

5
MATCHING MODEL

Equation (3.27) sets the goal for modeling investments. How well can returns on different assets be explained by the factors mentioned? Note that this implies that we are not interested in the set of factors that explains the returns of the assets as well as possible; we are only interested in the extent that the factors are "translated" into asset returns.

We shall not discuss the theory in this field. As well as many other studies, we refer the reader to Fisher and Weil (1971), Cooper (1977) and Vasicek and Fong (1982) for some background on the interest rate sensitivity of bonds, to Joehnk and Petty (1980) and Casabona *et al.* (1983–4) for the relation between interest rates and the return on common stocks and to Fama and Schwert (1977), Joehnk and Petty (1979–80) and Kaul (1990) for the effect of inflation on asset returns.

In the preceding paragraphs we described a way to estimate a linear factor model for the liabilities of a pension fund. This resulted in equation (3.27).

In general we can describe the one-period growth rate of the liabilities as

$$\ln L_t - \ln L_{t-1} = \mathrm{ret}_1 = \sum_{k=1}^{K} b_{l,k} f_k + \varepsilon_l \tag{3.28}$$

When a similar factor model is estimated for different assets, we have

$$\ln A_t - \ln A_{t-1} = \mathrm{ret}_a = \sum_{k=1}^{K} b_{a,k} f_k + \varepsilon_a \qquad \text{for } a = 1, \ldots, A \tag{3.29}$$

The growth rate of the surplus of the pension fund can then be described as

$$\text{ret}_s = \sum_{a=1}^{A} x_a \ \text{ret}_a - \text{ret}_l = \sum_{k=1}^{K} \left(\sum_{a=1}^{A} x_a b_{a,k} - b_{l,k} \right) f_k + \varepsilon_s \tag{3.30}$$

where x_a is the fraction of the total portfolio invested in asset a.

If we can find an investment portfolio of which the term in parenthesis is zero, i.e. the weighted sensitivities b_a are the same as the b_l for all factors k, we have matched the assets and the liabilities of this pension fund. If it is not possible to find such an asset mix, the matching problem turns into a mean-variance framework: for each level of the growth rate of the surplus we are interested in the one with the least variation:

$$\min E\left(\sum_{a=1}^{A} x_a \text{ret}_a - \text{ret}_l \right)^2 \tag{3.31}$$

subject to

$$\sum_{a=1}^{A} x_a \text{ret}_a - \text{ret}_l = \text{ret}^* \qquad \text{and} \qquad \sum_{a=1}^{A} x_a = 1$$

In this way the factor model approach is not only an intuitively appealing approach to matching, but also quantifies (in equation (3.31)) the possibilities of matching.

6
CONCLUSIONS AND FUTURE RESEARCH

In this chapter we have investigated the financial position and risks of a pension fund. The essential function of a pension fund is insuring the rights of (former) employees. This starting point leads to the following risks in the financial position of a fund: interest rate risk, inflation and real wage growth risk, actuarial risk and pension system risk. We derived a one-period linear factor model to describe these risks and proposed a simulation approach to estimate the third kind of risk. If a similar factor model is estimated for the different asset categories that are available, we can try to match the assets with the liabilities on the basis of a mean-variance approach.

For future research it is possible to extend the factor model to a multiperiod model and to make an estimation of the relevant sensitivities for a particular pension fund. This multiperiod case gives the opportunity to forecast changes in the file of participants, e.g. as a result of the ageing of the population, so giving the possibility to anticipate on these changes. It is also possible to look beyond short-term fluctuations in the asset returns and to introduce lags between variables, e.g. between inflation and asset returns. However, it should be stressed that the multiperiod case becomes more difficult to estimate: the sensitivities $b_{l,k}$ at time t are dependent on both the history of the economic variables—inflation, wage growth and the discount rate—up to time t (economic risk) and the historic development in the file of participants up to time t (actuarial risk). But again simulation can give insight in the relative magnitude of the risks.

NOTES

1. In this chapter we shall not make the distinction between risk and uncertainty as introduced by Knight (1921).
2. We define the liabilities of a pension fund as the present value of the accumulated rights of the participants, as explained above.
3. An example of a push model is described in van Aalst and Boender (1993).
4. The method was introduced by Boender and Romeijn (1991).
5. Or, stated otherwise, the duration of the liabilities decreases.

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4
An empirical study of the correlation between mutual funds' selectivity and timing performance

Zakri Y.Bello

1
INTRODUCTION

Studies of the micro- and macro-forecasting ability of mutual fund managers generally find a zero or negative performance for the average fund, suggesting that the average fund manager displays no significant selection or timing ability. Further, a negative correlation between selection and timing performance, suggestive of reverse skills or activity specialization, is reported by Kon (1983), Henriksson (1984) and Chang and Lewellen (1984), among others.[1] A few studies, however, find significant timing and selection performance at the individual fund level—Kon (1983), Lehmann and Modest (1987) and Lee and Rahman (1990).[2] Eun *et al.* (1991) and Cumby and Glen (1990) show that although US-based international funds fail to beat the Morgan Stanley Capital International Index (MSCI), they are able to beat two specific indices of US stocks.[3]

The purpose of this study is to determine if the correlation between timing ability and selectivity found in previous studies of mutual fund performance is indeed attributable to the nature of the mutual fund's asset holdings, as suggested by Jagannathan and Korajczyk (1986) and Dybvig and Ross (1985a). Would this phenomenon disappear if the performance of small company growth funds (which are supposed to be invested in highly levered firms) is measured relative to the Nasdaq index, and if the performance of equity income funds (which are supposed to be invested in firms with relatively low leverage) is measured relative to the Dow Jones Industrial Average (DJIA)?

Investment performance is measured using both the Nasdaq Composite Index and the DJIA for the entire sample of 86 mutual funds and, additionally, using the MSCI for the 15 international funds in our sample.[4]

2
METHODOLOGY

Selection and timing performance

The stock selection and market timing performance of each managed portfolio are estimated first within the framework of the quadratic equation attributed to Treynor and Mazuy (1966):

$$r_{pt} = \alpha_p + b_1 X_t + b_2 X_t^2 + \varepsilon_{pt} \qquad (4.1)$$

where r_{pt} is the dividend-adjusted return on portfolio *p* in month *t* minus the yield on 91-day Treasury bills in month t (Rf_t), X_t is the observed return on the market index in month *t* minus Rf_t, α and b_2 are estimated selectivity and timing performance respectively and ε_{pt} is the residual excess return on portfolio *i* in month *t*.

Treynor and Mazuy (1966) suggest that a positive value of b_2 is indicative of timing ability since it implies that the rates of return on the portfolio are more sensitive to large positive market returns than to large negative market returns. The Treynor and Mazuy (TM) model is mathematically correct, as demonstrated by Admati *et al.* (1986). However, the preponderance of negative timing performance as well as the negative correlation between timing and selection performance reported in several studies of mutual fund performance suggest that these two phenomena might be artificially induced by the model, perhaps due to a lack of fit to mutual fund data, and thus cast doubt on the validity of b_2 as a measure of a mutual fund's timing ability.[5] Accordingly, the TM model is reformulated as follows in order to provide a better fit to empirical data:

$$r_{pt} = \alpha_p + b_1 X_t + b_2 Z_t + \varepsilon_{pt} \qquad (4.2)$$

where

$$Z_t = \begin{cases} X_t^2 & \text{if } X_t \geqslant 0 \\ (X_t^2)(-1.0) & \text{otherwise} \end{cases}$$

The TM model is a modification of the security characteristic line (SCL), widely used for general evaluation of active management. The model correctly describes TM's view of what constitutes good management. The funds evaluated in most of the studies that report negative correlation between selectivity and timing performance, however, do not seem to fit that description as Jensen's alpha is invariably zero or negative. Figure 4.1 shows the SCL for a typical fund—without the b_2 term—compared with the standard SCL, illustrating a case of good management, which has kept its alpha high and its beta low. Figure 4.2 shows the curvilinear reform by TM, which suggests that: "As excess returns on the market reach high positive levels, a good management will be in the issues driving the market and therefore have excess returns which are even larger. When excess returns on the market reach low negative levels, a good management will be away from the issues driving the market and therefore have

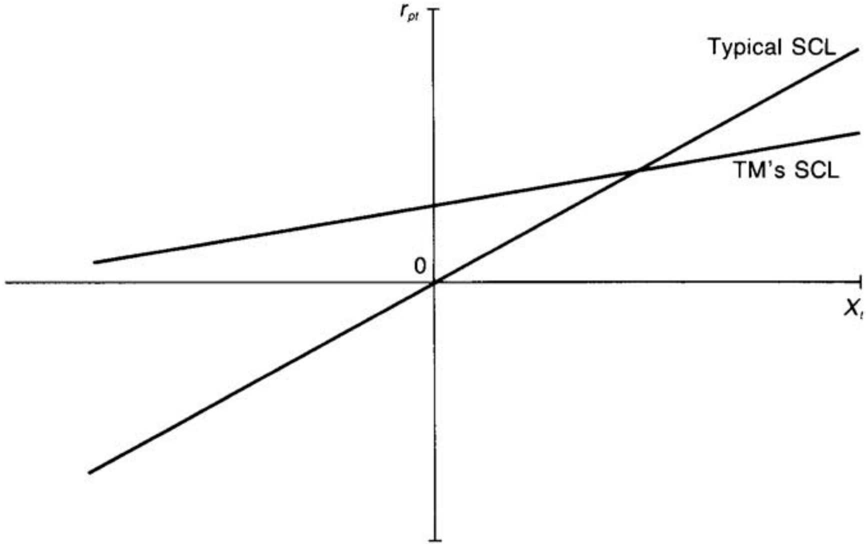

Figure 4.1 Alternative security characteristic lines

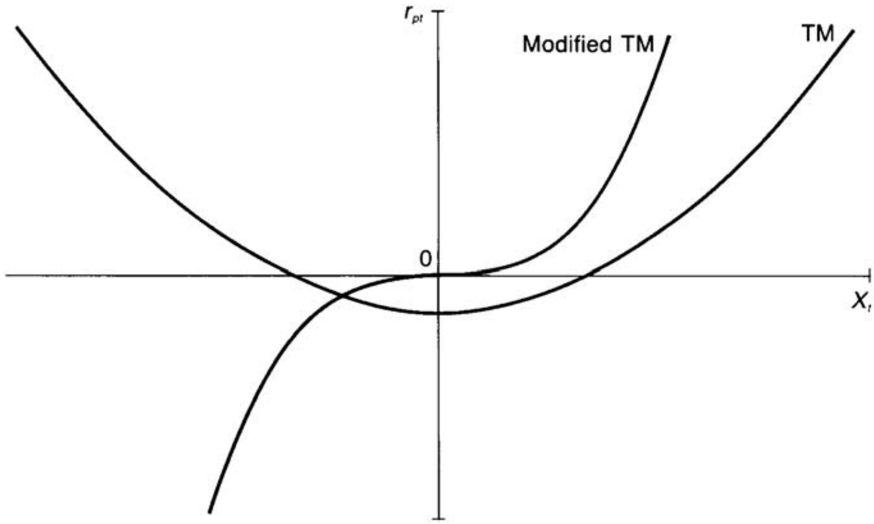

Figure 4.2 TM and modified TM models

excess returns which are less negative or even still positive." Thus impliedly, b_2 shows good or bad timing. Thus, guided by theory, the objective of TM is to describe what constitutes good management, not necessarily to get a good fit to empirical data. The modified TM model shown in Figure 4.2 implies that the management does increasingly worse than the market when the market is on the downside. In other words, the funds may have been good bull market timers and bad bear market timers.

Alternatively, both the series of market returns, X, and the mutual fund portfolio return series, r_p, for any extended time interval, would normally consist of a significant number of negative returns. Since b_2 is an estimate of the volatility of the portfolio return in relation to the market, merely squaring the variable X without due recognition of its normal co-movement with the portfolio would create a series X^2 whose covariance with the portfolio tends to be negative, thus probably resulting in a negative correlation between r_p and X^2, and therefore a negative b_2.[6]

Using the correlation analogy to multiple regression, equation (4.1) can be expressed in terms of full partial correlations and conditional variances as follows:

$$\mu_{r|xx^2} = \mu_x + \rho_{rx|x^2} \frac{\sigma_{r|x^2}}{\sigma_{x|x^2}} (X - \mu_x) + \rho_{rx^2|x} \frac{\sigma_{r|x}}{\sigma_{x^2|x}} (X^2 - \mu_{x^2}) \tag{4.3}$$

where

$$\beta_2 = \rho_{rx^2|x} \frac{\sigma_{r|x}}{\sigma_{x^2|x}} \tag{4.4}$$

ρrx^2 is the correlation between r_p and X^2 after controlling for the effect of X, $\sigma_{r|x}$ is the standard deviation of r after controlling for the effect of X and $\mu_{r|xx}{}^2$ is the mean of r for given values of X and X^2.

If b_2 is the estimate of β_2, c is the estimate of ρ and S is the estimate of σ, then

$$b_2 = c_{rx^2|x} \frac{S_{r|x}}{S_{x^2|x}} \tag{4.5}$$

Since S cannot be negative, the sign of b_2 depends solely on the sign of c, which tends to be negative the greater the prevalence of negative observations in the series of portfolio returns. This is likely to be the cause of the negative timing performance and negative correlation between the two measures of performance reported in several studies of mutual fund performance.

The α and b_2 estimated using equation (4.5) should be free of the phenomena discussed above, since the normal co-movement between r_p and X is preserved. The b_2 estimated using the TM model would be the same as that estimated using the modified TM model only if the series of market returns and portfolio returns included no significant number of negative returns. Since this is rarely the case with either the market or the portfolio return series for any extended time period, the TM model tends to artificially induce negative timing performance as well as a preponderance of negative correlation between timing performance and selectivity. This phenomenon would become more severe the more the prevalence of negative returns in the particular portfolio's series of returns, and suggests that the b_2 estimated using the Treynor and Mazuy model may not represent timing performance for the typical mutual fund.

In the present study, the measures of timing ability and stock selection ability, as well as the correlation between these two performance measures, are estimated using both the TM and the modified TM models, for the purpose of comparison.

3
THE SAMPLE AND THE DATA

The sample consists of 86 mutual funds, grouped into six investment objectives. The funds and their objectives were selected randomly from the Standard and Poor's/Lipper Mutual Fund Profiles. Each fund's quarterly net asset values per share, net assets and common equity are obtained from the Standard and Poor's OTC Stock Reports. Average values of these items, over the 1986–90 period are shown in Table 4.1.

Bid prices are obtained from the Standard and Poor's Daily Stock Price Record, and quarterly dividend data are obtained from the Moody's Annual Dividend Record. The funds are listed in Appendix 4A and the definitions of investment objectives are in Appendix 4B.

Table 4.1 Average portfolio compositions, 1986–90

Objective	*Beta*	*Sample size*	*NAV ($)*	*STD*	*Net assets ($M)*	*STD*	*%CE*	*STD*
G	0.96	15	18.7	18.5	190.0	210.2	88.7	7.3
SG	0.81	13	23.2	24.4	106.0	98.2	89.6	7.4
GI	0.77	15	15.2	6.9	571.1	801.1	79.0	8.6
E1	0.65	13	13.6	5.6	165.5	160.7	68.8	20.3
B	0.58	15	14.5	6.2	214.2	279.8	55.7	9.3
1F	0.27	15	16.0	7.4	135.9	160.8	84.6	6.2

Notes: Beta is computed using the Nasdaq index; NAV, net asset value per share; STD, standard deviation; %CE, common stock holdings as a percentage of net assets. Definitions of investment objectives are given in Appendix 4B.

4
THE RESULTS

Estimated performance measures

Measures of selection and timing performance, α and b_2 respectively, for our sample of 71 domestic funds and 15 international funds, estimated using the TM model, are shown in Appendix 4C. The performance measures estimated again using the modified TM model are presented in Appendix 4D. The corresponding F statistics and R^2 are shown in Appendices 4E and 4F.

As hypothesized in section 2 of this study, the estimated Jensen's alpha, i.e. the intercept of the SCL, is either zero or significantly negative for each mutual fund in our sample. Thus the modified TM model illustrated in Figures 4.1 and 4.2 appears to provide a better fit to empirical data than the TM model. Further, Table 4.2 shows that the F statistics and R^2 for overall regression quality are on average higher for the modified TM model, thus indicating a better fit to mutual fund data.

In line with the previous studies of mutual fund performance, Appendix 4C shows a preponderance of zero and negative performance measures for the domestic and international funds. Only one domestic fund, for example, has a significantly positive timing performance when the DJIA is used as the benchmark. This same fund has a significantly negative selection performance. Three funds have significantly positive timing performance

Table 4.2 Average F statistics and R^2 for regression quality

	DJIA		*NASDAQ*	
Objective	F	R^2	F	R^2
Panel A: TM model				
G	63.572	0.6323	74.924	0.6342
SG	47.003	0.5974	87.293	0.6807
GI	38.370	0.5409	34.534	0.5079
EI	31.851	0.5260	34.836	0.5387
B	32.134	0.4736	28.269	0.4304
Domestic funds	42.764	0.5536	51.459	0.5555
IF	13.184	0.3236	13.305	0.3247
Panel B: modified TM model				
G	73.304	0.7051	89.627	0.7279
SG	53.738	0.6345	116.470	0.7526
GI	54.493	0.6265	52.725	0.6218
EI	44.761	0.5918	52.405	0.6222
B	43.870	0.5544	41.284	0.5399
Domestic funds	54.303	0.6230	69.717	0.6510
IF	15.958	0.3742	15.845	0.3666

Note: Using the MSCI as the benchmark portfolio for the IF group, the TM model yields an R^2 of 0.5643 and the modified TM model yields an R^2 of 0.5414.

when the Nasdaq Composite Index is used. One of these three has a significantly negative selection performance. All other performance measures are either zero or significantly negative. Thus, using either of the two market indices, the average domestic fund fails to exhibit either selection or timing ability in the 1986–90 period.[7]

Further, only one international fund has a significantly positive selection performance when either the DJIA or the MSCI is used as the benchmark. With the Nasdaq Composite Index, however, three of the 15 international funds have significantly positive selection performance. But in all cases, the statistically significant selection performance is accompanied by a significant negative timing performance. This suggests that the average OTC international mutual fund fails to beat either the domestic or the international market in the 1986–90 period. This is in contrast to Cumby and Glen (1990) and Eun *et al.* (1991) who report that the average NYSE/AMEX international fund fails to beat the MSCI, but that they beat the domestic market.[8] The prevalence of negatively correlated performance measures reported in several studies of mutual fund performance is evident in Appendix 4C.

The performance of both the domestic and international funds improves dramatically, irrespective of the benchmark portfolio, when the performance measures are estimated using the modified TM model. Appendix 4D shows that 13 of the 71 domestic funds have significantly positive timing performance, only three of which are accompanied by a significantly negative selection performance, based on the DJIA. Nine of the funds have significantly positive timing performance, and one has a significantly positive selection performance, when the Nasdaq Composite Index is used as the market index. None of these performance measures is accompanied by a significantly negative "other" performance. Thus the average domestic mutual fund beats the market when performance measures are estimated using the modified TM model.

As for the international funds, eight out of 15 have positive timing performance, four of which also have statistically significant selection performance, when the DJIA is used as the market index, and 10 (including two with significantly negative selection performance) when the Nasdaq Composite Index is used. This of course means that the average international fund beats the domestic market irrespective of which of the two indices is used as the benchmark. The international funds as a group also beat the MSCI, with five of the funds having significantly positive timing performance.[9] It follows from these results that the prevalence of negative correlation between timing and selection performance measures is reduced when the modified TM model is used. Table 4.3 shows the average as and b2s, broken down by investment objective. No pattern based on investment objective seems to emerge. However, it is evident in Table 4.3 that the timing performance of the average mutual fund improves dramatically with

Table 4.3 Average selection and timing performance measures (*T* statistics in parentheses)

	DJIA		*Nasdaq*		*MSCI*	
	Selection	*Timing*	*Selection*	*Timing*	*Selection*	*Timing*
Panel A						
G	−0.004 (−3.297)*	−1.317 (−4.510)*	0.000 (0.046)	−0.764 (−3.449)*	–	–
SG	−0.004	−1.821	−0.001	−0.787	–	–

	DJIA		*Nasdaq*		*MSCI*	
	Selection	*Timing*	*Selection*	*Timing*	*Selection*	*Timing*
	(−2.675)*	(−4.274)*	(−0.746)	(−2.326)*		
GI	−0.006	−0.636	−0.001	−0.586	–	–
	(−6.816)*	(−3.599)*	(−1.269)	(−3.045)*		
EI	−0.005	−0.886	−0.002	−0.484	–	–
	(−6.916)*	(−4.045)*	(−3.619)*	(−2.803)*		
B	−0.007	−0.554	−0.004	−0.520	–	–
	(−5.486)*	(−1.876)	(−3.502)*	(−2.126)*		
Average	−0.005	−1.025	−0.002	−0.628	–	–
IF	0.005	−3.018	0.009	−3.027	0.003	−3.261*
	(3.377)*	(−9.835)*	(6.525)*	(−9.105)*	(1.450)	(−6.760)
Panel B						
G	−0.007	1.148	0.002	0.758	–	–
	(−5.043)*	(3.338)*	(−1.451)	(−3.670)*		
SG	−0.008	−0.899	−0.003	0.807	–	–
	(−4.906)*	(1.012)	(−1.764)	(1.948)		
GI	−0.009	−0.257	−0.003	0.251	–	–
	(−9.550)*	(−0.759)	(−3.672)*	(0.866)		
EI	−0.007	0.429	−0.004	0.352	–	–
	(−10.474)*	(1.117)	(−5.654)*	(−1.354)		
B	−0.009	0.031	−0.005	0.290	–	–
	(−9.531)*	(0.081)	(−6.315)*	(0.904)		
Average	−0.008	0.438	−0.003	0.487	–	–

Notes: Panel A is based on the TM model. Panel B is based on the modified version of the TM model. Figures in the table are arithmetic averages of performance measures computed using the following indices: DJIA, Dow Jones Industrial Average; Nasdaq, Nasdaq Composite Index; MSCI, Morgan Stanley Capital International Index. Definitions of investment objectives are given in Appendix 4B.

*, significant at the 5 percent level.

the use of the TM model, while the average selection performance remains relatively unchanged.

The correlation between selection and timing performance

The negative correlation between selection and timing performance reported in several studies of mutual fund performance is evident in Appendix 4C, and in panel A of Table 4.4. The Pearson correlation

Table 4.4 Pearson correlation coefficients between timing performance and selectivity

Objective	*DJIA*	*Nasdaq*	*MSCI*
Panel A: TM model			
Domestic and international	−0.63	−0.64	–
Domestic funds only	−0.48	−0.35	–
G	−0.23	−0.06	–
SG	−0.28	−0.23	–
GI	−0.30	−0.45	–
EI	−0.51	−0.43	–
B	−0.79	−0.69	–
IF	−0.25	−0.25	−0.70
Panel B: modified TM model			
Domestic and international	0.48	0.36	–
Domestic funds only	0.42	0.10	–
G	0.30	−0.11	–
SG	0.61	0.04	–
GI	0.04	0.00	–
EI	0.16	0.29	–
B	0.44	0.28	–
IF	−0.16	0.02	0.43

coefficient between the two performance measures is −0.48 when the DJIA is used as the benchmark and –0.35 when the Nasdaq Composite Index is used instead. For the international funds the correlation coefficient is −0.70 when the MSCI is used as the benchmark.[10]

As expected, panel B of Table 4.4 indicates that the negative correlations change to positive when the performance measures are estimated using the modified version of the TM model. The correlation coefficient for the domestic funds is now 0.42 using the DJIA as the benchmark portfolio, and 0.10 when the Nasdaq Composite Index is used. For the 15 international funds, the correlation coefficient is 0.43 using the MSCI. This finding supports Lee and Rahman (1990) who, using a different modification of the TM model, arrive at a correlation coefficient of 0.47.[11] Also, in line with Lee and Rahman (1990) and with Kon (1983) who reports a negative correlation, our sample indicates some timing ability at the individual fund level.[12]

There appears to be no apparent pattern based on investment objective with regard to the Pearson correlation coefficients shown in Table 4.4. As regards the small company growth funds (SG), which are invested in more option-like securities than the other groups, the correlation coefficients shown in panel A of Table 4.4 are not substantially different when either the DJIA or the Nasdaq Composite Index is used as the benchmark portfolio. Panel B of Table 4.4, however, shows that the correlation between timing and selection performance is near zero when the Nasdaq Composite Index is used and positive when the DJIA is used instead. Further, panel A of Table 4.3 indicates that the average measured timing and selection performance are negative for the SGs and for the other investment objective groups irrespective of which of the two market indices is used. Panel B on the other hand indicates that the average timing performance is positive and the average selection negative for all investment objective groups, with the exception of GIs, using either of the two market indices. This evidence based on actual mutual fund price data does not appear to support Jagannathan and Korajczyk (1986) who suggest, based on common stock prices, that for such funds one would expect to find average measured timing performance to be positive and average selectivity to be negative when a benchmark which contains less option-like securities, such as the DJIA, is used.[13]

Using the TM model, the results suggest that the timing and selection abilities are both negative for the average mutual fund. The results based on the modified TM model, however, indicate that a significant number of funds is successful at market timing, and that international funds on average are more successful at market timing than domestic funds.

5
SUMMARY AND CONCLUSIONS

The performance of domestic and US-based international mutual funds is evaluated, first using the model suggested by Treynor and Mazuy (1966) and then using a modified version of that same model. As is generally reported in previous studies of mutual fund performance, the performance of the average OTC mutual fund measured using the Treynor and Mazuy model is either zero or negative when either the DJIA or the Nasdaq Composite Index is used as the benchmark portfolio. These results are uniform across all five of the investment objective groups of domestic mutual funds. Unlike the findings of the few previous studies of international mutual funds, however, we find that these groups of funds do not beat the DJIA, the Nasdaq Composite Index or the MSCI. The performance of the average international fund is zero or negative in the 1986–90 period. Further, with both the domestic and international funds, the negative correlation between timing performance and selectivity reported in several studies is evident in our results. The results indicate that the negative correlation is not explained by the leverage characteristics of the mutual fund's asset holdings as suggested in previous studies which use common stock prices.

When a modified version of the Treynor and Mazuy model is used to measure performance, we find that, for both the domestic and international mutual funds, average selectivity remains unchanged while timing performance improves significantly. The results indicate that the modified Treynor and Mazuy model provides a better fit to empirical data. At the individual fund level we find evidence of significant timing ability. These results are uniform across all of the six investment objective groups (including international funds). The domestic funds outperform both the DJIA and the Nasdaq Composite Index, and the international funds beat these two indices as well as the MSCI. Further, the correlation between timing and selectivity turned positive for the average domestic and international funds, and for each investment objective group. The results suggest that the preponderance of negative timing performance and the negative correlation between timing performance and selectivity are explained not by the leverage characteristics of the fund's assets but by the form of the return-generating model used in those studies. Our results also indicate that the average fund is more successful at market timing than at stock selection.

APPENDIX 4A
LIST OF MUTUAL FUNDS

ID	*Name*	*Ticker*	*Objective*
1	AAL Capital Growth	AALGX	G
2	AARP Capital Growth	ACGFX	G
3	AARP Growth & Income FD	AGIFX	GI
4	ABT Growth and Income	GRWTX	GI
5	Acorn Fund	ACRNX	SG
6	Affiliated FD	LAFFX	GI
8	Alliance Balanced Shares	CABNX	B
10	Alliance Counterpoint FD	ALCPX	GI
11	Alliance Dividend Shares	CABDX	GI
12	Alliance International FD	ALIFX	IF
13	American Balanced Shares	ABALX	B
14	American Growth Fund	AMRGX	G
15	American Leaders FD	FALDX	GI
16	American Mutual FD	AMRMX	GI
17	American National Income Fund	AMNIX	EI
18	AMEV Capital FD	AMCLX	GI
19	Axe Houghton Fund B	AXEBX	B
20	Babson Enterprise FD	BABEX	SG
21	Brandywine Fund	BRWIX	G
23	Capital Income Builder	CAIBX	EI
24	Cardinal Fund	CDFIX	GI
26	Clipper Fund	CFIMX	GI
27	Colonial Fund	COLFX	GI
28	Colonial Small Stock Index FD	CSMIX	SG
29	Columbia Growth Fund	CLMBX	G
30	Composite Bond & Stock	CMPBX	B

ID	*Name*	*Ticker*	*Objective*
31	Dean Witter Div. Growth Sec.	DWDVX	GI
32	Dodge & Cox Balanced FD	DODBX	B
33	Dr Equity Fund	DIEFX	GI
34	Dreyfus Fund	DREVX	GI
35	Dreyfus New Leaders FD	DNLDX	SG
36	Eaton Vance Growth Fund	EVGFX	G
39	Eaton Vance Investors FD	EVIFX	B
40	Eclipse Equity TR FD	EEQFX	SG
41	Europacific Growth Fund	AEPGX	IF
42	Evergreen Total Return	EVTRX	EI
43	Fairfield Fund	FAFLX	SG
44	Fidelity Fund	FFIDX	GI
46	Fiduciary Capital Growth FD	FCGFX	SG

ID	*Name*	*Ticker*	*Objective*
47	Financial Industrial Income	FIIIX	EI
49	Flag Investors Corp. Cash	FLCCX	EI
50	Flag Investors International	FLITX	IF
51	Fund Source International Equity	FTIEX	IF
52	Gintel Fund	GINLX	G
53	G.T. International Growth Fund	GINGX	IF
54	Harbor Growth Fund	HAGWX	G
55	IDS Growth Fund	INIDX	G
56	IDS International FD	INIFX	IF
57	IDS Mutual	INMUX	B
58	Income Fund America	AMECX	EI
59	Ivy International Fund	IVINX	IF
60	Janus Venture Fund	JAVTX	SG
61	Kemper Growth Fund	KPGRX	G
63	Kemper International FD	KMIFX	IF
64	Kemper Summit Fund	KMSMX	SG
65	Kemper Total Return	KMRTX	B
66	Keystone International FD	KESTX	IF
67	Lifetime Emerging Growth	LTEGX	SG
68	Lindner Dividend Fund	LDDVX	EI
71	Metlife State Street Equity	MSEIX	EI
72	Morgan W.L. Growth FD	VMRGX	G
73	Nationwide Growth FD	MUIGX	G

ID	*Name*	*Ticker*	*Objective*
74	Nicholas II	NCTWX	SG
75	Normura Pacific Basin FD	NPBFX	IF
76	Oppenheimer Asset Allocation	OPASX	B
77	Oppenheimer Equity Income	OPPEX	EI
79	Oppenheimer OTC FD	OPOCX	SG
82	Phoenix Balanced FD	PHBLX	B
84	Provident Fund for Income	AGPRX	EI
87	Rodney Square Int. Equity Fund	RSIEX	IF
88	Safeco Growth Fund	SAFGX	G
89	Safeco Income Fund	SAFIX	EI
90	SBSF Growth Fund	SBFFX	G
91	Scudder International FD	SCINX	IF
92	Sentinel Balanced FD	SEBLX	B
93	Sigma Trust Shares	SGTRX	B
94	Steinroe Total Return	SRFBX	B
95	Strong Investment Fund	STIFX	B
96	Sunbelt Growth Fund	SUNBX	G
97	Templeton Foreign Fund	TEMFX	IF
98	Trustees Com. Fund Intl. Portf.	VTRIX	IF
99	United Income Fund	UNCMX	EI
101	United International Growth Fund	UNCGX	IF
102	Vanguard Equity Income	VEIPX	EI
103	Vanguard Star Fund	VGSTX	B
105	WPG Growth Fund Inc.	WPGRX	SG

APPENDIX 4B
DEFINITIONS OF INVESTMENT OBJECTIVES

G: Growth Fund Invests in companies whose long-term earnings are expected to grow significantly faster than the earnings of the stocks represented in the major unmanaged stock indices.
SG: Small Company Growth Fund A fund that by prospectus or portfolio practice limits its investments to companies on the basis of the size of the company.
GI: Growth and Income Fund Combines a growth of earnings orientation and an income requirement for level and/or rising dividends.
EI: Equity Income Fund Seeks relatively high current income and growth of income through investing 60 percent or more of its portfolio in equities.

B: Balanced Fund A fund whose primary objective is to conserve principal by maintaining at all times a balanced portfolio of both stocks and bonds. Typically, the stock-bond ratio ranges around 60–40 percent.
IF: International fund Invests its assets in securities whose primary trading markets are outside of the United States.

Source: Standard and Poor's/Lipper Mutual Fund Profiles

APPENDIX 4C
SELECTION AND TIMING PERFORMANCE: TM MODEL

	DJIA		*Nasdaq*		*MSCI*	
Fund ID	α	b_2	α	b_2	α	b_2
Panel A: Domestic funds						
1	0.0006	−0.1520	0.0028	−0.2719		
2	−0.0039	−0.7322	0.0012	−0.1846		
3	−0.0029	−0.5989	0.0014	−0.2780		
4	−0.0080	−1.1629	−0.0022	−0.4541		
5	0.0009	−2.5978*	0.0037	−1.8875*		
6	−0.0051	−1.5676*	−0.0009	−1.2460		
8	−0.0203*	1.5889	−0.0165	1.2387		
10	−0.0016	−0.8011	0.0027	−0.6090		
11	−0.0099	0.2264	−0.0030	−0.6256		
13	−0.0066	−0.6368	−0.0035	−0.5672		
14	−0.0064	−0.4651	−0.0027	−0.4312		
15	−0.0105*	0.1984	−0.0064	0.4307		
16	−0.0033	−0.5652	0.0002	−0.3673		
17	−0.0010	−1.7025*	0.0008	−0.9946		
18	−0.0004	−0.3346	0.0060	−0.5285		
19	0.0002	−2.5703	0.0012	−2.1378		
20	0.0019	−3.4352*	0.0047	−2.6292*		
21	0.0043	−1.8774*	0.0108	−0.9230		
23	−0.0021	0.1891	−0.0011	0.3796		
24	−0.0112	−0.4637	−0.0073	0.2039		
26	−0.0059	0.6821	−0.0034	0.9664*		
27	−0.0023	−1.3354*	0.0011	−1.0872*		
28	−0.0051	−4.0549*	−0.0016	−2.0462		
29	−0.0085	−0.7212	−0.0040	−0.5154		

	DJIA		Nasdaq		MSCI	
Fund ID	α	b_2	α	b_2	α	b_2
30	−0.0043	−0.9552*	−0.0031	0.4918		
31	−0.0088	−0.1017	−0.0039	−0.1194		
32	−0.0065	−0.2324	−0.0027	−0.1267		
33	−0.0079	−1.2748	−0.0014	−1.2324		
34	−0.0068	−0.8926	−0.0007	−1.2149		
35	0.0022	−1.8097*	0.0063	−0.8718*		
36	−0.0069	−1.4111*	−0.0015	−1.0144		
39	−0.0076	−0.9367	−0.0040	−1.0526		
40	−0.0098*	1.0254	−0.0070*	1.2788*		
42	−0.0062	−0.7124	−0.0037	−0.2836		
43	−0.0040	−3.0710*	−0.0057	−1.3052		
44	−0.0050	−1.5516*	0.0008	−1.6359*		
46	−0.0028	−3.3070*	−0.0008	−1.5645*		
47	−0.0044	−1.6436	−0.0022	−0.8770		
49	−0.0061*	−0.0121	−0.0060*	0.0425		
52	0.0030	−3.7245*	0.0029	−2.4737*		
54	−0.0026	−0.4554*	0.0006	0.2466		
55	−0.0101	−0.7506	−0.0052	0.0617		
57	−0.0060	−0.8747	−0.0024	−0.5138		
58	−0.0039	−1.2156*	−0.0020	−0.8403		
60	−0.0008	−0.2988	0.0031	0.0589		
61	−0.0054	−3.6269	−0.0036	−2.6752		
64	−0.0149	−2.4411	−0.0186	−1.1039		
65	−0.0082	−2.1129	−0.0032	−2.3091		
67	−0.0031	−0.6998	−0.0030	1.3496*		
68	−0.0021	−1.8322*	−0.0028	−1.1631*		
71	−0.0089	−0.1325	−0.0070	0.2244		
72	−0.0034	−1.7090*	0.0015	−1.2777		
73	−0.0060	−0.6480	−0.0021	−0.2463		
74	0.0005	−2.2136*	0.0029	−1.2313*		
76	0.0004	−1.8892*	0.0019	−1.4541*		
77	−0.0030	−1.2898*	0.0004	−1.0218*		
79	−0.0054	−0.4252	0.0010	−0.3404		
82	−0.0123*	1.3277*	−0.0066	0.6248		
84	−0.0087	−0.7583	−0.0045	−0.6622		
88	−0.0060	−2.2926*	−0.0037	−1.0566		
89	−0.0034	−2.0184*	−0.0003	−1.4348*		

	DJIA		*Nasdaq*		*MSCI*	
Fund ID	*α*	b_2	*α*	b_2	*α*	b_2
90	0.0003	−0.6871	0.0034	−0.6760		
92	−0.0067*	0.1885	−0.0035	0.3104		
93	−0.0049	−0.5139	−0.0029	−0.2534		
94	−0.0078	−0.7379	−0.0043	−0.6303		
95	−0.0089	0.2816	−0.0045	−0.4052		
96	−0.0020	−0.5040	0.0004	−0.0188		
99	−0.0057	0.1911	−0.0018	0.1739		
102	−0.0054	−0.5779	−0.0007	0.1666		
103	−0.0046	−0.2363	−0.0016	−0.0320		
105	0.0076	−0.3430	−0.0005	0.0672		

	DJIA		*Nasdaq*		*MSCI*	
Fund ID	*α*	b_2	*α*	b_2	*α*	b_2
Panel B: International funds						
12	0.0051	−3.7994	0.0100	−3.3686*	0.0082	−6.2131
41	0.0082	−2.6145*	0.0115*	−2.3294*	0.0068	−3.3358*
50	0.0058	−3.1993*	0.0087	−3.1140*	0.0077	−3.9904
51	0.0178*	−3.6384*	0.0177*	−3.1323*	0.0105*	−4.9893*
53	−0.0053	−3.3448	−0.0015	−3.4206	−0.0066	3.0357
56	0.0094	−4.3522*	0.0111	−3.7045*	0.0051	−4.9737*
59	0.0077	−2.1251*	0.0123	−2.0968*	0.0090	−2.9779*
63	0.0053	−5.3378*	0.0077	−5.3259*	−0.0028	−4.6427
66	−0.0056	−1.1487	−0.0005	−1.6173	−0.0139	1.5277
75	0.0063	−1.8012	0.0096	−2.0630	0.0005	−1.3323
87	0.0014	−4.3264	0.0147	−6.0443*	0.0003	−2.3805*
91	0.0066	−3.4680*	0.0099	−3.3035*	0.0040	−4.0808*
97	0.0104	−2.5652*	0.0136*	−2.2645*	0.0122	−4.2007*
98	0.0047	−1.3768	0.0091	−1.5166*	0.0028	-1.8403
101	−0.0001	−2.1661	0.0020	−2.0991	−0.0038	-2.4487

Note: *, significant at the 5 percent level.

APPENDIX 4D
SELECTION AND TIMING PERFORMANCE: MODIFIED TM MODEL

	DJIA		*Nasdaq*		*MSCI*	
Fund ID	*α*	*b_2*	*α*	*b_2*	*α*	*b_2*
Panel A: Domestic funds						
1	0.0005	0.3050	0.0024	0.5029		
2	−0.0056	0.8533	0.0007	0.0863		
3	−0.0040	0.9630	0.0009	0.4032		
4	−0.0132	−1.3370	−0.0065	0.6800		
5	−0.0064	1.7295	−0.0012	1.5511		
6	−0.0107	0.0285	−0.0046	0.6548		
8	−0.0184*	−2.6203	−0.0147	−1.8920		
10	−0.0044	−0.1078	0.0007	0.1973		
11	−0.0099	−0.6399	−0.0050	0.0242		
13	−0.0096*	−0.8529	−0.0055	−0.0268		
14	−0.0058	2.2870	−0.0025	1.8557		
15	−0.0108*	−1.1211	−0.0057	−0.7853		
16	−0.0062	−1.0098	−0.0014	−0.2457		
17	−0.0043	2.6386*	−0.0008	1.7568*		
18	−0.0022	−0.7372	0.0041	−0.0849		
19	−0.0074	1.4434	−0.0043	1.8269		
20	−0.0077	2.5062	−0.0017	2.5446*		
21	0.0009	3.2098*	0.0088*	1.3465		
23	−0.0020	−0.4788	−0.0005	−0.5303		
24	−0.0138	−0.6751	−0.0079	−0.9854		
26	−0.0060	−2.5992*	−0.0020	−2.0205*		
27	−0.0062	0.8385	−0.0018	0.8082		
28	−0.0149*	−3.3973	−0.0070	2.4061		
29	−0.0134	−2.2455	−0.0065	−0.5736		
30	−0.0074*	0.2384	−0.0047	0.1320		
31	−0.0091	0.0765	−0.0041	0.1889		
32	−0.0081*	−0.8627	−0.0034	−0.2488		
33	−0.0100*	3.1572	−0.0036	3.0188		
34	−0.0109	−1.0636	−0.0041	0.6730		

	DJIA		*Nasdaq*		*MSCI*	
Fund ID	α	b_2	α	b_2	α	b_2
35	−0.0019	2.2511*	0.0043	0.9747*		
36	−0.0088*	3.0975*	−0.0032	1.6986*		
39	−0.0112*	−0.2961	−0.0073	0.5711		
40	−0.0086*	−1.8175*	−0.0051*	−1.8441*		
42	−0.0087*	−0.1348	−0.0049	−0.1889		
43	−0.0075	6.5714*	−0.0063	2.7165		
44	−0.0101	0.3680	−0.0035	1.2456		
46	−0.0096	4.9014*	−0.0039	2.1712*		
47	−0.0085	1.4877	−0.0042	0.9857		
49	−0.0058*	0.2524	−0.0057*	0.0638		
52	−0.0100	−0.0727	−0.0047	0.8935		
54	−0.0037	0.5011	0.0013	−0.1841		
55	−0.0111	1.6107	−0.0048	0.1935		
57	−0.0079*	1.2078	−0.0034	0.7830		
58	−0.0076	0.5836	−0.0043	0.5898		
60	−0.0018	−0.0225	0.0031	−0.2284		
61	−0.0167	1.3134	−0.0105	2.2767		
64	−0.0249	−5.4206	−0.0225	−0.2651		
65	−0.0127	2.9968	−0.0079	3.1621		
67	−0.0048	0.4723	−0.0003	−1.3500		
68	−0.0074	1.1133	−0.0064	0.4508		
71	−0.0101*	−0.7199	−0.0072*	−0.9587		
72	−0.0083	1.2206	−0.0015	1.2374		
73	−0.0073	0.6770	−0.0027	0.1920		
74	−0.0048	2.5725*	0.0001	1.4346*		
76	−0.0021	2.70912*	−0.0006	1.7888*		
77	−0.0055	1.9930*	−0.0015	1.5135*		
79	−0.0058	0.7649	−0.0016	0.3218		
82	−0.0097*	−1.5108	−0.0054	−0.6959		
84	−0.0116*	−0.0829	−0.0066	0.1739		
88	−0.0123	1.4221	−0.0067	0.5481		
89	−0.0084*	2.1306*	−0.0036	1.6581*		
90	−0.0006	1.0987	0.0022	0.8400		
92	−0.0063*	−0.3154	−0.0029	−0.3944		
93	−0.0077	−0.7696	−0.0046	−0.6524		
94	−0.0107*	−0.1181	−0.0064	0.3155		
95	−0.0079	−0.0051	−0.0056	0.3283		

	DJIA		*Nasdaq*		*MSCI*	
Fund ID	α	b_2	α	b_2	α	b_2
96	−0.0016	1.8435*	0.0011	0.4529		
99	−0.0076	−1.9121	−0.0029	−1.0888		
102	−0.0066	−1.2901	−0.0003	0.1437		
103	−0.0062	−0.7723	−0.0024	−0.6507		
105	−0.0082	0.5713	0.0002	0.0564		

	DJIA		*Nasdaq*		*MSCI*	
Fund ID	α	b_2	α	b_2	α	b_2
Panel B: International funds						
12	−0.0040	4.2422	0.0019	3.3789	−0.0062	10.2121*
41	0.0021	3.0458*	0.0061	2.5813*	−0.0013	4.4180*
50	0.0025	5.9224*	0.0037	3.9185*	0.0011	11.1748*
51	0.0120	6.1995*	0.0133*	4.7096*	0.0019	6.8443*
53	−0.0092	5.7396	−0.0073	4.7782	−0.0140	2.0113
56	−0.0019	5.0410*	0.0119	4.0952*	−0.0063	5.5520
59	0.0042	3.9072*	0.0080	3.3387*	0.0024	5.4505*
63	−0.0087	4.7166	−0.0049	5.5579*	−0.0163	0.9912
66	−0.0069	3.2462	−0.0035	2.4016	−0.0093	0.3633
75	0.0038	3.8701	0.0053	2.6748	−0.0042	−2.0632
87	−0.0039	16.3625*	0.0059	14.6946*	−0.0061	4.7835
91	−0.0015	4.0986*	0.0024	3.7206*	−0.0061	5.1102
97	0.0040	2.5283	0.0082	2.2975*	0.0011	3.4420
98	0.0020	2.1428	0.0056	1.7170	−0.0013	3.4260
101	−0.0034	4.6120*	−0.0014	3.8404*	−0.0089	4.8178

Note: *, significant at the 5 percent level.

APPENDIX 4E
F STATISTICS AND R^2: TM MODEL

	DJIA		*Nasdaq*		*MSCI*	
Fund ID	*F*	R^2	*F*	R^2	*F*	R^2
Panel A: Domestic funds						
1	162.067	0.9051	82.564	0.8293		
2	103.070	0.7955	142.413	0.8431		
3	98.945	0.7856	110.299	0.8033		
4	8.841	0.2537	6.105	0.1902		

	DJIA		*Nasdaq*		*MSCI*	
Fund ID	*F*	R^2	*F*	R^2	*F*	R^2
5	39.222	0.5878	45.471	0.6231		
6	39.237	0.5924	24.643	0.4772		
8	12.119	0.3659	9.010	0.3002		
10	67.916	0.7512	48.857	0.6847		
11	14.000	0.4058	12.579	0.3803		
13	23.075	0.4563	17.807	0.3930		
14	15.041	0.3710	12.891	0.3358		
15	68.261	0.7128	58.578	0.6805		
16	45.215	0.6218	30.722	0.5277		
17	24.982	0.4806	26.398	0.4944		
18	5.591	0.1689	4.720	0.1465		
19	4.716	0.1464	3.883	0.1237		
20	36.681	0.5899	34.130	0.5724		
21	95.655	0.7895	161.602	0.8637		
23	27.367	0.6100	40.036	0.6958		
24	29.123	0.5189	33.642	0.5548		
26	26.380	0.4989	34.431	0.5651		
27	55.546	0.6689	51.608	0.6524		
28	18.952	0.6546	44.524	0.8166		
29	23.805	0.4732	14.400	0.3521		
30	29.022	0.5135	30.824	0.5285		
31	18.260	0.3990	15.394	0.3589		
32	46.867	0.6302	29.579	0.5182		
33	33.506	0.7128	43.141	0.7617		
34	16.773	0.3876	11.104	0.2953		
35	123.152	0.8229	279.296	0.9133		
36	78.068	0.7360	83.896	0.7498		
39	13.693	0.3365	9.893	0.2681		
40	27.720	0.5690	77.471	0.7867		
42	36.710	0.5717	41.878	0.6036		
43	12.024	0.3587	17.747	0.4522		
44	47.955	0.6355	32.189	0.5393		
46	71.724	0.7228	168.868	0.8600		
47	14.783	0.3538	17.210	0.3893		

	DJIA		Nasdaq		MSCI	
Fund ID	*F*	R^2	*F*	R^2	*F*	R^2
49	3.993	0.1997	3.965	0.1986		
52	15.442	0.3596	13.267	0.3254		
54	98.246	0.8170	233.613	0.9139		
55	27.628	0.5012	37.688	0.5781		
57	62.505	0.6983	66.292	0.7106		
58	24.302	0.4691	25.577	0.4819		
60	35.049	0.5603	40.329	0.5946		
61	6.693	0.1957	4.635	0.1442		
64	0.191*	0.0073	0.073*	0.0028		
65	7.241	0.2084	5.772	0.1735		
67	39.505	0.6811	151.558	0.8912		
68	6.968	0.2022	9.255	0.2518		
71	32.780	0.5984	47.899	0.6853		
72	42.884	0.6271	37.386	0.5945		
73	63.838	0.7394	56.093	0.7137		
74	74.166	0.7331	130.714	0.8288		
76	65.891	0.7716	76.472	0.7968		
77	42.502	0.6072	40.569	0.5960		
79	49.076	0.7054	51.615	0.7157		
82	35.557	0.5872	17.767	0.4154		
84	34.661	0.5859	25.671	0.5117		
88	34.698	0.5624	54.628	0.6692		
89	95.369	0.7762	94.536	0.7747		
90	61.549	0.7411	55.714	0.7216		
92	104.856	0.7922	89.556	0.7651		
93	16.377	0.4213	14.379	0.3899		
94	33.389	0.5622	27.166	0.5110		
95	6.404	0.1889	3.715	0.1190		
96	124.890	0.8710	133.075	0.8779		
99	29.717	0.6361	16.742	0.4962		
102	39.922	0.7473	63.137	0.8238		
103	20.304	0.4247	21.926	0.4436		
105	83.570	0.7733	93.014	0.7915		

	DJIA		*Nasdaq*		*MSCI*	
Fund ID	*F*	R^2	*F*	R^2	*F*	R^2
Panel B: International funds						
12	10.985	0.2854	11.283	0.2909	15.651	0.3627
41	28.537	0.5093	28.164	0.5060	72.138	0.7240
50	6.950	0.2579	9.343	0.3184	9.004	0.3104
51	33.477	0.6906	36.891	0.7109	70.978	0.8255
53	4.257	0.1653	4.215	0.1639	8.442	0.2819
56	12.075	0.3130	11.591	0.3043	28.535	0.5185
59	24.761	0.5078	22.529	0.4842	70.802	0.7468
63	3.954	0.1257	4.468	0.1398	10.066	0.2680
66	8.943	0.2523	7.040	0.2099	64.172	0.7039
75	3.673	0.1197	4.635	0.1465	26.534	0.4956
87	7.945	0.4086	6.554	0.3630	112.712	0.9074
91	14.740	0.3490	14.959	0.3523	47.400	0.6328
97	19.738	0.4178	20.069	0.4219	37.969	0.5800
98	14.423	0.3440	14.277	0.3417	27.616	0.5011
101	3.295	0.1088	3.554	0.1163	41.403	0.6053

Note: *, not significant at the 5 percent level.

APPENDIX 4F
F STATISTICS AND R^2: MODIFIED TM MODEL

	DJIA		*Nasdaq*		*MSCI*	
Fund ID	*F*1	R^2	*F*	R^2	*F*	R^2
Panel A: Domestic funds						
1	163.061	0.9056	84.063	0.8318		
2	104.607	0.7979	171.113	0.8659		
3	103.479	0.7931	132.464	0.8307		
4	42.438	0.6201	50.149	0.6586		
5	43.566	0.6130	75.571	0.7332		
6	79.099	0.7455	48.320	0.6415		
8	15.186	0.4197	14.262	0.4045		
10	73.850	0.7665	58.052	0.7207		
11	25.438	0.5538	27.744	0.5751		
13	42.460	0.6069	42.506	0.6072		
14	44.113	0.6337	40.397	0.6130		
15	73.896	0.7288	61.101	0.6896		
16	59.556	0.6841	48.920	0.6401		

	DJIA		*Nasdaq*		*MSCI*	
Fund ID	$F1$	R^2	F	R^2	F	R^2
17	28.169	0.5106	28.505	0.5136		
18	4.786	0.1482	4.361	0.1369		
19	6.169	0.1832	6.073	0.1809		
20	67.421	0.7256	99.079	0.7953		
21	97.981	0.7935	162.728	0.8645		
23	25.807	0.5959	32.981	0.6533		
24	30.055	0.5268	37.505	0.5814		
26	28.810	0.5209	34.502	0.5656		
27	88.997	0.7639	94.236	0.7741		
28	13.776	0.5794	39.605	0.7984		

	DJIA		*Nasdaq*		*MSCI*	
Fund ID	$F1$	R^2	F	R^2	F	R^2
29	57.132	0.6831	45.364	0.6312		
30	52.716	0.6572	67.714	0.7112		
31	14.521	0.3456	12.596	0.3141		
32	97.426	0.7799	71.105	0.7211		
33	33.587	0.7133	45.057	0.7695		
34	68.079	0.7198	62.475	0.7022		
35	111.575	0.8081	267.635	0.9099		
36	65.898	0.7018	61.489	0.6871		
39	24.429	0.4750	22.897	0.4589		
40	30.315	0.5908	90.137	0.8110		
42	49.696	0.6438	67.696	0.7110		
43	28.194	0.5674	49.891	0.6988		
44	90.805	0.7676	73.388	0.7274		
46	67.868	0.7116	168.973	0.8600		
47	46.926	0.6348	55.062	0.6710		
49	4.251	0.2099	3.966	0.1986		
52	24.467	0.4708	27.803	0.5027		
54	97.267	0.8155	229.505	0.9125		
55	36.364	0.5694	54.147	0.6632		
57	44.080	0.6201	41.070	0.6033		
58	38.078	0.5807	52.630	0.6568		
60	48.607	0.6387	75.973	0.7342		
61	27.217	0.4974	24.428	0.4704		
64	0.228*	0.0087	0.174*	0.0067		

	DJIA		*Nasdaq*		*MSCI*	
Fund ID	*F*1	R^2	*F*	R^2	*F*	R^2
65	10.331	0.2731	7.564	0.2157		
67	39.086	0.6787	141.891	0.8847		
68	8.555	0.2373	13.025	0.3214		
71	32.663	0.5975	50.633	0.6971		
72	57.488	0.6927	83.920	0.7670		
73	60.407	0.7286	52.029	0.6981		
74	90.858	0.7709	302.505	0.9181		
76	75.112	0.7939	75.508	0.7948		
77	95.291	0.7760	80.423	0.7452		
79	73.490	0.7819	109.688	0.8425		
82	33.723	0.5743	27.034	0.5195		
84	42.446	0.6340	33.592	0.5783		
88	50.581	0.6520	115.882	0.8110		
89	130.589	0.8260	171.786	0.8620		
90	62.649	0.7445	55.319	0.7201		
92	98.652	0.7820	76.478	0.7355		
93	23.028	0.5058	25.840	0.5345		
94	68.163	0.7239	70.254	0.7299		
95	8.845	0.2434	5.986	0.1788		
96	150.334	0.8904	136.223	0.8804		
99	42.356	0.7136	35.465	0.6760		
102	37.070	0.7330	55.499	0.8043		
103	57.733	0.6774	64.970	0.7026		
105	83.611	0.7734	92.993	0.7915		

	DJIA		*Nasdaq*		*MSCI*	
Fund ID	*F*1	R^2	*F*	R^2	*F*	R^2
Panel B: International funds						
12	13.127	0.3231	12.774	0.3172	13.238	0.3250
41	29.877	0.5207	30.044	0.5221	56.655	0.6732
50	8.960	0.3094	9.179	0.3146	12.496	0.3845
51	32.035	0.6811	37.648	0.7151	32.201	0.6822
53	4.836	0.1836	4.504	0.1732	7.859	0.2677
56	17.794	0.4017	17.830	0.4022	27.792	0.5119
59	26.709	0.5267	24.761	0.5078	68.017	0.7392
63	5.343	0.1627	4.554	0.1421	9.883	0.2644
66	11.884	0.3096	9.160	0.2569	62.168	0.6972

	DJIA		*Nasdaq*		*MSCI*	
Fund ID	$F1$	R^2	F	R^2	F	R^2
75	4.660	0.1472	4.364	0.1392	26.142	0.4919
87	9.847	0.4613	8.594	0.4277	102.150	0.8988
91	20.766	0.4302	19.135	0.4103	42.773	0.6087
97	25.870	0.4847	26.960	0.4950	30.805	0.5283
98	12.254	0.3082	11.188	0.2892	27.760	0.5024
101	15.407	0.3633	16.980	0.3861	32.508	0.5463

Note: *, not significant at the 5 percent level.

NOTES

1 Jagannathan and Korajczyk (1986), in line with Dybvig and Ross (1985a), attribute the negative correlation between timing and selectivity to the characteristics of the mutual funds' asset holdings. They demonstrate, using common stock prices, that a sample of funds that invest in highly levered firms relative to the benchmark portfolio will engender spurious timing and induce negative correlation between measures of timing and selection performance. They suggest that funds that invest in highly levered stocks will show a positive market timing performance and those that invest in stocks with little or no risky debt will show negative timing performance. In the present study we use mutual fund prices to investigate the correlation, and we hypothesize that the specific return-generating models used in those studies that report the negative correlation, not the leverage characteristics of the fund's asset holdings, are responsible for this phenomenon.

2 Lee and Rahman (1990) show a positive correlation of 0.47 between stock selection and market timing performance, indicating that the funds do not exhibit particular specialization in one forecasting skill. They find evidence of superior timing and selection at the individual fund level.

3 Eun *et al.* (1991), consistent with Grubel (1968) and Levy and Sarnat (1970), find that international mutual funds provide opportunities to US investors to diversify risk internationally. Cumby and Glen (1990) suggest that the superior performance of their sample of international funds relative to an index of US stocks is probably attributable entirely to the benefits of international diversification. Eun *et al.* used the MSCI and the Standard and Poor (S&P 500) indices as the benchmark portfolios, while Cumby and Glen used the MSCI and a contrived index of US stocks.

4 Performance of domestic funds is also measured using the S&P 500 Composite Index. The results are similar to those using DJIA and are available upon request.

5 Lehmann and Modest (1987) and Cumby and Glen (1990) find that the negative timing measures are largely illusory. Henricksson (1984) suspects model specification as the cause of the negative correlation between selectivity and timing performance. He raises questions regarding the validity of the capital asset pricing model in evaluating performance when the possibility of timing is admitted.

6 For similar reasons, the Henricksson and Merton model tends to produce a preponderance of negative timing performance and negative correlation between

timing performance and stock selection ability. These problems are reported by Kon (1983), Henricksson (1984) and Chang and Lewellen (1984). The Henriksson and Merton model is

$$r_{pt} = \alpha_p + b_1 X_t - b_2 X_t' + \varepsilon_t$$

where

$$X_t' = \begin{cases} X_t & \text{if } X_t < 0 \\ 0 & \text{otherwise} \end{cases}$$

Although both the TM and the Henriksson models are correctly specified they may not provide the best fit to specific empirical data.

7 Chang and Lewellen (1984) find that each of the only two mutual funds for which selection performance is significantly positive also has timing performance which is significantly negative. Henriksson (1984) finds that 62 percent of the funds in his sample have negative timing performance. And McDonald (1974) finds neither significantly superior nor inferior overall performance for any of the mutual funds in his sample. Finally, Treynor and Mazuy (1966) find that only one of the 57 funds in their sample has market timing ability.

8 Cumby and Glen (1990) use the TM model and the 1982–8 sample period, while Eun *et al.* (1991) use the Henriksson-Merton model and the 1977–86 sample period. Our sample covers 1985 to 1990, a period when mutual fund performance may have been worse. McDonald (1974:324) suggests that mutual fund performance varies substantially over time, and Grinblatt and Titman's (1989a: 396) finding in relation to the equal weighted benchmark and the 1975–84 sample period appears to suggest variable fund performance over time.

9 Cumby and Glen (1990) and Eun *et al.* (1991), using the TM model, find that the average NYSE/AMEX international mutual fund fails to beat the MSCI, but that it beats the domestic market.

10 For the small company growth funds, the correlation is −0.28 with the DJIA as the benchmark portfolio and −0.23 with the Nasdaq Composite Index. The fact that the negative correlation persists with this group of funds irrespective of which of the two market indices is used suggests that the leverage characteristics of the fund's asset holdings may not be the causal factor.

11 No other study reports a quantitative estimate of the correlation between the two performance measures.

12 Kon (1983) finds significant timing ability, and Lee and Rahman (1990) find significant timing performance as well as significant selection performance at the individual fund level. As indicated in Appendix 4D, nine of the 71 domestic funds have significantly positive timing performance, and only one has a significantly positive selection performance when the Nasdaq Composite Index is used as the benchmark. Five of the 15 international funds have positive selection using the MSCI as the benchmark portfolio.

13 The DJIA contains fewer option-like stocks than the Nasdaq Composite Index. Thus we expect small company growth funds (SG) on average to have positive timing performance and negative selectivity. We also expect funds that invest in fewer option-like stocks, e.g. Equity Income funds (EI), to show negative timing and positive selectivity.

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Part III

Credit, security volatility and cyclicality

5
Finding the factors associated with stock price volatility

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1
ABOUT STOCK PRICE CHANGES AND FACTORS DRIVING THE CHANGES

Investors in the very large fixed-income securities—notes and bond— markets are less worried about changes in prices of these securities than those investing in common stocks. The fundamentals driving price changes in fixed-income securities are relatively better specified: in essence, two major factors, namely intertemporal changes in interest rates and default risk of issuing firms, affect fixed-income security prices and thus the yields. One can readily immunize an investment portfolio from the effects of interest rate risk by matching the investment holding period to duration of the fixed-income investment portfolios. In this way portfolio managers circumvent the effects of interest rate changes on fixed-income security prices and coupon reinvestment yields. So, one worries less about these price changes; investors are concerned about the default risk of fixed-income investments.[1]

This is not the case for investment in common stocks. Much less is known about what factors drive the changes in share prices except the vague idea that some fundamental factors affect share prices. This is worrisome for investors and investment specialists (stockbrokers, fund managers, analysts etc). The study of share price volatility to isolate the factors associated with share price changes is therefore receiving increasing attention and more research reports on this subject have been published in recent years especially in view of the worldwide increases in share price volatility in several markets: e.g. Williams and Pfeifer (1982), Downs (1986), Baskin (1989) and the Spring issue of *Journal of Economic Perspectives* (1991) among others.[2] Share price volatility has increased in the last decade. Our knowledge about whether the various factors suggested by valuation theories and practices are in fact *jointly* related to share price volatility is still untested. Further, a recent study revealed that share price returns are explained more by factors such as size and book—price ratio than by the CAPM-suggested beta factor (see Fama and French 1991).

Another related issue also receiving much attention since the mid-1980s is the search for factors that change the values of firms which in turn lead to changes in the share prices of firms. If one can identify these factors, then it makes sense to relate changes in values of firms as being driven by these factors. Share price volatility may ultimately be due to changes in the values of firms *arising* from changes in the fundamental factors that are associated with changes in values of firms. Consequently increased volatility in share prices indeed may be a result of increased volatility in these value-drivers. There are theoretical and practitioners' guidelines which can be scrutinized to identify some of these probable factors. Recent examples of such studies include, among others, Wilcox (1984), Rappoport (1986), Baskin (1989) and Downs (1991). These factors influence price changes in the longer term and not day-to-day or short-term price changes.[3]

The purpose of this chapter, therefore, is to address the two related questions of individual share price volatility and firm value changes as essentially being determined by factors which are responsible for creating changes in the values of firms. We do this by scrutinizing related theories and practices to build empirical models in order to specify and then isolate the value-drivers (i.e. the factors) associated with share price volatility and price changes: this is done in section 2. Next, we proceed in section 3 to present the results of a study on the behavior of Kuala Lumpur, Singapore and Tokyo share prices: the Tokyo market is taken as a developed share market since it is the largest (in 1990 prices) single and very liquid market in the world. The findings suggest that part of the volatility of share prices can be attributed in both developing and developed share markets to four out of six key variables which are identified from commonly accepted valuation theories and investment practices.

2
STOCK PRICE VOLATILITY FACTORS AND TEST MODEL

There have been several but limited attempts to investigate individual share price volatility by relating share price changes to one or more independent factors suggested by existing theories in finance and accounting. The derivation of the relationship between price volatility and value-drivers (factors) is given elsewhere.[4] The relationship derived from several studies using this line of enquiry can be generalized as

$$\mathrm{PV}_i = a + \sum_{j=1}^{k} b_j (X_j)_i + e_i \tag{5.1}$$

where PVi is the cross-sectional observed values of share price volatility of a representative sample of $i=1,\dots,n$ shares in a country market under study; a and b_j are respectively the intercept and the coefficients of theory-suggested independent variables $j=1,\dots,k$ (we chose six such factors observed for each firm in our sample over each year of the test period from year one to 1990, in each country); X_j is a matrix of six independent variables observed over each year for each firm included in this study; and e_i is the independent and identically distributed (i.i.d.) residual term satisfying zero expectation, constant variance unrelated to the independent variables.[5]

The values of all but one of the independent variables, $(X_j)_i$, are obtained as the averages of the individual firm variables over annual cross-sections of time and then expressed as percentage changes over the test period of 16 or more years in each market: one variable is expressed as a standard deviation. That is, each variable is a simple average over several individual years for each firm and the sample size is 54 firms constituting an investor index in Singapore, 30 firms of the Industrial Index in Kuala Lumpur and all firms on the Tokyo Stock Exchange. The share price volatility, PV_i, was measured by Parkinson's extreme value method (Garman and Klass 1980)[6] in order to have an efficient estimate of this dependent variable. Also, most readily available sources for individual shares provide the financial year-end high and low prices of firms' shares. Price volatility is the standard deviation (i.e. the root of the square root) of the following volatility value of share prices of firms in a country sampled over the cross-section of time represented by the test period:

$$PV_i = \left(\left\{ \frac{AP_i(\text{high}) - AP_i(\text{low})}{0.5\,[AP_i(\text{high}) + AP_i(\text{low})]} \right\}^2 \right)^{1/2} \tag{5.2}$$

The capitalization-adjusted high prices, AP(high), and low prices, AP(low), of each firm's share were observed. The volatility is the square of the price difference between the high and low prices in each year divided by the firm's average price of shares in each financial year. The square root of this variable is the standard deviation which is used as the share price volatility variable, PV_i, in this study, i.e. i=1, 2,…, n firms at a cross-section over 16 or more years. Thus, we represent share price volatility as the extent of variation of share prices in a market and there are three markets included in this study.

The Japanese market data set is obtained from the Nikkei-NEEDS database and statistical series but on all shares traded on the Tokyo Stock Exchange. The end-of-year data were collected for this share market from 1959 to 1989, a total of 31 years. The values observed at the close of a year for all the listed firms were then used for calculating the seven variables; the first variable is the stock price volatility using the extreme value method. The six independent variables are also year-end values of the same six variables to be described shortly. The data for the Kuala Lumpur Stock Exchange were set up in the same way as the data for the Singapore exchange: the Financial Database was accessed for the Singapore data while the data for the other market were collected from annual reports in the Companies Handbook. The firms in the case of Kuala Lumpur are the 30 included in the New Straits Times Industrial Index, a popular price-weighted index which measures the market price changes more accurately than the value-weighted all shares index released officially by the exchange. The sample represents more than 50 percent of the capitalization of that market. The

Singapore market is represented by 54 firms included in a widely followed index (the OCBC Index) representing some 58 percent of the market capitalization.

The first of the six independent variables is the dividend yield, DY, which as per Gordon's (1962) theory is inversely related to share prices.[7] It is measured for each year as the ratio of the sum of interim and final dividends for the year divided by the closing stock price at the end of each financial year over the test period for each firm: the closing price is the average price over the three months. The cross-sectional average is the simple average of the variable for each of the firms over the test period in each market: 16 years in the cases of Kuala Lumpur and Singapore and 31 years in the case of Japan. So, this variable is a simple ratio of yields of the firms in the sample. The second variable, POR or the payout ratio, is calculated similarly but with the dividends divided by the after-tax net earnings of the firm.

The third variable suggested by evidence on the now well-entrenched efficient market theory (see Ariff and Finn (1989) for Singapore and Nassir, Ariff and Shamsher (1991) for Kuala Lumpur and Elton and Gruber (1990) for Japan for evidence on this theory for these markets) is the earnings variable, which should be related to stock price changes and thus to volatility. Share prices react directly in response to changes in the reported or predicted earnings changes in these markets. It is therefore logical to suggest a direct relation between share price volatility and earnings volatility, EV. It is measured by the standard deviation of the earnings per share of firms over the test period in the cases of Kuala Lumpur and Singapore and by changes in earnings of firms over adjacent years in the case of Tokyo.

A greater rate of asset growth suggests that firm's share prices change further: thus, Ag is positively related to volatility. Gordon's dividend valuation theory for firms with dividend growth suggests growth as an important variable. Though this relates to dividend growth, we assume that it is monotonically related to growth in assets of a firm over a long period for it is the asset growth potential that sustains the long-term dividend growth. Hence the fourth independent variable is measured as asset growth, Ag, which is the ratio of the change in assets to total book value assets of a firm at the end of each year over the test period. We collected data from 1974 (in the case of Singapore) in order to have observations over the test period starting with 1975: similar procedures were followed for other markets but with different starting years. The values of this ratio for each year are calculated and the average over the test period is a simple average of the time series for the firms in the cases of Kuala Lumpur and Singapore; for Japan, Ag is the growth rate in assets of all listed firms over any consecutive moving average over five-year periods. The fifth variable, DA, is also a ratio, a ratio of total borrowing to assets of a firm at the end of each year averaged over the test period. Corporate finance theory on financial leverage predicts that increases in the debt-asset ratio should lead to a greater rate of change in a firm's value provided that the firms had unused debt capacity. Thus this variable of surviving firms should be positively related to price volatility.[8] We excluded trade debt as it is not a leverage-related variable. Firms in all the test markets raise debt capital mostly from banks in the form of lines of credit extended over each year and/or as term loans from banks.

Larger firms, being more diversified, have lower risk and their earnings are stable. This suggests that size of firms may inhibit price volatility (see Atiase (1985)). The sixth and final independent variable is firm size, SZ. SZ is observed as the size of the total assets with equity measured at market values at the end of each year for each firm, again averaged over the test period. Since these are levels data, we observed the firm size in thousands of dollars and specified this variable as logarithm to the base 10 in the cases of Kuala Lumpur and Singapore: for Japan, this factor was observed as billions of yen and then specified in a similar manner. This makes the variable normally distributed. There are good reasons for including this variable. Studies to date have shown that firm size appears to matter in almost all tests of theories; scholars have shown that small and large firms appear to behave slightly differently as evidenced in the firm-size effect studies of Basu (1977), Reinganum (1982) and, more recently, Fama and French (1991). At worst, this variable is also important as a control for the firm-size factor but less so as a value-driver in our model.

In the absence of multicollinearity and assuming that residuals are normally distributed, the above discussion embodied in equation (5.1) predicts a very close relationship between the fundamental variables, the X_j, and the share price changes represented by the extreme value volatility measure. As we observed these variables over such a lengthy interval, over 16 years, it can be expected that the *ex post* realization is close to the *ex ante* expectations of the relationship. The F ratio and the R^2 values of the linear model will suggest whether the model developed above holds. The strategic hypothesis is therefore

H_0: There is no significant joint relationship between the fundamental variables and share price volatility.

H_1: There is a significant joint relationship between the fundamental variables and share price volatility.

Rejection of the null hypothesis would suggest that the model explains the relationship between the share price volatility and would identify the marginal effects of the factors determining the share prices. The proposition of the model is true if the alternate hypothesis is accepted. Tests can be done by examining the $F(k, N-k)$ value for significance of the postulated relationship, where k=6 and N takes different values for each market. After testing the general model with six independent variables, we proceeded to control multicollinearity by removing one or more such variables and we developed a parsimonious model using stepwise regression.[9]

The predicted relation of each of the independent variables is specified by theory developed elsewhere.[10] The relations are as follows: DY<0; POR<0; Ag>0; EV>0; DA>0; SZ<0. That is, the dividend yield, payout ratio and firm size should be negatively related to price changes measured as volatility; earnings volatility, asset growth and leverage should be positively related. Hypothesis tests will be done by examining the signs of the coefficients with the *t* values providing test statistics for significance tests of the predicted relations. We intend to quantify the extent of the joint relationship in the model by computing the adjusted R^2 value as a measure of the proportion of variation in share price volatility explained by the fundamental variables entering the model. Applying the same variables is expected to reveal the extent to which share price volatility is determined by the same fundamental factors in a given market. For example, it is hypothesized that fundamental factors are more likely to be associated with volatility in more developed markets such as Tokyo than in developing markets. This is examined by the coefficient of determination.

3
STOCK PRICE VOLATILITY MODEL TESTED

Tokyo stock price changes

The results of the analysis of the Japanese market revealed some regularities in the behavior of individual variables: these are not shown here. The extreme value volatility measure is small compared with the values obtained for developing markets in Kuala Lumpur and Singapore. The mean value of this variable was 25. 98 percent over the 1959–89 period. The average dividend yield was 2.99 percent; this is consistent with the historically declining dividend yield of Japanese firms from its high of about 4.5 percent in the 1960s to the current value which is less than 1 percent. The payout ratio in Japan was 43.45 percent, again not inconsistent with published reports. The earnings volatility was rather high; Japan experienced high earnings growth during its high economic growth period from 1958 to 1973, after which the earnings declined to half its earlier levels. The change in debt-asset ratio was moderate at 15 percent. Asset growth was represented by the change over a five-year moving average in the growth rate of the total assets; the mean was 14.79 percent per annum which is about right given the historical growth in assets of Japanese firms of about 15 percent per annum.

The results of a multiple regression of equation (5.1) are summarized in Table 5.1. The residuals were examined and found to be normally distributed, which suggests that the results included are reliable. Note first that the adjusted R^2 value suggests that 42.30 percent of the variation in share price volatility of Tokyo stocks was explained by the six theory-derived variables and that the alternative hypothesis was acceptable: the *F* value of 6.36 was significant. The model fit is very pronounced relative to the more speculative Singapore and Kuala Lumpur stock markets to be

Table 5.1 Share price volatility and fundamental variables in Japan: 1959–89 (general model)

	DY	*EV*	*POR*	*SZ*	*DA*	*Ag*
Regression coefficients	−2.51	−0.33	−0.06	−0.44	0.95	0.79
t values of coefficients	−0.706	−1.758**	−0.221	−0.024	1.610	1.765**
Regression *F* ratio			6.36*			
Adjusted R^2			42.30			

Note: Significant at about 0.10* and 0.05** confidence levels.

described below. Next, note the individual coefficients which were also significant. The dividend yield was negatively related to price volatility as suggested by theory, but the coefficient was not significant at any reasonably acceptable confidence level. The earnings volatility was opposite in sign to that predicted by theory. The coefficients of debt-asset ratio and asset growth were significant. These results are prior to checks on multicollinearity and a parsimonious selection of independent variables to build a simpler and more robust model.

These results are presented in Table 5.2. As can be noticed in the table, four variables survived the procedure and the simpler model with (a) dividend yield DY, (b) asset growth Ag, (c) debt-asset ratio change DA and (d) earnings volatility EV entered in that order explained price volatility sufficiently well, in fact as much as the six variables in the general model. Note first that the adjusted R^2 was about the same, 42.12 percent, suggesting that the four variables can jointly account for slightly over four-tenths of the variation in share price volatility in the Tokyo market, and the *F* ratio of 12.45 was highly significant. Next, all four theory-driven variables were significant. The *t* values ranged from 1.774 for debt-asset ratio to 3.42 for asset growth; these were significant at or better than 0.10 confidence levels. But the sign on the earnings variables is still inconsistent with theory. An explanation for this is that earnings volatility declined consistently for Japanese firms over the 31 years. The model is robust, and was significant in explaining about half the variation in share price volatility of Japanese

Table 5.2 Share price volatility and fundamental variables in Japan: 1959–89 (simpler model)

	Intercept	*DY*	*Ag*	*DA*	*EV*
Regression coefficients	28.23	−2.74	0.778	0.885	−0.39
t values of coefficients	2.873**	−2.175**	3.412**	1.774*	1.838*
Regression *F* ratio		12.45**			
Adjusted R^2		42.12			

Note: Significant at 0.10* and 0.05** confidence levels.

common stocks. Let us assume that this represents the results of a developed common stock market.[11] We proceed now to examine two developing markets included in this study.

Singapore stock price changes

The first set of results for Singapore firms is meant to describe the summary character of the variables. Next, we will examine the results of the general model prior to the stepwise selection of a simpler model. Table 5.3 contains the descriptive statistics on the seven variables.

The Singapore sample of 54 firms can be described as having a price volatility of 68 percent per annum (two-and-a-half times that of Tokyo) with an average dividend yield of 3.21 percent, volatility in earnings of 2.88 percent, a payout of 51 percent. The debt rate of the firms was moderate at 15 percent, and the asset size was about S$600 million with assets growing at about 20 percent per year. These estimates were consistent with evidence on similar sets of firms reported in existing studies of this market. The size by the extreme value method of estimation of volatility was certainly very large (68 percent): the normal volatility of the market is only 27 percent per annum.

Table 5.4 is a summary of the results from the general model in equation (5.1). The test on the error term produced a mean value equal to 0 (–2.9E—15), skewness equal to 0.527 and kurtosis equal to 2.76. These and the plot of the residuals (not shown) suggested that the regression assumptions specified in the model were not violated, and thus the results

Table 5.3 Descriptive statistics of fundamental variables in Singapore: 1975–90 (variable×100)

	PV	*DY*	*EV*	*POR*	*SZ*	*DA*	*Ag*
Mean	68.30	3.21	2.88	50.92	5.92	15.00	19.68
Standard deviation	15.04	1.74	2.00	40.49	0.49	11.78	19.80

Table 5.4 Share price volatility and fundamental variables in Singapore: 1975–89 (general model)

	DY	*EV*	*POR*	*SZ*	*DA*	*Ag*
Regression coefficients	−2.40	1.87	0.01	2.16	0.20	0.22
t values of coefficients	−1.99	1.59	0.17	0.50	1.10	2.30^{*}
Regression *F* ratio			3.43^{**}			
Adjusted R^2			21.90			

Note: Significant at 0.10^{**} and 0.05^{*} confidence levels.

are reliable. Now we examine the regression results. Notice that the model appears to hold with an F value of 3.43, which is significant at the 0.10

confidence level. That is, the alternative strategic hypothesis was accepted. The independent variables were jointly and significantly related to price volatility. The signs on four of the six variables were as predicted by theory; these were –(DY), +(EV), +(DA), +(Ag). But the signs on payout and size variables were opposite to the predicted directions: we suggest sample-specific reasons for this behavior. The significance of the dividend yield (DY), earnings (EV) and asset growth (Ag) should be noted by reference to the *t* values: DY was not significant though the sign was correct; EV was wrong in sign but significant (t=−1.758); and Ag was significant (t=1.765).

Table 5.5 gives a summary of the results after the procedures adopted to remove multicollinearity and for stepwise selection of variables to select a parsimonious model. The payout ratio and leverage variables were excluded by the procedure adopted for multicollinearity. The former was found not to contribute further to explaining the variation in the model and the latter was significantly negatively multicollinear with dividend yield (confidence level 0.05) and positively with earnings volatility (confidence level 0.05). The size variable also did not produce significantly different results in explaining the variation in the dependent variable. This left (a) asset growth Ag, (b) dividend yield DY and (c) earnings volatility EV as the remaining variables to enter the regression after completing the stepwise procedure.

Now examine the results in the above table. The model fitted satisfactorily, which suggests that the three remaining variables were significantly related to and explained share price volatility. The *F* ratio improved now to 6.49 which is significant at or above the 0.05 confidence level. The adjusted R^2 value was also improved in the parsimonious model (24.10 percent) suggesting that the parsimonious model explained a quarter of all variations in the share price volatility. The alternative hypothesis was accepted and the null hypothesis of no relation between the share price volatility and fundamental variables was rejected. Remember that this is with only three of the six theory-suggested variables entering the test, perhaps because firms included in the sample are large with insufficient variations in their payout

Table 5.5 Share price volatility and fundamental variables in Singapore: 1975–90 (simpler model)

	Intercept	*Ag*	*DY*	*EV*
Regression coefficients	66.94	0.23	−2.91	2.16
t values of coefficients		2.44*	−2.71*	2.29*
F value of regression		6.49*		
Adjusted R^2		24.10		

Note: Significant at 0.05* confidence level.

experiences. The individual coefficients were now clearly significant at or better than 0.05 confidence levels: t(DY)=−2.44, t(EV)=2.29 and t(Ag)=2.44. The variables isolated in Singapore are the same as those for the Tokyo market with the difference that the debt rate appears to matter in the latter market only.

Compared with the developed Tokyo share market, it appears that three fundamental factors (EV, DY and Ag) explain about a quarter of the variation in share prices in Singapore. We move now to an examination of the Kuala Lumpur share market.

Malaysian share price changes

Information on the behavior of the seven variables in the Kuala Lumpur market is given in Table 5.6. The volatility of 38.8 percent is less than that of Singapore (68.30 percent) but more than that of Tokyo (25 percent): this makes sense as the Singapore market experienced dramatic changes over the test period with two deep recessions in 1975–6 and 1985–6 and a share scandal in 1984 referred to as the Pan El Crisis. The dividend yield was 4.98 percent but these firms had the lowest payout ratio of 23.21 percent. The payout ratio for Tokyo firms was 43.45 percent and that for Singapore was 50 percent. Earnings volatility was 28.80 percent and the debt rate was higher at 34.40 percent. The asset growth rate was only 11.73 percent, which is the lowest among the three markets. The average behavior of the firms as suggested by these numbers is not inconsistent with public knowledge about this market. Now, we proceed to isolate the value-drivers associated with share price volatility.

Table 5.7 is a summary of results from fitting the general model to the data from the 30 firms in this market prior to parsimonious model selection. Overall, the six fundamental variables do not appear to jointly determine the share price changes. The null hypothesis was accepted as the *F* ratio was not significant at the 0.10 confidence level. Only 20 percent of the variation in price changes is explained by the models.[12] It therefore appears that the general model does not fit the observations in this market. It should be borne in mind that these results are not reliable as multicollinearity is not controlled in the test: with a correlation of +0.65 between POR and DY, there is a need to eliminate one variable, which we did by retaining POR,

Table 5.6 Descriptive statistics of fundamental variables in Kuala Lumpur: 1975–90 (variable×100)

	PV	*DY*	*EV*	*POR*	*SZ*	*DA*	*Ag*
Mean	38.80	4.98	28.00	23.21	6.41	34.40	11.73
Standard deviation	16.62	1.64	16.90	13.31	0.87	20.46	6.77

Table 5.7 Share price volatility and fundamental variables in Kuala Lumpur: 1975–89 (general model)

	DY	*EV*	*POR*	*SZ*	*DA*	*Ag*
Regression coefficients	1.00	0.37	−0.76	−0.003	0.15	0.21

	DY	*EV*	*POR*	*SZ*	*DA*	*Ag*
t values of coefficients	0.403	1.503	−2.121	−0.136	0.808	0.420
Regression *F* ratio			2.232[a]			
Adjusted R^2			20.30			

Note: [a]Not significant at acceptable level.

and we then proceeded with the stepwise regression. The resulting parsimonious model produced the results presented in Table 5.8.

First, note the *F* ratio of 3.507 and the adjusted R^2 value of 26.00 percent. The null hypothesis was rejected at the 0.10 confidence level and 26 percent of the variation in share price volatility was explained by (a) earnings volatility EV, (b) debt usage DA, (c) size of firms SZ and (d) payout ratio POR. The signs on the four variables were the same as predicted by theory. Greater volatility of earnings suggests a higher probability that a firm will have higher or lower earnings—hence the observed positive relation which was significant with t=1. 850. Firms apply more debt, providing gearing for equity leading to higher price changes. Firms that are large have stable earnings and thus should have less earnings volatility so that the size of a firm should be inversely related to price changes. But the size effect was marginal at –0.0004, which is negligible. Finally, the greater the payout ratio, the higher was the dividend rate, which means that the price volatility is lower as suggested by the significance of its coefficient with t=−2.682.

The changes in the common stock prices in the Kuala Lumpur market can be described as being significantly determined by four of the six fundamental factors: earnings volatility, debt usage, size of firms and asset growth. Jointly, these variables explain 26 percent of the variation in share

Table 5.8 Share price volatility and fundamental variables in Kuala Lumpur: 1975–90 (simpler model)

	Intercept	*EV*	*DA*	*SZ*	*POR*
Regression coefficients	0.43	0.39	0.13	−0.0004	−0.67
t values of coefficients		1.850**	0.759	−1.314	−2.682*
F value of regression		3.507**			
Adjusted R^2		25.70			

Note: Significant at 0.10** and 0.05* confidence levels.

price volatility. These factors relating to earnings, dividends and asset accumulation appear to affect share prices in this developing market.

4
CONCLUSIONS

This study started with the objective of isolating the factors, call them value-drivers, associated with stock price changes defined in this study as share price volatility in one developed and two developing share markets. Factors suggested by valuation theories and investment practices were isolated and then related to price changes in a test model with share price volatility at firm levels. We tested the price volatility model with data from representative firms in three markets. In running the linear regressions of the model, sufficient care was taken to produce results that are robust and reliable by examining collinearity, normality and parsimonious modeling.

It appears that the factors associated with share price volatility in both developed and developing markets are as follows.

1 Dividend-related variables, either dividend yield or payout rates, are negatively related to share price changes as suggested by theory.
2 Earnings-related variables, earnings changes or earnings volatility, are positively related to share price changes. The more stable the earnings of a firm, as in the case of large firms, the less likely are the share prices to change. The sign of the coefficient for the earnings variable in the Japanese market was anomalous.
3 Debt usage is significant for firms in Kuala Lumpur and Tokyo but not Singapore firms. Evidence suggests that the rates of change in debt usage in these two markets are at least twice as much as in Singapore.
4 The growth rate in the accumulation of assets of firms is the fourth factor. This is the highest and most significant factor for the Tokyo market. This variable is a proxy for two other factors, namely the retention ratio and positive net present values from projects with ROE>*k* undertaken by the firms.
5 Firm size is not important though it appears to be marginally significant in the model fitted for Kuala Lumpur firms.

Important value-drivers therefore appear to be dividends or earnings or debt or asset accumulation factors in both the developed and the developing markets. The same variables explain more of the price volatility in developed markets than in a developing share market. These findings corroborate indirectly the share price valuation theories commonly referred to as dividend valuation and price-earnings models. The results are consistent also with the efficient market theory's predictions about the earnings changes affecting share prices; similar remarks can also be made about the leverage theory's prediction about the magnifying effects on value of a firm by leverage: MM's Propositions.

A limitation of this study is the linearity relation assumed in the tests. Theory does not provide any guide on this issue. It is suspected, however, that the relation may be nonlinear, in fact concave. If firms are likely to face greater and increased competition from other firms for maintaining their higher rates of return, it is more difficult to maintain higher rates than moderate or small rates of abnormal returns. This line of reasoning suggests that the relation is unlikely to be monotonically increasing as modeled by a linear relation; therefore, the relation may well be concave. More research is needed to address this limitation. More markets—especially American and British ones known for lower volatility rates—should be included in further tests of the model developed in this chapter. Further work is also needed to validate the results of this study by re-specifying the variables not as averages but as volatilities of the fundamental variables along with price volatility as the standard deviation of the average of high and low prices.

NOTES

The results reported in this chapter are from a research that commenced in Singapore and was extended to Japanese stocks when the first author was a Komai Fellow in Japan at the Faculty of Economics of Tokyo University. The study was later replicated with data from Kuala Lumpur Stock Exchange: he wants to express his gratitude to the Hitachi Foundation for the financial assistance in this regard. This work was presented at the Michael Smurfit Graduate School of Business, University College Dublin, the Faculty of Commerce, University of Western Australia, Perth, and RMIT University of Technology, Melbourne. Comments of Philip Bourrke, Philip Brown, Izan, Kevin Davis and Kim Sawyer have been particularly useful. The remaining errors are ours.

1 The changes induced in prices of fixed-income securities can be tracked approximately by following the forward rates implicit in the spot term structure of interest rates. Duration theory (Macaulay 1938) also suggests that immunization is a strategy to neutralize the effect of interest rate changes on the value of a fixed-income investment portfolio. Therefore the source of uncertainty for immunized fixed-income securities is only the default risk.

2 The standard deviations of the rates of change in the last 10 years to 1990 are 8 percent (London), 12 percent (Tokyo), 13 percent (New York), 27 percent (Singapore) and 31 percent (Kuala Lumpur) (see Ariff and Johnson 1990). Share and bond price volatility in these markets were much lower in earlier decades (see *The Wall Street Journal,* May 15, 1987). There is a parallel literature which examines the factors—e.g. introduction of derivatives—that influence the volatility of share markets. This research is focused on the volatility of individual share prices rather than the market.

3 There has been a spate of research in the last 10 years to explain the changes in share price indices using high-frequency data such as daily closing prices: an example is French *et al.* (1987). Volatility of the whole market is investigated in this line of research but this study is concerned about *individual* common stock volatility in three international markets.

4 The model is derived through an examination of the dividend valuation and the duration theories to identify likely factors affecting share prices, and hence the share price volatility. See Williams and Pfeifer (1982) and Baskin (1989) for two examples among several studies which relate volatility with one or more theory-suggested variables. This study is concerned with examining the *joint* linear effects of several variables.

5 The model tested in this chapter is specified as a linear model. If in fact the relationship is nonlinear, further work is necessary to test other functional forms of the model. These and other refinements are suggested for continuing research on this subject.

6 The extreme value method is computationally more efficient as it is obtained from high and low (i.e. extreme) prices of a firm's share price over the test period. The traditional standard deviation calculated as the root of the variance in prices is only one-third as efficient as this extreme value measure for measuring the volatility: see Garman and Klass (1980). Kunitomo (1992) suggests an improvement to this method; however, he admitted in his conversation with me in Tokyo in June 1991 that this would require a lot more data than are publicly available and that this improved method could be feasible for investment houses. Hence the reason for the choice of Parkinson's measure in the cited paper. Most print data series available on companies report year's low and high prices in their annual reports: extreme value volatility thus makes full use of the low and high prices.

7 Gordon's share valuation theory can be extended to show that dividend yield and payout ratio are inversely related share price changes: see Williams and Pfeifer (1982) and Baskin (1989).

8 The positive effect of financial leverage must be balanced against the costs arising from increased financial distress. In either case price changes are likely to be directly related to debt-to-asset changes.

9 Pairwise regression results revealed substantial multicollinearity between some independent variables: POR and DY are multicollinear by definition. Some of these variables were dropped in order to improve the reliability of the test results. The normality assumption tests done by plotting residuals and testing the moments of the distribution revealed that the residuals were normally distributed with constant variance. The parsimonious model was built using Akaike's procedure as in Mendenhall and Sincich (1989). Therefore the test results reported later are robust and reliable.

10 See note 3.

11 This is our tentative assumption until the model is tested with New York Stock Exchange listed firms. Indirect evidence from related research cited in this chapter gives the impression that these variables are likely to be equally important in the American market.

12 Various combinations of the variables were tried. Leaving the Ag variable and keeping the five remaining variables, the test result was just about significant at the 0.10 confidence level. For comparison with other markets, only the results from the full model are reported.

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6
The short-term return structure of rationally (?) priced cyclical securities

John C.Woods

1
INTRODUCTION—THE CONVENTIONAL MODEL

In a world where risk-adjusted required returns are constant over time, the valuation of securities is straightforward—value is the present value of the expected dividend stream discounted at the appropriate discount rate, or $PV=\Sigma E[D_t]/(1+k)^t$. If earnings (and dividends) are expected to fluctuate cyclically, then stock value will also fluctuate cyclically, depending on the stage of the business cycle. If dividends oscillate in a sinusoidal form between $6.00 and $14.00 over a 20-period economic cycle, and the required return is 10 percent per period, then security prices will fluctuate between $111.55 and $88.45 as shown in Figure 6.1.[1]

2
COMPETING MODELS

The key assumption in the above analysis is the equality of risk-adjusted discount rates over time. Recent studies, however, by Fama (1991), Fama and French (1989) and Chen (1991) suggest that the concept of a time-invariant discount rate is inconsistent with modern intertemporal asset pricing models as well as uniform rational risk aversion. Integration of this possibility into the valuation analysis yields unforeseen results.

The arguments for a cyclically varying discount rate can be summarized in two separate, but not mutually exclusive, propositions. First, in an economic downturn, funds for current consumption are scarce and, in this state of the world, time value analysis would place a higher than normal discount rate on future cash flows. Conversely, when funds are plentiful, their marginal utility is slight, so lower discount rates would be appropriate. This time preference argument, which arises from the income smoothing work of Modigliani and Friedman, will be designated the M&F argument. It leads to placing a high discount rate on funds to be received in the future during economic troughs and a lower rate on funds to be received at peaks.

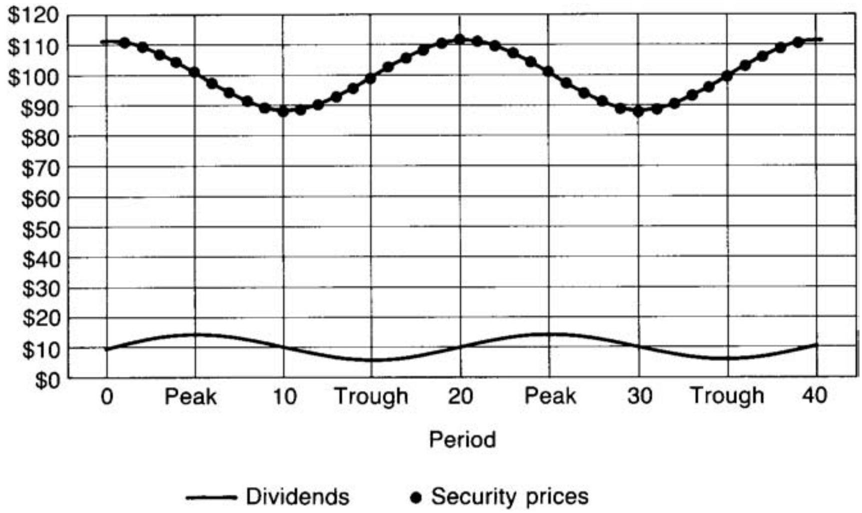

Figure 6.1 Security prices and cyclical dividends

A second explanation of variable discount rates is based on the possibility that the economic outlook is riskier than normal when earnings are cyclically low and therefore rational risk aversion justifies higher than normal discount rates at such times. The risk aversion argument follows from the work of Fama and French (F&F) and calls for utilizing a higher rate for discounting all future expected flows when the economy is poor and a lower rate for all future flows when the economy is at a cyclical peak.

Both of these contentions lead to higher discount rates and higher expected returns on securities in times of economic hardship, but the economic implications of the two models differ greatly. It will be shown that the M&F justification leads to an unambiguous enhancement of security values while the F&F approach leads to increased fluctuation in prices which results in inappropriate short-term risk-adjusted trading profits.

3
A SPECIFIC EXAMPLE

In order to clarify the above contentions, let us assume, as above, that dividends fluctuate between $6.00 and $14.00, and that the required return also fluctuates in a sinusoidal pattern between 12 percent when payments are low and 8 percent when payments are high. Table 6.1 shows the specific values over the 20-period cycle for dividends (column 2) and required returns (column 3). Column 4 shows the aggregate present value of a perpetual series of flows as calculated for each period with a constant discount rate of 10 percent as originally assumed.

Period 0	$111.55=11.24/1.10+12.35/1.10^2+13.24/1.10^3+\ldots$
Period 1	$111.47=12.35/1.10+13.24/1.10^2+13.80/1.10^3+\ldots$
Period 2	$110.27=13.24/1.10=13.80/1.10^2+14.00/1.10^3+\ldots$

Table 6.1 Values over the 20-period cycle for dividends, required returns and aggregate present value

(1) *Period*	(2) *Dividend ($)*	(3) *Variable required return (%)*	(4) *Constant return value ($)*	(5) *M&F value ($)*	(6) *F&F value ($)*
0	10.00	10.00	111.55	118.75	111.55
1	11.24	9.38	111.47	118.18	118.11
2	12.35	8.82	110.27	116.40	123.56
3	13.24	8.38	108.06	113.61	127.15
4	13.80	8.10	105.06	110.10	128.11
5	14.00	8.00	101.57	106.22	125.97
6	13.80	8.10	97.92	102.36	120.76
7	13.24	8.38	94.48	98.91	113.22
8	12.35	8.82	91.57	96.18	104.52
9	11.24	9.38	89.50	94.43	95.92
10	10.00	10.00	88.45	93.81	88.45
11	8.76	10.62	88.53	94.37	82.76
12	7.65	11.18	89.73	96.07	79.21
13	6.76	11.62	91.94	98.74	77.84
14	6.20	11.90	94.94	102.15	78.59
15	6.00	12.00	98.43	105.97	81.23
16	6.20	11.90	102.08	109.83	85.50
17	6.76	11.62	105.52	113.37	91.06
18	7.65	11.18	108.43	116.21	97.53
19	8.76	10.62	110.50	118.07	104.52
20	10.00	10.00	111.55	118.75	111.55

Column 5 shows the aggregate present value under the M&F time preference valuation scenario. Different discount rates are applied to each cash flow in accordance with the economic conditions which will exist when the payments are received, i.e. each dividend in column 2 is discounted by the corresponding required return in column 3.

Period 0	$118.75	=	$11.24/1.0938+12.35/1.0882^2$ $+13.24/1.0838^3+\ldots$
Period 1	$118.18	=	$12.35/1.0882+13.24/1.0838^2$

			$+13.80/1.0810^3+\ldots$
Period 2	\$116.40	=	$13.24/1.0838+13.80/1.0810^2$ $+14.00/1.0800^3+\ldots$

Column 6 in turn shows the valuation with the F&F risk aversion scenario. Note that, as economic conditions improve, higher rates are used to discount all expected flows, regardless of the conditions that are expected to exist at the actual time of receipt. The required return in column 3 *at the time of valuation* is used to discount all future flows.

Period 0	\$111.55	=	$11.24/1.10+12.35/1.10^2+13.24/1.10^3+\ldots$
Period 1	\$118.11	=	$12.35/1.0938+13.24/1.0938^2+13.80/1.0938^3+\ldots$
Period 2	\$123.56	=	$13.24/1.0882+13.80/1.0882^2+14.00/1.0882^3+\ldots$

The results of the three possible pricing scenarios are shown in Figure 6.2. Note that the M&F model results in security prices which are consistently higher than the constant discount rate scenario while the F&F representation results in significantly greater variation in prices. The higher valuation for the M&F model is explained by the lower discount rates used for valuing the relatively high flows and vice versa. The added penalty on the smaller flows caused by the time preference consideration is more than offset by the reduction of the discount rates when flows are larger. Thus aggregate valuation rises.

Under the F&F risk aversion scenario, values are enhanced prior to a cyclical peak because of the conjunction of low discount rates and high near-term dividend prospects. Conversely, they are reduced prior to cyclical bottoms when discount rates are high and near-term prospects poor. The greater variation observed with the F&F pricing scenario directly supports Fama's contention that the apparently excessive variability of security prices may be due to rational changes in required returns as economic conditions vary and not to irrational bubbles as implied by Schiller (1981) and many others.

4
IMPLICATIONS OF THE NEW MODELS

Inasmuch as risk aversion is predominantly a psychological phenomenon, it is impossible to say *a priori* whether a specific risk pricing model is rational or not. Reasonable cases can certainly be made for both the M&F and F&F evaluation scenarios. A look into the short-term return implications for the two models, however, may provide some insight into these essentially long-term formulations.

With the constant discount model first considered, a key consequence is the consistency of short-term returns—the return per period is independent of the investment horizon. Purchase of the security at time 0 for \$111.55 and sale at time 1 for \$111.47 after receiving period 1 payment of \$11.24 provides a return of 10

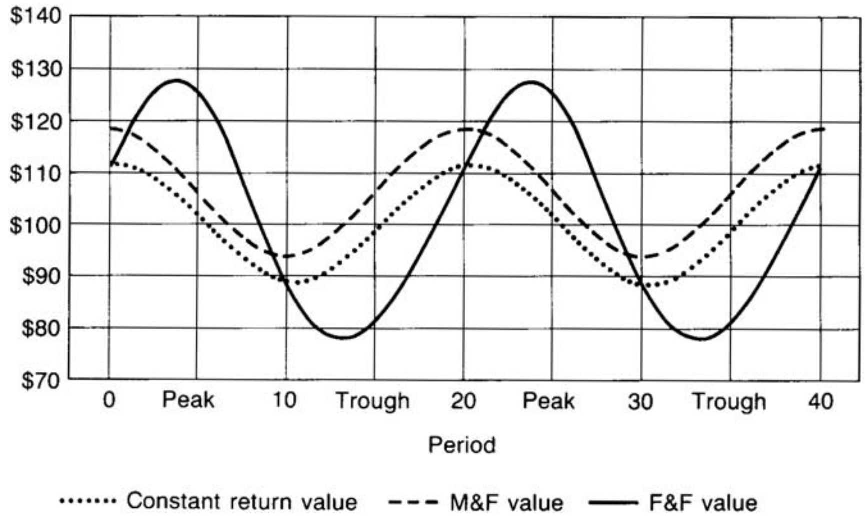

Figure 6.2 Security prices under differing valuation scenarios

percent, the discount rate utilized in determining the prices at times 0 and 1. Similarly a 2-year horizon entails purchase at $111.55, receipt of dividends of $11.24 and $12.35, and sale for $110.27 at time 2. The required return of these flows is likewise 10 percent, and this relationship holds for all possible investment horizons.

Under the M&F time preference model it was observed that security prices are consistently higher than under the constant discount rate model. As a consequence, short-term returns will be lower than the underlying average required return of 10 percent. As evidence, consider purchase at time 0 for $118. 75 and sale one period later for $118.18 after receipt of the dividend of $11.24. These payments correspond to a return of only 8.98 percent, and it can easily be shown that these inadequate short-term returns will persist throughout the economic cycle. Thus the M&F model, which calls for higher discount rates in hard times as a result of liquidity preference, results in substandard returns to short-term investors throughout the cycle. Whether such a model can be considered either rational or feasible is thus subject to debate.

Analysis of the short-term returns available under the F&F risk aversion model shows a more complicated pattern of returns. Utilizing the assumptions embodied in Table 6.1, under the F&F pricing scenario, short-term returns can be shown to fluctuate between 16 and 2 percent although long-term returns are constrained to lie in the 8–12 percent range. For example, purchase at time 0 for $111.55 and sale at time 1 for $118.11 after receipt of the dividend of $11.24 provides a one-period return of 15.95 percent. In Figure 6.3 the cyclical nature of short-term returns for varying horizons is illustrated. A 20-year holding period will provide the same return as the underlying perpetual model in which required

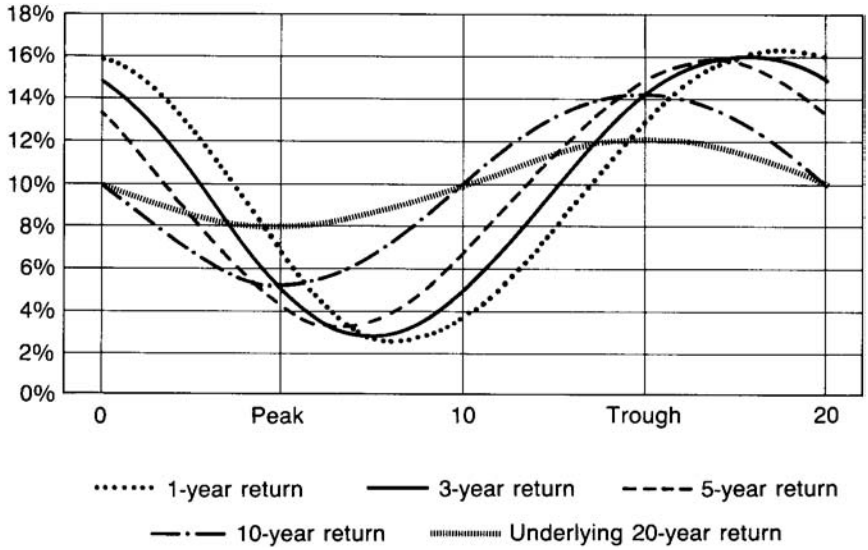

Figure 6.3 Realized short-term trading returns for various horizons with F&F valuation

returns are a function of the economic conditions at the time of purchase; any shorter period will provide returns which may vary greatly from this value.

Not only can the F&F model generate prices which imply a perhaps unreasonable range of short-term returns, it can also lead to negative short-term returns if there is sufficient variability in the discount rate. The underlying discount rate in the above example varied by only 2 percent from its mean value of 10 percent; a 4 percent variation would have induced negative returns in some periods and such a pricing structure would be patently untenable.

5
CONCLUSIONS

While the above observations are insufficient to disprove the variable risk-adjusted required return hypothesis, they do demonstrate the necessity of exploring all the implications of a model in order to establish its potential validity. While the variable return hypothesis would certainly be reasonable within a certain range of parameters, it just as certainly would not be acceptable within other ranges. Further studies into the nature of our economic cycles and the impact of these cycles upon investor behavior is called for, either as a means of identifying favourable investment opportunities or in order to enhance our understanding of the valuation process.

NOTES

1 The optimal price is found in periods 0 and 20 for discount rates within the wide range of 0.5–10.8 percent per period, for the range of payments hypothesized. Discount rates outside this range will shift the value peaks closer to the dividend peaks (in periods 5 and 25), but this fact is not germane to the substance of this chapter.

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7
Black Monday
What burst the bubble?

A.M.Parhizgari, Krishnan Dandapani and A.J.Prakash

On October 16, 1987, the US Stock Market began to crash. The Dow Jones Industrial Average fell 108.35 points (4.6 percent). The Standard and Poor 500 (S&P 500) experienced a similar downturn, 15.38 points (5.16 percent). By the close of business on Monday October 19, the Dow and the S&P were down by 508 points (22.61 percent) and 57.86 points (20.47 percent) respectively. This was the largest one-day decline on record. The nosedive on Monday alone resulted in a loss in value of over $500 billion, or about 23 percent of the total value of the market. The crash was a real one. The notion of a transitory shock in the market was no longer a suspect.

Since October 1987, the crash as well as the ensuing violent fluctuations and gyrations have left both the academicians and the market analysts scrambling for causes. There seems to be none. What is more puzzling is the absence of any negative information preceding the crash. In October 1987, the United States was still striding in the longest peacetime economic expansion: unemployment was at an eight-year low, corporate profits and personal income were on the rise, industrial production was increasing, inflation and interest rates were under control, and the economy in general was performing well. In the face of these outcomes Black Monday was a wonder, especially to many anxious investors, market analysts and regulators.

Our purpose in this chapter is to shed some light on the causes of the crash. With hindsight and with the crash nearly five years behind us, we have realized that this seemingly easy task might be somewhat formidable. This is not because the list of causes or culprits, or even theories, that have been advanced are few (see section 2). Rather, what is lacking is a unique *testable* theory which could stand the prevailing enquiries and anomalies surrounding the crash. This chapter is an attempt towards the development of such a theory. In addition to the conventional economic factors, a set of "other" factors determining stock prices are identified. It is hypothesized that the (gradual) buildup of the combined effect of these factors could bring substantial variations in stock prices.

The layout of the chapter is as follows. As an introduction to the issue, section 1 briefly reviews the prior research on the relationship between stock prices and the factors affecting them. Section 2 examines the recent research on the crash. Section 3 develops on the prior literature and builds the base for a testable model. Section 4 applies the model within a limited context and analyzes the results obtained. Conclusions follow in section 5.

1
BACKGROUND

Traditionally, academicians have set forth that the stock prices are the present value of the expected future stream of benefits (e.g. dividends, earnings or investment opportunities) discounted by an appropriate discount factor. Given that the variations in the expected future benefits is minimal over a *short* period of time, much of the fluctuations in stock prices can be attributed to the discount factor which in turn is directly related to the current and future level of economic activity. This suggests an investigation into (a) the factors affecting the current and future level of economic activity and (b) the nature of the influence of such factors on the stock market.

Prior research has taken two approaches in identifying the determinants of the variability of stock market prices: resort to macro variables, and the demand and supply theory of shares. The macro variables that are often considered are inflation, interest rates and some measures of real economic activity.

While many studies have established the relationship between share prices and macro variables, a comprehensive work in this area could be traced to King (1966). His pioneering work using factor analysis suggests the use of a set of market and industry factors as indicators of the direction and the magnitude of change in the price of a select number of securities.

Most of the studies to date have assumed that the stock prices reflect rational expectations and quickly adjust to new information. This can be seen formally in Fama *et al.* (1969). The inflation experience of the 1970s provided the first major challenge to the concept of rational valuation of the market. Modigliani and Cohn (1979) postulate that inflation causes investors to commit two major errors in evaluating common stocks and these errors could lead to a depressed market. They suggest that investors should capitalize equity earnings by using the real rate, e.g. the nominal rate less the inflation premium. Failure to do so leads to a systematic undervaluation of the market. Hence, they argue that the market is severely under-valued because of valuation errors by individual investors. The implication is that the market is irrational.

Another challenge to the concept of rational valuation is the work by De Bondt and Thaler (1985). They argue that most investors tend to overreact to unexpected and dramatic news events in violation of Bayes's rule and this in turn leads to an undervaluation or overvaluation of the market.

In support of rational expectations, Fama (1981) and Grossman and Shiller (1981) consider some of the anomalies of the stock market. Fama shows that the anomalous relationship between stock returns and inflation is consistent with the hypothesis that the negative relation between stock returns and inflation is proxying for a positive relation between stock returns and real variables which are more fundamental determinants of equity values. Grossman and Shiller argue that the variability of stock price indices cannot be accounted for by information regarding future dividends and can be attributed to information on the discount factor which in turn is related to current and future levels of economic activity.

James *et al.* (1985) examine the relationship between stock returns, real activity, inflation and changes in money supply using a vector autoregressive moving average model. Their empirical results support a reversed causality model whereby changes in real activity result in changes in money supply growth and this in turn affects the expected inflation. They find a strong link between stock returns, real activity and inflation.

Kim and Wu (1987) explore the economic nature of return factors by incorporating a multifactor return-generating process. They identify at least three significant factors and associate them with general economy-wide variables (factor 1), interest rate and money supply (factor 2) and labor market variables (factor 3). They show that the market return is generally explained well by these economic factors.

To recapitulate, under the rational market hypothesis or otherwise, the existence of some linkage between stock prices and a set of market factors is acknowledged. This trend of thought is still prevalent in most of the studies that have investigated the crash, as will be seen in the next section.

2
POST-CRASH STUDIES

The post-crash era has been quite responsive in seeking an explanation for the crash. The media and many *ad hoc* interviews were in the forefont in this regard. Within a span of less than a week after the crash, a number of new probable causes or culprits was added to the already rather extensive list of the macro variables. The new list included several institutional and market factors such as portfolio insurance, program trading, the futures market, index options, liquidity, domestic and foreign trade deficits, international integration and its bidirectional feedback, and the psychology of the market.

The probable causes that have been advanced by the academicians, the market specialists and the appointed task forces are divergent in scope. The following brief review attests to this point.

Fama (1989) analyzes the crash from a rational markets pricing perspective. He reviews several probable causes of the crash advanced by the Presidential Task Force. He regards them largely irrelevant. Linking stock returns to an "expectation" of future economic activity, he questions the cause of the shift in expectations. His response is: "I don't know. But I am not alone in my ignorance, and it is not special to the October experience" (p. 76). He points out that the existing framework and models in finance and economics are insufficient to identify and decipher how the market forecasts future business conditions and transforms their effect into stock prices. Notwithstanding this shortcoming, Black Monday is reviewed as a rational adjustment motivated by fundamental changes in expectations. Fama's contribution in this regard is particularly echoed by one of Diba and Grossman's (1988) conclusions, namely that stock prices do not contain explosive rational bubbles.

Greenwald and Stein (1988) offer an extensive analysis of the crash within the context of the Presidential Task Force recommendations. They observe that the stock market crash is a fundamentally unique event that is caused partly because of the overwhelming institutional barriers. During the crash the information function of prices is destroyed. This disables the market mechanism and distorts the prices used in transactions which need to take place only seconds apart. The magnitude and uncertainty of price movements, potentially huge and immeasurable, lead to dangerous rumours and financial panic.

They observe that the concept of frictionless market assumed in all financial models does not recognize the presence of many invisible institutional barriers and constraints. Their conclusion is that, in a world without institutional constraints, the *laissez-faire* logic of letting prices equilibrate as rapidly as possible without interference would be compelling. However, with institutional constraints in processing and executing orders, trading halts or circuit breakers are essential.

Gammill and Marsh (1988) consider the effect of the interaction of new investment technology and the market mechanism on the market's volatility in October. They recommend research in the microstructure of financial markets and emphasize a need for the development of transactions-level models of rational learning and how "rational" panic can occur when markets and their feedback mechanisms break down.

Leland and Rubinstein (1988) dismiss the two earlier explanations advanced for the crash, namely: (a) the market panic theory and (b) the Brady Commission's explanation that the crash was caused by a few large traders. The reasons offered are, respectively, the absence of any news creating a panic, and the relative insignificance of the large traders. They also reject the standard model of stock price determination since its under-lying assumptions, i.e. rational expectations, continuously functioning markets and continual optimization by all investors, might not fully hold.

Leland and Rubinstein observe that, contrary to rational expectations, investors overreact. Large sales create an imbalance between demand and supply leading to temporary stork closures and to nonsynchronous trading and breakdown of the market mechanism. Most investors, being unprofessional traders, are unable to determine the intrinsic value of shares. Hence, they suggest development of models of financial equilibrium which are more sensitive to real-life trading mechanisms.

Ferguson (1988) also analyzes major reasons for the crash. He dismisses the relevance of several factors like the futures market, arbitrage and portfolio insurance which have been cited as probable causes. Developing on Leland and Rubinstein's work he concentrates on portfolio insurance within a demand and

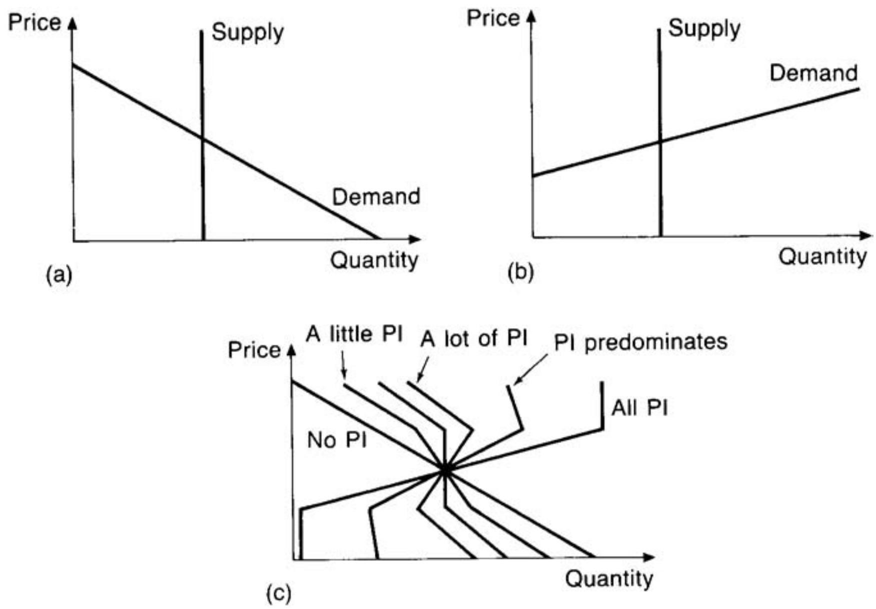

Figure 7.1 Demand and supply for stocks: (a) value-based investors (VB); (b) portfolio-insurance investors (PI); (c) aggregate demand (VB+PI).

Source: based on Ferguson 1988

supply framework. He concludes that economic models based on complete information and rationality work well in descriptions and forecasts. However, they totally fail when dealing with other aspects of human behavior. He recommends development of economic models in the light of psychological knowledge.

3 METHODOLOGY

Building on the above studies, we hypothesize that stock prices (SP) are related to a host of fundamental economic factors (FEF), market mechanisms factors (MMF) and behavioral factors (BF).

Consideration of the combined effect of these determining factors on price leads to an unconventional demand and supply analysis of stock price determination. To clarify this point, consider one of the new probable determining factors of the crash, i.e. portfolio insurance. Drawing upon the Leland and Rubinstein (1988) exposition as reported in Ferguson (1988), the demand and supply might resemble Figure 7.1. Two kinds of investors are considered in this figure: (a) value-based investors and (b) portfolio insurance investors. Note that the portfolio insurance investors have a demand curve that slopes upward to the right. This is because they buy when prices go up and sell when prices go down. The aggregate demand curve could take the shape of a conventional demand curve at one extreme and a Z-shaped demand curve at the other. This depends on the size of the demand in each category.

When portfolio insurance investors dominate the value-based investors, a maximum of three equilibrium prices exist: one in the middle and two on the extreme sides. Equilibrium price is unstable in the middle stretch of the Z-shaped demand curve. Hence, a small perturbation in demand swings the price from one extreme to the other.

The above presentation is of course highly idealized. Furthermore, it overemphasizes the importance of portfolio insurance investors in the overall market. In reality, the portfolio insurance effect is expected to make the total demand somewhat steeper (inelastic). However, this idealized case portrays one of the several effects that the alleged institutional and behavioral factors could have on the shape of the demand curve. Naturally, inclusion of the other factors could make the above analysis more complex, if not formidable.

Our hypothesis could then be summarized as

$$\mathrm{SP} = f(\mathrm{FEF}, \mathrm{MMF}, \mathrm{BF}) \tag{7.1}$$

where the variables are as defined above.

Since the behavioral factors represent primarily the market psychology, it could be assumed that they are formed on the basis of fundamental economic and the market mechanisms factors. Hence

$$\mathrm{BF} = g(\mathrm{FEF}, \mathrm{MMF}) \tag{7.2}$$

This simplification is primarily to achieve a testable hypothesis. Relationship (7. 1) therefore reduces to

$$\mathrm{SP} = h(\mathrm{FEF}, \mathrm{MMF}) \tag{7.3}$$

The proxies representing the fundamental economic factors (FEF) are less difficult to identify than those suitable for the market mechanisms factors (MMF). Prominent candidates for the fundamental economic factors are (a) some measure of real activity, (b) expected inflation, (c) expected interest rates, (d) exchange rates, (e) trade deficit and (f) budget deficit.

The above variables have become exemplary in the post-crash era, and there has been sporadic reasoning that one or more of them led the market to the Monday crash. While there is no consensus on the “list” of these factors or on the (relative) magnitude of the impact of each on the market, a consensus does exist that “they” are effective.

The proxies representing the market mechanisms factors are somewhat controversial and are less mature at this stage. The list includes (a) portfolio insurance, (b) liquidity, (c) program trading, (d) the futures market, (e) index options, (f) international bidirectional feedback, (g) operational capacity constraints, (h) margin trading, (i) market-making systems and (j) the linkages between the various exchanges and other markets.

There might be some degree of overlap among the proxies mentioned above for both the fundamental economic and the market mechanisms factors. In reality, the suggested proxies might *not* be completely mutually exclusive.

Substitution of the above proxies in (7.3) yields a price equation of the form

$$\mathrm{SP} = h(X_i) \tag{7.4}$$

where each X_i represents one proxy.

4 EMPIRICAL APPLICATION

Estimation of relationship (7.4) would not have been difficult if data on each X_i could have been identified. For the fundamental economic factors, identification of data for the proxies suggested has not posed much problem. For the market mechanisms factors, however, we recommend a two-step procedure: (a) identification of data for the proxies mentioned earlier and (b) compilation of such data. With empiricism in hindsight, the identification task needs to consider feasibility and hence data availability. Some preliminary suggestions for this step are summarized in Table 7.1. Though this task does not seem difficult, actual data compilation might pose severe constraints. This step awaits future research.

To test equation (7.4) under the existing data constraints, we have estimated a proxy to capture the influence of all the market mechanisms factors. We have assumed that the market mechanisms factors can be represented by a variable measuring overvaluation (undervaluation) of the market (see below). Thus the testable form of relationship (7.4) reduces to

$$\mathrm{SP} = h(\mathrm{IP}, \mathrm{ER}, \mathrm{PW}, \mathrm{RP}, \mathrm{DD}, \mathrm{DT}, \mathrm{OV}) \tag{7.5}$$

where SP is stock prices (Dow Jones (DJ) and S&P 500 (SP)), IP is real economic activity (industrial production), ER is the exchange rate, PW is inflation (wholesale price index), RP is interest rates, DD is the government budget deficit, DT is the trade deficit and OV is a measure of overvaluation (undervaluation) of the market. The above relationship reflects a comprehensive treatment of the post-crash lines of thought on this subject.

Inclusion of the first six explanatory variables in (7.5) is based on the points discussed in the preceding sections. Inclusion of OV is to reflect the possibility of (short-term) bias(es) in the market due to the influences of the market mechanisms factors. We hypothesize that the stock market's valuation based on a subset of determinants alone may have been biased and this bias may lead periodically to a violent valuation correction over a very short

Table 7.1 Preliminary proxies for market mechanism factors

	Proxies	*Suggested market variables*
1	Portfolio insurance	Ratio of volume of portfolio insurance to total market
2	Liquidity	Measure used in Wang (1988)

	Proxies	*Suggested market variables*
3	Program trading	Ratio of volume of program traders to total market
4	Futures market	Ratio of total value of trading in futures to other equity trading, or ratio of open interest to volume
5	Index options	Ratio of total value of trading in index options to other equity trading
6	International bidirectional feedback	Some measure of international integration, e.g. relative differences in some financial variables
7	Operational capacity constraints	Ratio of total number of traders to volume combined with some measure of automation on processing capacity
8	Margin trading	Percentage established by the regulatory agencies
9	Market-making systems	Bid-ask spread
10	Linkages between exchanges	Correlation coefficient between the exchanges

period of time. The Monday crash, for example, could have been one of such instances. The proxy OV for each period (i.e. month) N is calculated by first estimating

$$\mathrm{SP}_t = a_0 + a_N t \tag{7.6}$$

over $t=N-12,\ldots, N$. The proxy OV for each period is then defined as (see Edwards 1984)

$$\mathrm{OV} = \left[\frac{\Sigma_{t=N-12}^{N}(\mathrm{SP}_t - \mathrm{SP}_{t-1} - a_N)^2}{12}\right]^{1/2} \tag{7.7}$$

where $\hat{a}_N$ is the estimated value of a_N. Note that OV represents a measure of variation of detrended stock prices.

Monthly data covering the period from November 1981 to October 1987 are extracted from various sources including International Monetary Fund (IMF), DRI and CRSP tapes. For the dependent variable, SP, Dow Jones 30 Industrials and S&P 500 indices are utilized. For OV, the measure of variation of the detrended prices, relationships (7.6) and (7.7) are employed to calculate the respective measures for the Dow Jones and for the S&P 500. These OV variables, labelled OD (for Dow Jones) and OS (for S&P), proxy to a great extent the variations in the market due to overvaluation (undervaluation).

Relationship (7.5) is specified in an additive linear form. One drawback in estimating such a specification is the existence of multicollinearity. This

Table 7.2 OLS estimates of stock prices

1	DJ	=	8.7867	− 0.4538ER	− 0.4897PM	+ 0.8446IP	− 0.5776RP	− 0.0028DD	− 0.0127DT	+ 0.1106OD
			6.9939	4.9933	4.5676	3.3639	6.3400	0.2683*	0.4852*	2.7573

R^{-2}=0.946; R^2=0.951; DW=0.83; NO=71; SSR=0.3460037E+00; F(7, 63) =175.445; SER=0.741E−01

1	SP	=	6.0421	− 0.3106ER	− 0.6104PW	+ 1.0023IP	− 0.5513RP	− 0.0071DD	− 0.0134DT	+ 0.1027OS
			5.7889	4.0473	6.1439	4.4909	6.2740	0.7615*	0.5753*	2.5545

R^{-2}=0.950; R^2=0.955; DW=0.93; NO=71; SSR=0.2724664E+00; F(7, 63) =192.627; SER=0.658E−01

2	DJ	=	8.7293	− 0.3981ER_{-1}	− 0.4441PW_{-1}	+ 0.7091IP_{-1}	− 0.5716RP	+ 0.0017DD_{-1}	− 0.0125DT_{-1}	+ 0.1530OD_{-1}
			7.1201	4.5634	4.3563	2.8945	6.5140	0.1608*	0.4778*	3.3871

R^{-2}=0.948; R^2=0.953; DW=0.62; NO=71; SSR=0.3328519E+00; F(7, 63) =182.732; SER=0.727E−01

2	SP	=	6.1348	− 0.2359ER_{-1}	− 0.6223PW_{-1}	+ 0.8266IP_{-1}	− 0.4745RP	− 0.0018DD_{-1}	− 0.0096DT_{-1}	+ 0.1850OS_{-1}
			6.3476	3.3267	6.8525	3.9395	5.6535	0.2001*	0.4302*	4.2373

R^{-2}=0.956; R^2=0.960; DW=0.74; NO=71; SSR=0.241827E+00; F(7, 63)=218.172; SER=0.620E−01

Notes: Figures below the coefficients are t statistics.
All parameter estimates are significant at the 1 percent level or better except those indicated by an asterisk.
Time subscripts are omitted, thus the subscript '−1' indicates 't−1'.

Table 7.3 Estimates of stock prices under alternative specification

1	DJ	=	9.619	− 0.463ER_r	− 52.270PW_d	+ 9.592IP_m	− 0.899RP_r	− 0.010DD	− 0.088DT	+ 0.177OD
			11.701	3.922	6.847	1.485	6.667	0.767	3.199	3.513

R^{-2}=0.906; R^2=0.916; DW=1.444; F(7, 62)=96.328; SSR=0.581; SER=0.097; NO=70

1	SP	=	7.434	− 0.342ER_r	− 53.281PW_d	+ 11.300IP_m	− 0.924RP_r	− 0.015DD	− 0.102DT	+ 0.150OS
			10.441	3.016	6.969	1.755	6.845	1.072	3.771	2.937

R^{-2}=0.893; R^2=0.903; DW=1.486; F(7, 62)=82.840; SSR=0.574; SER=0.096; NO=70

2	DJ	=	9.343	− 0.445ER_r	− 52.599PW_d	+ 0.005IP_a	− 0.890RP_r	− 0.015DD	− 0.070DT	+ 0.204OD
			12.289	4.110	7.473	2.545	7.093	1.150	2.584	4.207

R^{-2}=0.914; R^2=0.923; DW=1.423; F(7, 63)=107.427; SSR=0.548; SER=0.093; NO=71

2	SP	=	6.790	− 0.292ER_r	− 50.249PW_d	+ 0.008IP_a	− 0.839RP_r	− 0.021DD	− 0.069DT	+ 0.234OS
			10.488	2.944	7.460	3.951	6.952	1.701	2.672	4.543

R^{-2}=0.912; R^2=0.921; DW=1.514; F(7, 63)=104.573; SSR=0.484; SER=0.088; NO=71

3	DJ	=	9.445	− 0.431ER_r	− 55.460PW_d	+ 1.119IP_d	− 0.949RP_r	− 0.011DD	− 0.085DT	+ 0.181OD
			11.589	3.703	7.568	0.765	7.204	0.758	3.094	3.597

R^{-2}=0.906; R^2=0.916; DW=1.437; F(7, 63)=97.555; SSR=0.599; SER=0.098; NO=71

3	SP	=	7.412	−	0.330ER$_r$	−	56.323PW$_d$	+	1.583IP$_d$	−	0.969RP$_r$	−	0.016DD	−	0.099DT	+	0.145OS
			10.502		2.951		7.700		1.094		7.372		1.140		3.625		2.845

R^{-2}=0.892; R^2=0.903; DW=1.458; F(7, 63)=83.749; SSR=0.592; SER=0.097; NO=71

4	DJ	=	9.624	−	0.464ER$_r$	−	52.245PW$_d$	+	2.117IP$_{d1}$	−	0.898RP$_r$	−	0.011DD	−	0.088DT	+	0.176OD
			11.715		3.931		6.858		1.518		6.674		0.774		3.199		3.511

R^{-2}=0.906; R^2=0.916; DW=1.445; F(7, 62)=96.488; SSR=0.580; SER=0.097; NO=70

4	SP	=	7.437	−	0.342ER$_r$	−	53.272PW$_d$	+	2.480IP$_{d1}$	−	0.923RP$_r$	−	0.015DD	−	0.102DT	+	0.150OS
			10.452		3.022		6.983		1.784		6.856		1.080		3.770		2.939

R^{-2}=0.893; R^2=0.904; DW=1.487; F(7, 62)=82.984; SSR=0.573; SER=0.096; NO=70

5	DJ	=	4.410	−	0.420ERr	−	43.602PW$_d$	+	0.995IP	−	0.743RP$_r$	−	0.003DD	−	0.009DT	+	0.182OD
			3.545		4.343		6.433		4.719		6.207		0.251		0.326		4.214

R^{-2}=0.930; R^2=0.937; DW=1.205; F(7, 63)=133.898; SSR=0.447; SER=0.084; NO=71

5	SP	=	1.078	−	0.288ER$_r$	−	41.713PW$_d$	+	1.206IP	−	0.714RP$_r$	−	0.006DD	−	0.005DT	+	0.166OS

			0.941	3.300	6.688	6.230	6.497	0.509	0.186	4.096

R^{-2}=0.932; R^2=0.939; DW=1.238; F(7, 63)=138.091; SSR=0.373; SER=0.077; NO=71

6	DJ	=	9.897	− 0.505 ER	− 52.420 PW_d	+ 1.433 IP_d	− 0.893 RP_r	− 0.010 DD	− 0.075 DT	+ 0.148 OD
			12.821	4.538	7.348	1.020	6.959	0.745	2.812	2.943

R^{-2}=0.914; R^2=0.922; DW=1.412; F(7, 63)=107.112; SSR=0.550; SER=0.093; NO=71

6	SP	=	7.777	− 0.398 ER	− 53.719 PW_d	+ 1.752 IP_d	− 0.920 RP_r	− 0.016 DD	− 0.090 DT	+ 0.116 OS
			11.663	3.702	7.481	1.253	7.119	1.179	3.370	2.263

R^{-2}=0.899; R^2=0.909; DW=1.424; F(7, 63)=90. 213; SSR=0.554; SER=0.094; NO=71

Notes: Figures below the coefficients are t statistics.

All parameter estimates are significant at the 1 percent level or better except those indicated by an asterisk.

Notation is condensed for brevity in presentation, though the general acronyms used in the text are employed. All values are in natural logs (ln): ER, "nominal" exchange rate; ER_r ("real" exchange rate)=ln[ER(1+P_1)/(1+P_2)], where P_1 and P_2 are the US and the foreign inflation rates, respectively; RP,"nominal" interest rate; RP_r, ("real" interest rate plus one)=ln[1.0+RP_t−(PW_t−PW_{t-1})/PW_{t-1}] (*Note:* one is added to make the natural log (ln) possible); IP, real economic activity (industrial production index); IP_d, change in IP=ln IP_t−ln IP_{t-1}; IP_{d1}=[ln IP_t–ln IP_{t-1}]$_{t-1}$; IP_a=[(ln IP_t−ln IP_{t-12})/ln IP_{t-12}]$_{t-1}$ (*Note:* this corrects for the seasonality in IP); IP_m=[(ln IP_t−ln IP_{t-1})/ln IP_{t-1}]$_{t-1}$; PW, inflation measure (wholesale price index); PW_d, change in PW=ln PW_t−ln PW_{t-1}; DD, domestic deficit; DT, trade deficit; OD, the OV variable pertaining to the Dow Jones; OS, the OV variable pertaining to the S&P 500; DJ, Dow Jones index; SP, S&P 500 index.

is substantially reduced by first purging (adjusting) the variables and then converting them into first differences of their logarithms. To check into other specifications, some experiments with (a) the modified (purged) explanatory variables and (b) the lagged values of the (modified) explanatory variables are also performed. Where applicable, these results are included as alternatives under the equations. It is possible that the choice of a better lag structure might improve the results further.

The results of the ordinary least squares (OLS) estimates are presented in Tables 7.2 and 7.3. Table 7.2 includes estimates of an additive specification of relationship (7.5) when natural logarithms of the variables in "levels" are employed and without any modification (adjustment) in the explanatory variables, except for a consideration of their lagged values. Table 7.3 portrays estimates of the same general relationship but with the explanatory variables therein modified (purged) to remove multicollinearity and/or serial correlation. The modifications in variables are threefold. First, the interest rate and the exchange rate variables are adjusted to remove the effect of inflation since the inflation variable is explicitly included in the equation. Second, the variables are converted into the first differences or percentage changes of their logarithms. Finally, a set of simple lag structures is considered.

In our experiments with alternative model specifications, we paid particular attention to the "dynamics" between the stock prices and the real economic activity variable (IP). We considered several forms of IP, e.g. IP_m, IP_a, IP_d and IP_{d1}. "Monthly" percentage changes (IP_m) in the proxy used for the real economic activity variable, i.e. the industrial production (IP), are known to be highly seasonal (see Fama 1981). To correct for seasonality, we calculated "annual" percentage changes for each month (IP_a). The "lagged" values of these two variables performed best with the latter (IP_a) yielding superior results. The first two pairs of equations in Table 7.3 portray these results. Note that in the table the "one-period lagged" values of monthly and annual percentage changes in IP are indicated by IP_m and IP_a respectively (see notes to Table 7.3).

The third and fourth pairs of equations in Table 7.3 employ IP in its first difference (IP_d) and IP_d lagged one period (IP_{d1}). The fifth and sixth pairs of equations in the table portray, respectively, the results for IP with no modification in it and for "nominal", rather than "real" exchange rate.

To draw some comparative conclusion from Table 7.3, the pair of equations labeled 2 appears to perform best on theoretical, empirical and statistical grounds.

The outcome of the estimation in general appears satisfactory. The presence of some degree of serial correlation in Table 7.2 as indicated by the low values of the DW statistics should be acknowledged. This was expected as was pointed out earlier. It is substantially removed in Table 7.3.

The majority of the coefficients are significant at the 1 percent level and their signs conform with *a priori* expectations. For example, the stock price (DJ or SP) is expected to drop when the dollar exchange rate (ER) goes up. The price also drops due to higher inflation (PW) and higher domestic deficit (DD). It responds positively to the real economic activity (IP) and positively (negatively) to overvaluation (undervaluation) of the market (OV=OD, OS). (OD and OS represent the OV variables for Dow Jones and S&P 500, respectively.) Hence, the higher the distortion of the market stemming from the market mechanisms factors, the higher the variability in prices.

It appears that the twin deficits, DT and in particular DD, do not in general carry the importance attached to them in the stock price

Table 7.4 A subset of measures of the OV variables

Year	*Month*	*SP*	*DJ*	*OVSP*	*OVDJ*
1981	12	122.55	875.00	15.43	99.19
1982	1	120.40	871.09	14.62	99.96
1982	12	140.64	1046.54	21.07	146.20
1983	1	145.30	1075.69	20.96	146.17
1983	12	164.92	1258.64	14.95	114.99
1984	1	163.41	1220.57	15.04	125.72
1984	12	167.24	1211.56	20.70	156.22
1985	1	179.63	1286.77	23.61	168.08
1985	12	211.28	1546.67	21.42	136.51
1986	1	211.78	1570.98	19.03	124.41
1986	2	226.92	1709.06	22.47	162.42
1986	3	238.89	1818.60	23.26	166.90
1986	4	235.52	1783.97	23.87	176.37
1986	5	247.35	1878.70	24.44	183.12
1986	6	250.84	1892.71	24.55	186.01
1986	7	236.12	1775.31	31.30	248.11
1986	8	252.92	1898.33	32.19	249.09
1986	9	231.22	1767.57	40.19	300.05
1986	10	243.98	1877.70	40.76	307.13
1986	11	249.22	1914.22	39.99	301.91
1986	12	242.17	1895.94	40.93	303.19
1987	1	274.07	2158.04	50.17	383.42
1987	2	284.20	2223.98	49.04	367.97
1987	3	291.70	2304.68	48.22	361.00
1987	4	288.35	2283.36	48.14	358.08
1987	5	290.10	2291.57	47.70	356.96
1987	6	304.00	2418.53	48.73	366.34
1987	7	318.66	2572.07	45.00	336.04
1987	8	329.79	2662.94	44.24	332.79
1987	9	321.82	2596.28	36.68	298.84
1987	10	251.78	1993.53	83.69	717.11

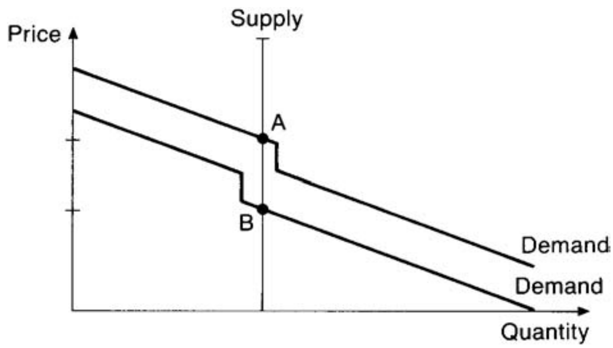

Figure 7.2 Kinked demand and supply for stocks

determination. They are not significant in some cases, and furthermore DT carries the wrong sign in two of the equations.

Further interpretation of the fundamental economic variables in Tables 7.2 and 7.3 should be self-explanatory. Regarding the OV variables (OD and OS), a few additional observations are now timely.

An examination of the estimated values of the OV variables reveals an increasing pattern in their magnitudes, especially as we approach the crash in October 1987. Furthermore, the extreme values of OV, relative to the other months, occur in October. As a trading rule, this monotonously increasing trend may be employed as a “predictive” tool signaling that, for some relative extreme measures, an explosive situation may be in the offing. For brevity, we have reported only subsets of the estimated OV measures in Table 7.4. Based on the relative magnitudes of these measures, there is ample indication of the buildup of an unusual situation in the latter part of 1986 and in 1987. In October, these measures attain the relatively extreme values of 83.69 and 717.12 for S&P 500 and Dow Jones, respectively, indicating, in part, why the bubble burst.

Based on the above points, OV, which is expected to capture the overall effect of the market mechanisms factors, could be interpreted as a measure of the overvaluation of the market. If the gradual buildup of the market mechanisms factors yields to a sudden correction, the OV variables drop, at maximum, to zero. This change yields a downward shift in the demand curve(s) already presented in Figure 7.1. The consequence of this shift is more severe if the supply is on, or in the vicinity of, the kink points of the demand curve(s). This point is portrayed in Figure 7.2.

It could be postulated that around the kink points there exists a group of investors who would swing position according to the market mechanisms factors alone. The drop in prices, say from point A to B in Figure 7.2, could be substantial. This drop could be initiated, if not completely brought about, by such a group of investors who are, of course, expected to be the dominating ones in the *short run*. Though there are currently no data on such investors, an analysis of the drop in stock prices in light of the market size during the crash supports the very existence of the market mechanisms factors and the kinks in the demand curve. The total volume of trading on the three heaviest days around Black Monday amounted to less than $60 billion or 3 percent of the outstanding equity. However, the fact that this mere 3 percent of equity trading changed the stock prices in excess of 20 percent could signal a change in the market mechanisms factors depicted in Figure 7.2.

5
CONCLUSION

In this chapter we have made an attempt to synthesize the determinants of stock price valuation and have tested this synthesis. The results are encouraging, especially in the sense that a good number of linkages between stock prices and their potential determinants are identified.

In the vein of this analysis, a cursory evaluation of the state of our knowledge on crash-related phenomena is indispensable. In general we concur with the prior findings. In particular, we would like to reiterate our derived synthesis, i.e. that there are several factors which affect stock prices, namely economic, institutional and behavioral. Within this context, it is obvious that the existing models are inadequate in capturing the institutional and the behavioral factors. Thus, new normative models incorporating institutional constraints and in particular trading strategies are necessary. These models have to explain the demand and supply in the light of portfolio insurance, program trading and other derivative securities. Furthermore, they should be able to capture the behavioral aspects of the psychology of the market participants. The direction of future research along these lines appears inevitable.

NOTE

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8
Australian imputation tax system and dividend reinvestment plans

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1
INTRODUCTION

The imputation system eliminates the double taxation of dividends and provides most Australian shareholders with a strong reason to prefer companies that pay franked dividends rather than retain profits. Many companies have responded by substantially increasing their dividends and implementing measures such as dividend reinvestment plans (DRPs) to retain cash flows. Participation in the DRP allows shareholders to receive all or part of their dividends in the form of additional shares in the company, usually at a discount to the market price, rather than in cash.

Since the implementation of the dividend imputation system on July 1, 1987, Australian companies have increasingly used DRPs to raise new equity capital. In the year prior to the introduction, there were some 40 DRPs in operation, raising only 2.5 percent of the total new equity capital. However, by June 30, 1991, there were more than 150 DRPs in operation and their share issues accounted for 32.7 percent of the total equity capital in that financial year.

This increase in the number of DRPs may be related to a change in the dividend policies and financing decisions of Australian companies. Officer (1988, 1991) suggests that the before-tax cost of capital for Australian companies is likely to be reduced under imputation and that the value of those companies paying franked dividends will increase. Wood *et al.* (1991) show that superannuation funds, which are a significant investor group in Australia, will demand more franked dividends owing to their tax status. Similarly, Howard and Brown (1992) argue that the optimal dividend policy for most Australian-owned companies is to pay the maximum franked dividends. Nicol (1991) suggests that companies could maintain both their investment programmes and dividend payments by encouraging dividend reinvestment. This study examines whether the market might react differently to DRP announcements in the pre- and post-imputation environment. The results indicate that the market reacted positively to DRP announcements post-imputation.

The chapter is organized as follows. An overview of the DRP and its announcement effects are discussed in section 2. This is followed by an examination of the implications of the dividend imputation system in section 3. The methodology and the data are detailed in section 4. The results are presented in section 5. A summary of the paper's major results and conclusions is presented in section 6.

2
DIVIDEND REINVESTMENT PLAN

Dividend reinvestment plans allow shareholders to have dividends on some or all of their shares in a company automatically reinvested in newly issued shares.[1] Shares issued under the DRP are normally at a discount, usually 5–10 percent, from the weighted average market price of the shares traded on the Australian Stock Exchange, typically during the five days after the ex dividend date. Shareholders are not charged brokerage fees, commission or stamp duty for any allotment of shares under the DRP. Where the issue formula results in a fraction of a share, the entitlement is usually rounded up to the next whole share. A transaction statement and a certificate for the new shares are usually forwarded to participants at each dividend payment. Shareholders can vary their participation or withdraw from the DRP at any time.

In the United States, many corporations have long allowed shareholders to automatically reinvest their dividends, but it was not until March 26, 1982, that an Australian company, the Lend Lease Corporation, offered this opportunity to its shareholders with a 10 percent discount from market price. Similar plans were soon introduced by other companies and by the end of June 1987 there were 38 DRPs in operation.

The primary attraction of the dividend reinvestment plan is to help shareholders reinvest their dividends without incurring transaction costs. Participants also benefit from purchasing new shares at a discount to the market price and the convenience of compound dividends. The ease of the DRP transactions is particularly attractive to small investors. Reinvestment is made on a regular basis and share records are produced periodically.

From a corporate viewpoint, dividend reinvestment provides an inexpensive source of additional equity capital and an effective means of increasing dividend payout without committing cash flows. A company usually knows with some precision how much funds will return to the company. Indeed, Fredman and Nichols (1982) found that DRPs provide a substantial flow of working capital, irrespective of market conditions. Companies also benefit from improved shareholder relations: Anderson (1986) found that this was the main reason for Australian companies introducing DRPs.

In some circumstances, DRPs are a new method of raising equity capital in their own right. Wilson (1982) argues that capital-intensive firms with high leverage but poor growth prospects have the most to gain from DRPs, particularly when shareholders demand high dividend payouts. Wilson claims that these companies would experience increasing difficulty in raising funds to meet their needs in an inflationary environment as new share issues would depress further the share price given the poor growth prospects, while borrowing opportunities are limited owing to the already high leverage. A reduction in dividend would result in a negative market reaction. Given a significant participation rate, dividend reinvestment plans reduce the need to raise external funds and provide an effective means of bypassing the capital market, thus allowing these companies to face less market monitoring.

Dividend reinvestment plans do have some drawbacks. For example, all shareholders pay for the DRP's implementation and administrative costs but only the participants receive the benefit; thus non-participants are subsidizing them. Another problem is the possible dilution of the earnings per share (EPS) caused by an expanding equity base. When a discount is offered, this dilution potential is magnified. In fact, a number of companies have recently reduced their discount (e.g. ANZ Bank in 1991) or even suspended their DRPs (e.g. Brambles in 1991) to reduce the dilution in EPS. In addition, DRPs are another means of retaining funds and could therefore create a problem of free cash flow for companies with insufficient investment opportunities. Free cash flow, defined by Jensen (1986), is cash flow in excess of that required to fund all projects that have a positive net present value when discounted at the relevant cost of capital. Such free cash flow not paid to shareholders would have been invested by managers at below the cost of capital or wasted on organization inefficiencies, the cost of which is borne by shareholders.

Thus far, most empirical work on DRPs has concentrated on the impact of a firm announcing its intention to introduce a DRP. They have been conducted on the US data in the form of event studies and use residual analysis to identify abnormal returns associated with the announcement. Perumpral (1983) found that the market reacted positively when a firm announced its intention to introduce a DRP, but that not all announcements produced positive returns. Peterson *et al.* (1987) examined the announcement effects on utility company DRPs prior to and during a special $750 US tax exemption on DRP reinvestment in public utility shares between 1983 and 1985. They found that DRP announcements had little market impact before the reform, but were valued positively during the tax exemption period. Dubofsky and Bierman (1988) examined the market reaction to firms announcing DRPs with a discount from market price feature. Using daily data for a sample of 46 firms between 1975 and 1983, they found that DRPs were valued positively. These various results suggest that DRPs offer share-holders real benefits.

In a perfect market, the introduction of a DRP should have no impact on the firm value or a shareholder's wealth. However, market imperfections such as transaction costs, taxation, information asymmetry and other factors affecting capital structure might cause these plans to have value. Anderson (1986) found that the shareholders' potential savings of transaction costs were an important factor in Australian companies deciding to introduce DRPs. Miller and Rock (1985) contend that informational asymmetries exist between management and shareholders with regard to the firm's future well-being. The announcement of a firm's intention to introduce a DRP might be construed to have an information effect as the plan will result in new shares being issued and hence in the size of the firm's total dollar amount of dividends being increased. As with Miller and Modigliani (1961), the willingness to service additional dividend payments may signal that management perceives good earning prospects for at least the immediate future, or that the company has sufficient positive net present value projects available to employ the additional equity so that there will be no EPS dilution. Thus, Dubofsky and Bierman (1988:61) contended that a DRP may lead to positive abnormal returns for shareholders if the firm "is signalling favourable information via the decision to utilize the internal financing characteristics of the DRP and/or is reducing the total brokerage fees and transaction costs normally incurred by the firm and its owners".

As DRPs are an equity-raising mechanism, such announcements might be expected to receive negative market reaction. Ross (1977) and Jensen (1986) suggest that most leverage-increasing transactions such as stock repurchases are associated with significant positive increases in share prices, while leverage-reducing transactions such as rights issues or dividend reinvestment plans are received negatively. Myers and Majluf (1984) show that, when there is information asymmetry between managers and investors, the latter will interpret an announcement of a share issue such as a DRP as bad news and the share price will fall. The decline in share price is attributable to investor concern that equity is being issued because management has private information suggesting that the share is overpriced. The price decline could also be caused by the concern over the buildup of free cash flow, which adds to the agency cost of equity capital. In contrast, raising capital through a DRP might help reduce some of the potential information asymmetries that a larger, one time capital raising might entail. Scholes and Wolfson (1989) suggest that, if management has to raise equity capital and does not possess adverse private information, they can commit the firm to raise funds for a future project over a period of time, rather than all at once, to mitigate the adverse signaling effect.

3
IMPLICATIONS OF THE DIVIDEND IMPUTATION

The implementation of the dividend imputation tax system from July 1, 1987, provided a catalyst for the growth of DRPs in Australia.[2] Prior to imputation, a company would pay corporate tax on its earnings and then individual shareholders would pay personal tax again if these earnings were paid out in dividends. Imputation, though, now allows Australian resident shareholders to receive a credit for the full amount of income tax paid by the company. These dividends paid out of a company's after-tax profit are referred to as franked dividends. The imputation credit, known as a franking credit, can then be used to offset the shareholders' own tax liabilities.

The benefit that imputation affords an Australian resident shareholder depends largely on the shareholder's marginal tax rate and the company's dividend policy. As shown in the Appendix 8A, fully taxed company profit distributed as dividends is effectively taxed only once at the shareholder's marginal tax rate. Investors with personal marginal tax rates less than the company tax rate (39 percent in 1991–2) will prefer a 100 percent dividend payout as they can apply the excess credits against any tax payable on other income. In the absence of a capital gains tax, investors with higher marginal tax rates will prefer the company to retain these profits. However, with the introduction of capital gains tax on September 19, 1985, any shares then purchased will be subject to normal taxation on the inflation-adjusted capital gain on resale. Hence, while imputation has removed the previous double taxation of dividends, the capital gains tax results in the double taxation of retained profits.[3] This adds to the incentive to pay dividends.

Also from July 1, 1988, superannuation funds, which were previously tax exempt, have been subject to an income tax at the rate of 15 percent and are able to use imputation credits to offset this tax. Wood *et al.* (1991) show that superannuation funds will prefer earnings which have been taxed at the full corporate rate to be distributed as fully franked dividends rather than retained within a firm. This tax change has increased significantly the super-annuation funds demand for franked dividends.

The imputation tax system in fact benefits not only Australian resident shareholders but also the tax exempt and overseas investors. Officer (1988) points out that investors who are unable to fully utilize the franking credits can effectively sell those tax credits. The ease of tax arbitrage implies that all investors, irrespective of their tax status, have the opportunity to benefit from the tax credits associated with franked dividends. This could substantially reduce company tax for Australian companies which in turn can be expected to reduce the before-tax cost of capital and increase the after-tax net cash flows. Officer (1991) shows that the before-tax cost of capital is reduced by the relative value of tax credits compared with the cost of equity under a classical tax system and that the after-tax net cash flows need to be adjusted for by adding back the value of tax credits. As a result, the value of companies paying franked dividends will increase.

Howard and Brown (1992) argue that, under imputation, dividend decisions are more important than capital structure decisions. Companies with mixed classes of shareholders should adopt policies which suit the tax position of dominant clienteles. Given that superannuation funds and life offices are the dominant shareholders, the optimal dividend policy for most Australian companies is to pay the maximum possible franked dividends. Nicol (1991) suggests that, if new equity needs to be raised for investment as a consequence of this policy, then a company should introduce a DRP to retain the necessary funds. Though many Australian listed companies do not pay full corporate tax and are partly owned by overseas investors, these companies usually have an investor base of financial institutions who have a strong demand for high franked dividends and are likely to be more supportive in participating in DRPs. In fact, Nicol argues that the shareholder commitment under reinvestment plans is the reason underlying the significant increase of franked dividend payouts by Australian listed companies post-imputation.[4]

For companies whose shareholders can use franking credits the incidence of tax on equity is reduced whereas the tax treatment of debt remains unchanged as it was under the classical system. Consequently, there is now an incentive for such companies to use more equity finance such as dividend reinvestment.[5] Theory suggests that DRPs may affect firm valuations in an imperfect world. Skully (1982) and Fletcher (1985) argue that as DRPs become more popular one might expect firms with DRPs to become more desirable and hence more highly valued. Given that the value of a firm could increase by paying franked dividends and that dividend reinvestment plans would help most Australian companies to pay the maximum franked dividends while maintaining their investment activities, the announcement of the DRPs could be expected to receive positive market response in the post-imputation environment.

4
DATA AND METHODOLOGY

Sample selection

This study used an event study approach to examine the announcement effects of Australian DRPs. Through published sources, 188 companies were found to have or have had DRPs or to have made changes to their DRPs. The company files held at the Australian Stock Exchange's library were examined to identify exactly when each DRP was first announced and its details. In most cases, the first recorded announcement occurred in a Notice of Meeting. Thirty firms were found to have unclear announcement dates, and the files of four firms were unavailable. This sample of 154 firms was further reduced by data limitations; the School of Banking and Finance, UNSW's Statex Data Base coverage (January 3, 1984, to February 17, 1989), precluded daily price data on 29 of these companies. Finally, the remaining 125 DRP announcements were screened against contamination from other price-sensitive information. The screening was necessary because the Notice of Meeting may contain information such as resolutions pertaining to takeover bids, asset revaluations or rights issues which could affect share prices.[6] Also, the effect of some DRP announcements may have been crowded out as they were made simultaneously with other events such as earnings announcements. An examination of the period during the five days before and after the announcement date[7] revealed that 37 events were contaminated and these were therefore dropped from the study. Thus 88 clean DRP announcements remained.[8]

The sample screening used in this study represents a significant improvement on the previous empirical work. For instance, there was virtually no screening of the samples used by Perumpral (1983) and Peterson *et al.* (1987). The rejection criterion used by Dubofsky and Bierman (1988) was that no other *Wall Street Journal* news items were reported in the three days surrounding the DRP announcements, though they used an 11-day period to measure excess returns. While using only clean announcement dates imposes some bias, Brickley (1986), when examining a similar sample bias in proxy statements, concluded that the clean filtering had no significant impact upon event study conclusions.

The sample of 88 clean events was divided into 36 pre-imputation and 52 post-imputation announcements. DRPs were classified as post-imputation if they were announced after June 30, 1987. One may argue that the starting date for post-imputation period should be somewhat earlier as the structure of the imputation tax system was set out in a statement entitled "Reform the Australian Taxation System", released by the Treasurer in September 1985. However, that structure was modified further by the Treasurer in a public announcement on December 10, 1986, and the bills formalizing the system were only tabled in Parliament on April 2, 1987. Given that the exact details were not finalized and that resident shareholders would not benefit until July 1, 1987, the actual implementation date of the imputation system was used in this study.

Excess return measures

The date of a given DRP announcement was defined as the event day, day 0. For each announcement, 106 daily return observations for the period around the event day were used, starting at day −100 and ending at day +5. The period from day −100 through −6 was designated the "estimation period", while the period from day −5 through +5 was the "event period".

Let $R_{i,t}$ be the observed return for security i on day t and $X_{i,t}$ the excess return for security i on day t. For each DRP announcement, the excess return for each day in the event period was estimated using the market model and the market-adjusted returns model.

Market model

$$X_{i,t} = R_{i,t} - \hat{\alpha}_i - \hat{\beta}_i R_{m,t} \tag{8.1}$$

where $R_{m,t}$ is the return on a value weighted accumulation index on day t and are the intercept and slope coefficients respectively from the estimation period.

Market-adjusted returns model

$$X_{i,t} = R_{i,t} - R_{\mathrm{m},t} \tag{8.2}$$

The market model infers that there is a linear relationship between the return on a security and the return on the market portfolio, while the market-adjusted returns model assumes that expected returns are constant across all securities but not necessarily constant over time. Brown and Warner (1980, 1985) found that event studies based on the market model and the market-adjusted returns model are as powerful in detecting abnormal returns as other complex methodologies, and Shevlin (1981) confirmed this within an Australian study.

Test statistics

Given the excess returns based on each method, their statistical significance was assessed for the pre- and post-imputation samples. To reflect the average effect of the DRP announcement on returns to shareholders, the null hypothesis tested was that the event day excess return was equal to zero. Following the work of Dodd and Warner (1983) and Dubofsky and Bierman (1988), the *Z* statistic was used in this study. This meant that individual abnormal returns were first standardized before they were aggregated to mitigate the effects of outliers.

In the event period, the equally weighted average excess return on day *t* is

$$\overline{X_t} = \sum_{i=1}^{N} \frac{X_{i,t}}{N} \tag{8.3}$$

where *N* is the number of securities in the sample. The cumulative average excess return over any interval from day d_1, to day d_2 is

$$\mathrm{CX}_{d1,d2} = \sum_{t=d1}^{d2} \overline{X_t} \tag{8.4}$$

To test for the statistical significance of the average excess return on a day, each X_{it} is first standardized by dividing it by its estimated standard deviation:

$$\mathrm{SX}_{i,t} = \frac{X_{i,t}}{\sigma(X_i)} \tag{8.5}$$

where

$$\sigma(X_i) = \sum_{t=-100}^{-6} \left[\frac{(X_{i,t} - \overline{X_i})^2}{94}\right]^{1/2} \tag{8.6}$$

and

$$\overline{X_i} = \sum_{t=-100}^{-6} \frac{X_{i,t}}{95} \tag{8.7}$$

Assuming that the standardized excess returns are independent and identically distributed, the *Z* statistic allows the entire cross-sectional distribution of excess returns to be compared with a unit normal and is given as

$$Z = \sum_{i=1}^{N} \frac{SX_{i,t}}{N^{1/2}} \tag{8.8}$$

To correct for the bias arising from nonsynchronous trading in the Australian market, Dimson's (1979) aggregated coefficients procedure for estimating market model parameters was used. This requires a multiple regression of security returns against lagged, matching and leading market returns. Following an examination of the sample data, one lag was used in this study.[9] In addition, the sample data were also corrected for heteroskedasticity using White's heteroskedastic-consistent covariance matrix. The modified Cochrane—Orcutt procedure was used to correct for autocorrelation.

A company's risk level may change due to the event being studied, and any abnormal return might simply reflect an appropriate compensation for the new risk level. Thus switching regression techniques were used to test whether risk levels changed around DRP announcement dates. The technique uses a maximum likelihood procedure to identify simultaneously the number of effective risk "regimes", the parameter values in each regime, the switch dates at which one regime supersedes another and the gradualness of each regime switch. The tests did not reveal any such changes during either the event or the estimation period.

5 RESULTS

Pre-imputation results

Table 8.1 presents the market model estimates of the average daily rates of excess return for the 36 DRP announcements in the pre-imputation period from January 3, 1984, to June 30, 1987. The results are different from the US announcement effect studies (cf. Perumpral 1983; Peterson *et al.* 1987; Dubofsky and Bierman 1988). The daily share return behavior around the announcement date indicates that dividend reinvestment plans were received indifferently by the market. The average excess return on the day of the DRP announcement was −0. 221 percent, with an insignificant Z statistic of −1.210. This pre-imputation indifference to DRPs was highlighted by the fact that only 38.9 percent of the excess returns were positive on the announcement day. Also, the standard deviation of the cross-sectional residuals was very small on the event day, thus indicating that this indifferent response was rather uniform across firms, though not unanimous.

Similar results from the market-adjusted returns model are presented in Table 8.2. The average excess return on the announcement day was again

Table 8.1 Market model results of DRP announcements: pre-imputation

Days	*Average excess return (%)*	*Proportion of positive excess returns (%)*	*Cross-sectional standard deviation*	*Z statistic*	*Cumulative average excess return (%)*
−5	0.273	47.2	0.015636	0.255	0.273
−4	−0.117	47.2	0.024194	0.366	0.156
−3	0.129	58.3	0.026687	1.308	0.284
−2	0.184	41.7	0.013224	−0.634	0.468
−1	0.333	41.7	0.046478	−3.523[a]	0.801
0	−0.221	38.9	0.015223	−1.210	0.580
+1	−0.471	47.2	0.014965	0.507	0.109
+2	−0.305	41.7	0.019103	−0.399	−0.196
+3	0.253	47.2	0.025968	0.762	0.057
+4	−0.422	41.7	0.014174	0.434	−0.365
+5	0.074	52.8	0.044811	0.535	−0.291

Note: [a]Significant at the 1 percent level using a two-tailed test.

Table 8.2 Market-adjusted returns model results of DRP announcements: pre-imputation

Days	*Average excess return (%)*	*Proportion of positive excess returns (%)*	*Cross-sectional standard deviation*	*Z statistic*	*Cumulative average excess return (%)*
−5	0.056	47.2	0.016789	0.003	0.056
−4	−0.218	52.8	0.026787	1.089	−0.162
−3	0.058	47.2	0.024879	0.453	−0.104
−2	0.467	38.9	0.018971	−1.025	0.363
−1	0.082	36.1	0.052197	−4.172[a]	0.445
0	−0.284	38.9	0.012978	−1.326	0.162
+1	−0.750	47.2	0.019786	0.159	−0.588
+2	−0.275	41.7	0.020018	−1.361	−0.863
+3	0.132	55.6	0.022218	1.002	−0.731
+4	−0.692	38.9	0.021548	−0.174	−1.423
+5	0.291	44.4	0.041789	0.142	−1.132

Note: [a]Significant at the 1 percent level using a two-tailed test.

negative (−0.284 percent) and was statistically insignificant. Also, on the announcement day, the standard deviation of the cross-sectional excess returns was the smallest during the entire event period, and again only 38.9 percent of the excess returns were positive.

Tables 8.1 and 8.2 show that the market adjusted quickly to the announcements, with the *Z* statistics on each of the five days after the announcement being insignificant. However, the market seems to have anticipated the DRP announcements on the day just before the event. The average excess returns on day −1 under the market model and the market-adjusted returns model were significantly negative, suggesting market inefficiency or possible misspecification of the event date in the sample. It is possible, but highly unlikely, that the event date of the announcements was misspecified in spite of an exhaustive search of company files. It may be that the pending announcement of DRPs was somehow leaked to the market, possibly to lessen any unfavorable market response such as the Myers and Majluf effect. While most of the excess returns on day −1 were negative, the average excess return was positive, with a negative *Z* statistic, under both models. This happens because the mean excess return was affected by a few extreme positive outliers which have large standard deviations. After the standardization procedure, the effect of these positive outliers was mitigated and the *Z* statistic would have a negative sign.

The *Z* statistics for the five-day interval before the announcement in Table 8.3 indicate that overall there was no anticipation of the DRP announcements, with the *Z* statistic for the interval [−5, −1] being −0.996 and −1.554 under the market model and market-adjusted returns model respectively. The market also appeared to react quickly to the announcements, with insignificant *Z* statistics for the period [+1, +5].

One explanation for this indifference pre-imputation is that DRPs were then still a new phenomenon to Australian investors and so their advantages may not have been fully appreciated. Similarly, shareholders may have been more concerned with the possible dilution of EPS and the problem of free

Table 8.3 Z statistic for excess returns over time interval

Sample	*[−5, −1]*	*[0]*	*[+1, +5]*
Pre-imputation			
Market model	−0.996	−1.210	0.822
Market-adjusted returns model	−1.554	−1.326	0.003
Post-imputation			
Market model	2.269[a]	4.655[b]	−1.420
Market-adjusted returns model	1.599	3.516[b]	−0.596

Notes: [a]Significant at the 5 percent level using a two-tailed test.
[b]Significant at the b percent level using a two-tailed test.

cash flow than the opportunity to invest without transaction costs, thus resulting in negative, though insignificant, responses to most announcements. Also, companies initially introduced these plans to enhance share-holder goodwill rather than to increase firm value.

Post-imputation results

Table 8.4 presents the market model results of the residual analysis performed on a sample of 52 DRP announcements post-imputation. These results were markedly different from those of the pre-imputation period. The average excess return on day 0 was 1.040 percent, with a significant *Z* statistic of 4.655. Also, there were more positive excess returns on this day (53.8 percent) than on any other day in the event period. The standard deviation on day 0 was similar to those across the event period, thus suggesting that the strong positive response was quite uniform across the sample.

There was some anticipation of the announcements of DRPs as indicated by the significant *Z* statistic of −2.315 on day −2. Most of the excess returns on day −2 were negative, but the average excess return was positive due to the outlier effect. The anticipation, also evidenced by the significant *Z* statistic of 2.269 for the [−5, −1] interval in Table 8.3, may have stemmed from shareholders' demand for greater dividend payout, especially from superannuation funds, thus putting pressure on companies to introduce the plans. The market appeared to adjust quickly to the announcements, however, with the *Z* statistic on each day after the announcement being insignificant.

Table 8.4 Market model results of DRP announcements: post-imputation

Days	*Average excess return (%)*	*Proportion of positive excess returns (%)*	*Cross-sectional standard deviation*	*Z statistic*	*Cumulative average excess return (%)*
−5	−0.916	48.1	0.027003	1.335	−0.916
−4	0.847	36.5	0.032887	0.301	−0.069
−3	−0.120	40.4	0.027911	1.564	−0.190
−2	0.404	38.5	0.037104	−2.315[a]	0.215
−1	−0.071	40.4	0.031825	0.019	0.144
0	1.040	53.8	0.034413	4.655[b]	1.184
+ 1	0.388	50.0	0.022160	−0.267	1.572
+2	0.573	42.3	0.029700	0.216	2.145
+ 3	−0.083	38.5	0.091540	−1.674	2.062
+4	0.312	38.5	0.040994	−0.247	2.374
+5	−1.068	34.6	0.033232	−1.204	1.306

Notes: [a]Significant at the 5 percent level using a two-tailed test.
[b]Significant at the 1 percent level using a two-tailed test.

Table 8.5 Market-adjusted returns model results of DRP announcements: post-imputation

Days	*Average excess return (%)*	*Proportion of positive excess returns (%)*	*Cross-sectional standard deviation*	*Z statistic*	*Cumulative average excess return (%)*
−5	0.386	46.2	0.029794	0.625	0.386
−4	0.486	46.2	0.031548	−0.218	0.872
−3	0.016	57.7	0.025798	1.171	0.888
−2	−0.095	44.2	0.039897	−1.337	0.793
−1	0.172	51.9	0.031547	0.159	0.965
0	0.503	57.7	0.032549	3.516[a]	1.468
+1	0.134	50.0	0.028789	0.132	1.601
+2	0.692	57.7	0.031224	−0.012	2.293
+3	0.091	44.2	0.074516	−1.208	2.384
+4	−0.028	51.9	0.042897	0.582	2.356
+5	0.394	50.0	0.031869	−0.826	2.751

Note: [a]Significant at the 1 percent level using a two-tailed test.

The strong positive market reaction to the DRP announcements in the post-imputation period was not model specific. Table 8.5 presents the results for the market-adjusted returns model. On day 0, the mean excess return was 0.503, with a *Z* statistic of 3.516. There were again more positive excess returns on the announcement day than on any other day. However, contrary to the market model results, there was no indication of any market anticipation of the DRP announcements. The *Z* statistic on each of the five days before the announcement was insignificant, as was the *Z* statistic for the [−5, −1] interval in Table 8.3.

6
CONCLUSIONS

This chapter examined the impact of Australian dividend reinvestment plans on shareholders returns in the pre- and post-imputation environment. The daily share return behavior indicated that the announcement to introduce a DRP was received indifferently by the market prior to imputation, but was valued positively post-imputation. The marked increase in the number of DRPs following imputation was justified. DRPs allow companies to satisfy shareholders' demand for greater franked dividends while retaining sufficient funds for investment purposes. The strong positive response post-imputation, however, did not occur to every firm, with only half of excess returns on the announcement day being positive, implying that the reaction to the DRP may be interlinked with specific firm characteristics as well as the DRP itself.

Consistent with Brown and Warner (1985), the results also indicated that a simple market-adjusted returns model was as powerful as the market model in detecting daily excess returns in event study methodologies in an Australian context. The market model with Dimson's adjustment for non-synchronous trading did not offer any benefit over the market-adjusted returns model.

In conclusion, dividend reinvestment plans have served a useful function for Australian companies and shareholders following the implementation of the imputation tax system and as such are valued positively in the market.

APPENDIX 8A
THE IMPACT OF FULLY FRANKED DIVIDENDS ON DIFFERING PERSONAL MARGINAL TAX RATES

Shareholders maginal tax rate	*Assumed gross profit ($)*	*Tax paid by the company ($)*	*Dividend paid ($)*	*Grossed up dividend ($)*	*Notional tax payable by shareholder on grossed up dividend ($)*	*Credit for tax paid by company ($)*	*Resulting tax credit/tax payable ($)*
21.0	100	39.00	61.00	100.00	21.00	39.00	18.00 tax credit
25.0	100	39.00	61.00	100.00	25.00	39.00	14.00 tax credit
30.0	100	39.00	61.00	100.00	30.00	39.00	9.00 tax credit
38.5	100	39.00	61.00	100.00	38.50	39.00	0.50 tax credit
42.5	100	39.00	61.00	100.00	42.50	39.00	−3.50 tax payable
46.5	100	39.00	61.00	100.00	46.50	39.00	−7.50 tax payable
47.0	100	39.00	61.00	100.00	47.00	39.00	−8.50 tax payable

Note: The above does not reflect the impact of the 1.25 percent Medicare levy.
The tax credit earned through dividend imputation can be utilized against other income in the year it is earned. There is no opportunity for a refund.

APPENDIX 8B
LIST OF 88 DRP ANNOUNCEMENTS

Company	*Date*
Adroyal Ltd	August 23, 1988
Advance Bank Australia Ltd	August 7, 1986
ANZ Banking Group Ltd	December 18, 1984
Ariadne Australia Ltd	October 3, 1984
Australia & New Zealand Bank Ltd	April 13, 1987
Australia & New Zealand Bank Ltd	September 27, 1988
Australian Building Industries Ltd	November 10, 1988
Australian Foundation Investment Co. Ltd	August 9, 1985
Australian National Industries Ltd	October 1, 1988
Aust-wide Group Ltd	November 6, 1989
Avcorp Ltd	October 28, 1988
AURNL	September 28, 1988
Barlile Corporation Ltd	August 10, 1987
Boral Ltd	November 10, 1986
Brambles Industries Ltd	November 6, 1985
Brash Holdings Ltd	November 4, 1988
Brick & Pipe Industries Ltd	June 9, 1988
Brunckhorst & Co. Ltd	June 3, 1988
Bundaberg Sugar Company Ltd	November 20, 1987
Bunnings Ltd	February 9, 1989
Campbell Brothers Ltd	July 18, 1987
Capital Property Trust	May 8, 1987
Cities of Australia Property Trust	October 10, 1988
Clyde Industries Ltd	December 4, 1987
Clyde Industries Ltd	December 16, 1988
Corporate Equities Ltd	March 31, 1988
CRA Ltd	August 19, 1988
CRA Ltd	April 3, 1986
Crane (GE) Holdings Ltd	October 6, 1987
Ectec Ltd	July 27, 1988
ENT Ltd	October 1, 1988
Fortuna Corporation Ltd	June 10, 1986
Fortuna Corporation Ltd	July 1, 1988
Foster's Brewing Group Ltd	November 20, 1984
Foster's Brewing Group Ltd	October 23, 1987
Galore Group Ltd	October 28, 1988

Company	*Date*
General Property Trust	April 12, 1985
Goodman Fielder Wattie Ltd	October 16, 1986
Goodman Fielder Wattie Ltd	October 12, 1984
Hancock & Gore Ltd	January 31, 1986
Helm Corporation Ltd	October 14, 1987
Hills Industries Ltd	October 26, 1988
Hudson Conway Ltd	October 28, 1988
Industrial Securities Ltd	October 26, 1986
Industrial Securities Ltd	October 14, 1987
International Income and Property Inc	August 14, 1984
James Hardie Industries Ltd	July 2, 1984
Jennings Group Ltd	August 26, 1985
Jones (David) Ltd	October 31, 1988
Kern Corporation Ltd	October 30, 1986
Korvest Ltd	October 27, 1988

Company	*Date*
Macarthur National Ltd	November 3, 1988
Mayne Nickless Ltd	April 30, 1984
McKay Australia Ltd	June 26, 1984
Milton Corporation Ltd	October 2, 1987
Natcorp Ltd	September 23, 1986
Natcorp Ltd	July 21, 1987
National Consolidated Ltd	December 16, 1988
Nicron Resources N.L	November 2, 1987
Normandy Resources N.L	November 21, 1986
North Broken Hill Peko Ltd	October 6, 1988
North Broken Hill Peko Ltd	October 7, 1987
North Quay Ltd	April 1, 1985
NZI Corporation Ltd	November 1, 1985
Pacific Dunlop Ltd	October 15, 1984
Palmer Tube Mills Ltd	October 14, 1988
Perpetual Trustees Australia Ltd	September 15, 1986
Petersville Sleigh Ltd	February 6, 1989
Pioneer Property Group Ltd	May 8, 1987
QBE Insurance Group Ltd	February 10, 1989
QCT Resources Ltd	December 22, 1984
Qintex Australia Ltd	July 6, 1987

Company	*Date*
Redweaver Investments Ltd	September 14, 1987
Richardson Pacific Ltd	June 3, 1988
Siddons Ramset Ltd	September 14, 1988
Smith (Howard) Ltd	October 10, 1984
Smith (Howard) Ltd	August 27, 1986
Solander Holdings Ltd	May 18, 1987
Southern Farmers Group Ltd	September 21, 1987
S.A. Brewing Holdings Ltd	October 28, 1986
S.E.A.S. Sapfor Ltd	November 4, 1988
Tooth & Company Ltd	February 9, 1989
Tricom Corporation Ltd	September 29, 1987
Waco Ltd	October 25, 1988
Watkins Pacific Ltd	October 9, 1987
Wesfarmers Ltd	March 27, 1985
Western Equity Ltd	July 23, 1985
Westpac Banking Corporation Ltd	July 29, 1988

NOTES

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1 One innovation which has not yet been seen in Australia, though common in United States, is an open market DRP where shares are purchased from existing shareholders on the open market for reinvestment.
2 An Australian Stock Exchange draft paper in 1991 suggests that imputation is the most important factor behind the growth of dividend reinvestment schemes.
3 Howard and Brown (1992) show that if all company profit is taxable and no dividends are paid, retained company profit is taxed once at the corporate tax rate and eventually again as capital gain on resale.
4 Recently, some Australian companies even paid out all of their after-tax earnings as franked dividends and arranged for their DRPs to be fully underwritten.
5 Howard and Brown (1992) show that, depending on the personal and corporate tax rates in force, the imputation system can be neutral or biased toward equity.
6 A "clean" notice obviously still contains such items as the election of directors which are common to most proxy forms.
7 This was the period in which the daily excess returns would be estimated to reflect the announcement effects.
8 See Appendix 8B for a complete list of these company announcements.
9 Using monthly data, Sinclair (1981) also found that one lag was appropriate for the adjustment. It is possible that the optimal number of lags for daily returns data may be more than one. However, Brown and Warner (1985) point out that

misspecification of the number of lags is unlikely to have any impact on event study methodology when daily data are used.

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9
The credit availability theory
A non-monetarist test

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1
INTRODUCTION

This chapter presents an analysis of the non-monetarist theoretical underpinnings of the credit availability doctrine and tests some of the implications of the theory as applied to the commercial loan market. Equations explaining the commercial loan rate and the value of commercial loans are examined. The data used are for the time period 1960–89, with the data divided into periods of monetary tightness and easiness. The effects of credit availability are hypothesized to be more prevalent in periods of monetary tightness and a structural shift may occur in the two equations between the two time periods. To test this hypothesis, regressions are run for periods of both monetary tightness and easiness, and a Bayesian procedure is used to test for a parameter shift. In section 2 of this chapter, the theory of credit availability is examined. In section 3, the model (equations) is developed, and in section 4, the empirical results are presented.

2
THEORY

The effectiveness of the availability theory depends on the critical assumption that lenders are sensitive to changes in the yield on government securities brought about by open market operations. Recent structural and institutional changes in the financial system of the US economy seem highly compatible with this assumption, i.e. an increased volume of funds handled by non-bank lenders (Kareken 1957:293), the growth of securities dealers and the growth of public debt *(ibid.)*. According to the credit view, monetary policy influences the behavior of lenders in basically five different channels:

1 liquidity effects,
2 yield differentials,
3 locking in effects,
4 expectations effects and

5 credit rationing.

The liquidity or value of portfolio effect occurs following an open market sale of securities by the Federal Reserve. The resulting fall in the price of securities leads to a decline in the market value of the lenders' portfolio. This creates a feeling of insufficient liquidity for the asset-holder. In order to rebalance his liquidity position, the lender or asset-holder is forced to substitute relatively liquid, low yielding and risky securities. Since government securities are low risk and relatively liquid, while private loans are high risk and illiquid, the lender will shift his portfolio in favour of more government and fewer private securities.

The behaviour of lenders will also be influenced by changes in the relation between yields on assets. When interest rates on government securities rise, the yield differential between private loans and government securities is reduced, leading to a shift in the portfolio toward more government securities and fewer private loans. This leads to a reduction in the supply of credit available for private borrowers.

The third way monetary policy affects the behaviour of lenders is the so-called "locking-in" hypothesis. "Here an increase in the yield on government securities sufficient enough to create potential capital loss will decrease the willingness of lenders to shift out of government securities and into private securities because there exists a widespread reluctance to realize capital loss" (Kareken 1957:294). Therefore, banks and other lenders are reluctant to sell securities at a loss and become "locked into" their portfolio position. The locking-in effect can also be explained if one assumes the price drop on securities to be temporary. In this case the banks expect to recoup their capital loss if they continue to hold securities and wait for the price to rise (Jaffe 1971:21).

Another characteristic feature of the availability theory is its stress on the psychological effects of monetary policy, in particular the effect on lenders' expectations about future credit market conditions. If there is a period of credit tightness in the economy this will create uncertainty about future market conditions. Under these conditions lenders will become anxious to hold cash and other liquid assets and will be reluctant to supply the riskier private credit.

3
MODEL

To test the credit rationing or credit availability theory would require a direct quantitative estimate of the degree of credit rationing. This type of direct estimate does not seem possible. Therefore indirect methods of analysis will be required. In a previous study Jaffee (1971) (see also Jaffee and Russell 1976; Laffont and Garcia 1977; Sealey 1979; Ito and Ueda 1981; Stiglitz and Weiss 1981) used a proxy (the percentage of loans granted at the prime rate) to measure the degree of credit rationing. He found credit rationing to be a significant factor in the commercial loan market. However, the data used to measure the proxy are no longer collected by the Federal Reserve, making them unavailable for this study. Since there seems to be no alternative proxy for credit rationing, the loan rate equation and a volume of commercial loans equation must be used to test the credit rationing hypothesis for the time period 1967–89. This may not be as restrictive as it first seems. By using these two equations a number of interesting hypotheses can be tested to see if they conform with the conclusions predicted by the availability theory.

The commercial loan rate equation couches the loan rate as the spread between the desired loan rate and the interest rate quoted in the preceding period.

$$\Delta r_{cL} = \alpha + \lambda(r_{cL^*} - r_{cL(-1)}) \tag{9.1}$$

where r_{cL*} is the desired loan rate and λ is the speed of adjustment of the loan to its desired level. The larger the value of λ is, the faster is the bank's response to changes in credit market conditions and the less important is credit rationing. "The bank's expected return on commercial loans must equal, after adjustment for varying risk, liquidity and maturity, the return on other assets or liabilities held in the banks portfolio" (Jaffee 1971:105). Thus, the desired loan rate depends on both the bank's ability to lend and the yield on competing assets (Goldfeld 1966:65).

The commercial paper rate represents the principal asset competing with commercial loans. It should be positively related to the loan rate. The loan-asset ratio measures both the bank's ability to lend and its liquidity position. Thus, a high loan-asset ratio indicates that the banks are in a poor liquidity position and will require higher rates on any additional loans.

The yields on six-month Treasury bills and on three- to five-year government securities test the availability theory. Since they are competing assets in the banks' portfolio, they should be positively related to the loan rate. The estimated equation is

$$\Delta r_{cL} = B_0 + B_1 r_{cp} + B_2\ \Delta r_{tb} + B_3 r_{3-5} - B_4 \frac{CL}{TA} + B_5 r_{cL} \tag{9.2}$$

where r_{cp} is the yield on commercial paper, r_{tb} is the yield on six-month Treasury bills, r_{3-5} is the yield on three- to five-year government securities, CL/TA is the loan-assets ratio and $r_{cL(-1)}$ is the commercial loan lagged one quarter.

The equation for volume of commercial loans includes both demand and supply factors. The demand factors depend on the business sectors need for financing and the yields on competing assets. Therefore, fixed investment, inventory investment and the yield on commercial paper are positively related to commercial loan volume.

The supply-side factors are represented by the change in the yield on government securities, the portfolio composition constraint represented by loan—total asset ratio. (If this ratio becomes too high, banks may consider their portfolio too illiquid and will limit the amount of available credit.) The expected sign on the loan-total asset ratio should be negative and the commercial loan rate is

$$\Delta \mathrm{CL} = \alpha_0 + \alpha_1 I_{\mathrm{f}} + \alpha_2 I_{\mathrm{inv}} + \alpha_3 r_{\mathrm{cL}} + \alpha_4 \Delta r_{\mathrm{tb}} + A_5 r_{\mathrm{cp}} + \alpha_6 r_{3-5} - a_7 \frac{\mathrm{CL}}{\mathrm{TA}} \quad (9.3)$$

where I_{f} is fixed investment, I_{inv} is inventory investment and CL/TA is the loan-total asset ratio.

In this analysis it is hypothesized that availability is decreased when monetary policy is tightened. If this is true there should be some structural changes in the above equations between periods of monetary tightness and periods of easiness. To test this hypothesis the following conditions are investigated.

For equation (9.2),

1 in periods of tight money one would expect a more slowly adjusting loan rate;
2 the constraint CL/TA which is a proxy for the liquidity position of the bank should have a positive sign in both periods with a larger effect in periods of tight money;
3 the commercial loan rate should be less responsive to changes in the yields on government securities during periods of tight money.

For equation (9.3),

1 the commercial loan rate should be more positive in periods of tight money;
2 the supply factors should be more prevalent in periods of tight money;
3 the demand factors should be more prevalent in periods of easy money.

Certain proxy variables can be used to measure the degree of tightness of credit in the economy. One good cyclical measure is the rate of change in M2. In periods of credit tightness, the rate of change in M_2 is decreasing. In monetary ease, the M_2 rate of change is increasing. Periods of money tightness are found to occur in the following periods: 1968.IV–1970.I, 1972.IV–1975.I, 1978.I–1981.IV, 1987.I–1991.IV. Data points outside these periods are pooled together into a period of monetary easiness. Regressions are run on the two grouped periods using ordinary least squares. A Bayesian procedure is used to test if a parameter shift has occurred between the two time periods. The Bayesian procedure is developed in Appendix 9A.

4
RESULTS

We will now apply the model specified in the previous section to the data. Quarterly data are used (the data are described in Appendix 9B). The commercial loan rate for the period 1967–91 is first examined. The estimated equation is

$$\Delta r_{cL} = \underset{(8.80)}{4.217} + \underset{(15.66)}{0.501} r_{cL(-1)} + \underset{(1.81)}{0.06} \Delta r_{tb} + \underset{(36)}{0.165} r_{3-5} + \underset{(8.01)}{21.82} \frac{CL}{TA} + \underset{(8.88)}{76} r_{cp} \tag{9.4}$$

$$R^2 = 0.921 \qquad DW = 1.82 \qquad SSR = 2.98$$

In the above equation the R^2 value 0.921 indicates that the model accounts for a substantial portion of the variation in the loan rate. The value of 0.165 for the coefficient on the three- to five-year government security rate indicates that banks slowly adjust the loan rate to changes in the yields on longer-term government securities. This is in agreement with the availability hypothesis. Signs on both the Treasury bill rate and the loan-asset ratio agree with our hypothesis.

The equations for monetary tightness and easiness are now examined. The estimated equations are as follows.

Monetary tightness

$$\Delta r_{cL} = \underset{(2.85)}{2.95} - \underset{(8.88)}{0.41} r_{cL(-1)} + \underset{(0.90)}{0.121} \Delta r_{tb} + \underset{(1.42)}{0.107} r_{3-5} + \underset{(3.09)}{18.02} \frac{CL}{TA} + \underset{(6.30)}{0.715} r_{cp} \tag{9.5}$$

$$R^2 = 0.844 \qquad DW = 2.11 \qquad SSR = 1.314$$

Monetary easiness

$$\Delta r_{cL} = \underset{(3.88)}{2.51} - \underset{(10.25)}{0.55} r_{cL(-1)} + \underset{(2.11)}{0.441} \Delta r_{tb} + \underset{(2.21)}{0.168} r_{3-5} + \underset{(3.81)}{11.94} \frac{CL}{TA} + \underset{(0.85)}{0.179} r_{cp} \tag{9.6}$$

$$R^2 = 0.911 \qquad DW = 2.02 \qquad SSR = 1.274$$

The R^2 values are reasonable in both equations, as are the Durbin—Watson statistics. All of the coefficients in the equations estimated have the right sign. From the t test, the following coefficients are statistically insignificant: the Treasury bill rate in both equations, the yield on three- to five-year government securities in equation (9.5) and the commercial paper rate in equation (9.6). In the above equations, the value of the coefficient on the lagged loan rate is smaller in absolute terms in periods of monetary tightness. This seems to indicate that the loan rate adjusts more slowly to its desired level, and agrees with condition (9.1) of our hypothesis. Similarly, the loan rate responds more slowly to changes in the yield on government securities in periods of tight money (the coefficients have smaller values). This agrees with condition (9.3) of our hypothesis. Finally, the positive sign on the coefficient of the loan-asset ratio indicates that the second condition in the hypothesis holds. Structural tests are applied to test if these shifts in the coefficients are indeed statistically significant (Appendix 9C).

From the analysis of the loan rate equation in Appendix 9C, the hypothesis that the effects of credit availability are more prevalent in periods of tight money is researched. Moreover the following regression results do support some of the implications of the availability doctrine:

1 the commercial loan rate response to changes in the rate of government securities is rapid;
2 since the loan rate takes only about half a quarter to adjust, availability may not be important in the short run.

Thus, it seems that the effects of credit availability are not present over the entire business cycle, without any major increases occurring in periods of money tightness.

The volume of commercial loans equations is now examined. The estimated equation for the period 1967–91 is

$$\begin{aligned}\Delta \mathrm{CL} = \underset{(0.57)}{3.21} + \underset{(6.20)}{0.038} I_{\mathrm{fix}} + \underset{(1.50)}{0.016} I_{\mathrm{inv}} + \underset{(4.03)}{3.54} r_{\mathrm{cp}} - \underset{(1.10)}{1.25} r_{\mathrm{tb}} \\ - \underset{(2.25)}{2.44} r_{3-5} - \underset{(1.61)}{0.91} \frac{\mathrm{CL}}{\mathrm{TA}} - \underset{(3.44)}{1.78} r_{\mathrm{cL}} \end{aligned} \tag{9.7}$$

$$R^2 = 0.791 \qquad \mathrm{DW} = 1.79 \qquad \mathrm{SSR} = 192.2$$

In the above equation, the demand-side factors I_{fix}, I_{inv} and r_{cp} are all positive. This agrees with our hypothesis. From the *t* test, all the coefficients are significant except for inventory investment. This is surprising, for one would expect inventory investment to be heavily dependent on financing by commercial bank loans.

The supply-side factors r_{tb}, $r_{3\text{–}5}$ and CL/TA as predicted are all negative. However, from the *t* test only the yield on three- to five-year government securities proves to be significant. Thus, it appears from the significance of the coefficients and the negative sign on the loan rate that demand-side factors are more important in the above equation. The relatively low R^2 value 0.761 indicates that the equation does not fully explain all the variation in the volume of commercial loans. This is not surprising, for if availability is relevant, non-price information such as the maturity of the loan becomes important. This information is difficult to measure and is not fully represented by the supply-side factors in our equation.

The equations for periods of monetary easiness and tightness are now examined. The estimated equations are as follows.

Monetary tightness

$$\begin{aligned}\Delta\mathrm{CL} = {} & \underset{(0.80)}{-12.75} + \underset{(3.12)}{0.091 I_{\mathrm{fix}}} - \underset{(0.76)}{0.094 I_{\mathrm{inv}}} + \underset{(2.34)}{3.81 r_{\mathrm{cp}}} - \underset{(0.87)}{2.05 r_{\mathrm{tb}}} \\ & - \underset{(2.19)}{5.10 r_{3-5}} - \underset{(1.86)}{0.82 r_{\mathrm{CL}}} - \underset{(1.34)}{0.31} \frac{\mathrm{CL}}{\mathrm{TA}}\end{aligned} \tag{9.8}$$

$$R^2 = 0.71 \qquad \mathrm{DW} = 1.88 \qquad \mathrm{SSR} = 94.59$$

Monetary easiness

$$\begin{aligned}\Delta\mathrm{CL} = {} & \underset{(0.55)}{-2.61} + \underset{(5.41)}{0.038 I_{\mathrm{fix}}} + \underset{(0.728)}{0.021 I_{\mathrm{inv}}} + \underset{(1.88)}{2.24 r_{\mathrm{cp}}} - \underset{(0.87)}{0.91 r_{\mathrm{tb}}} \\ & - \underset{(0.76)}{1.31 r_{3-5}} - \underset{(2.18)}{2.22 r_{\mathrm{cL}}} + \underset{(2.38)}{0.69} \frac{\mathrm{CL}}{\mathrm{TA}}\end{aligned} \tag{9.9}$$

$$R^2 = 0.85 \qquad \mathrm{DW} = 1.82 \qquad \mathrm{SSR} = 39.25$$

In the above equations, the value of R^2 is higher in periods of monetary easiness. This can be explained if one assumes that availability is more important in periods of tight money. During this time, non-price information becomes more important, and since this information is not directly measured by the equation the value of R^2 declines.

The demand-side factors all have the correct sign except for the inventory investment coefficient in equation (9.8). From the *t* test, the inventory investment term is insignificant in both equations. The hypothesis that commercial factors are more important in periods of easy money does not appear to hold. This is because the size of the coefficients of the fixed investment term and the commercial paper rate are smaller in periods of easy money. One would expect the opposite results to occur if our hypothesis is correct.

The supply-side factors all have the correct signs including the loan—asset term in equation (9.8). However, the only significant coefficients are the yields on three- to five-year government securities in equation (9.9) and the loan—asset ratio. The coefficient shifts from positive in periods of monetary easiness to negative in periods of tight money, which agrees with the availability doctrine. In periods of money easiness, this liquidity effect is not important.

The values of the coefficients on the Treasury bill rate and the three- to five-year government security rate are more negative in periods of tight money. Thus, changes in the yield on government securities appear to have a greater impact on the volume of loans granted in this period. This seems to indicate that supply-side factors are more important in periods of tight

Table 9.1

	C	I_{fix}	I_{inv}	r_{cp}	r_{tb}	$r_{3\text{–}5}$	CL/TA	r_{cL}
Monetary easiness								
C	25.92	0.011	−0.0112	3.10	0.70	−4.71	0.26	−1.23

	C	I_{fix}	I_{inv}	r_{cp}	r_{tb}	$r_{3–5}$	CL/TA	r_{cL}
I_{fix}		0.000052	−0.000078	0.0036	−0.0008	−0.0042	0.00029	−0.0016
I_{inv}			0.00075	−0.0052	0.0011	−0.0043	0.00042	0.0062
r_{cp}				1.072	−0.65	0.178	0.045	−0.285
r_{tb}					1.14	−1.02	0.0011	0.036
$r_{3–5}$						2.27	−0.079	0.12
CL/TA							0.050	−0.017
r_{cL}								1.08
Monetary tightness								
C	299.97	−0.39	0.59	−7.16	8.30	14.64	−0.62	4.22
I_{fix}		0.00084	−0.017	0.027	−0.014	−0.014	0.0015	−0.015
I_{inv}			0.011	−0.0085	−0.05	0.12	−0.007	0.018
r_{cp}				2.74	−2.33	−0.87	−0.147	1.29
r_{tb}					4.26	−1.61	0.014	0.346
$r_{3–5}$						5.79	−0.13	1.03
CL/TA							0.011	0.025
r_{cL}								0.25

money, and agrees with condition (9.2) of our hypothesis. Finally, the more positive value of the loan rate in periods of money tightness agrees with condition (9.1) of our hypothesis. To test if these shifts are statistically significant the structural tests are applied.

From the t test

$$F = \frac{\mathrm{SSR}_1/n_1 - K}{\mathrm{SSR}_2/n_2 - K} = \frac{94.59/22}{39.25/49} = 5.37 \tag{9.10}$$

$F(22, 49)_{\mathrm{table}}$=1.72 at the 95 percent confidence level

One rejects the null hypothesis that there is a common variance between two periods. However, one can blindly apply the Chow and t test and see how they compare with the Bayesian procedure. The results of the Chow test are given by

$$F = \frac{192.2 - 94.59 - 39.25}{94.59 + 39.25/87 - 16} = 3.44 \tag{9.11}$$

$F(8, 71)_{\mathrm{table}}$=1.98 at the 95 percent confidence level

and one rejects the null hypothesis that there is no structural shift between the two equations.

The variance-covariance matrices used in the Bayesian procedure are given in Table 9.1. The results of the t test are given in Table 9.2, while the results of the Bayesian procedures are given in Table 9.3.

From the volume of commercial loans equation we conclude that only the loan-asset coefficient has shifted. This result is obtained by using the Bayesian procedure, which does not require a common variance to exist in the two periods.

If, in this test, we had blindly used the *t* test, we would have concluded that the coefficients both of the loan-asset ratio and of the fixed investment term have shifted. Thus, using the *t* test when the assumption of a common

Table 9.2

	$\lambda=B_{ij}-B_{2j}$	*t test calculated*	t^*, *table value*	*Accept or reject null hypothesis*
C	10.70	0.76	2.00	Accept
I_{fix}	−0.053	2.11	2.00	Reject
I_{inv}	0.114	1.36	2.00	Accept
r_{cp}	−1.96	1.03	2.00	Accept
r_{tb}	1.28	0.60	2.00	Accept
r_{3-5}	4.05	1.47	2.00	Accept
CL/TA	0.85	2.52	2.00	Reject
r_{cL}	1.41	1.37	2.00	Accept

Note: *, 95 percent confidence level used.

Table 9.3

	$\lambda-B_{1j}-B_{2j}$	$a^2(C_{1j}+C_{2j})$	$[a^2(C_{1j}+C_{2j})]^{1/2}$	b	*95% HPD*	*Accept or reject null hypothesis*
C	10.70	1.007 (325.89)	18.12	25.29	−26.62, 48.01	Accept
I_{fix}	−0.053	1.006 (0.00089)	0.029	24.26	−0.11, 0.006	Accept
I_{inv}	0.114	1.006 (0.012)	0.11	24.32	−0.11, 0.34	Accept
r_{cp}	−1.96	1.026 (3.81)	1.97	35.76	−5.95, 2.03	Accept
r_{tb}	1.28	1.02 (5.39)	2.34	31.31	−3.49, 6.05	Accept
r_{3-5}	4.05	1.03 (8.06)	2.87	36.19	−1.77, 9.87	Accept
CL/TA	0.85	1.02 (0.061)	0.25	48.92	0.35, 1.35	Reject
r_{CL}	1.41	1.01 (1.33)	1.16	24.51	−0.98, 3.80	Accept

variance is violated gives misleading results. Finally, if we had used the Chow test we would have concluded that there was a structural shift in the entire equation when in fact only one coefficient has shifted.

The results of the parameter test show that no significant differences exist between the demand factors in the two periods. However, the shift in the loan-asset ratio indicates that supply-side factors and the composition of the bank's portfolio are important in periods of tight money. This result may be attributed to the importance of both the psychological effects of monetary policy and the bank's desire to protect its liquidity position. In periods of tight money, banks have unfavourable expectations of future credit market conditions. Thus, they are reluctant to grant loans, viewing them as too risky, and prefer to hold more liquid types of assets. This will lead to a negative sign on the coefficient of the loan-asset ratio. In contrast, in periods of easy money, banks hold a more favourable view of future credit market conditions. They are now anxious to grant loans, viewing them as more profitable than alternative securities. This tends to explain the positive sign of the coefficient in periods of easy money. The other supply-side factors in the equation show no significant differences between the two periods. In conclusion, we reject conditions (9.1) and (9.3) and accept condition (9.2) of our hypothesis.

5
CONCLUSIONS

The results of this chapter tend to support few of the hypotheses of the credit availability doctrine. First, the loan rate is found to have a rapid response to changes in the yield on government securities. Only in very short periods will banks find government securities to be more attractive than private securities in their portfolio. Therefore, banks will rarely restrict the government securities at the expense of private securities and supply of available credit. This response of the loan rate is found to occur over the entire business cycle and not just in periods of tight money. Thus, it appears that monetary policy will not be effective in restricting the supply of credit in periods either of monetary tightness or of easiness.

Second, the loan rate was found to take only about half a quarter to adjust to its desired level. This indicates that credit rationing is a very-short-run phenomenon and that banks will rapidly adjust the loan rate toward its new equilibrium position. This effect also occurs both in periods of tight money and in periods of easy money.

However, the composition of a bank's portfolio and its liquidity position are important, especially in periods of money tightness. In this period, banks have unfavourable expectations about future credit market conditions (due to the increased possibilities of defaults) and are reluctant to grant loans. Thus, banks desire to hold more liquid and less risky assets and therefore reduce the supply of credit available for private borrowers.

APPENDIX 9A
ECONOMETRIC PROCEDURE

A number of tests are available to test the hypothesis that a structural shift has occurred between the coefficients in two regressions. The basic test was developed by Chow (1960) using the sampling theory approach. In the Chow test one considers the following model:

$$\begin{aligned} Y_1 + X_1 B_1 + U_1 \\ Y_2 + X_2 B_2 + U_2 \end{aligned} \tag{9A.1}$$

where Y_i is an $n_i \times 1$ vector of dependent variables, X_i is an $n_i \times k_i$ matrix of independent variables, B_i is a $K_i \times 1$ vector of parameters and U_i is an $n_i \times 1$ vector of error terms and the subscripts 1 and 2 denote the sample points assigned to the first and second regimes respectively.

The null hypothesis to be tested is

$$\mathrm{H}_0\colon B_1 = B_2 \qquad \mathrm{H}_1\colon B_1 \neq B_2$$

and the test statistic is given by

$$F = \frac{e'e - e_1'e_1 - e_2'e_2/K}{e_1'e_1 + e_2'e_2/N_1 + N_2 - 2K} \tag{9A.2}$$

where $e'e$ is the sum of square residuals for the entire period examined, while $e_1'e_1$ and $e_2'e_2$ are the sum of square residuals for regimes 1 and 2 respectively.

The critical region for this test can be stated as

$$\{F\colon FF(k_1T - 2K, \alpha)\} \tag{9A.3}$$

where α denotes the level of significance of the test.

However, this test has a number of significant drawbacks. First, the Chow test assumes that the error terms have mutually independent normal distributions with a common variance. That is, it assumes homeskedastic behaviour of the error terms over the entire sample period. Even if we assume homoskedasticity, the Chow test will not enable us to compare parameters individually. A test involving such individual comparisons is often desirable. In the sampling theory framework the t test can be used to compare parameters individually. However, this test is only valid if one assumes a common variance in the periods examined. If the variances are not equal the t test is no longer a legitimate statistic and cannot be used.

The Bayesian test, since it is not a joint test, enables us to compare parameters individually. Also the Bayesian test is valid under conditions of heteroskedasticity as well as homoskedasticity.

The Bayesian test will now be derived (Tsurumi 1977). Let us again assume that we have two regressions given by

$$Y_i + X_i B_i + U_i \qquad i = 1, 2 \tag{9A.4}$$

Furthermore, let us assume that the error terms are mutually independent and that each U_i has a multivariate student t distribution with a zero location vector. Zellner (1976) has shown that an identical posterior probability distribution function (pdf) can be obtained for B_i if we assume normally distributed error terms and a diffuse prior. The diffuse prior or B_i and σ_i^2 is given by

$$P(B_i, \sigma_i^2) \propto \frac{1}{\sigma_i^2} \qquad -\infty < \beta_{ij} < \infty,\ 0 < \sigma_i^2 < \infty \tag{9A.5}$$

where j is the number of coefficients to be estimated. The posterior pdf for the parameters becomes

$$P(B_i, \sigma_i^2/\text{data}) \propto \sigma^{-(n+1)} \exp\left[\frac{-1}{2\sigma^2} (VS^2 + (B-\hat{B})' X' X(B-\hat{B})\right] \quad (9A.6)$$

where

$$\hat{B}_i = (X_i' X_i)^{-1} X_i' y \qquad V_i = n_i - K_i$$

and

$$V_i S_i^2 = (Y_i - X_i\hat{B}_i)'(Y_i - X_i\hat{B}_i)$$

Integrating out σ_i^2 using the properties of the inverted gamma distribution, we obtain the marginal posterior pdf for B_i=(B_{i1},…, B_{ik}) as the multivariate Student t distribution.

$$P(B_i/\text{data}) \propto [V_i S_i^2 + (B_i - \hat{B}_i) X' X(B_i - \hat{B}_i)]^{-(V_i + K_i)/2} \quad (9A.7)$$

From (9A.7) we can obtain the marginal posterior pdf for the jth parameter of B_i, B_{ij}, as the univariate t distribution.

$$P(B_{ij}/\text{data}) \propto \left[1 + \frac{(B_{ij} - \hat{B}_{ij})^2}{C_{ij}}\right]^{-(V_i+1)/2} \quad (9A.8)$$

where C_{ij} is the jth diagonal element of the variance-covariance matrix .

Using the assumption that U_1 and U_2 are mutually independent, we can find the joint marginal posterior pdf of B_{ij} in the first equation and B_2j in the second equation as

$$P(B_{1j}, B/\text{data}) \propto \prod_{i=1}^{n} \left[1 + \frac{(B_{ij} - B_{ij})^2}{C_{ij}}\right]^{-(V_i+1)^2} \quad (9A.9)$$

Our objective, as already stated, is to test the hypothesis on B_{ij} and B_2j by the following linear operation:

$$\lambda = B_{ij} - B_{2j}$$
$$\delta = B_{ij}$$

We then obtain the joint pdf of (λ, δ):

$$p(\lambda, \delta/\text{data}) \propto \left[1 + \frac{(\delta - \delta)^2}{C_{ij}}\right]^{-(V_i+1)} \left[1 + \frac{(\lambda - \delta - \lambda + \delta)^2}{C_{2j}}\right] \frac{-(V_2+1)}{2} \quad (9A.10)$$

To determine the posterior distribution of λ we integrate out δ from the joint distribution of (λ, δ). We obtain

$$P(\lambda/\text{data}) \propto \int_{-\infty}^{\infty} \left[1 + \frac{(\delta - \delta)^2}{C_{ij}}\right] \frac{-(V_i+1)}{2} \times \left[1 + \frac{(\lambda - \delta - \lambda + \delta)}{C_{2j}}\right]^{-(V_2+1)/2} d\delta \quad (9A.11)$$

The above integral is in the form of a Behrens-Fisher distribution. It can be evaluated by a numerical integration method or can be approximated by a t

distribution as suggested by Patil (1964). Following Patil, we can approximate (9A.8)

$$t[\lambda, a^2(C_{ij} + C_{2j}), b] \qquad (9A.12)$$

where

$$a^2 = \frac{b-2}{b} f_{ij} \qquad b = \frac{4 + f_{ij}^2}{f_{2j}}$$

$$f_{1j} = \frac{v_2}{v_2 - 2} \cos^4 \sigma + \frac{v_1}{v_1 - 2} \sin^2 \sigma$$

$$f_{2j} = \frac{v_2^2}{(v_2 + 2)^2} (v_2 - 4) \cos^4 \sigma + \frac{v_1^2}{(v_1 - 2)^2} (v_x - 4) \sin^4 \sigma$$

$$v_1 = n_1 - K \qquad v_2 = n_2 - K$$

$$\cos^2 \sigma = \frac{C_{2j}}{C_{ij} + C_{2j}} \qquad \sin^2 \sigma = 1 - \cos^2 \sigma$$

Thus, the pdf of $\lambda = B_{1j} - B_{2j}$ can be approximated by a *t* distribution centred at λ having *b* degrees of freedom and a scaling factor of $[a^2(c_{ij}+c_{2j})]^{1/2}$. Using the calculated values of *a* and *b* and tables of the density of Student's *t* distribution we can obtain approximate sketches of the posterior distribution. From the numerical information obtained, Bayesian highest posterior density (HPD) intervals can be constructed for the posterior distribution. Since the *t* distribution is symmetric this is equivalent to a confidence interval. The approximate 95 percent HPD interval is given by

$$\lambda \pm t_{(0.025)}^{(b)} [a^2(c_{ij} + c_{2j})]^{1/2} \qquad (9A.13)$$

The test criterion for testing the null hypothesis

$$H_0\colon B_{ij} = B_{2j}$$

$$H_1\colon B_{ij} \neq B_{2j}$$

is to find out whether, for each case, the 95 percent confidence interval includes zero. If it does then we accept H_0. Otherwise we reject it.

APPENDIX 9B
DATA (ALL SEASONALLY ADJUSTED)

Δr_{cL}	percentage change in the average rate on commercial loans, *(Source: Federal Reserve Bulletin)*
r_{tb}	six-month Treasury bill rate *(Source: Federal Reserve Bulletin)*
r_{3-5}	US government security yield, three- to five-year issue *(Source: Federal Reserve Bulletin)*
r_{cp}	commercial paper rate, four to six months *(Source: Federal Reserve Bulletin)*

CL	commercial and industrial loans outstanding *(Source: Federal Reserve Bulletin)*
TD	sum of demand and time deposits *(Source: Federal Reserve Bulletin)*
CL/TA	ratio of commercial loans to total assets
I_{fix}	gross private domestic investment, fixed *(Source: Federal Reserve Bulletin)*
I_{inv}	total inventory investment *(Source: Federal Reserve Bulletin)*
TA	total assets of commercial banks *(Source: Federal Reserve Bulletin)*

APPENDIX 9C

$$F=\frac{\mathrm{SSR}_1/n_1-K}{\mathrm{SSR}_2/n_2-K}=\frac{1.314/24}{1.274/51}=2.5$$

$F(24, 51)_{\text{table}}=1.74$ at the 95 percent confidence level

One accepts the null hypothesis that there is a common variance between the two periods. Thus, both the *t* test and the Chow test can be used. The results of the Chow test are given by

$$F=\frac{e'e-e_1'e_1-e_2'e_2/K}{e_1'e_1+e_2'e_2/n_1-2K}=\frac{(3.01-2.55)/6}{2.55/75}=2.14$$

$F(6, 75)_{\text{table}}=2.2$ at the 95 percent confidence level

and one accepts the null hypothesis that there is no structural shift in the equation at the 95 percent confidence level.

To test the parameters individually, both the *t* test and the Bayesian method are used. Following Gossett (1980) the *t* test is given by

$$\mathrm{H}_0\colon\ \lambda=0 \qquad \mathrm{H}_1=\lambda\neq 0$$

where $\lambda=B_{1j}-B_{2j}$

$$t=\frac{\lambda-\hat{\lambda}}{e_1'e_1+e_2'e_2}\ \frac{a_{1i}+a_{2i}}{(n_1-K)+(n_2-K)}$$

where is the estimated value of $B_{ij}-B_{2j}$, λ is the true value, $e_1'e_1$ is the sum of square residuals from the first equation, $e_2'e_2$ is the sum of square residuals from the second equation and a_{1i} and a_{2i} are the diagonal elements of the $(X'X)^{-1}$ matrix for the first and second regressions respectively.

The variance-covariance matrices used in the calculation of the Bayesian procedure are given in Table 9.4. The results of the *t* test are given in Table 9.5 while the results of the Bayesian procedure are given in Table 9.6.

The interpretation of the results in Table 9.6 is straightforward. For example, the second row in Table 9.6 shows that the difference in the coefficient of the lagged loan rate can be approximated by a *t* distribution having 65.27 degrees of freedom, centred at −0.17 and with a scaling factor of 0.082. Similar interpretations can be made for the other cases.

Using the criterion that we accept the null hypothesis for each case in which the 95 percent HPD contains zero, we find that there is no significant statistical difference in any of the coefficients between the two time periods. Identical results are obtained from the t test and Chow test.

Table 9.4

	C	$r_{cL(-1)}$	r_{tb}	r_{3-5}	CL/TA	r_{cp}
Monetary tightness						
C	1.54	0.02	−0.04	0.007	−6.93	0.07
$r_{cL(-1)}$		0.002	0.001	0.001	0.107	0.001
r_{tb}			0.03	0.012	0.134	0.016
r_{3-5}				0.009	0.046	0.005
CL/TA					31.94	0.276
r_{cp}						0.013
Monetary ease						
C	0.433	−0.004	−0.066	0.0007	−2.37	0.08
$r_{cL(-1)}$		0.003	0.004	0.001	−0.003	−0.004
r_{tb}			0.04	0.008	0.354	−0.033
r_{3-5}				0.005	0.069	0.445
CL/TA					13.99	0.005
r_{cp}						0.033

Table 9.5

	$\lambda = B_{ij} - B_{2j}$	*t test calculated*	t^*, *table value*	*Accept or reject null hypothesis*
C	−0.575	0.45	1.99	Accept
$r_{cL(-1)}$	−0.11	1.71	1.99	Accept
r_{tb}	0.25	0.97	1.99	Accept
r_{3-5}	0.058	0.51	1.99	Accept
CL/TA	5.28	0.82	1.99	Accept
r_{cp}	−0.31	1.37	1.99	Accept

Note: *, 95 percent confidence level used.

Table 9.6

	$\lambda - B_{1j} - B_{2j}$	$a^2(C_{1j}+C_{2j})$	$[a^2(C_{1j}+C_{2j})]^{1/2}$	b	*95% HPD*
C	−0.575	1.015 (1.97)	1.41	28.59	−3.46, 2.31
$r_{cL(-1)}$	−0.11	1.04 (0.005)	0.070	53.27	−0.25, 0.03
r_{tb}	0.25	1.04 (0.068)	0.265	54.24	−0.30, 0.80
r_{3-5}	0.058	1.03 (0.014)	0.12	41.83	−0.18, 0.29
CL/TA	5.28	1.03 (45.93)	6.87	37.50	−8.63, 19.19
r_{cp}	−0.31	1.03 (0.046)	0.22	53.81	−0.76, 0.14

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Part IV

Financial institutions

10
Establishing an efficient private-federal partnership in deposit insurance

Edward J.Kane

Every insurance system combines two characteristic activities. The first is managing a system for monitoring and controlling the insurer's exposure to potential losses (Schlesinger and Venezian 1986). The second is managing a fund of assets specifically set aside as a reserve for use in paying whatever losses the loss-control system proves unable to avoid.

Whether an insurance company's managers follow optimal policies for reserving and loss control depends on their incentives (Jensen and Meckling 1975). Incentive conflict is inherent in the political and bureaucratic environment in which government managers must operate. Information asymmetries tempt managers of government deposit insurance systems to employ inefficient reserving, monitoring and loss-control policies (Kane 1989). In state and federal enterprises, incentive conflict is reinforced by the limited capacity of labor and financial markets to monitor and to appropriately reward and punish the actions of elected and appointed officials.

Taxpayer losses in deposit insurance may be likened to the symptoms of a slowly developing *disease* that society needs to arrest or cure. In this conception, government officials (regulators and elected politicians) become doctors who have lapsed into regulatory malpractice. The medical ideal is to find out precisely what's wrong with a patient and to treat the diseased party to the best of one's ability. Around the world, in jurisdiction after jurisdiction, officials have routinely failed to follow up important symptoms of institutional weakness and contented themselves with superficial tests and treatments. It would be unethical for doctors to satisfy themselves with superficial tests and treatments.

We may think of the range of regulatory and supervisory reforms adopted or proposed in various countries as prescriptions based on inadequate diagnoses (i.e. incomplete tests and theories) of what fundamentally ails taxpayers and insured institutions. Far from mixing the medicines the financial system needs, authorities in most countries have dosed their banking industries with palliatives (substances that only treat symptoms) and placebos (substances that have no pharmacological effect but are given to placate a patient who feels a need for medication). The danger of sham and incomplete programs of deposit-institution therapy is that inadequate reserving and loss control foster further deterioration and structural adaptations that create resistance to genuine healing agents.

Economists prefer complete and elegant solutions. Formally eliminating government deposit insurance and creating safe banks as Litan (1987) and Merton and Bodie (1992) have proposed is an elegant but incomplete solution. This is because incentive conflict in government-provided deposit insurance can be lessened but not fully reformed away. Analysis of political and bureaucratic incentives to rescue vociferous or politically powerful stakeholders in failed banking enterprises indicates that renouncing deposit insurance is not a time-consistent policy. In the absence of an explicit prior system of guarantees, incumbent politicians and top government regulators would continue to find it in their career and reputational interests to forbear from distributing losses promptly when important financial institutions or collections of institutions fell into trouble.

Acknowledging the absence of a comprehensive method for making deposit insurance (or indeed any government enterprise) completely efficient assigns the problem to the realm of second-best welfare economics. In this realm, reform is pursued by pushing inelegantly in more than one direction.

Federal law now subjects managers of the federal insurance funds to statutory restraints that oblige them to calculate and respond in part to market-like signals of client weakness. But these laws contain loopholes that allow regulators considerable leeway to eschew politically tough action. The incentive force of informative market signals could be increased by further ethical reform and by partially privatizing deposit-insurance liabilities and loss-control activities. This chapter seeks to identify some ethical constraints and patterns of privatization that promise to increase the efficiency and fairness of federal deposit insurance.

1
DECOMPOSING DEPOSIT INSURANCE INTO SIX COMPONENTS

In the language of insurance, a deposit insurer is engaged in surety bonding. A "surety" is a personal or corporate party that, at the request of a second party, accepts responsibility for the performance of a designated contract. A surety relationship is trilateral. The surety agrees to compensate a protected second party (the "obligee") if a third party that is "obliged" by the protected contract fails to perform as promised. The purpose of the guarantee is to set the obligee's mind at ease and to shift to the surety all or most of the task of monitoring the obliged's willingness and ability to perform. Effecting such a shift implies that the protection afforded the obligee cannot be contractually conditioned on whether or not the obliged maintains protective safeguards that the surety might prescribe.

For this reason, safeguards seeking to regulate the condition and activities of the obliged party cannot be made self-enforcing. A surety must proactively manage its exposure to loss to overcome information asymmetry and the adverse selection and moral hazard this asymmetry engenders. Tools of loss control consist of underwriting standards, coverage adjustments (e.g. limits, deductibles and other loss-sharing provisions), monitoring rights, reporting formats, price variations, penalty provisions and *(in extremis)* takeover or cancellation of rights.

Envisioning deposit-insurance losses as symptoms of a progressive disease likens a nation's fund of deposit-insurance reserves to an organism. Every organism's overall health depends on the functioning of what doctors conceive to be an aggregate of interacting subsystems. In medicine, each subsystem is named to reflect a closely related set of subsidiary activities that are collectively vital to the organism's health. Analyzing deposit insurance as a diseased entity implies the need to distinguish an appropriate number of component subsystems and to treat whatever subsystems become troubled in an effective way.

It is appropriate to identify at least six linked subsystems in deposit insurance: an information subsystem, a monitoring subsystem, an enforcement subsystem, a pricing subsystem, a funding subsystem and an incentive subsystem. The first links consist of the information and monitoring subsystems. Information detected by the monitoring system feeds into pricing and policing subsystems which must develop disciplinary responses. Disciplinary responses are intended to stop small problems from escalating into big ones and to keep a client's incentives to take risk from diverging greatly from the surety's interest in protecting its reserves. A surety's policing and pricing activity aims to convince institutions whose obligations are being bonded that behaviour known to harm the fund will be promptly recognized and penalized. This loss-control activity links to the funding subsystem, because changes in loss exposure must be funded either explicitly or implicitly. Finally, how promptly and effectively the first five subsystems are operated depends on the incentive system fund managers face.

In most forums, policy debate has focused predominantly on making technical adjustments in the monitoring, pricing and enforcement subsystems. Ironically, economic analysis traces aggregate weaknesses predominantly to problems in the information, funding and incentive subsystems (Pyle 1983; Brumbaugh 1988; Barth *et al.* 1990; Cole 1990; Barth 1991; Demirgüç-Kunt 1991; US General Accounting Office 1991; White 1991; Bartholomew 1992; Calomiris 1992; Thomson 1992).

The information subsystem embodies agreed-upon methods for defining and accounting for the fund's loss exposure in client institutions. Accounting methods may be conceived as having three parts: (1) itemization principles that differ in their inclusiveness; (2) valuation principles that are divorced to some extent from the economic realities of opportunity cost, and (3) features that require or encourage the *nondisclosure* of information on an institution's supervisory rating and the date of the government examination in which that rating was assessed. Accountability for deposit-insurance losses would be improved greatly if an opportunity-cost accounting covering all sources of client value were required. In the United States it would also be useful if examination ratings were not kept confidential. It would improve incentives if examination ratings and the dates on which they were assigned were recorded in large characters on the FDIC-insured decals that deposit institutions routinely display.

The funding subsystem consists of access to implicit and explicit reserves against which anticipated losses can be charged. In the United States, official reports account and reserve for only part of the risks that insured institutions pass through to the taxpayer. In evaluating the explicit funding subsystem, the major problem is to trace the ultimate source of reserve funds and to ascertain how much net worth (if any) price changes and financial activities truly inject into the fund's balance sheet. Neither borrowing from the Treasury nor earmarking specific federal tax revenues for a government insurance fund truly increase the economic value of the net worth of the fund. These activities affect only the liquidity of the fund's balance sheet and the likely distribution of the funding costs across different classes of taxpayers.

The surety's incentive subsystem is conceived as the structure of net rewards that its managers reap from adopting alternative courses of action. The fundamental source of taxpayer losses in deposit insurance does not lie in defects in the particular array of the loss-management controls that have been written into deposit-insurance contracts. The critical defects lie instead in incentive conflicts that—in tough times and tough cases—lead government officials *not to enforce* the underwriting standards, coverage limitations, price-adjustment privileges and takeover rights that are already included in existing contracts.

2
RECENT LEGISLATIVE RESPONSE TO THE US DEPOSIT-INSURANCE MESS

In December 1991, the Federal Deposit Insurance Corporation Improvement Act (FDICIA) importantly restructured supervisory responsibilities and broadened the disciplinary powers assigned to the deposit-insurance bureaucracy. Unlike the Financial Institutions Reform Recovery and Enforcement Act of 1989 (FIRREA), FDICIA seeks to overcome incentive weaknesses in supervisory activities.

FDICIA strengthens deposit-institution regulators' takeover rights and obligates them to use these and other disciplinary powers in market-mimicking patterns. FDICIA specifically requires the Federal Deposit Insurance Corporation (FDIC) to revise its loss-control policies in three specific areas: (1) to set "risk-sensitive" insurance premiums; (2) to undertake "least-cost" resolution of failed institutions (prohibiting the FDIC from paying off losses suffered by uninsured depositors in potential liquidations unless the Federal Reserve and the Treasury declare that a systemic risk is at stake); and (3) to engage in prompt and escalating "corrective action" when and as an insured institution's accounting net worth deteriorates. The Act also restricts, and in some cases prohibits, access by poorly capitalized banks to brokered deposits and to Federal Reserve borrowing. Finally, regulators are asked to formulate discretionary accounting and supervisory standards whose intended effects are to make regulators accountable for future acts of supervisory forbearance.

Although FDICIA has narrowed regulatory options, Table 10.1 is meant to clarify that supervisory discretion to forbear increases rather than decreases as a bank's net worth position deteriorates. The incentive subsystem still confronts authorities with a painful tradeoff between scrupulously protecting the economic interests of general taxpayers and avoiding reputational and career damage from punishing politically strong regulatory clients and alienating their political allies. For this tradeoff to be made more favourable to general taxpayers, political-bureaucratic incentives must be reworked further. Labor markets must be made to reward rather than punish whistleblowers and taxpayers must require politicians and deposit-insurance officials to surrender the discretion they now enjoy with respect to the information they choose to report and the forbearances they choose to give.

The durability of incentive weaknesses in solvency supervision may be interpreted as evidence that elected politicians receive value from short-changing deposit-insurance enterprises on their loss-control powers and explicit financial resources. Critical defects exist in political and bureaucratic accountability (Stigler 1971; Weingast 1984). The overriding problem is that, in the face of a sizeable insurance fund insolvency, the short horizons and narrow career and reputational interests of responsible politicians and bureaucrats make denying or covering up evidence of weakness and offering regulatory forbearances a rational response (Kane 1989). It pays politicians to work behind the scenes for lenient treatment of their troubled constituents. It pays regulators to use their discretion to conceal long-run problems (e.g. in the Bank Insurance Fund) and to postpone what looks to be painful loss-control activity to a successor's watch.

This strategy of concealment and deferral is not reliably penalized because broadcast journalists and the press have had neither the informational nor the analytic tools to monitor the performance of federal regulators. As a result, the public has not been able to appreciate the tradeoffs between short-run and long-run costs and benefits inherent in the decisions that deposit-institution regulators make. Voters blame officials disproportionately for the particular problems that happen to *surface* while they are in office and tend not to penalise authorities for the anticipatable future damage that they create when they adopt short-sighted policies.

FDICIA enhances the position of the taxpayer in three ways. It seeks to improve the information subsystem by asking reluctant regulators to move

Table 10.1 Market-mimicking “prompt corrective action” injunctions for regulators in the Federal Deposit Insurance Corporation Improvement Act of 1991

Net worth zone of bank	*Strict mandates*	*Semi-mandates*	*Discretionary authority*
Well-capitalized	None	None	Powers of ordinary supervision
Adequately capitalized	None	No brokered deposits	Exceptions for brokered deposits may be approved by the FDIC
Undercapitalized	(a) No brokered deposits (b) Suspend dividends and management fees (c) Restrict asset growth (d) Require recapitalization plan (e) Pass on acquisitions, new branches and new activities		(a) Restrict transactions with holding-company affiliates (b) Restrict deposit interest rates (c) Restrict designated other activities (d) Order recapitalization (e) Undertake any other action that would better implement prompt corrective action
Significantly undercapitalized	(a) All mandates applicable to previous zone (b) Restrict pay of officers	(a) Restrict transactions with affiliates[a] (b) Order recapitalization[a] (c) Restrict deposit interest rates[a]	(a) All authority operative in previous zone (b) Institute conservatorship or receivership if recapitalization order is resisted or if plan is not satisfactorily submitted or carried out (c) Actions mandated for critically undercapitalized zone, if necessary to implement prompt correction action
Critically undercapitalized	(a) All mandates applicable to previous zone	(a) Put into receivership or conservatorship within 90 days[a]	(a) Extensions of 90-day deadline (b) Allow accounting

	(b) Restrict designated other activities (c) Put into receivership if zone is not departed after four quarters	(b) Suspend payments on subordinated debt[a]	dispensations in capital calculation

Note: [a]These actions are not mandated if an institution's primary supervisor holds that they would not serve the purpose of prompt corrective action or if designated other conditions obtain.

toward using market valuations and conservative itemization standards. It improves monitoring and enforcement by requesting annual exams, early intervention, documented appraisals of loan collateral, and limitations on paying off uninsured depositors in insolvency resolutions. It seeks to make deposit insurance pricing risk sensitive and to improve fund capitalization by putting teeth into coverage limitations and risk-based capital requirements.

While each of these strategies promotes greater long-run efficiency, FDICIA fails to eliminate a stressed regulator's incentives and opportunities to misregulate (Shadow Financial Regulatory Committee 1992). Complete accountability awaits additional accounting, funding, ethical and campaign-financing reforms. Missing are arrangements for quickly and reliably repairing deficiencies in deposit-insurance reserves as they arise and for establishing timely budgetary responsibility for the implicit and explicit implications of monitoring and loss-control adjustments as they are made. FDICIA imposes a formal obligation on the FDIC to intervene strongly and predictably into the affairs of every capital-deficient firm before its capital is exhausted. But the Act leaves it to conflicted regulators to define capital and to develop and enforce specific intervention criteria. Without additional incentive reform, it is unlikely that enforcement will be guided by reproducible and nondiscretionary tests.

Table 10.1 emphasizes that FDICIA leaves authorities free to tailor specific supervisory penalties to individual situations. The February 1992 CrossLand Savings Bank nationalization attests that the FDIC's right to extend unlimited insurance coverage after the fact to the formally uninsured obligations of a failing client has been abridged rather than eliminated. The limits that FDICIA imposes on covering uninsured balances can be undone by choosing not to liquidate an insolvent institution based on FDIC least-cost calculations that do not have to pass a publicly reproducible "smell" test. The US General Accounting Office (1991) criticized the incompleteness of the particular calculations documented in the CrossLand case. But the dispute indicates that FDIC analysis of whatever calculations are made by its staff can be manipulated adversely to taxpayers' economic interests when political or career pressures make this desirable.

The fundamental weakness in deposit insurance and banking regulation is the absence of timely accountability for losses that accrue to taxpayers from governmental acts of financial misregulation. For nearly three decades, top regulatory officials, deposit-institution trade associations and selected politicians have cooperated in denying and covering up the size of the industry's and insurers' growing capital shortage. They have done this primarily in two ways. First, they have used or authorized accounting options that conceal weaknesses by delaying the accounting realization of developing losses. Second, they have laboured to mischaracterize and discredit the efforts of outside critics to measure realistically the net reserve position of the federal deposit-insurance funds.

It is disheartening that allegedly corrective post-1989 legislation, which increased penalties for fraud and fiduciary violations for managers of federally insured entities, included no penalties for fiduciary violations by federal regulators or elected officials. Incentive conflict would be greatly tempered if top regulators could be prosecuted for choosing not to reserve for distant but readily appraisable losses, for using smoke-and-mirrors accounting to cover up inadequacies in bureaucratic performance and for sacrificing broad taxpayer interests to quell narrow political pressure.

The same mistakes that undermined the Federal Savings and Loan Insurance Corporation (FSLIC) are being repeated in the 1990s by FDIC officials who run the Bank Insurance Fund (BIF). FDIC leaders have adopted the same costly strategy of officially understating the extent of their fund's secular weakness. They have done this by routinely suppressing unfavourable information on the BIF's loss exposure and granting accounting and regulatory forbearances to decapitalized client firms; by throwing their weight behind schemes for allegedly "recapitalizing" their fund with borrowed money; and by supporting the extension of inadequately supervised new powers to members of their client base.

Many politicians and regulators claim to have been blindsided by the expanding costs of deposit-insurance subsidies to risk-taking. If their claim is true, these officials refused to heed long-standing theoretical warnings (Emerson 1934; Scott and Mayer 1971; Kareken 1983) and to face important opportunity-cost evidence. This blindspot testifies to an *insensitivity* to their duty to analyze and clarify the long-run consequences of the policies they accept. In choosing not to reserve fully for appraisable or *de facto* losses that were plainly developing on an opportunity-cost basis in decapitalized clients, FSLIC and BIF officials strengthened the deposit-institution industry's capacity to lobby against more effective premium structures and regulatory frameworks. Under-reporting their funds' loss exposures meant that options for delaying the recording of client losses in official accounting records had to be played out before regulators could move to bring troubled institutions under control.

Deposit-insurance losses do not trace to *technical ignorance* about how to design a workable bonding contract. Taxpayer losses are rooted in conflicts of interest between government officials and taxpayers that support inefficient regulatory forbearances. The problem lies in the selective and repeated nonenforcement of key contract provisions that any surety's beneficial owners should want to see enforced.

The work of even the most conscientious regulators and politicians involves cutting deals with interested parties. This means understanding the desires of the various bargainers and negotiating a middle-ground position that all parties can live with. FDICIA puts the onus for avoiding future acts of misregulation squarely on the regulators. It keeps open options for regulators to misinform the public about the quality of their current and cumulative performances and for Congress and the President to mediate perversely between bankers and regulators. While formally espousing mandatory early intervention, FDICIA effectively preserves officials' dangerous discretion to misdesign and to waive their regulatory triggers and responses.

To align regulatory incentives with the interests of taxpayers, the key step is to improve the monitoring capability of news organizations by developing workable measures of the implicit and explicit budgetary implications of deposit-insurance decisions at the time they are being made. The Congressional Budget Office, Office of Management and Budget and the General Accounting Office are challenging the FDIC to report its loss exposures more accurately. Nevertheless, the BIF is valued officially by costing out discretionarily projected near-term "failures" rather than by seeking to cost out what taxpayers would have to pay an efficient private entity to take BIF's net loss exposure to current and anticipatable insolvencies off tax-payer hands.

In 1989, the President and Congress underfunded the Resolution Trust Corporation (RTC) and loaded it and other enormous administrative burdens onto an already overstretched FDIC. In 1991, Congress and the President increased the FDIC's borrowing authority and gave the agency important new powers and responsibilities. In 1993, Congress and the President agreed on a depositor-preference statute that subordinates all forms of nondeposit debt in liquidation to the claims of a failed institution's deposit-insurance fund. But they have never appropriated the funds the FDIC needs to clean up the RTC's problems fully or to restore BIF's net worth on a fully reserved basis.

As long as the extent of the FDIC's true capital shortage need not be officially reported, incentive conflicts will tempt politicians and regulators to relax solvency regulation and to defer accounting recognition of resulting deposit-insurance loss exposures. To end contorted refinancing schemes, inadvisedly lenient supervision and hidden nationalizations of both troubled institutions and selected pools of overvalued assets requires an information system that informs outsiders if and when regulators and politicians fail to function steadfastly in the interest of taxpayers.

A direct path for unblocking the information flow is to impose self-reporting obligations and comprehensive market-value accounting principles on regulators and insured institutions to force them to measure their performance and loss exposure as accurately as they can. But, as in IRS tax enforcement, to give weight to reporting obligations requires subjecting officials to civil and criminal penalties if they can be shown after the fact to have willfully provided anything but their best estimate of their enterprise's market value.

However, merely developing better information is not enough. To reduce the scope for official procrastination, taxpayers also need “action-forcing rules”. These rules must redefine and penalize dereliction of duty at all levels. It is necessary to specify the ethical duties of supervisory officials more completely. At a minimum, it would be desirable:

1 to require FDIC managers to recapitalize their insurance funds according to a prespecified timetable whenever the market value of their loss exposure increases;
2 to require deposit-insurance losses to be run through the federal budget as they accrue;
3 to lessen the advantages of incumbency to strengthen electoral challenges of unsatisfactory Congressional performers;[1]
4 to require members of Congress and the Administration

   (a) to set explicit limits on their ability to intervene ethically into the process of closing or recapitalizing individual institutions;
   (b) to report all interventions to Congressional banking and ethics committees for explicit review;
   (c) to subject committee reviews (such as the Senate ethics committee’s whitewash of all but one of the Keating Five) to regular evaluation by truly “disinterested” outside experts.

3
BENEFITS FROM PARTIAL PRIVATIZATION

These hypothetical restraints and penalties would establish direct accountability for measuring, pricing and managing the value of implicit and explicit federal guarantees. But authorities have proved unwilling to contemplate such thoroughgoing restrictions. The nut of the problem is that conflicted officials directly control the agenda of reform. Their willingness to expose themselves to tough reforms in their incentive system is limited by the reputational and other benefits that exploiting incentive conflict offers to them. Such conflicts can be lessened in an indirect manner by privatizing proactive loss-control decisions in deposit insurance.

Even a partial privatization of loss control and deposit-insurance responsibilities would importantly realign managerial incentives in the government portion of the insurance system. Pressure on government officials to make better decisions would be produced as a byproduct as long as some of the loss exposure of each private guarantor is reinsured by the government. Market discipline on a government’s private partners would signal the quality of the government’s complementary supervision and loss control for the private sureties.

Loss control focuses on risk measurement, risk management and insolvency resolution. In deposit insurance, the core task is to protect the insurance fund by identifying problem institutions and correcting or resolving their problems before potential shortages exceed institutional capital and thereby impose losses on insurance reserves.

Privatization means “any loosening of government controls, including the sale of minority interest in a state-owned enterprise to private buyers, the delegation of management responsibility for a state-owned enterprise to private managers, and even the relaxation of a state monopoly to allow private entry into the market” (Vernon 1988:2). Requiring that private parties underwrite at least the first layers of the insurable risks in a deposit-insurance system would create a tiered partnership of explicit private and government guarantees. The loss-control interests of the private partners would help to set monitoring procedures, prices and penalty structures. The private partners would also help to decide what nontraditional markets federally insured institutions can safely enter.

Individual deposit institutions are “informationally opaque” entities. Outside monitoring is relatively difficult because generally accepted accounting principles offer reporting options that render a depository firm’s accounting records unreliable guides to both its risk-taking patterns and its true economic income and net worth.

To identify and measure changes in risk exposure caused by managerial decisions. a surety must be able to persuade institutional managers to open their books in ever-changing and nonstandard ways. To avoid unnecessary disruption, the surety must also possess the expertise and contractual power to discipline at low cost any inappropriate risk-taking it happens to observe. At the same time, it must be recognized that the stronger the opportunities by which a putative loss-sharing party can tempt government officials not to enforce loss participation provisions, the less reliably contractual provisions can shift risk to that party.

Efficiently shifting a layer of deposit-institution losses from the federal insurers to private parties means identifying parties that are better and more reliably positioned to monitor and to discipline the relevant risk. This chapter holds subordinated debtholders and specialized private sureties to be especially efficient risk-bearing candidates. This is because these particular counterparties expressly and openly volunteer to bear the risks of widespread industry weakness. As wary volunteers rather than uninformed depositor draftees, such entities are poorly positioned relative to other private parties to use political pressure to force government forbearance for their obligations.

To lessen opportunities for government coverup of deposit-institution weakness and to rationalize exit policy and asset workouts, it is necessary to increase market surveillance of monitoring, loss-control and reserving activities. A straightforward way to do this is for federal deposit insurers to cede to private sureties and to agents directly responsible to subordinated debtholders most of the supervision and examination functions that are now performed in-house by government agencies.

Any time that poor management of their loss exposure engulfs subordinated debtholders or allows a *private* surety to deplete its fund of gross reserves, punitive forces come into play. These forces generate timely and transparent market signals that things are going wrong for taxpayers too.

Private parties may earn profits from divining and acting upon information about changes in the value of an institution's subordinated debt (see Benston *et al.* 1986; Wall 1989) or from tracking changes in the quality of a surety's guarantees. However, uncovering the consequences for tax-payers from a decline in the value of a single institution's subordinated debt requires observers to undertake more follow-up analysis than discerning the effects of decreases in the credibility of a federally reinsured private surety would.

Declines in a private surety's credibility are bound to be noticed. This notice is going to decrease the demand for the surety's services and to increase the regulatory scrutiny the surety must face. In addition, resulting expectations of higher expected losses and falling demand would reduce the surety's current and projected earnings. This is bound to depress the market value both of the surety's stock and of its outstanding guarantees. Such developments create pressure for stockholders and creditors to press for better management strategies and for outside firms to identify the surety as an attractive takeover target.

This market information would unambiguously signal taxpayers and news organizations that some of the private surety's growing loss exposure was passing through to its federal reinsurance partner. Such clear signals would turn the travails of a private surety into "drumbeats of news" about changes in taxpayers' loss exposure. In this way, instead of being the unobservable "nonevents" they were during the burgeoning savings and loan insurance mess, government forbearances and their consequences would become recognizable news events with political implications about sectoral conflict that mainstream news coverage thrives upon (Skidmore 1992). This news coverage would subject the reputations and career prospects of government managers to timely market discipline.

4
A FOUR-PARAMETER PARTNERSHIP PLAN[2]

The following partnership structure promises to align the incentives of all participants (see Figure 10.1).

1 Each depositor is to be fully insured up to a fixed dollar amount I by a private surety. The amount I should be large enough to free the average household depositor from the need to spend time monitoring the financial condition of its deposit institution.
2 Additional private bonding is provided beyond the amount I for each deposit account up to an upper limit L. Between I and L, however, only a portion (to be labeled p) of the deposit is to be insured by a private surety. The social

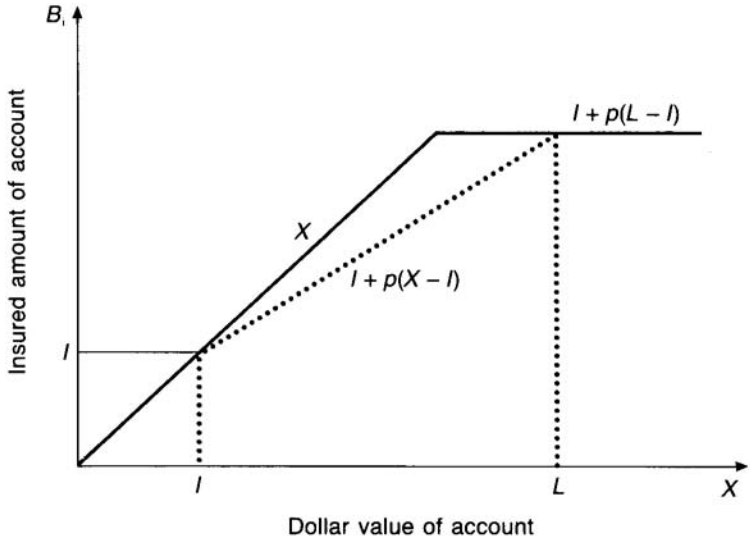

Figure 10.1 Insured amounts

value of this "coinsurance" arrangement comes from the assumption that a depositor's monitoring and disciplinary capacities increase with its deposit size. The uninsured portion $1-p$ of deposit amounts between I and L provides an incentive for customers to monitor and discipline deposit institutions that increases with deposit balance.

3 A deposit insurance premium for each institution is to be set by the private surety. Competition from potential entrants should see that this premium costs out weaknesses in managerial controls, shortfalls in the diversification and the quality of the assets supporting the deposit liabilities, and liquidity and other risk characteristics in the institution's liability structure. Well-functioning markets would award lower premiums to managers of institutions that manage their risks well.

4 Irrespective of whether a surety is organized as a stock or mutual institution, optimizing the value of its net loss exposures serves the interests of its beneficial owners. This is why society can expect a well-capitalized private surety to monitor the financial condition of insured depositories in ways that are statically and dynamically cost-efficient. Static efficiency means producing current monitoring and loss-control services at minimum cost. Dynamic efficiency requires the further wrinkle of approving demonstrably advantageous innovations and extensions of services over time. Other things equal, profitable adaptations by insured institutions increase their intangible capital, thereby reducing surety loss exposure. Private sureties and their federal "reinsurers" benefit jointly from seeing both that the costs of producing given levels of loss-control services are minimized and that

insured institutions remain sound and adapt efficiently to changing opportunities.

5 To allow for the possibility that a private surety could not cover its obligations in full, each private surety would have to accept the oversight of a federal surety. Federal reinsurance serves to protect depositors against this catastrophe. At the same time, the federal surety's reinsurance loss exposure gives its managers an incentive to monitor every private surety whose liabilities it reinsures. The contribution the partnership system makes to incentive reform lies in its ability to increase the transparency of federal monitoring efforts. It would be far easier for watchdog institutions such as the press and academia to analyze the implications for federal deposit-insurance reserves of changes in the financial condition and security prices of a handful of private sureties than it has been for them to calculate how taxpayers loss exposure responds to the ebb and flow of income and capital at nearly 30,000 individual banks, thrifts and credit unions.

6 In each institution it insures, a private surety might wish to assign to the federal reinsurer all losses in excess of a "stop-loss" limit *S*. The more effectively a surety performs its monitoring and salvage tasks, the less likely it should be for the costs of resolving an individual institution to exceed *S*. To smoothe the transition from a 100 percent federal system to the layered insurance partnership, at the start *S* ought to be deliberately set below its long-run value. As capital and expertise accumulate at private sureties, it would be appropriate for *S* to increase gradually to an optimal long-run value. The long-run value of S might well differ for institutions that differ either in asset size or in the diversity of their product lines.

7 Aggregate premiums would flow from insured institutions to the private surety. In turn, the private surety would pay appropriate subpremiums for stop-loss and catastrophic coverage to the federal reinsurer. It is desirable that federal subpremiums be priced competitively. This could be done by requiring the federal sureties to solicit bids for well-defined portions of their coverages in global reinsurance markets.

Incentives affected by contract design

The plan has four parameters: *I* (basic insurance amount), *L* (upper limit on insured deposits), *p* (portion of the account between *I* and *L* that is insured) and *S* (stop-loss point). It is envisaged that time paths for parameter values will be determined by negotiations among sureties, federal insurers and deposit institutions.

At each institution, *S* may be conceived as a fraction *f* of the threshold amount of deposits at which federal reinsurance begins. As *S* rises, the potential cost of a failure to the private surety increases and the potential liability of the federal reinsurer falls. Lowering the coinsurance parameters *I, L* and *p* increases the monitoring responsibility of individual depositors.

Let us suppose I were set at \$10,000 and L at \$100,000. All customers with deposits equal to or less than \$10,000 would be fully covered and their incentive to monitor the operations of their depository would depend on the chance that their balance might occasionally rise above I. As long as $p<1$, depositors whose accounts actually or potentially exceed \$10,000 would have an increased incentive to monitor the operations of their depository.

Since the federal surety would pick up the private surety's liability if the private provider were to become insolvent, federal officials would have a clear incentive to monitor the adequacy of the private insurer's reserves and loss-control policies. In turn, both the private surety and the federal reinsurer would have incentives to maximize the salvage value of each insured institution. With efficient monitoring and salvage, the total benefits B payable by the private surety would typically fall far short of S. Monitoring would seek to prevent the assets backing deposits from falling below the sum of bank liabilities plus workout costs. With the private surety responsible for the first S dollars of an institution's losses, the surety would have a frontline incentive to spot developing problems and to resolve insolvencies as soon as they come into view. Efficient salvage operations by the surety would minimize workout costs. Conditional on the information available when action is taken, the expected losses experienced when restructuring or liquidating an insolvent institution would be minimized.

Alternative organizational structures for the private insurers

Every US insurance company has to be chartered by a particular state. To underwrite deposit insurance, a private surety would have to incorporate itself in a state whose laws accommodate contracts providing financial insurance. At the same time, before it could offer deposit insurance for federally insured depositories, each private surety would have to meet conditions that would be set by the federal regulator.

Each private surety would need to raise sufficient initial capital to pay organizational costs and to provide a financial cushion for absorbing possible early losses. Three organizational approaches exist for raising this capital. Which organizational structure is selected by potential entrants should be worked out in joint negotiations with their back-up federal surety and prospective client deposit institutions.

The first and simplest alternative would be to let the capital be down-streamed from an existing financial institution whose managers viewed deposit insurance as a profitable business in which to operate a subsidiary. To make it easier for regulatory authorities to monitor the surety to assure its financial responsibility, the parent corporation ought to be required to capitalize each deposit insurance subsidiary as a single-line business.

Alternatively, a wholly independent, single-line company might be established. This independent company could be stockholder-owned or take a mutual form. Stock companies enjoy simple and direct methods of raising initial capital. The advice of insureds can be solicited, but ultimate responsibility for risk control and pricing rests with directors elected by stock-holders. Mutual firms are more difficult to start, but because policyholders take the place of stockholders, directors tend to be tightly attuned to the interests of the insureds.

A stock company would raise its initial capital by selling shares of stock. The new owners, some of which might be deposit institutions, would elect directors who, in turn, would employ management.[3] Stock shares would pay dividends. To incorporate policyholder influence, the directors might find it advantageous to create a committee of policyholders to provide advice on the operation of the firm.

In a mutual organization, the initial capital to fund precautionary reserves could be raised most easily by issuing notes to a set of sponsoring organizations. So that they would not all come due at one time, it would be best for these notes to be laddered in their initial maturity. Over time, the notes would be paid off from the cash flows the surety would generate from profitable operation. The insureds would own the company, elect the directors and receive interest payments that would parallel stockholder dividends. Once the notes were paid off, profits in excess of prudent additions to reserves could reasonably be applied to reduce the sponsoring institutions' deposit-insurance premiums.

5
THE NEED TO UNMANGLE REGULATOR AND EX-REGULATOR ASSERTIONS

During the 1970s and 1980s, the problems of the savings and loans industry were not hidden from academics, regulators or the news media (see, for example, Kane 1981; Kopcke 1981). Nevertheless, regulators helped the press to "mangle" the story of the FSLIC mess (Meltzer 1992).

This mangling underscores the unreliability of discretionary government regulation. As Meltzer clarifies, not only did regulators do little to warn taxpayers about the developing costs of savings and loans problems, they have failed to inform the public about the deficiencies that remain in the regulatory system that is in place today.

In September 1993, former FDIC Chairman L. William Seidman told a Congressional committee that failing to appropriate during 1992–3 funds the RTC needed to close "borderline thrifts" had saved taxpayers a "bundle". He noted that permitting these thrifts to stay open allowed these enterprises to recover as interest rates fell, and went on to allege that had these institutions been *liquidated* taxpayers would have suffered.

These allegations are dishonest in two respects. First, and most importantly, what Seidman calls borderline thrifts may be presumed to have been economically insolvent for a good while. It is true that Congressional delay kept the costs of resolving these institutions' insolvencies from being *recorded* in government budgets in recent years. But much future benefit to taxpayers was surrendered. The delay prevented taxpayers from staking a balanced equity claim to the profits that these enterprises accrue in return for taking risks whose downside taxpayers were in fact underwriting. Gains from falling interest rates beyond the amounts needed strictly to cure thrift insolvencies flowed mainly to thrift owners rather than being shared equitably with taxpayers. Second, with efficient government loss control, whether or not an institution would be liquidated when its insolvency was resolved would depend on whether it was worth more alive (as in the bulk of the cases) or dead (Acharya and Dreyfus 1989). Liquidation is not the best way to resolve a thrift's insolvency whenever "going-concern" values are substantial. In such cases, private acquirers should be willing to purchase these enterprises for more than their liquidation value. Hence, Seidman deliberately chose to measure taxpayer's alleged saving against a *false* and *inefficient* liquidation standard for loss control.

A good way for regulators to determine whether intangible going-concern values are large enough to overcome an institution's tangible insolvency is to ask its owners to *recapitalize* it promptly or be taken over. If these owners are unwilling either to put up or to raise from others additional funds in 60 or 90 days, the insurer must act to curtail managerial incentives to take unhealthy risks at taxpayer expense. This can be done either by demanding a sizeable claim on future profits (e.g. via warrants) or by taking title to the institution itself. After a takeover, the insurer can realize any intangible values in a deposit institution by soliciting private bids for the enterprise.

Instead of promoting principles of good government, Seidman's testimony reinforces a faith-breaking preference for regulatory and institutional "gambling for resurrection" (Brumbaugh 1988). Even if borderline institutions had been liquidated by the RTC, risks and the returns on their assets would have belonged to taxpayers. This would have required government officials to confront and rebalance the risks they were managing at taxpayer expense.

The deposit-insurance mess shows that Congressional oversight of discretionary government loss control is a system that continues to mis-serve taxpayer interests. Incentive reforms modeled on those outlined here would constrain regulators and politicians to treat taxpayer loss exposure more nearly as if it were their own.

NOTES

This chapter extends the analysis in Kane (1992a, b) and Kane *et al.* (1993). This work has already been published in the *International Journal of Finance* 6(2) (1994).

1 My specific plan would be to insist that all incumbent members of Congress transfer half of all campaign contributions they receive to their party, to be used in other electoral districts to fund campaigns by challengers of incumbents of the opposite party. Besides making elections more competitive, the plan may be regarded as providing prosecutable temptations to cheat that will selectively establish term limits for the most venal member of Congress.
2 This plan is described more fully in Kane *et al.* (1993).
3 Ely (1986) has long proposed a system in which deposit institutions form syndicates through which covered institutions would cross-guarantee one another's liabilities.

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11
Bank risk-taking, risk-hedging and the effects of the risk-based bank capital regulation

Hua Yu

1
INTRODUCTION

The chapter analyzes the impact of bank capital regulations on the two major types of risk affecting the banking sector: the risk of default of bank assets and the interest rate risk of borrowed funds. Bank capital regulation and the bank portfolio decision are closely linked to the deposit insurance system. It is widely recognized that insurance on bank deposits may cause a moral hazard problem when it is not fairly priced (Kareken and Wallace 1990; Dothan and Williams 1980; Benston *et al.* 1986; Furlong and Keeley 1990; Lawrence and Harikumar 1991). To reduce the risk-taking incentive of the insured banks which can result from mispricing of the public insurance, the regulatory authority should adjust capital standards (Sharpe 1978; Buser *et al.* 1981; Pyle 1986; Flannery 1989). A number of studies argue that bank capital adequacy regulations may also cause a similar moral hazard problem. Raising minimum bank capital standards reduces bank profit. Consequently, banks may shift to riskier assets to maintain profitability (Koehn and Santomero 1980; Shapiro 1982; Kim and Santomero 1988; Arshadi 1989; Gennotte and Pyle 1991; Shrieves and Dahl 1992).

Recently, bank regulators in the major industrialized countries have adopted the Basle Accord. Under this new regulation, banks with riskier assets should have relatively more capital and less debt. Some studies have suggested that this new standard could reduce both the riskiness of bank assets and the risk of bank failure (Alfriend 1988; Ronn and Verma 1989; Eyssell and Nasser 1990).

Although most previous studies have discussed the relationship between the default risk of bank assets and bank capital standards, few have integrated interest rate risk into the analysis. The cost of funding the bank is directly linked to the market interest rate. The uncertainty of funding costs may contribute to the volatility of bank profitability and the risk of failure. Consequently, the bank may reduce its interest rate risk through hedging. Hedging may increase the value of a firm when the market is imperfect (Smith and Stulz 1985). Risk-averse financial institutions may hedge, at least partially, their exposure to interest rate risk in order to maximize utility (see, for instance, Koppenhaver 1985). Some studies have suggested that interest rate risk and the hedging policy of financial institutions can indeed affect the value of the equity capital of these institutions (Flannery and James 1984; Scott and Peterson 1986; Unal and Kane 1988, Bae 1990; Wall *et al.* 1990; Yourougou 1990).

Markets may be imperfect for various reasons such as tax and bankruptcy costs. In this chapter taxation is considered as the primary market imperfection which induces the risk-hedging actions of banks. When banks are insured by public insurers, the equityholders and debtholders should be less concerned about bankruptcy costs. In cases of failure, the insurer will fill the gap between the debtholders' claims and the failed bank's asset value.

Under a progressive tax system, the tax liabilities of a firm are a convex function of the pre-tax value of the firm, which may explain the firm's incentive to hedge its risk (Smith and Stulz 1985). The model in this chapter considers the taxes from a different point of view: tax liabilities are contingent since a bank does not pay taxes unless its taxable income is positive (Galai 1988). Thus expected tax liabilities can be treated as an option on the pre-tax value of the bank.

An increase in the risk of bank bankruptcy reduces the expected tax liabilities but increases the value of the subsidy received by the bank from the public insurer. This value can be interpreted as a put option on the value of the bank's assets (Merton 1977, Marcus and Shaked 1984; Giammarino *et al.* 1989). The bank's optimal portfolio decision, therefore, should be based on the optimal tradeoff between the increasing tax liabilities and the welfare transfers from the public insurer.

The contingent nature of both the tax liabilities and the insurance subsidy justifies the application of an option valuation model. Under the new risk-based capital regulation, the minimum bank capital requirements are based on banks' investments in different categories of assets. Therefore the standard Black and Scholes (1973) option valuation method cannot apply directly. A multiple-asset option valuation model is necessary to analyze a bank's portfolio allocation policy and risk-hedging policy. Since the Black and Scholes model holds only for fixed interest rates, a further technical problem may arise due to the introduction of interest rate risk into the analysis. To tackle these problems, a displaced diffusion option model is developed (Rubinstein 1983). A perfect hedge asset is also introduced into the analysis (Fischer 1978) which allows the valuation of bank contingent tax liabilities and insurance subsidies on the basis of the rate of return of the hedged default-free asset.

The chapter is organized as follows. Section 2 develops a basic model of bank equity valuation. While the before-tax equity value of the bank in the model is independent of the bank's portfolio selection and risk-hedging policy, the expected tax liabilities and insurance subsidy vary with the bank's decisions. The model derives the solution of the optimal portfolio choice. In section 3, bank capital regulations, both the conventional single ratio regulation and the newly adopted risk-based regulation, are introduced into the analysis. The impacts of both regulations on bank portfolio behavior are discussed. Finally, concluding remarks are presented in section 4.

2
THE BASIC MODEL

Assumptions and definitions

The model is based on the following assumptions.

Value-maximizing objective function

The objective of the bank is to maximize the after-tax value of its equity capital, denoted C. It is assumed that the management of the bank acts exclusively in the interests of the bank's shareholders.

Cost of funding

The bank borrows from depositors and repays principal and interest at the end of decision period T. The maturity of bank assets is longer than that of its liabilities. Thus the bank has to refinance its assets with revolving deposits. The interest rate on the revolved deposits is equivalent to the risk-free rate in the market. If D is the amount of deposits at the beginning of the decision period and r the interest rate on deposits, the total amount the bank has to repay at time T should be equal to De^{rT}. The dynamics of r are defined as

$$\mathrm{d}r = \lambda(\mu_r - r)\,\mathrm{d}t + \sigma_r\,\mathrm{d}Z_r \tag{11.1}$$

where μ_r and σ_r represent the instantaneous expected interest rate and the variance of interest rate respectively. λ and $\mathrm{d}z_r$ are the parameters.

Two-asset model

The model examines the bank's portfolio selection and risk-taking behavior according to the quantities of lending funds invested in two types of assets: risky assets and riskless assets. The first is an investment asset with default risk and the second is a default-free short-term liquid asset. Both assets, however, are subject to interest rate risk. The returns of the two assets are defined below.

Denoting y as the rate of return on the before-tax value of the risky asset and Y as the value of the asset,

$$\frac{\mathrm{d}Y}{Y} = \mu_y\,\mathrm{d}t + \sigma_t\,\mathrm{d}z_y \tag{11.2}$$

where μ_y and σ_y represent the instantaneous expected return of the risky asset and the variance of the return on the risky asset respectively. However, dz_y is a standard Wiener process.

The return on the second asset is assumed to be equal to the risk-free interest rate. Furthermore, the returns on the two assets are correlated with each other. This relation is defined as

$$dz_y \, dz_r = \rho_{yr} \, dt \tag{11.3}$$

where ρ_{yr} is the coefficient of correlation of the returns on the two assets.

Perfect hedge asset

There is a hedge asset whose value is perfectly correlated with the interest rate. The expected return of the hedge asset, h, is assumed to be equal to the expected interest rate plus a risk premium q.

Mispriced insurance premium

The bank pays a risk premium to the public insurer which is assumed to be an underestimation of the true value of the insurance. More particularly, the premium is equal to ϕ (ϕ<1) times the true value of the insurance.

Tax liabilities and risk hedging

At this stage, the analysis focuses exclusively on the relationship between the bank's risk-hedging policy and its tax liabilities. The bank's portfolio decision is assumed to be given.

The bank pays tax at time T only if the value of its assets is sufficient to cover its interest costs and principal repayment. Thus the tax on the bank's income can be regarded as an option on the before-tax value of the bank assets. If the tax rate is τ and the bank's current debt is D, then according to the boundary conditions the expected tax that the bank has to pay at T, K, should be

$$K = \begin{cases} \tau[V_T - V_0 - D(e^{rT} - 1)] & \text{if } V_T > De^{rT} \\ 0 & \text{if } V_T < De^{rT} \end{cases} \tag{11.4}$$

where $V_T - V_0$ is the gain on the bank's financial assets and $D(e^{rT}-1)$ is the interest on bank debt. Since, as noted above, the bank allocates its funds across two assets, the value of bank assets at time T should be a function of the bank's portfolio chosen at time zero. In particular,

$$V_T = sV_0e^{yT} + (1 - s)V_0e^{rT} \tag{11.5}$$

where s is the proportion of funds invested in the risky asset. Substituting equation (11.5) into the boundary conditions in equation (11.4), the value of the bank's equity becomes

$$\begin{aligned}K &= \tau \max[sV_0\mathrm{e}^{yT} - V_0 - D(\mathrm{e}^{rT} - 1) + (1-s)V_0\mathrm{e}^{rT}, 0] \\ &= \tau \max(sV_0\mathrm{e}^{yT} - X\mathrm{e}^{rT} - V_0 + D, 0)\end{aligned} \tag{11.6}$$

where $X=D-(1-s)\ V_0$. Equation (11.6) is the Rubinstein (1983) displaced diffusion process with $sV_0\mathrm{e}^{yT}$ as the underlying variable and $X\mathrm{e}^{rT}$ as the exercise price at T. Note that, in the presence of interest rate risk, the assumption of market arbitrage requires the inclusion of the hedge asset in the riskless hedge portfolio. The expected tax liabilities of the bank, based on continuous trading and riskless arbitrage, are given by

$$\begin{aligned}K &= \tau[sV_0N(d_1) - X\mathrm{e}^{-qT}N(d_2)] - \tau(V_0 - D)\mathrm{e}^{-ht}N(d_2) \\ &= \tau[C^* - (V_0 - D)\mathrm{e}^{-hT}N(d_2)]\end{aligned} \tag{11.7}$$

where

$$d_1 = \frac{\ln(sV_0/X) + qT}{\sigma T^{1/2}} + \frac{1}{2}\sigma T^{1/2}$$

$$d_2 = d_1 - \sigma T^{1/2}$$

$N(\cdot)$ is the standardized cumulative normal density function. The risk parameter is the instantaneous proportional variance of the change in the ratio V_0/X. $C^*=[sV_0N(d_1)-X\mathrm{e}^{-qT}N(d_2)]$ in equation (11.7) is a Black and Scholes option valuation formula of bank equity in the absence of tax. The discount rate h is the expected return on the hedge asset (see Fischer 1978). The expected amount of tax that the bank has to pay at T is a contingent value which depends on the tax rate τ, the before-tax value of bank equity C^* and the initial equity capital V_0-D, which is not taxable.

The bank is assumed to hedge the risk of its funding costs as long as hedging increases the after-tax value of bank equity. Hedging is a financial decision. In the context of a perfect market without tax, risk hedging should not increase the value of the bank nor that of its equity. Although hedging may stabilize bank revenues and reduce variability, the resulting increase in safety will be compensated exactly by a lower rate of return on bank shares. However, when the bank has to pay tax, hedging could play a significant role in maximizing the bank's equity value if it reduces the bank's expected tax liabilities.

Since the return on the risk-free asset is perfectly correlated with the change in its funding cost, the interest rate risk of the bank can be partially hedged by the default-free asset. Thus the bank's exposure to interest rate is equal to the proportion of the funds invested in the risky asset. Consequently, reducing the proportion of the riskless asset should allow the bank to reduce interest rate risk exposure. Taking the partial derivative of K with respect to s results in

$$\frac{\partial K}{\partial s} = \tau V_0[N(d_1) - \mathrm{e}^{-qT}N(d_2)] - \frac{\partial N(d_2)}{\partial s}\tau(V_0 - D)\mathrm{e}^{-hT} \tag{11.8}$$

The sign of equation (11.8) is positive since the probability that the bank will be solvent at T decreases as the bank increases its investment in the risky asset, $\partial N(d_2)/\partial s<0$.[1] According to this result, the expected tax liabilities of the bank increase with s. This implies that a reduction in s, or an increase in interest rate risk hedging, will make bank shareholders better off. The implications which can be drawn from equation (11.8) suggest that the bank has an incentive to reduce the risk of its funding costs. *Ceteris paribus,* the bank will tend to adopt a complete hedge whereby its risk of funding costs is reduced to zero. However, an optimal partial hedge policy may be adopted eventually if interest rate risk hedging has a negative impact on components of after-tax bank equity value other than its tax liabilities.

Value of deposit insurance and risk-taking

As noted above, the bank in the model may choose to invest in two assets at time zero. When s increases, the bank invests more funds in the risky asset and consequently the total risk of the bank increases. This will eventually result in a transfer of wealth from insurers to the insured banks. The total benefit of deposit insurance to bank shareholders is the expected loss to the depositors to be compensated by the insurer.[2] Denoting P as the value of the insurance and applying the boundary condition of bank bankruptcy,

$$P = \min(Xe^{rT} - sV_0e^{yt}, 0) \tag{11.9}$$

The valuation of the deposit insurance, following the method used previously, is

$$P = -sV_0N(-d_1) + Xe^{-qT}N(-d_2) \tag{11.10}$$

where

$$d_1 = \frac{\ln(sV_0/X) + qT}{\sigma T^{1/2}} + \frac{1}{2}\sigma T^{1/2}$$

$$d_2 = d_1 - \sigma T^{1/2}$$

Note that $V_0 > D$ and P $\geqslant$ 0; hence $e^{-qT}N(-d_2) > N(-d_1)$. Given the other parameters, the value of the deposit insurance depends on s. When the bank increases the proportion of the risky asset in its portfolio, the value of deposit insurance rises accordingly. This can be seen from the result below:

$$\frac{\partial P}{\partial s} = V_0[e^{-qT}N(-d_2) - N(-d_1)] > 0 \tag{11.11}$$

Equation (11.11) implies that the bank may realize an additional welfare transfer from insurers if it increases the proportion of high risk loans in its portfolio. This result is counter to the bank's policy objective of reducing both s and the volatility of its funding costs in order to reduce its expected tax liabilities, as noted previously. There should be an optimal level of s which can balance the risk hedging and risk shifting and optimize the value of bank equity. With the insurance subsidy, the bank tends to invest all its funds in the risky asset, s=1, and do little to reduce the risk of its funding costs. The risk shifted to the public insurers includes both default risk and funding risk. In the presence of the tax effect, however, the bank would not choose s=1, since this would increase its tax liabilities. The optimal portfolio and risk hedging is discussed in detail in the next section using an objective function to maximize the after-tax value of bank equity which includes both tax and deposit insurance effects.

Optimal portfolio allocation and risk hedging

The bank's portfolio decision should maximize the following objective function:

$$\max\ C = C^* - K + (1-\phi)P \tag{11.12}$$

The first-order optimization requires that

$$\frac{\partial C}{\partial s} = \frac{\partial P}{\partial s} + (1-\phi)\,\frac{\partial P}{\partial s} - \frac{\partial K}{\partial s} = 0 \tag{11.13}$$

The original bank equity value C^*, in the absence of tax and deposit insurance, is a standard Black and Scholes option value. It increases with s $\partial C^*/\partial s = V_0 N(d_1)$. Changing s may also alter the expected tax liability and the value of the deposit insurance subsidy. According to the results of equations (11.8) and (11.11), the resulting optimal condition is

$$V_0 N(d_1) + (1-\phi-\tau)\,V_0[N(d_1) - \mathrm{e}^{-qT}N(d_2)] + \tau(V_0 - D)\mathrm{e}^{-hT}\,\frac{\partial N(d_2)}{\partial s} = 0 \tag{11.14}$$

At the optimal level of *s*, the marginal tax liability of reducing interest rate risk hedging is equal to the marginal benefit of increasing the default risk of the bank's asset portfolio. The choice of *s* depends, *ceteris paribus,* on the tax rate and the degree of underestimation of the value of the insurance.

Using the results of equation (11.14), it is easy to show that

$$\frac{\partial^2 C}{\partial s\,\partial \tau} = -\,[N(d_1) - \mathrm{e}^{-qT}N(d_2)] + (V_0 - D)\mathrm{e}^{-hT}\,\frac{\partial N(d_2)}{\partial s} < 0 \tag{11.15}$$

$$\frac{\partial^2 C}{\partial s\,\partial \phi} = -\,[N(d_1) - \mathrm{e}^{-qT}N(d_2)] < 0 \tag{11.16}$$

If the bank pays tax at a higher rate, the marginal gain of increasing s is lower. This leads to a lower *s* and lower risk of bank failure. Alternatively, if ϕ is higher, the bank lowers *s* in order to reduce the cost of insurance. The results of equations (11.15) and (11.16) imply that the regulatory authority can reduce the bank's risk-shifting incentive by increasing either the bank tax rate or the risk premium which make the risk shifting more costly and less attractive.

3
BANK ASSET PORTFOLIO AND CAPITAL REGULATIONS

According to bank capital regulations, the book value of the bank's equity cannot be less than a pre-specified proportion of bank assets. The level of debt is a function of the value of the value of bank assets. If the required ratio is *w,* then the maximum permissible bank debt is

$$D = (1 - w\beta) V_0 \tag{11.17}$$

where β is the ratio of book value to market value of the bank assets. For simplicity, consider that $\beta<1$, as in the general case.

When the regulator raises *w,* the bank has to reduce debt if it does not change its size. Lower bank indebtedness reduces the risk of bank failure. However, in response to an increase in the capital-assets ratio, the bank may alter both its optimal portfolio allocation policy and its risk-hedging policy. If the bank decides to reduce *s,* this will subsequently reduce the risk of failure. However, if the bank eventually opts to raise *s,* then the regulator's objective of reducing the risk of bank failure will be unsuccessful.

Substituting the definition of equation (11.17) into equation (11.14) and differentiating the implicit function with respect to *w,* the effect of a higher capital—assets ratio on bank portfolio allocation and risk hedging for a value-maximizing bank is

$$\begin{aligned}\frac{\partial^2 C}{\partial s\,\partial w} &= \frac{\beta V_0 f(\cdot)}{\sigma T^{1/2} X} + (1-\phi-\tau)(1-\mathrm{e}^{-qT})\,\frac{\beta V_0 f(\cdot)}{\sigma T^{1/2} X} \\ &\quad + \tau\beta V_0 \mathrm{e}^{-hT}\left[\frac{\partial N(d_2)}{\partial s} + \frac{w\,\partial^2 N(d_2)}{\partial s\,\partial w}\right]\end{aligned} \tag{11.18}$$

Since the second term of equation (11.18) is negative,[3] the sign of this equation is indeterminate. Raising the capital-assets ratio can have two opposing effects on the optimal choice of *s*. With a higher capital to asset ratio the bank has more initial capital and less debt. The probability that the bank will be solvent and pay taxes at *T* is higher. The marginal benefit of increasing the level of risk-taking is higher. On the other hand, the lower financial leverage reduces the bank's before-tax assets value and its expected tax liabilities. But the marginal tax liability of reducing risk hedging is higher. *Ceteris paribus,* the bank's eventual reaction to the increase in the capital to asset ratio relies on the net result of two opposing effects. Without imposing other restrictive conditions on the parameters in equation (11.18), it is obvious that the regulatory authority's objective of reducing the risk of bank failure using a higher capital to asset ratio could be unsuccessful because it does not take into account the bank's interest rate risk and its risk hedge incentive.

The rest of the section discusses the effectiveness of the new capital standards, adopted in Basel, to determine whether this new standard could improve the effectiveness of bank capital regulation and reduce the bank's risk-shifting incentive which results from the mispricing of deposit insurance.

According to the new capital standard, the two bank assets in the model should have different risk weights for the purpose of calculating minimum capital requirements. These risk weights are then multiplied by the required capital to the risk-weighted-assets ratio to determine the effective capital to assets ratio for each category of assets as well as total bank equity capital. If w1 is the effective ratio of the risky asset, and w_2=0 for simplicity, then the effective overall capital ratio should be

$$w = w_1 s \tag{11.19}$$

Substituting w into equations (11.7) and (11.10) and repeating the optimization of equation (11.14) yields

$$\begin{aligned} \frac{\partial C}{\partial s} &= V_0 N(d_1) + (1-\phi-\tau) V_0 [N(d_1) - e^{-qT} N(d_2)] \\ &\quad + \tau w_1 \beta V_0 N(d_2) + (1 - \tau w_1 s \beta) V_0 \frac{\partial N(d_2)}{\partial s} = 0 \end{aligned} \tag{11.20}$$

The last term of equation (11.20) is zero.[4] Under the framework of risk-weighted capital regulation, a higher s is always accompanied by a higher capital ratio which automatically reduces bank debt. If the regulator increases the effective capital ratio on risky assets, using either higher risk weight or a higher overall required ratio, the impact on the bank's marginal equity value of s is

$$\begin{aligned} \frac{\partial^2 C}{\partial s\, \partial w_1} &= \frac{\partial N(\cdot)}{\partial w_1} + (1-\phi-\tau) V_0 (1 - e^{-qT}) \frac{\partial N(\cdot)}{\partial w_1} \\ &\quad + \tau \beta V_0 \left[N(d_2) + \frac{w_1 f(\cdot)}{\partial X \sigma T^{1/2}} \right] > 0 \end{aligned} \tag{11.21}$$

The sign of equation (11.21) is positive if . Raising the effective capital to asset ratio of the risky asset increases the bank's incentive to increase the risk of its portfolio if the risk premium of deposit insurance is low. This seems to imply that the new standard may not be effective in solving the problem of moral hazard since it ignores the effects of interest rate risk. When the bank increases its risky assets, debt decreases and the bank has to increase equity capital which will subsequently reduce its taxable income. In response to lower expected tax liabilities, the bank will rebalance the risk hedge and alter its investment policies. This may eventually lead to a higher s and a correspondingly higher risk exposure.

4
CONCLUDING REMARKS

Much of the previous research on bank capital regulation has concerned itself primarily with the default risk of bank assets. This chapter analyses bank capital regulation in the light of two types of risk: default risk and interest rate risk. The bank is assumed to act to maximize the after-tax value of its equity. This analysis, which is based on the contingent claims approach, suggests that the tax liabilities of the bank can be represented as a convex function of the before-tax value of bank assets. Risk hedging may stabilize taxable income and reduce the expected tax liabilities of the bank. Alternately, the value of the deposit insurance subsidy increases with the bank's risky investments. The optimal bank portfolio is jointly determined by its risk-hedging policy related to the expected tax liabilities and its risk-taking policy related to the value of the deposit insurance subsidy.

The model in this chapter has a particular feature: it introduces a stochastic diffusion process and develops a two-asset option valuation formula based on Rubinstein (1983). The high-return risky asset and the low-return liquid asset in the portfolio represent the realities of banking. Furthermore, the model also allows the separate analysis of both types of risk. It shows that, in the presence of interest rate risk, bank capital regulation based on default risk of bank assets exclusively may not effectively reduce the proportion of risky investments in the bank's overall portfolio. In response to the new risk-based bank capital regulation, a value-maximizing bank may adjust its global management policy such that it increases its interest rate risk exposure. As result, the total bank risk, as well as the risk of bankruptcy, may not be reduced.

NOTES

1 The marginal probability of bank solvency with respect to s is

$$\frac{\partial N(d_2)}{\partial s} = f(\cdot)\,\frac{D - V_0}{sX\sigma T^{1/2}} < 0$$

2 According to the regulations on bank deposits, usually only the small depositors can be fully compensated in the case of deposit loss. In the United States, for instance, the maximum deposit ceiling to the deposit insurance is US\$100,000. In Canada the maximum insured deposits is C\$60,000. In this analysis, full compensation of all depositors is assumed to simplify the analysis.

3 Since $D=(1-w\beta)V_0$, the partial derivative

$$\frac{\partial N(d_2)}{\partial w} = f(\cdot)\,\frac{\beta V_0}{\sigma T^{1/2} X} > 0$$

$$\frac{\partial N(d_2)}{\partial s\,\partial w} = \frac{-f(\cdot)\beta V_0}{\sigma T^{1/2} sX}\left(1 + \frac{w\beta V_0}{\sigma T^{1/2} sX}\right) < 0$$

4 Since D is a function of both s and w,

$$\frac{\partial N(d_2)}{\partial s} = f(\cdot)\left(\frac{\partial d_2}{\partial s} + \frac{\partial d_2}{\partial w}\,\frac{\partial w}{\partial s}\right) = \frac{f(\cdot)V_0}{\sigma T^{1/2} sX}\,(w_1\beta - w_1\beta) = 0$$

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12
Financial Institutions Reform, Recovery and Enforcement Act 1989 (FIRREA) and the management of thrifts in the 1990s

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1
INTRODUCTION

The passage of the Depository Institutions Deregulation and Monetary Control Act (DIDMCA) of 1980 and the Garn-St Germain Act of 1982 opened a new era of challenges to the financial service sector in general and the thrift industry in particular. The birth of money market funds under the pressures of the inflationary growth of the 1970s, and the roller coaster performance of the thrifts ever since, brought out clearly the threats to the survival of the thrift industry. Bounded by the tradition of dual banking system thrifts were burdened with mortgage assets most exposed to interest rate risks. The significant flight of deposits during the late 1970s from the thrifts hampered their ability to reposition their asset portfolio towards more interest-sensitive lending options. The changes initiated by the Acts did provide a reprieve from the certain demise of these institutions due to disintermediation (see Gillian *et al.* 1983). The Acts opened a whole set of options including MMDAs and broadened asset acquisition powers for the thrifts as a vehicle to ensure their competitive survival.

However, the very process of deregulation initiated at a time of inflationary growth, and the new emphasis of the Federal Reserve away from interest rate management towards the management of monetary aggregates (see Kane 1983), led not only to increased cost of funding but also to increased exposure to highly volatile interest costs. The time lag in the broadening of asset acquisition powers coupled with a backlog of fixed rate mortgage portfolios handicapped the thrifts from the start. Innovations in the mortgage market, including the ARMs, met with consumer resistance and presented competitive problems. The exposure to interest rate risks and the difficulties in restructuring asset portfolios placed enormous pressure on (thrift) management to find a whole set of nontraditional strategies for successful performance. This was and is no ordinary challenge to the management of thrifts whose experience has largely been in the prederegulation environment.

The spate of recent performance failures in the thrift industry exacerbated by regional economic problems is largely the result of thrift managements' inability to cope with the challenge. However, the shear magnitude of the burden imposed on the taxpayer to the tune of $285 billion by 1989 (see Thomas 1989) forced the community to recognize the debacle and stem the haemorrhage. The Financial Institutions Reform, Recovery, and Enforcement Act (FIRREA) of 1989 was the community's response to the savings and loan institutions (S&Ls) debacle. It was a major attempt to restructure the governance of the thrift activities, to formulate standards and expectations of appropriate conduct and to provide enforcement authority to the regulators. FIRREA's focus, content and impact on thrift performance management is best understood and appreciated by looking back on performance strategies of the 1980s in the wake of deregulation.

This chapter sketches broadly the events leading to the debacle, the key features and challenges posed by FIRREA, and its impact on the formulation and development of viable thrift performance strategies for the 1990s.

2
THRIFT MANAGEMENT OF THE 1980s

The dual banking system, unique to the United States, assigned to the thrifts a central role in the financial system, as providers of home mortgage financing over the decades. All through this period management strategy has been fairly straightforward. Sustained growth and profitability were accomplished through a relatively successful technique of funding fixed rate mortgage growth with renewable short-term deposit sources. A consistent positive spread with short-term rates remaining below lending rates combined with the secular growth in demand for mortgages validated this strategy for years. The notion that there is risk exposure in this strategy and that spreads could become adverse was lost on a whole generation of thrift management.

Consequently, the first reckoning of the risk exposure came in the mid 1960s. Increasing interest rates during this period burdened the thrifts with the increasing costs of refinancing deposits, resulting in a profit squeeze. The Interest Rate Control Act of 1966 that enabled the Federal Home Loan Bank Board (FHLBB) to set the (interest rate) ceilings on deposits solved the profit squeeze problem for the remainder of the decade (see White 1991). However, by the late 1970s the comfort of the controlled deposit rate scenario collapsed with the advent of money market funds. Increasing inflation and interest rates caused large-scale flight of deposits from the thrifts. Interest rate ceilings transformed the interest rate risk to imminent funding crisis. At this time the pressure to deregulate the whole financial industry was mounting. It was resolved that the thrifts' problems could best be solved by giving them the powers to diversify the asset base, to provide flexibility in pricing methods and more importantly to enhance their competitive position versus the money market funds in securing and retaining deposits. These special provisions were built into the DIDMCA of 1980 and the Garn-St Germain Act of 1982. The regulatory responses of the 1980s were seen as sensible because these provisions were expected to help thrift management to resolve their funding crisis, and offer them the needed flexibility to diversify their asset base as a vehicle to reducing their exposure to interest rate risk. However, the Fed's policy shift in favour of holding down monetary growth in late 1979 (see Kane 1983) and the subsequent interest rate volatility threw the thrifts to the wolves: recurrent and unmanageable negative spreads. In this environment, as noted by White (1991), the lack of provisions in the deregulation acts for any "stepped up effort at safety-and-soundness regulation and/or the expanded use of economic incentives (e.g., the use of risk based insurance premiums)" opened the gates for *ad hoc* and even perverse management strategies for growth and profitability. A number of thrifts took the opportunities to expand their asset base into diverse high risk areas, using their new-found capabilities in funding asset growth with highly interest-sensitive deposits including high cost brokered funds. The incentive was the relatively high (expected) profit potential that could lead to an easy turnaround (see White 1991).

A strategy based on this opportunity-capability-incentive framework could have proved to be successful had it been implemented with restraint and prudence in ensuring that the newly acquired asset risks were properly assessed and the returns were commensurate with risk exposure. The pace of opportunity seeking in the case of failed institutions were clearly not consistent with prudent behavior. In the case of a few S&Ls; within this group growth was accomplished without regard to laws and regulations. White (1991) refers to studies by Barth *et al.* (1989) and Cole and McKenzie (1989). These studies show that the failed institutions were quite aggressive in acquiring nontraditional assets. Further evidence offered by White (1991) comparing the group of soon-to-fail thrifts with the rest of the thrift industry as of 1985, showed that the first group "had appreciably higher percentages of all categories of nontraditional assets, except for consumer loans". For a number of them this strategy meant a disaster. For many thrifts failures resulted, as White noted, from "an amalgam of deliberately high risk strategies, poor business judgment, foolish strategies, excessive optimizm, and sloppy and careless underwriting, compounded by deteriorating real estate markets". All of this was possible because of the cover provided by the deposit insurance facility, the lack of regulatory will and the lack of regulatory authority that was needed to ensure prudent behavior. FIRREA had to be legislated as a corrective measure. The Act thus turned out to be an effort to pull together various pieces of legislative demands directed largely towards cleaning up the S&L mess and forestalling further bleeding in the industry.

3
FIRREA

Key features

FIRREA is voluminous, sweeping and even radical in its approach to regulation. However, being a sequel to the S&L debacle, it is focused on the perceived need to clean up the mess of the 1980s. FIRREA is an attempt to promote rational banking behavior in risk-taking. One can only see in this Act the desire of the community that provides deposit insurance to become an implicit partner in the thrift management process.

The stated purposes of the Act include the objectives of promoting stable and sound housing finance, and effective supervisory powers with enforcement authority (see Raymond 1990). The major features of the Act are as follows: redefining and restructuring of regulatory authority, the establishment of a funding mechanism to absorb failed S&Ls, affordable housing guidelines, the imposition of asset constraints and capital requirements, and the strengthening of enforcement powers (see Barth *et al.* 1990).

Regulatory structure of thrifts

The Office of Thrift Supervision (OTC) was created as the new supervisory agency replacing the FHLBB as the oversight authority for the industry. The 12 district banks of the Bank Board were retained to provide emergency loans and to initiate and administer affordable housing and community lending programs. A new agency, the Federal Housing Finance Board, was created to oversee the district banks. The Office of Thrift Supervision was placed under the Treasury. The Act abolished FSLIC and empowered FDIC as the sole insurer of depository institutions.

Funding and liquidation of assets of failed thrifts

The Act established the Resolution Funding Corporation to raise funds to meet the obligations incurred by FSLIC. These funds were to be transferred to the Resolution Trust Corporation (RTC) set up to manage the disposition of insolvent thrifts. FDIC was designated as the “exclusive manager” of the RTC’s day-to-day operations.

Asset constraints and capital requirements provisions

The Act prohibited the thrifts’ acquisition of junk bonds, and reduced acceptable exposure to commercial real estate mortgages. The Qualified Thrift Lender (QTL) test was changed, requiring 70 percent of assets to be in mortgage-related investments. Eligibility to enjoy the tax advantages were thus extended at the cost of flexibility.

Capital requirements for thrifts were brought in line with those for national banks through a provision that such requirements could be “no less stringent” than those for national banks. The Act also eliminated the forbearance provisions of the Competitive Equality Banking Act 1987. The new capital standards included core capital, tangible net worth requirements and risk-based capital requirements (see Wade 1990). As of October 1989, it appeared that about 23 percent of the 3,000 thrifts would have difficulty in meeting the new capital ratio of 1.5 percent in tangible assets (see Nowesnick 1989). The law also requires that institutions not meeting the new standards file capital (regulation) compliance plans by the end of 1994 (see Fair 1990).

Enforcement provisions

The law strengthened the enforcement authority of regulators by specifying penalties for fraudulent acts committed by managers and directors of the thrifts. These provisions also gave more leeway in issuing cease and desist orders to depositories (see Lang and Schiller 1989).

Other provisions

Other provisions include standards for appraisals, community reinvestment and consumer protection legislation, empowering of bank holding companies’ acquisition of thrifts across state boundaries, state agency purchase of mortgage-related assets from RTC or FDIC, and eligibility of commercial banks for voluntary membership in the Federal Home Loan Bank system.

4
MANAGEMENT OF THRIFTS IN THE 1990s

FIRREA is a culmination of the S&L debacle of the 1980s. In the context of Kane’s regulatory dialectics (see Kane 1977, 1981, 1986) it is hard to see where this legislation would fit. It is at best a component of antithesis, but coming this time from the frustration of the community at large. The public has not been able to grapple yet with the critical issue: if not the legitimacy of deposit insurance, at least the pricing of it to ensure that depository managers would meet their dual role of agents of stockholders and the community. Inevitably it is as rational an approach as the community could agree upon under the pressure of the cascading thrift insolvency of the time. It is an attempt to put in place a mechanism that would promote acceptable risk-taking behavior among the thrifts and yet enable continuation of the dual banking system that seemed to have worked so well in funding growth of housing stock in United States over the years.

One could see in this Act, the desire of the public who provides deposit insurance to become an implicit partner in the thrift management process. Whether such arrangements implicit in this legislation can be lasting, only time will tell. However, one may conjecture that the enormity of the supervisory burden imposed on both the regulators and the regulated will force the search for more cost-effective alternatives to manage the agency risk built into the deposit insurance privilege. Until then thrift management has to accept the challenge of working within the law and develop performance strategies compatible with their dual agent role.

5
PERFORMANCE STRATEGIES

Thrifts, by design, operate in a niche market within the financial service industry, though not exclusively. They have to compete for their share not only among themselves but also among their big brothers, the commercial banks. The privileges of being a niche player and the attendant favorable tax provisions are mitigated by constraints on product diversity. Dependence on mortgage markets primarily in the regional markets limits geographic diversity and further compounds volatility problems. Furthermore the traditional approach to profit generation through the classic "transmutation" process of funding long-term assets with short-term deposits is simply not prudent in the new world of interest rate volatility, as the lessons of the late 1970s and the 1980s have shown. Imperative for successful performance is carefully planned quality asset acquisition, pricing, rollover and disposition approaches coupled with carefully priced liabilities with a diversified maturity composition supported by a disciplined accumulation and timely acquisition of capital. The key words are discipline and planning. The major components of a performance strategy for the 1990s are identified below.

Asset management issues

Asset quality

Traditional asset quality determination is primarily based on the borrower's capacity variables. With the advent of a variety of options to price mortgages these traditional approaches need to be supplemented by a disciplined review of a borrower's capacity in the context of the pricing scheme preferred by the borrower. The new variable rate schemes provide interest rate sensitivity to the mortgages. However, if the cash flow pattern of the repayment scheme is not compatible with the borrower's exposure to income risk, the mortgage is more likely to be exposed to increased default risk, negating the interest rate risk reduction. The loan to value ratio, to the extent that it is competitively feasible, must reflect borrowers' exposure to income risk without violating the fair lending process. Maximum discipline must be exercised in ensuring conformity to appraisal standards, preferably using a more conservative yardstick than the law requires. Thrifts must ensure that the acquisition of the revenue stream in every case is fully compatible with the acceptable risk exposure.

Asset pricing

Asset pricing options should be identified in the context of market segments served, cost effectiveness of implementation, and the balance required between flexibility and continuity of product offering. Initiation of new products or changes in emphasis from one product to another must be timed on a planned basis and in no case should be *ad hoc*. Cash flow implications of different alternatives should be matched to the liability and capital management requirements over the planning horizon. Choice of pricing schemes should also conform with the need to communicate effectively with the borrower and the training needs of lending and loan originating professionals.

Asset diversification

The diversification needs discussed here relate to the composition of assets priced using different schemes. The objective should be to achieve a desirable (if not optimal) cash flow pattern consistent with interest rate and economic scenario and the liability composition.

Asset rollover

Reinvestment of mortgages on resale of homes and refinancing of existing mortgages must be carefully forecasted and budgeted to avoid *ad hoc* changes in the portfolio risk exposure. Where pricing schemes lead to built-in changes in outstanding balances as interest rates change, strategies should be in place for funding the increases or using the decreases.

Asset disposition

Active but planned and timely disposition of assets through securitization and secondary market operations should be put in place to ensure cost-effective cash flow generation. Managed disposition should form an integral part of asset quality management. Signalling approaches must be implemented to trigger asset disposition activities.

Liability management issues

Product diversity

The management should seek diverse deposit liabilities tailored to its clientele group and timed to meet the planned demand for funds consistent with interest rate risk exposure expectations. Nontraditional deposits should be carefully priced and should conform to predetermined guidelines. Home loan bank sources of funds should be prudently managed with a formulated retirement plan.

Capital planning

Capital planning that ensures a disciplined reinvestment approach should form an essential part of cash flow management. Cost-effectiveness of dividend policies must be carefully analyzed and a long-term approach should be nurtured. New capital funding should be timed in the context of long-term needs and market conditions.

6
CONCLUSION

The components of the performance strategy narrated above are largely a restatement of the basic principles of good management practices necessary to ensure an appropriate risk-return strategy in any business setting. The restatement is meaningful here in the context of the 1980s S&L management practices. Among a multitude of reasons for the debacle the one that stands out is the failure of management to follow basic principles of rational business decision-making. One wonders why S&Ls who had lost their net worth just wouldn't quit like most other businesses. Herein lies the problem of deposit insurance. As long as the depositories are the beneficiaries of this unique shield, the only way to hold the management from running towards the bear (see Kane 1977) is to expect compliance to the basics of prudent management methods through the force of law.

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13
Bank failure and capital adequacy regulation in commercial banks

Jiachu Song and William Rayburn

1
INTRODUCTION

A financial institution's capital is expected to serve a variety of purposes. It serves the purpose of absorbing losses so that banks can continue to operate, it protects investors from the possible losses associated with bank insolvency and it helps to build investors' confidence in banking firms so that banks can attract deposits. Furthermore, adequate capital allows financial institutions to comply with regulatory guidelines. It is considered an essential factor in risk control by investors, the public and government regulatory agencies.

Capital adequacy is the level of capital necessary, as determined by regulators, investors and others, to guarantee a financial institution's health and soundness. Agreement on what level of capital is sufficient to serve these purposes is difficult to reach. Bankers argue that there are market forces which monitor the behavior of financial institutions, and so there is no need for government intervention. Regulators think market forces are not sufficient to control financial institutions' risk-taking activities and government capital adequacy regulations are needed to force the financial institutions to maintain sufficient capital to sustain the health and soundness of the financial system.

Capital adequacy regulations are not new. The first formal one was set by the Comptroller of the Currency in 1914. Those regulations have undergone continued refinement and the three government banking regulatory agencies (FDIC, FRB, OCC) had separate standards for the financial institutions under their supervision. In 1981, these three government regulatory agencies set the first coordinated minimum capital adequacy requirement for all regional and community banks. In 1983, the Federal Reserve set the minimum capital ratio for multinational banks. This is the so-called uniform capital ratio requirement.

The uniform capital ratio requirement has been criticized for being ineffective in bounding financial institutions' risk-taking activities. A major drawback of this regulation is that financial institutions can adjust their portfolio by increasing the share of higher-yielding assets but requiring no more capital than lower-yielding assets. In particular, some banks switched from short-term, low-yielding, liquid assets to higher-yielding but riskier assets. Also, since the capital requirements only applied to assets carried on the balance sheet, banks began to expand off-balance-sheet activities rapidly. As a consequence, the Fed proposed standards for measuring capital on a risk-adjusted basis in February 1986. The proposal was designed (1) to reduce incentives to substitute lower-risk for higher-risk assets; (2) to address the rapid expansion of off-balance-sheet exposure; (3) to move US capital policies more closely into line with those of other industrialized countries. This proposal has undergone continued refinement and final guidelines were adopted officially in December 1988 (Alfriend 1988).

As shown in Tables 13.1 and 13.2, under this proposal the assets and certain off-balance-sheet items were assigned to one of four broad categories and weighted by their relative riskiness. The sum of the weighted assets values served as the risk asset total against which primary capital was to be

Table 13.1 Summary of the new risk-based capital standards

Risk categories
Category AS0 (0 percent weight)
Cash, Federal Reserve Bank balances
Securities of the US Treasury, OECD government and some US agencies
Category AS20 (20 percent weight)
Cash items in the process of collection
US and OECD interbank deposits and guaranteed claims
Some non-OECD bank and government deposits and securities
General obligation municipal bonds
Some mortgage-backed securities
Claims collateralized by the US Treasury and some other government securities
Category AS50 (50 percent weight)
Loans fully secured by first liens on family residential properties
Other (revenue) municipal bonds
Category AS100 (100 percent weight)
All other on-balance-sheet assets not listed above, including loans to private entities and individuals, some claims on non-OECD governments and banks, real assets and investment in subsidiaries
Category OBSI (off-balance-sheet items, weight in parentheses)
Direct-credit-substitute standby letters of credit (100 percent)
Performance-related standby letters of credit (50 percent)
Unused portion of loan commitments with original maturity of more than 1 year (50 percent)
Other loan commitments (0 percent)
Commercial letters of credit (20 percent)
Bankers acceptances conveyed (20 percent)
Interest rate swaps, forward commitments to purchase foreign exchange and other items (between 0 and 5 percent of the notional value, plus the mark-to-market value of the contract, capped at 50 percent)

Source: Federal Reserve Press Release

Table 13.2 Proposed definition of capital

Capital would be composed of two parts (tiers 1 and 2). Beginning December 31, 1992, all national banks would be expected to maintain a capital to risk-weighted asset ratio of 8.0 percent of which at least half must consist of tier 1 capital. In other words, tier 2 capital elements will qualify as part of a bank's total capital base up to a maximum of 100 percent of that bank's tier 1 capital.

Definition of capital

Tier 1

- common stock
- surplus
- undivided profits and capital reserves
- minority interests in consolidated subsidiaries

Tier 2

- perpetual and long-term preferred stock
- perpetual debt and other hybrid debt/equity
- intermediate-term preferred stock and term subordinated debt (to a maximum of 50 percent of tier 1 capital)
- loan loss reserves (to a maximum of 1.25 percent of risk-weighted assets)

Deductions from capital

- all intangibles except mortgage servicing rights (supervisory exceptions may also be made for goodwill)
- investments in unconsolidated banking and finance subsidiaries
- reciprocal holdings of the capital instruments of other banks

Transitional Definition

During a transition period beginning December 31, 1990, all national banks are expected to maintain a capital to risk-weighted asset ratio of 7.25 percent, of which at least 3.25 percentage points must consist of tier 1 capital. In other words, during this period up to 4 percentage points of the 7.25 percent capital ratio may consist of tier 2 capital. Also during this period, the sublimit on limited-life preferred stock and subordinated debt will not be enforced, while that on loan loss reserves will be 1.5 percent of risk-weighted assets.

Source: Federal Reserve Press Release

compared. The resulting ratio was to be used together with the existing ratios of primary and total capital to total assets in determining capital adequacy.

According to this proposal, all national banks are expected to maintain an interim minimum target ratio of capital to risk-weighted assets of 7.25 percent by year-end 1990 and a minimum target ratio of 8 percent by the end of 1992.[1]

The subject of bank capital adequacy regulation has been attracting the attention of researchers for a long time. Many studies try to answer the question whether the risk-based capital ratio regulation constitutes a significant improvement over the uniform capital standard. To answer this question, most theoretical studies focus on evaluating the effectiveness of the capital adequacy regulations (uniform and risk-based capital ratio regulations) in risk control. Several studies (Kahane 1977; Koehn and Santomero 1980; Kim and Santomero 1988) have shown that banks can adjust their portfolios by increasing the shares of high-yielding assets but requiring no more capital than lower-yielding assets to circumvent the uniform capital requirement. Thus, it is possible that the uniform capital ratio regulation may actually increase the probability of failure for some banking firms. Those models have been criticized by Keeley and Furlong (1990). By taking into account bankruptcy risk and deposit insurance, Keeley and Furlong are able to use an option-pricing model to show that the uniform bank capital regulation can actually reduce the risk exposure of the deposit-insurance system.

Several empirical studies have been conducted to test the two conflicting hypotheses. Keeley and Furlong (1990) and Wall and Peterson (1987) have analyzed the stringency of the risk-based and uniform capital standards and whether they are binding. Avery and Berger (1991) tested the risk-based capital ratio (RBC) relative risk weights by regressing several measures of bank performance on the proportion of bank portfolios in each of the risk categories. Their results suggest that RBC constitutes a significant improvement over the uniform capital ratio standards. They also find that RBC is stricter on large banks and more stringent overall. Eyssell and Arshad (1990) examined the wealth effects of the announcements of the RBC. They found that the equity values of a sample of large publicly traded banks decrease at the time of the announcement and those banks with capital levels which are deficient relative to RBC suffer the largest relative losses. Bradley *et al.* (1991) calculated statistical estimates of the relative risk weights and the overall capital requirement for the thrift insurance system. Their empirical results suggest that the risk weights assigned to some asset categories may be too high.

As discussed above, the primary purpose of bank capital is the prevention of bank failure by absorbing losses. For the regulators, a bank's capital is adequate when it reduces the probability of future failure of that bank to some predetermined minimum level, so the determination of capital adequacy requires evaluating the risks of insolvency that result from a particular portfolio choice. In other words, bank failure is the ultimate determinant of bank performance and is probably the most appropriate measure to use in testing capital standards. But the determination of bank failure is not simple. It requires evaluating different aspects of the viability of a bank and taking into consideration credit risk, liquidity risk, management risk and so on, which cannot be captured by the simple regression models and event-study methodology used in previous studies.

During the early 1980s, the number and size of failed banks reached a historical high. This has increased the interest in developing early warning systems for bank failure. Numerous models have been developed to measure bankruptcy risk and to predict bank failures. The earliest and the best known of these models was developed by Altman (1968). Altman's Z score model uses multiple discriminant analysis (MDA) to predict business failures of firms of larger asset size. McFadden (1976) and Martin (1977) have suggested an alternative model using logic analysis. More recent studies by Frydman *et al.* (1985) and Messier and Hansen (1988) use a classification tree to deal with category variables. Unlike the previous studies, this method creates a classification tree that best discriminates the original sample. Frydman *et al.'s* study uses recursive partitioning to generate a classification tree, while Messier and Hansen's study uses an inductive method.

This study uses bank failure prediction models developed using MDA, logic analysis and a classification tree to test the effectiveness of the risk-based capital standard and the uniform capital standard in predicting future bank failures. The sample consists of 500 banks closed by the FDIC during 1984 and 1989. The financial data of the banks one year and two years prior to their bankruptcies were collected from the Call Report and used to predict the bank failures. The models developed by using the risk-based capital ratios outperform the models developed by using the uniform capital ratios in both the number of misclassifications and the ability to identify problem banks. The evidence suggests that the risk-based capital ratio is a better indicator of bank health than the uniform capital ratio and the risk-based capital ratio standards constitute a significant improvement over the uniform capital standards.

2
METHODOLOGY

In the mid-1970s the three government banking regulatory agencies (OCC, Fed and FDIC) started to use bank failure prediction models to give CAMEL ratings (capital adequacy, asset quality, management, earnings, and liquidity) to the banks under their supervision to reflect their conditions. Recently, CAMEL has been standardized by the Uniform Financial Institutions Rating System, as published by the Federal Financial Institutions Examination Council. While not formally acknowledged by the regulators, it is widely believed that the capital component of the rating scheme generally bears the greatest weight in establishing an institution's CAMEL rating (Evans 1991).

The models are usually formulated in a multidimensional space defined by a set of financial ratios (Tam 1991). The performance and portfolio ratios of banks are compared with some standards or arranged according to some statistical cutoff. Banks that fail these ratio tests are classified as potential problem banks (West 1985). Eighteen ratios are listed and defined in Table 13.3. The selection of ratios closely follows the CAMEL criteria used by the three government banking regulatory agencies. They are chosen so that each of the CAMEL areas is represented. The ratios have appeared in previous studies and have been identified as good indicators of failure.

Table 13.3 Ratio description

Ratio	*Model* *MDA*	*FL*	*DT*
Total capital/total assets	×	×	×
Net income/total capital	×	×	
Return on average asset		×	×
Loan to individual/net loan		×	×
Commercial and industrial loan/total loan	×	×	
Total loan 90 days or more past due/net loans and leases			×
Total nonaccrual loans and leases/net loan and leases			×
Total interest paid on deposits/total deposits	×	×	×
Total expenses/total assets		×	×
Net income/total assets	×	×	×
Total income/total expenses			×
Total loan/total deposits	×		
Total loan and total leases/total assets		×	×
Municipal securities/total assets	×		
Fed fund purchased and securities sold/total assets		×	×
Total loan/total assets	×		
Net loan recoveries/total loan	×		
Total loan/total capital	×		

Capital to assets ratios have been used by all these models as a measure of capital adequacy.

The MDA model used in this study was originally suggested by Altman (1968) as a tool to predict corporate failure and was implemented by Leeuwen (1985) in a banking environment. The MDA model is first established by group separation criteria, i.e. by maximizing the between-group and within-group variances. Then, the classification rule is established. Assuming a multinormal distribution of the ratios, in the case of a binary classification, the discriminant function can be stated as

$$D(X) = X'\Sigma^{-1}(U_1 - U_2) - \tfrac{1}{2}(U_1 - U_2)^{\mathrm{T}}\Sigma^{-1}(U_1 - U_2) \qquad (13.1)$$

where U_1, U_2 and Σ are the group mean and the common covariance matrix respectively. The decision rule is to classify an observation X to group 1 if $D(X) \geqslant \ln(C_{21\pi1}/C_{12\pi2})$; otherwise X is assigned to group 2. The variables C_{21}, C_{12}, π_1 and π_2 are the costs of misclassification and the prior probability of each group, respectively. The model is a linear function which actually represents a hyperplane dividing the variable space into two half-plane regions.

The factor-logistic model was suggested by McFadden (1976) and Martin (1977) as an alternative to MDA. West (1985) employed it to predict bank failures. In West's study, the logistic function is stated in the following form:

$$Y = \frac{1}{1 + e^{y}} \qquad y = C_0 + \sum_{i=1}^{n} C_i X_i \tag{13.2}$$

where X_i (i=1,…, n) represents the ith financial ratio, C_i is the coefficient of the ith ratio and Y is an index indicating the likelihood of bankruptcy. The model is constructed in two stages. First, a factor analysis is performed on the observations to identify important "factors" that influence the financial condition of a bank. Then, each bank is assigned a probability of being a problem institution.

The classification tree model was developed by Messier and Hansen (1988) by using inductive inference and was applied to predict bank failure by Tam (1991). Inductive inference is the process of going from specific observations about objects and an initial inductive hypothesis to an inductive assertion that accounts for the observation. Inductive methods attempt to discover regularities (rules) by analyzing a series of instances or examples related to a particular problem. Instances (real or hypothesized) can be provided by an expert or obtained from archival data. After relevant attributes have been identified and their values determined for each instance, an induction algorithm is used to derive production rules. In the application of the inductive algorithm to predict bank failure Tam first took examples of failed and nonfailed banks (each described by a list of ratios) and generated a decision procedure in the form of a classification tree. Unlike MDA, a classification tree is used instead of a discriminant function to classify the observations. First, assume a bank is described in terms of a fixed collection of attributes (ratios). Then, assume a ratio of a bank can be classified into two different sets C_1 and C_2, and the probability of the ratio being in set C_i is $p(C_i)$ (i=1, 2); the entropy (measure of uncertainty) of classification $E(C)$ is

$$E(C) = -\sum_{i=1}^{2} p(C_i) \log p(C_i) \tag{13.3}$$

The splitting criterion is set to maximize the entropy of the split subsets. By using examples of failed and nonfailed banks (each described by a list of ratios), a classification tree which can best discriminate the original sample can be generated.

3
DATA SELECTION AND VARIABLES DESCRIPTION

The data for testing the hypotheses are collected from 10-K reports,[2] the Call Report of Condition and Income.[3] The consolidated Report of Condition Schedule provides details on asset, liability and equity capital accounts. The Report of Income Schedule provides information on annual income. The experimental sample includes 300 banks that failed in the period 1984–7. They are taken from FDIC Annual Reports. As a control measure, the failed banks are matched against a sample of 300 nonfailed banks in term of asset sizes, number of branches, age and charter status. Values are calculated for each ratio for the year prior to failure (the one-year data set) and two years prior to failure (the two-year data set). Total capital, total assets and the assets of the four different risk categories of each bank are calculated according to the definitions shown in Tables 13.1 and 13.2.

The MDA model, the factor-logistic model and the classification tree model developed by using the risk-based capital ratios are called $\mathrm{MDA}_R(i)$, $\mathrm{FL}_R(i)$ and $\mathrm{DT}_R(i)$, while the models developed by using uniform capital ratios are called $\mathrm{MDA}_U(i)$, $\mathrm{FL}_U(i)$ and $\mathrm{DT}_U(i)$, where i=1, 2 indicates whether they are one-year models or two-year models.

The classification accuracy of the models developed by using the risk-based capital ratio is compared with that of the corresponding models developed by using the uniform capital ratio in terms of type I and type II misclassification rates. Type I misclassification is the classification of a failing bank as sound, which is most likely to be of concern to government regulators. Type II misclassification is the classification of a healthy bank as a problem bank and, if disclosed, will result in a loss of public confidence in the affected bank.

4
EMPIRICAL RESULTS

The characteristics of the experimental sample and the validation sample are presented in Table 13.4. The classification results (experimental sample) of the models developed by using the risk-based capital ratios and uniform capital ratios are shown and compared in Table 13.5. The resubstitution risk for each model is also calculated and presented in Table 13.6. The resubstitution risk is the observed expected cost of misclassification defined as

$$\frac{\pi_1 C_{12} n_1}{N_1} + \frac{\pi_2 C_{21} n_2}{N_2} \tag{13.4}$$

where n_i is the total number of type i misclassifications and N_i is the sample

Table 13.4 Characteristics of the samples

		No. of banks	*Mean total deposits*	*Mean total assets*
Experimental	Failed banks	300	45, 480, 236	49, 730, 729
	Nonfailed banks	300	48, 579, 927	51, 175, 653
Validation	Failed banks	200	120, 743, 480	159, 769, 420
	Nonfailed banks	200	124, 751, 333	166, 221, 047

Source: FDIC Annual Report 1984–9

Table 13.5 Misclassification rate (%) in the experimental sample

	One-year model			*Two-year model*		
	I	*II*	*T*	*I*	*II*	*T*
MDA_R*(i)*	6.7	17.9	12.3	6.9	19.1	12.95
MDA_U*(i)*	7.1	22.7	14.9	8.0	23.2	15.6
FL_R*(i)*	12.2	12.7	12.45	13.4	13.6	13.5
FL_U*(i)*	13.1	12.9	13.00	13.9	14.2	14.05
DT_R*(i)*	8.5	5.2	6.85	8.9	5.4	7.15
DT_U*(i)*	9.3	5.2	7.25	9.8	5.6	7.7

Note: Type I refers to the misclassification of a failed bank as sound; type II refers to the misclassification of a nonfailed bank as failed.

Table 13.6 Resubstitution risks (%) of the models

	One-year model		*Two-year model*	
	Experimental	*Validation*	*Experimental*	*Validation*
MDA_R*(i)*	0.274	0.402	0.446	0.478
MDA_U*(i)*	0.326	0.334	0.503	0.591
FL_R*(i)*	0.332	0.412	0.465	0.474
FL_U*(i)*	0.621	0.754	0.611	0.667
DT_R*(i)*	0.274	0.316	0.402	0.471
DTU*(i)*	0.324	0.366	0.512	0.560

Note: $RR=\pi_1 C_{12} n_1/N_1+\pi_2 C_{21} n_2/N_2$ where ni is the total number of type *i* misclassifications, N_i is the sample size of the *i*th group, *i*=1, 2; $\pi_1 C_{12}=\pi_2 C_{21}$.

size of the *i*th group (*i*=1, 2). Since the factor-logistic and classification tree models do not account for prior probabilities and misclassification costs, comparisons are made possible by setting $\pi_1 C_{12}=\pi_2 C_{21}$ in the MDA model.

In both the one-year and two-year periods, MDA_R*(i)*, FL_R*(i)* and DT_R*(i)* dominate MDA_U*(i)*, FL_U*(i)* and DT_U*(i)* with fewer misclassifications and lower resubstitution risks. In the one-year period, MDA_R(1) only misclassified 6.7 percent of the failed banks and 17.9 percent of the nonfailed banks, while MDA_U (1) misclassified 7.1 percent of the failed banks and 22.7 percent of the nonfailed banks. In the two-year period, MDA_R(2) misclassified 6.9 percent of the failed banks and 19.1 percent of the nonfailed banks, while MDA_U(2) misclassified 8 percent of the failed banks and 23.2 percent of the nonfailed banks. The MDA_R *(i)* (*i*=1, 2) also have substantially lower resubstitution risks compared with the risks shown by the MDA_U*(i)*. Even though the prediction capacity of MDA_R starts to degrade in the two-year period, MDA_R(2) still outperforms MDA_U(2) in terms of fewer misclassifications and lower resubstitution risks. In the case of the factor-logistic model, the results in Table 13.5 illustrate that FL_R(1) slightly outperforms FL_U(1) in terms of fewer type I misclassifications and lower resubstitution risks but agrees with $FL_U(1)$ in terms of type II misclassifications. In the two-year period, $FL_R(2)$ agrees with $FL_U(2)$ in terms of type I misclassifications but outperforms $FL_U(2)$ in terms of type II misclassifications. $DT_R(i)$ dominants $DT_U(i)$ in terms of type I misclassifications in both the one-year and two-year periods but agrees with $DT_U(i)$ in terms of type II misclassifications.

In all cases, the prediction power of the models starts to decrease in the two-year period. A plausible explanation, as suggested by Tam (1991), is that the further away from the actual bankruptcy date, the more homogeneous are the banks, making the classification more difficult. In both the one-year and two-year periods, type I misclassification rates are lower than type II misclassification rates. In government regulators' view, a type I error is more important than either type II or total classification accuracy. Banking authorities, given their goal of failure prediction, would be most concerned about the size of the type I error rate and will be willing to accept a higher type II error rate for a lower type I rate. The results obtained using the experimental sample indicate that the prediction models developed by using the risk-based capital ratios outperform the corresponding models developed by using the uniform capital ratios. Since the only differences between these two groups of models are the capital ratios used to measure capital adequacy (risk-based capital ratio versus uniform capital ratio), the results provide strong evidence to support the argument that the risk-based capital ratio is a better indicator of financial distress in commercial banks than the uniform capital ratio.

This conclusion is further reinforced by the results obtained using the validation sample. Validation tests examine the ability of classification models to predict failure or survival among a new set of samples. From a practical perspective, a prediction model which is based on past experiences and developed from a set of data from one time period should be tested against a set of data from a later time period. In this study, the validation sample consists of 200 failed banks and 200 nonfailed banks from the period 1988–9. Selection is made according to a similar matching procedure for both the experimental and the control sample.

The results are illustrated in Tables 13.6 and 13.7. In the validation sample, the prediction accuracy of $MDA_R(i)$, $MDA_U(i)$, $FL_R(i)$, $FL_U(i)$, $DT_R(i)$ and $DT_U(i)$ (i=1, 2) decrease substantially in terms of more type I and type II misclassifications than in the experimental sample, but the models developed by using the risk-based capital ratios still dominate the models developed by using the uniform capital ratios in terms of relatively fewer misclassifications and relatively lower resubstitution risks.

In summary, the empirical findings show that the models developed by using the risk-based capital ratios outperform the models developed by

Table 13.7 Misclassification rate (%) in the validation sample

	One-year model			*Two-year model*		
	I	*II*	*T*	*I*	*II*	*T*
$MDA_R(i)$	18.4	30.4	24.4	20.5	31.3	25.9
$MDA_U(i)$	19.1	22.7	25.45	22.1	36.4	29.25
$FL_R(i)$	28.4	13.2	20.8	23.5	17.6	20.55
$FL_U(i)$	28.9	14.5	20.9	26.3	16.3	21.3
$DT_R(i)$	21.4	20.3	20.85	27.3	19.7	23.5
$DT_U(i)$	23.2	20.9	22.05	29.1	23.2	26.15

Note: Type I refers to the misclassification of a failed bank as sound; type II refers to the misclassification of a nonfailed bank as failed.

using the uniform capital ratios in bank failure prediction in both the experimental sample and the validation sample. These results suggest that the risk-based capital ratio is a better indicator of financial distress than the uniform capital ratio and the risk-based capital ratio standards constitute a significant improvement over the uniform capital ratio standards.

NOTES

1 Lawrence Trautman, statement before the Committee on Banking, Finance and Urban Affairs, 100th Congress, August 10, 1987.
2 10-K is a report which provides a comprehensive overview of the registrant of SEC. It includes financial reports of firms (include banks and S&Ls) with asset size larger than $20 million.
3 The Report of Condition and Income is a data tape compiled by the FDIC which contains the financial information of banks and some other selected financial institutions.

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14
Capital regulation and bank portfolio adjustment

Tseng-Chuan Tseng, Soushan Wu and Mei-Ying Liu

1
INTRODUCTION

Banks are subject to various forms of regulation, intended to ensure their solvency. Commonly, regulators seek to achieve this goal by imposing an upper bound on the banks' leverage (i.e. through the use of the minimum capital requirement). The capital regulation is the most controversial one owing to the imprecise nature of measuring and enforcing capital standards. Basically, regulators prefer more capital to less since banks will become insolvent when their losses exceed equity and the regulators assume that, the higher the level of capital, the less the risk.

However, a bank can increase financial leverage and/or business risk to achieve the goal of expected return on equity maximization. When the ability to expand leverage is bounded by capital regulation, the bank may have an incentive to increase its business risk and thereby equity return by holding more high-yielding but riskier assets to retard the efforts of regulators. This is especially so under the uniform capital ratio regulation which neglects the asset quality of individual banks in determining capital adequacy. Furthermore, the simple leverage constraint ignores off-balance-sheet activities which generate risky returns on equity and provide an effective means to circumvent the capital ratio constraint. Consequently, it appears that the effect of the leverage constraint may be contrary to the regulatory intent and may not be an effective way to control bank risk.

The ineffectiveness of the uniform capital ratio regulation to reduce bankruptcy risk has led to the new "risk-based capital plan". The proposal requires banks to keep more capital when they engage in more risky banking practices, including off-balance-sheet activities, and therefore can correct the risk-taking behavior of banks and thereby lessen the risk of bank insolvency.

In contrast to the dramatic growth in other Taiwan economic sectors over the last four decades, the financial system has been criticized as underdeveloped and inefficient. This has led to domestic and foreign pressure for financial liberalization and internationalization which have become the major goal of financial reform over the past decade.[1] However, the authorities in Taiwan are also concerned about financial stability during the financial deregulation process. To control the risk-taking behavior of banks and maintain the soundness of the banking system, the revised Banking Law of 1989 sets a requirement for a risk-based capital ratio of at least 8 percent[2] as recommended worldwide by the Bank for International Settlement. The new act took effect in January 1993. In addition to increasing capital, most banks in Taiwan should restructure their portfolios to hold more safe and less risky assets; this can be expected to cause a substantial structural change of the banking system in Taiwan.

The main purpose of this chapter is to examine analytically the effectiveness of both the uniform capital ratio requirement and the risk-based capital plan in controlling the risk of bank insolvency. We will also examine empirically the "announcement effects" of the new risk-based capital Act on bank portfolio adjustment and the risk of bank failure in Taiwan.

This chapter proceeds as follows: in section 2, following Kim and Santomero (1988), we develop a model based on the portfolio approach to analyze the effects of the uniform ratio regulation on the opportunity set and portfolio adjustment of banks, and through it we show why ratio regulation fails to reduce the bankruptcy risk. The methods to measure the probability of failure and the regulators' solvency standard are also described in this section. Section 3 evaluates the effectiveness of the newly proposed risk-based capital plan in redressing the risk-taking behavior of banks. In section 4, we perform an empirical test in the case of Taiwan to examine the announcement effects of the new Act. The final section summarizes our findings with respect to policy implications.

2
UNIFORM CAPITAL RATIO REQUIREMENT

In this section, we investigate the bank portfolio response to the capital ratio regulation. The approach goes on to compare the efficient frontier and optimal portfolio with and without the capital adequacy requirement. The major assumptions used to construct the model are as follows:

1 The bank acts as if it is operating in perfectly competitive markets.
2 All assets are risky and their returns have a joint normal distribution, but the deposit is riskless and only one item. No short sales of assets are allowed while deposits can be sold short. The risks of the first n–1 assets which appear on the bank's balance sheet result from the default, interest rate and liquidity risk. The nth asset represents off-balance-sheet activities which do not need any monetary investment but generate risky returns contributing to the return on equity capital.
3 Banks are single-period risk-averse expected utility maximizers. The utility function of end-of-period wealth is approximated by a Taylor expansion

truncated after the second moment. Thus, the objective function is defined over the mean and standard deviation of return on equity capital.

4 Bank regulators are concerned with the safety and soundness of the banking system and hence try to reduce the risk exposure of banks through capital regulation.

The efficient frontier

We derive the efficient frontier with and without capital regulation to investigate the effects of capital regulation on the opportunity set of a bank. To conduct this analysis we first examine the optimal allocation of funds with a given leverage and later allow the leverage ratio to vary to obtain the global or unconstrained efficient frontier.

To find the efficient frontier, the bank has the following problem:

$$\min \frac{1}{2}\sigma^2 = \frac{1}{2} X^{\mathrm{T}}\Sigma X \tag{14.1}$$

subject to

$$X^{\mathrm{T}}\mathbf{1} \leqslant \frac{1}{k} \qquad 0 < k < 1 \tag{14.2}$$

with

$$E = (1 - X^{\mathrm{T}}\mathbf{1})R + X^{\mathrm{T}}\bar{E}$$

where E and σ^2 are the expected value and variance of the return, per unit of capital, on the bank portfolio. X is an $n\times 1$ vector of asset holdings x_i, as a proportion of the equity capital, for i=1, 2,…, n, where x_n is the amount of off-balance-sheet items; therefore the amount of deposit issued is $x_0=1-X^{\mathrm{T}}1<0$, with $x_i>0$ due to the short sale restriction. 1 is an $n\times 1$ vector with first $n-1$ elements 1 and nth element 0. $\bar{E}$ is an $n\times 1$ vector of asset returns E_i, for i=1, 2,…, n. Σ is an $n\times n$ variance-covariance matrix of asset returns $[\sigma_{ij}]$ for i, j=1, 2,…, n and is assumed to be positive definite. R is the risk-free rate paid for deposits and k is the ratio of equity capital to assets.

Equation (14.2) represents the leverage or capital constraint imposed by regulators. As the value of k varies from zero to unity, the leveraging potential of the bank varies from the bank's unconstrained optimum to an amount equal only to its equity capital. That is, the leverage of the bank is constrained by k.

Solving this constrained portfolio problem yields the following constrained frontier:

$$\sigma^2 = \frac{C(E-R)^2 - 2(A/k)(E-R) + B/k^2}{\Delta}$$

or

$$E = R + \frac{1}{C}\left[\frac{A}{K} + \left(-\frac{\Delta}{K^2} + C\,\Delta\sigma^2\right)^{1/2}\right] \tag{14.3}$$

where

$$A \equiv \mathbf{1}\Sigma^{-1}(\bar{E}-\mathbf{1}R) \qquad C \equiv \mathbf{1}\Sigma^{-1}\mathbf{1} > 0$$

$$B \equiv (\bar{E}-\mathbf{1}R)^{\mathrm{T}}\Sigma^{-1}(\bar{E}-\mathbf{1}R) > 0 \qquad \Delta \equiv BC - A^2 > 0$$

Equation (14.3) indicates that the frontier is a function of the target return on equity, the leverage constraint and the market-determined parameters of the return on each asset and liability. In the mean—standard deviation space, the constrained frontier is the upper half of a hyperbola with minimum variance portfolio $P_{mvp}(\sigma_{mvp}, E_{mvp})$: $((1/k)C^{1/2}, R+(A/kC))$.

The effect of changing the capital requirement on the position of the efficient frontier can be examined by allowing k to change in equation (14.3). The derivatives of σ_{mvp} and E_{mvp} with respect to k will demonstrate the effect of changing k on the minimum variance portfolio:

$$\frac{\partial\sigma_{\mathrm{mvp}}}{\partial k} < 0 \qquad \frac{\partial E_{\mathrm{mvp}}}{\partial k} < 0 \tag{14.4}$$

Equation (14.4) indicates that the more stringent the restriction imposed on the leveraging capacity of the bank (larger k), the more the minimum variance portfolio and the constrained frontier fall downward and to the left. This implies that both the risk and the return of bank portfolios decline over the entire efficient frontier as k increases.

Next, the characteristics of the bank's efficient frontier are described when there is no constraint, so that the effect of capital regulation can be compared with this benchmark.

The global efficient frontier can be obtained from equation (14.4) by choosing the optimal leverage k to minimize the variance σ^2 for a given expected return on equity, as follows.

$$\sigma^2 = \frac{(E-R)^2}{B}$$

or

$$E = R + B^{1/2}\sigma \tag{14.5}$$

The global efficient frontier represents the efficient set that the bank can achieve when there is no regulatory constraint imposed on its leverage decision. As pictured in Figure 14.1, the frontier is the solid part ($0<k<1$) of the half-line RF. Figure 14.1 also presents a comparative display of constrained and unconstrained frontiers. The constrained frontier with a certain level of k_i is tangent to the unconstrained frontier from below at the point where the optimal leverage k^* of the bank is exactly equal to k_i. This

implies that all these portfolios over the entire constrained frontier are inefficient relative to those of the unconstrained frontier except for the tangent portfolio. In fact, the global frontier is composed of all these tangent points. Thus, the global frontier is the envelope curve of constrained frontiers which correspond to all levels of leverage k.

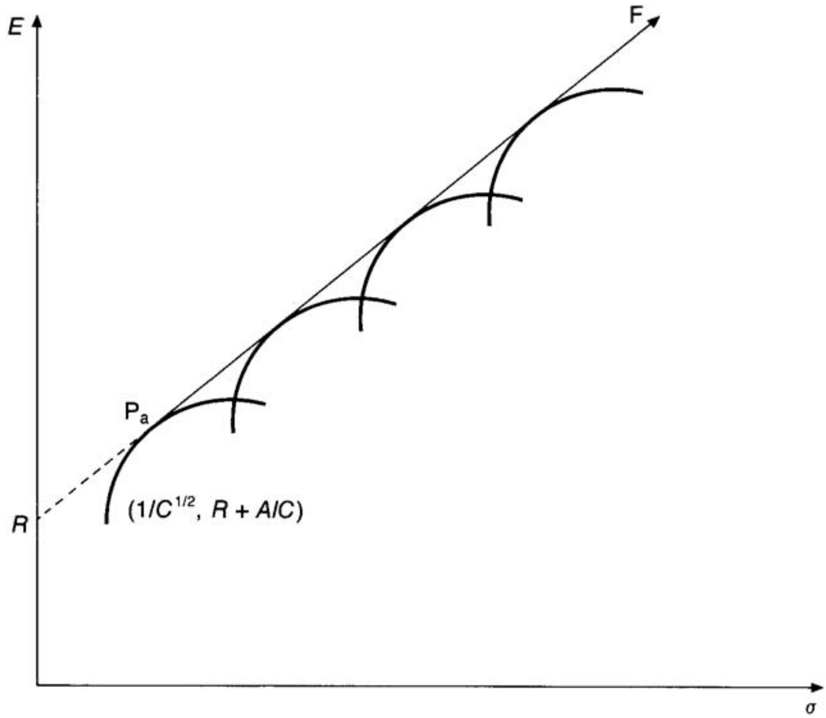

Figure 14.1 Global (unconstrained) versus constrained efficient frontier

We have demonstrated that the capital regulation can alter the shape and position of the efficient frontier. Now the net effect of the uniform capital ratio regulation on the investment opportunity of the bank can be examined.

Consider that the regulators set a minimum capital ratio requirement k_R (i.e. $k \geqslant k_R$). Under this regulation, if the bank chooses a portfolio corresponding to the optimal leverage k^* and $k^* \geqslant k_R$ (i.e. $E^* \leqslant E_R$), then the capital ratio constraint is not binding. Thus the frontier which the bank faces is the global frontier P_aF. Otherwise, if $k^* \leqslant k_R$ (i.e. $E^* \geqslant E_R$), then the capital ratio constraint becomes binding and the frontier which the bank faces becomes the unconstrained frontier GH (see Figure 14.2).

Therefore, under the capital regulation the frontier changes from P_aF to P_aH which is composed of two parts: P_aP_R and P_RH, eliminating the area between P_RH and P_RF. On the whole, the net impact of the capital

regulation on the bank is a result of shrinkage of the feasible set in which the bank may operate. That is, the capital regulation degrades the investment opportunity of the bank, whereas the exact portfolio, as discussed later, will be dependent upon the risk preference of the bank.

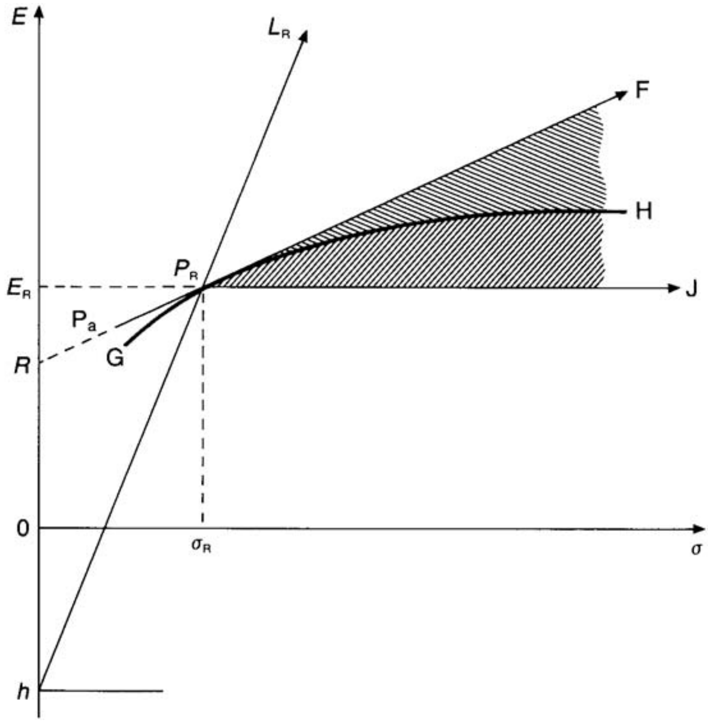

Figure 14.2 Bankruptcy probability, bank portfolio and capital regulation

Bankruptcy risk and ruin constraint

An important part of this study is to determine whether the regulation, in fact, promotes the safety of the bank and lessens its possibility of failure. To carry out this analysis, the effects of capital regulation on a bank's risk-return characteristic must be translated into probability of failure.

Bankruptcy risk

We assume that the purpose of regulation of banks is to constrain the probability of failure. Failure is defined as the situation where the bank's earnings fall below a certain level h. Apparently, the probability of failure depends on the distribution of the bank's return on equity R_p. Without prior information about the properties of the distribution of R_p, the upper bound of the probability of failure can be estimated by use of the Chebyshev inequality[3]

$$P\left(R_p < h\right) \leqslant \beta = \frac{\sigma^2}{(E-h)^2} \tag{14.6}$$

where β is the probability of failure of the bank. For a given portfolio, the relationship between the probability of failure and *(σ, E)* can be further specified when Rp is assumed to be approximately normally distributed. Rewriting equation (14.6) in its standardized form leads to

$$P(R_{\mathrm{p}} \leqslant h) = Z\left(\frac{h-E}{\sigma}\right) = \beta \tag{14.7}$$

which gives

$$E = h - Z^{-1}(\beta)\sigma \tag{14.8}$$

where Z is the standard normal variate. Given the mean and standard deviation of the bank's selected portfolio, the probability of failure can be determined according to equation (14.8). Graphically, equation (14.8) represents a line connecting (0, h) to the selected portfolio $P(E^*, \sigma^*)$ in (E, σ) space and provides a simple means of comparing the possibility of default of different banks. The steeper the slope is, the smaller is the probability of default of the selected portfolio. Moreover, the probability of default of the selected portfolio is indifferent along the same line. These lines, corresponding to different levels of probability, may be regarded as iso-probability lines.

Ruin constraint

The major responsibility of the regulators is to set a solvency standard. They attempt to reduce the chance of bank failure by setting the level of h and an upper bound a on the probability of bankruptcy, i.e. a requirement that

$$P(R_{\mathrm{p}} \leqslant h) \leqslant \alpha \tag{14.9}$$

Under the normality assumption, equation (14.9) can be rewritten as

$$E_{\mathrm{R}} \geqslant h - Z^{-1}(\alpha)\sigma \tag{14.10}$$

Equation (14.9) implies that the regulator's preference depends on the probability of bank failure. That is, the utility function of regulators is $U(\alpha)$ and $U'<0$ since the regulators prefer the lower failure probability. Therefore, the above discussed iso-probability lines are equivalent to the indifference curves of regulators. Referring to Figure 14.2, equation (14.10) defines a half-plane in (E, σ) space. Only banks with portfolios to the left of L_{R}: $E_{\mathrm{R}}=h-Z^{-1}(\alpha)$ voluntarily comply with this constraint and are regarded as safe (conservative) banks. The others will be classified as risky. Clearly, the solvency regulation is redundant for safe banks. Thus, only the risky banks are of interest to bank regulators.

Portfolio behavior under capital regulation

The bank is assumed to maximize expected utility which is defined over all (E, σ) of returns according to Assumption 3. The objective function U is monotonically increasing and strictly concave, and $U_E>0$, $U_\sigma<0$. Accordingly, the risk-averse bank's preferences may be described by upward-sloping indifference curves.

To achieve the solvency standard, the regulator imposes a minimum capital requirement $k \geqslant k_R$ to constrain the upper bound of bankruptcy probability at α since the constrained frontier with k_R is tangential to the global frontier at $P_R(E_R, \sigma_R)$. Thus, the decision problem of the bank becomes[4]

$$\max_{E,\sigma} \; E(U) = U(E, \sigma) \tag{14.11}$$

subject to

$$E = R + B^{1/2}\sigma \text{ if } E \leqslant E_R \tag{14.12}$$

$$E = R + \frac{1}{C}\left[\frac{A}{k_R} + \left(C\Delta\sigma^2 - \frac{\Delta}{k_R}\right)^{1/2}\right] \tag{14.13}$$

The first constraint refers to a global frontier which the safe bank faces, while the risky bank faces the constrained frontier with capital ratio kR. Note that capital regulation has no effect on the safe bank whereas it is bounding to the risky bank. The optimal portfolio that maximizes the expected utility is determined by the tangent point between the frontier and the highest attainable indifference curve. Thus, when the capital regulation is not binding, the optimal portfolio will lie on the global frontier along which the asset portfolio is invariant. That is, being compatible with the M-M leverage irrelevance proposition, the bank's investment decision can be separated from its leverage decision without capital regulation. When the capital regulation is in effect, the frontier falls downward, changing to P_aH from P_aF. This regulation forces the bank to choose the less efficient portfolio on the segment P_RH which can satisfy the capital requirement but, lying to the right of L_R, violates the solvency. In addition, the bank is worse off since it will be on a lower, difference curve. Although the capital regulation can limit the leverage capacity, and therefore the potential for high returns, of a bank, the bank may reshuffle its asset portfolio toward risker assets (moving along P_RH to the right). Thus the reduction of leverage via regulation may be offset by an increase in business risk. In other words, the bank's portfolio decision is not irrelevant to its leverage decision. However, the imposition of a stringent capital regulation on the banks may have a perverse effect and therefore be an ineffective way to control the risk exposure of the bank and its failure probability. It seems that some other form of capital regulation is indeed required. One option described below is the new risk-based capital plan that can correct the shortcomings of the capital ratio constraint and reduce the probability of failure to an acceptable level.

3
RISK-BASED CAPITAL PLAN

The failure of the traditional capital ratio regulation in controlling bank failure has led to the risk-based capital plan. The major aspects of this new proposal are as follows: (1) classify bank assets according to their risk characteristics and assign a risk weight to determine the minimum capital requirement of each category; (2) introduce the off-balance-sheet activities to calculate the minimum capital required level. The objective of this plan is to force the banks to add more capital to finance risky assets and off-balance-sheet activities. The new proposal is especially designed to circumvent a bank's excessive risk-taking behavior under the stringent ratio regulation.

Neglecting the complicated details, the new plan requires that

$$W^{T}X \leqslant 1 \tag{14.14}$$

where W is the $n\times 1$ risk weight vector. Equation (14.14) states that the actual level of capital must be greater than the minimum requirement.

The problem we now face is how to determine the proper risk weights so that the bankruptcy probability can be constrained to the upper level α. A rather elegant approach to drive the risk weights has been suggested by Kim and Santomero (1988), and is presented below.

To achieve the safety goal, the regulation can design a set of risk weights to make sure that the bank portfolios under the new constraint, equation (14.14), can satisfy the solvency standard, equation (14.10). Capital regulation can eliminate only the area between P_RF and P_RH but not the area between P_RH and P_RJ. The new plan will be effective if and only if it can eliminate the feasible set between P_RH and P_RJ from the opportunity set so that the bank operates only in the region to the left of L_R and thereby complies with the ruin constraint. Alternatively, the necessary and sufficient condition for the success of bank risk management through capital regulation is to make the highest expected return on the bank portfolio be bounded by E_R, i.e.

$$E_R \geqslant E = \left(1 - \sum_{i=1}^{n} x_i\right)R + \sum_{i=1}^{n} x_i E_i \tag{14.15}$$

where E_R is the highest expected return on equity among those satisfying the ruin constraint. If every asset's net contribution to E is not greater than E_R, then the expectation of any portfolio composed of such assets will be bounded by E_R. Therefore, the optimal risk weights w_i should satisfy

$$E_i \leqslant (1 - w_i)R - w_i E_R \tag{14.16}$$

Solving equation (14.16) for w_i, the sufficient condition for bounding E by E_R,

$$w_i \geqslant \frac{E_i - R}{E_R - R} > 0 \tag{14.17}$$

According to equation (14.17), the regulator can set the minimum capitalised ratio for the ith asset, i.e. the optimal risk weight for asset i is

$$\begin{aligned} w_i^* &\geqslant \frac{E_i - R}{E_R - R} \qquad \text{if } E_i > R \\ w_i &= 0 \qquad \text{if } E_R \leqslant R \end{aligned} \tag{14.18}$$

Inspection of equations (14.18) implies that, the higher the return of an asset, the more capital (lower leverage) is required. Hence, the higher return of an asset will be offset by lower leverage. In this respect, the new plan can redress effectively the bank's bias toward riskier assets under the uniform capital ratio regulation and achieve the safety goal to reduce the bankruptcy risk. In fact, it is a mixed regulation means imposed on both asset composition and capital adequacy. The critical implication of this new plan is that it places a more stringent restriction on bank activities which may well result in a significant structural change in bank portfolios along with a distortion of credit allocation in the banking system. In addition, the reduction in industry profits will to some extend retard the incentive for investment in the banking industry.

4
EMPIRICAL EVIDENCE

Data and test methodology

This section examines the "announcement effects" of bank portfolio responses to the new risk-based capital Act in Taiwan. Eleven listed banks were selected for this study. The study covers the period from 1980 to 1991 and is divided into two subperiods: (1) the pre-announcement period (1980–8); (2) the post-announcement period (1989–91). Data are from the database of Financial Report in Taiwan (FRIT). The year 1989 in which the banking law was revised is the event year.

As suggested in a previous section, the bank will respond to the new capital plan by reshuffling its asset portfolio toward safer assets, which may reduce the bankruptcy risk. Based on this facility, we designed a two-phase methodology including (1) an asset reshuffling hypothesis and (2) a bankruptcy risk hypothesis to examine the announcement effects of the new Act. The first hypothesis compares the portfolio holdings before and after the announcement. The second hypothesis examines whether bankruptcy risk decreases or increases subsequent to the announcement.

Asset reshuffling hypotheses

The difference in the mean values of the financial variables will be tested by use of the *t* statistic for paired observations. The time required to adjust portfolio composition is unknown. Thus the speed and direction of portfolio adjustment can be identified in the following regression model:

$$X_i = \alpha + \beta Z + \varepsilon_i \tag{14.19}$$

with Z=0 if T=1980–8, Z=1 if T=1989, Z=2 if T=1990 and Z=3 if T=1991, where $Z=Dt$, D is a dummy variable (D=0 if T=1980–8; otherwise D=1) and t is a time indicator (t=−8 if T≡1980,…, t; t=3 if T≡1991). The regression coefficient β can be interpreted as the rate of change of the financial variables. If β is significantly greater than zero it indicates an increase in the holding of asset i during the post-announcement period. Conversely, if β is significantly less than zero, then the holding of asset i is decreasing over the same period. In addition, a larger absolute value of β indicates a more rapid adjustment of the portfolio, and vice versa.

Bankruptcy risk hypothesis

As we suggested, the bank will react to the capital regulation and, as a result, reshuffle their asset portfolio, thereby altering their default risk. Even if asset portfolio reshuffling is detected, the problem remains whether the bankruptcy risk of the bank increases or decreases subsequent to the announcement of the new Act. This can be determined by the following multiple regression equation:[5]

$$\mathrm{ROE} = \alpha + \beta_1 D + \beta_2(\mathrm{Risk}) + \beta_3(D\ \mathrm{Risk}) + \varepsilon \tag{14.20}$$

where ROE is the mean value of the return on equity of a bank and Risk is the variance (Risk_1) or standard deviation (Risk_2) of ROE.

An estimate of the coefficient of risk, β_2, can measure the relationship between overall risk and equity return for the banking industry, while the interaction term β_3 captures the information required to test the bankruptcy risk hypothesis. A significant positive sign for β_3 implies that the bankruptcy risk decreases subsequent to the announcement of the new Act. Conversely, a negative coefficient for the interaction term suggests an increase in the bankruptcy risk over the same period.

Empirical results

Asset reshuffling hypothesis

The results for paired t tests are listed in Table 14.1. There is significant change in the holdings of cash, interbank deposits, fixed assets etc. Furthermore, Table 14.2 shows the direction and speed of bank portfolio adjustment. We find that banks hold fewer fixed assets and a larger percentage of liquidity assets, mutual funds and loans after the announcement of 1989. In addition, the equity capital and total assets, on average, increase by 4, 111 million NT dollars and 48, 426 million NT dollars in every year during

Table 14.1 Tests of reshuffling hypothesis: t test results

	1980–8 (mean value)	*1989–91 (mean value)*	*t value*	*Prob>|T|*
Portfolio composition				
X_1 Cash+deposits in other banks/TA	0.1379	0.1974	−3.0093*	0.0038
X_2 Other current assets/TA	0.1235	0.1101	1.0311	0.3068
X_3 Loans and discount/TA	0.5812	0.6145	−1.1534	0.2524

	1980–8 (mean value)	*1989–91 (mean value)*	*t value*	*Prob>|T|*
X_4 Funds, investment/TA	0.0270	0.0230	0.2913	0.7720
X_5 Fixed assets/TA	0.0258	0.0203	2.5585*	0.0118
X_6 Other fixed assets/TA	0.1043	0.0345	3.5880**	0.0005
X_7 Current liabilities/TA	0.1241	0.1248	−0.0260	0.9794
X_8 Deposits, financing/TA	0.6107	0.7059	−1.8296	0.0722
X_9 Other liabilities/TA	0.1892	0.0649	4.6242**	0.0001
X_{10} Net worth/TA	0.0759	0.0849	−0.5498	0.5848
X_{11} total assets (TA)	117522.13[a]	239542.93[a]	−2.2700*	0.0287
Profitability measures				
X_{12} Operating income	6615.38[a]	17290.93[a]	−3.4077**	0.0044
X_{13} Returns on assets	0.0128	0.0145	−0.6547	0.5162
X_{14} Returns on equity	0.2224	0.2254	−0.0872	0.9309
X_{15} Returns on sales	0.1344	0.1604	−0.0217	0.3137

Notes: *, statistically significant at 5 percent level; **, statistically significant at 1 percent level;
[a] In units of billion NT$.

Table 14.2 Tests of reshuffling hypothesis: regression results

	Constant	*Z*		*Constant*	*Z*
X_1	0.1398	0.0262	X_9	0.1893	−0.0623
	(13.511)**	(2.768)*		(11.852)**	(−4.265)*
X_2	0.1247	−0.0090	X_{10}	0.0771	0.0019
	(19.034)**	(−1.506)		(9.686)**	(2.534)*
X_3	0.5796	0.0198	X_{11}	123960	48426
	(35.273)**	(1.315)		(5.937)*	(2.534)*
X_4	0.0265	−0.0009	X_{12}	6789	4998
	(3.294)*	(−0.417)		(5.807)*	(4.671)*
X_5	0.0253	−0.0018	X_{13}	0.0129	0.0005
	(17.023)*	(−1.361)		(11.842)**	(0.573)
X_6	0.1039	−0.0341	X_{14}	0.2206	0.0048
	(8.373)**	(−3.008)**		(15.027)**	(0.3640)
X_7	0.1237	0.0010	X_{15}	0.1366	0.0085

	Constant	Z	Constant	Z
	(9.995)**	(0.090)	(15.442)**	(1.060)
X_8	0.6090	0.0509		
	(22.753)**	(2.080)*		

Note: *, statistically significant at 5 percent level; **, statistically significant at 1 percent level.

the post-announcement period. In terms of profitability the banks realized a higher return on equity and total assets. Therefore there is evidence that the banks did respond to the newly promulgated risk-based capital Act by reshuffling their portfolio composition as well as increasing capitalization.

Bankruptcy risk hypothesis

The regression results of the bankruptcy risk hypothesis tests are as follows:

$$\begin{aligned} \text{ROE} &= 0.0025 + 0.0044D + 1.3418\ \text{Risk}_1 - 0.803D\ \text{Risk}_1 \\ &\quad\ (1.917) \quad (0.994) \quad\ (8.611)^{**} \quad\ (-2.424)^{*} \\ F &= 26.384 \qquad R^2 = 0.9082 \end{aligned} \tag{14.21}$$

$$\begin{aligned} \text{ROE} &= 0.0080 + 0.0026D + 66.2858\ \text{Risk}_2 - 47.7403D\ \text{Risk}_2 \\ &\quad\ (7.937)^{**}(0.874) \quad\ (6.973)^{*} \quad\ (-3.104)^{*} \\ F &= 17.363 \qquad R^2 = 0.8669 \end{aligned} \tag{14.22}$$

A consistent, significant conclusion can be obtained from the above results. For all risk proxy tests, the sign of β_2 is positive. As expected, a positive relationship occurred between risk and return for banks over the entire period. Contrary to the hypothesis, the coefficient of the interactive term β_3 is significantly negative. This implies that the relative values of return-risk declines. That is, the bankruptcy risk of banks rose unexpectedly after announcement of the new Act. There are two explanations. First, although the new act had been promulgated, it had not come into effect. Therefore, it is not currently binding on banks. Consequently the regulation effects have not appeared in full yet. Second, because of a series of financial liberalization measures, such as deregulation of interest rates and foreign exchange holdings and particularly the possibility of establishing private banks, the competition among banks has risen drastically. As a result, the business risk of banks may increase.

5
SUMMARY AND CONCLUDING REMARKS

This study examines the reaction in bank portfolios to capital regulation. By applying a mean-variance approach, we have demonstrated that the leverage constraint changes shape from linear to convex. Further, the constrained frontier lies below the unconstrained one over the entire feasible range, yielding a less favourable efficient set. Interestingly, the impact of capital regulation on a bank's investment opportunity is to reduce the feasible set that is available. In this respect, the leverage constraint degrades the opportunity set.

When the capital constraint is not binding, a bank's investment (portfolio) decision is independent of its financial (leverage) decision, confirming the M-M leverage irrelevance proposition. When the capital constraint is binding, it forces the bank to choose an inefficient portfolio. However, the capital regulation can limit the leverage capacity for higher returns for a bank, but not the investment decision. In response to the regulation, the bank may alter its investment decision, reshuffling its asset portfolio toward riskier assets or increasing off-balance-sheet activities, to contradict the regulatory intent. Therefore, the uniform capital ratio regulation appears to be an ineffective way of controlling bank risk exposure and bankruptcy probability. The new risk-related capital plan requires the banks to add more equity capital to finance the risky assets. This can redress a bank's bias toward risk, and is potentially more effective in achieving the solvency goal. In fact, it is a mixed regulation means imposed on both asset composition and capital adequacy.

Our empirical results suggest that banks in Taiwan are responding to the promulgation of the new capital regulation Act by reshuffling their portfolios. There is evidence of a significant structural change in bank portfolios. Contrary to the hypothesis, the bankruptcy risk increased significantly subsequent to promulgation of new Act. The possible reasons are (1) that although the new capital regulation Act has been declared, it had not come into effect during our investigation period and thus the regulation effect had not fully appeared and (2) owing to a series of recent financial liberalization measures, the competition among banks rose drastically. As a result, the business risk of banks may increase —but this requires further evidence.

NOTES

1 Until now, the major measures adopted for financial liberalization and financial internalization in Taiwan include (1) interest rate liberalization; (2) market entry deregulation; (3) privatization of commercial banks; (4) capital flow deregulation; (5) access to the domestic financial market; (6) establishing an offshore banking center etc.

2 According to the revised Banking Law of 1989, if the said ratio is less than the prescribed ratio, the bank's power to distribute earnings may be restricted by the central competent authority.

3 For a detailed discussion refer to Blair and Heggestad (1978).

4 See Koehn and Santomero (1980) for the detailed derivation.

5 A similar application of this model is described by Lamy (1984).

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Part V

International investments and corporate finance

15
A general equilibrium model of international asset pricing

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1
INTRODUCTION

The objective of this chapter is to develop a general equilibrium model to examine the consumption and investment decisions of an international investor and to study the stochastic behavior of equilibrium prices of international assets, equilibrium interest rates and exchange rates. These issues are explored within the framework of intertemporal, continuous-time and multi-good open economies with fully integrated real and financial markets under a regime of flexible exchange rates. More specifically, we are concerned about pricing risks present in a production-exchange international economy.

The model posited here develops the microeconomic foundations of the intertemporal behavior of consumer-investors across countries in a dynamic general equilibrium setting in which portfolio choices and production decisions are made simultaneously. The stochastic processes followed by asset prices, commodity prices, interest rates and exchange rates are endogenously determined within the model in terms of real macroeconomic variables, risk preferences, time rate preferences and expectations. Since the production decision is endogenous in the model, it allows for tracking the effects of random changes in technology on the equilibrium prices.

The international asset pricing models (IAPM)[1] developed so far assume an exogenously specified return-generating process in which the equilibrium asset prices are not derived from the interactions between value-maximizing firms and utility-maximizing individuals. In the present work an effort is made to bridge this gap. Previous studies mainly draw on the work of Merton (1971, 1973) and Breeden (1979). The Merton-Breeden framework addresses systematic risks inherent in a closed exchange economy. The application of the Merton-Breeden framework to the open economy setting alters the nature of the systematic or market risk in the presence of flexible exchange rates. The fact that investors include international assets in order to finance their intertemporal consumption changes the nature of systematic risk. Stulz (1981) extended the Breeden (1979) model for an open exchange economy with fully integrated capital markets. The model results in a two-fund separation theorem, one fund consisting of risky assets and the other consisting of the risk-free bond of the investor's country. Stulz (1981) shows that the real expected excess return of an asset is an increasing function of the covariance of that asset with the "world" real consumption of a basket of commodities. In his model, however, no effort is made to price the exchange risk. In an earlier work, Solnik (1974) derives an IAPM in which asset returns are uncorrelated with the exchange rates which eliminates the exchange risk premium[2] based on covariance of exchange rates with assets.

Adler and Dumas (1983) allow for violation of purchasing power parity (PPP) theory. Their equilibrium relationship contains wealth and the risk-tolerance weighted average of the covariance of an asset with the inflation rates of various countries. The equilibrium prices derived within the pure exchange economy models in the extant literature do not consider the full general equilibrium in the sense of Arrow-Debreu because the equilibrium prices of risky financial assets are not related to the technological uncertainty. In general the common problem with the theories advanced so far is that they envisage allocation and pricing of risk which is not related to the fundamental sources of risk present in the economy.

Several efforts in modelling a closed economy with endogenous supply decision have been made. Among the notable ones are those of Brock (1982), Prescott and Mehra (1980), Donaldson and Mehra (1984) and Cox *et al*. (1985). In Brock (1982), the pure trade model of an exchange economy is extended to a production economy by incorporating a nontrivial investment decision into the asset pricing model of Lucas (1978). Prescott and Mehra (1980) employ a multi-good production framework to study the asset prices in a recursive competitive equilibrium. Donaldson and Mehra (1984) use recursive competitive theory to develop the general equilibrium asset pricing model and to analyze the effects of changes in preferences, technological uncertainty and expectations. Cox, Ingersoll and Ross (hereafter CIR) (1985) develop a general equilibrium asset pricing model with endogenous production. The equilibrium relationships thus incorporate hedging against technological uncertainty.

Here, a model for production-exchange open economies comprising two countries producing multiple goods is constructed to study equilibrium pricing of international assets and exchange rates. The economic environment utilizes fully integrated capital and goods markets which are informationally efficient. The methodology employs Itô type stochastic processes followed by asset and goods prices and exchange rates. Principles of stochastic control theory are used to solve the expected lifetime utility maximization problem of a consumer-investor and to determine the endogenous dynamics of equilibrium prices. These pricing relationships exhibit premia on fundamental sources of risks, namely productivity risk due to variations in productivity in various production processes, exchange risk, technology risk arising due to exogenous shocks on productivity, and systematic risk due to changes in the fundamental variables describing the state of the economy.

2
MODEL SPECIFICATIONS AND ASSUMPTIONS

The structure of the continuous-time production and exchange world economy considered here consists of two countries, home and foreign, represented by homogeneous consumer-investors[3] whose tastes, preferences and endowments are identical. At each point in time, they optimally allocate their wealth among the uniformly perceived consumption and investment opportunities which change stochastically through time.

It is assumed that international goods and capital markets are open continuously and consumer-investors face no restriction in trading continuously. The goods and capital markets are fully integrated so that the stochastic differences of the actual returns on assets and their expected returns are a martingale. This means that changes in prices imply an independent increments process. Law of one price holds all the time. Each country uses a different unit of account and different risky technologies[4] to produce a different good by combining other goods. The exogenous state variables which characterize the state of the economy at any time and other endogenous variables follow stochastic processes of Itô type. Let $X(t)$ be the vector of state variables of order $k\times 1$; the dynamics of $X(t)$ are given by the following stochastically perturbed simultaneous equations:

$$\mathrm{d}X(t) = \mu[X(t), t]\ \mathrm{d}t + \sigma[X(t), t]\ \mathrm{d}z \tag{15.1}$$

where μ is the vector-valued function of order $k\times 1$ and represents the expected changes in the state variables over the next instant, σ is the diagonal matrix-valued function of order $k\times(n+k)$ of instantaneous standard deviations or diffusions of the changes in the state variables, $\mathrm{d}z$ is the increment vector of the Wiener process of order $(n+k)\times 1$, and n and k span the investment fields in production processes and contingent claims respectively. The components of the Wiener process are jointly normally distributed random variables with zero drift and variance per unit of time normalized to unity. Drift vector μ and diffusion matrix σ together with the state $X(s)$ at any initial instant s are enough to specify the probability distribution of state $X(t)$ at any time $t>s$.

The exchange rates change according to the following stochastic dynamics:

$$\frac{\mathrm{d}e}{e} = \mu_e[X(t), t]\ \mathrm{d}t + \sigma_e[X(t), t]\ \mathrm{d}z \tag{15.2}$$

where μ_e is the drift of the rate of change of the exchange rate and σ_e is a $1\times(n+k)$ vector-valued function representing diffusion. In the present model, identical endowments and homothetic preferences of consumer-investors across countries are sufficient conditions to ensure that purchasing power parity holds continuously.[5]

Structure of the real sector

In each country, capital is the only factor of production, which can be allocated in n production technologies of which the first N pertain to home and the remaining N^* to the foreign country. Without loss of generality it is assumed that the market value of the firm using technology[6] i to produce a distinct good i by combining n goods is I_i denominated in the currency of the country of origin. Technologies are assumed to be stochastic constant returns to scale. The rate of output of each technology is stochastic due to random shocks imparted by stochastic state variables. It is assumed that capital stock does not depreciate and it is costless to install capital into production processes. It is also costless to allocate capital across all processes.

Production process i at any instant t involves a vector $q_i(t)$ of dimension n with elements $q_{ij}(t)$, j=1,…, n, which are the amounts of each good used as inputs for process i. The total amount of good j invested in all the production processes in the world is

$$Q_j(t) = \sum_{i=1}^{n} q_{ij}(t) \qquad j = 1, \ldots, n$$

The growth of a good i in excess of the consumption rate c_i is given by the stochastic differential equation

$$\begin{aligned} \mathrm{d}Q_i = \{f_i[q_i(t), X, t] - c_i\}\ \mathrm{d}t \\ + F_i[q_i(t), X, t]\ \mathrm{d}z \qquad i = 1, \ldots, n \end{aligned} \tag{15.3}$$

where f_i is the instantaneous expected total output of good i, F_i is a $1\times(n+k)$ vector-valued function of diffusion coefficients and the dz are $(n+k)$-dimensional increments of a Wiener process in space . Together f_i, and F_i represent a stochastic production function employed for production of good i. It is assumed that f_i and F_i are homogeneous of degree one in arguments $q_i(t)$ in order that the production function is stochastic constant returns to scale. The values of the domestic and foreign firms in the currency of their country are I_i=P_iQ_i, and respectively, where is the domestic (foreign) price of good i and it follows an Itô process which may be endogenously determined.

The rates of return from home and foreign industries follow the stochastic processes

$$\begin{aligned} \frac{\mathrm{d}I_N}{I_N} &= \alpha_N\ \mathrm{d}t + G_N\ \mathrm{d}z \\ \frac{\mathrm{d}I_{N^*}}{I_{N^*}} &= \alpha_{N^*}\ \mathrm{d}t + G_{N^*}\ \mathrm{d}z \end{aligned} \tag{15.4}$$

where I_N (I_{N^*}) is an $N\times N$ $(N^*\times N^*)$ diagonal-matrix-valued function whose ith diagonal element represents the market value of the ith home (foreign) industry. The vector-valued function α_N (α_{N^*}) of order $N\times1$ $(N^*\times1)$ represents the instantaneous expected rate of return from N home (N^* foreign) production processes. G_N (G_{N*}) are bounded matrix-valued functions of order $N \times (n+k)$ and $N^* \times (n+k)$ respectively.

Let

$$\frac{dI}{I} = \begin{bmatrix} \dfrac{dI_N}{I_N} \\ \\ \dfrac{dI_{N^*}}{I_{N^*}} \end{bmatrix} \qquad \alpha = \begin{bmatrix} \alpha_N \\ \alpha_{N^*} \end{bmatrix} \qquad G = \begin{bmatrix} G_N \\ G_{N^*} \end{bmatrix}$$

The covariance matrix GG' is assumed to be positive definite. When a and G are constants, the value of investment in each process will be stationary and log-normally distributed. Rates of return on production processes are contemporaneously correlated with changes in state variables provided that the covariance matrix $G\sigma'$ is not a null matrix.

Structure of the capital market

There are K and K^* contingent claims in the home and foreign country respectively, and it is assumed that $K+K^*=k$, the number of state variables.[7] The investment opportunity set with basis $n+k$ includes n production processes and k investment opportunities. The dynamics of the rate of return from the contingent claims are given by

$$\begin{aligned} \frac{dV_K}{V_K} &= \beta_K \, dt + H_K \, dz \\ \frac{dV_{K^*}}{V_{K^*}} &= \beta_{K^*} \, dt + H_{K^*} \, dz \end{aligned} \tag{15.5}$$

where V_K (V_{K*}) is a $K \times K$ $(K^* \times K^*)$ diagonal-matrix-valued function whose ith diagonal element represents the market value of the ith home (foreign) contingent claim. The vector-valued function β_K (β_{K*}) of order $K \times 1$ $(K^* \times 1)$ represents the instantaneous expected rate of return from K home (K^* foreign) contingent claims. H_K and H_{K*} are bounded matrix-valued functions of order $K \times (n+k)$ and $K^* \times (n+k)$ respectively.

Let

$$\frac{dV}{V} = \begin{bmatrix} \dfrac{dV_K}{V_K} \\ \\ \dfrac{dV_{K^*}}{V_{K^*}} \end{bmatrix} \qquad \beta = \begin{bmatrix} \beta_K \\ \beta_{K^*} \end{bmatrix} \qquad H = \begin{bmatrix} H_K \\ H_{K^*} \end{bmatrix}$$

The covariance matrix HH' is assumed to be positive definite. The returns on claims are assumed to be capital gains.

The dynamics of the foreign nominal bond are given as

$$\frac{dB^*}{B^*} = r^*[X(t), t] \; dt \tag{15.6}$$

The coefficient of diffusion is a vector-valued function with elements zero. For the foreign investor, the instantaneously risk-free bond implies that at each instant, he knows with certainty that he could earn a rate of return $r^*(t)$ over the next instant holding the risk-free bond. Similarly in the home country a market exists for risk-free borrowing or lending at an instantaneously risk-free rate of return $r(t)$.

Preference structure and optimization problem

Consumer-investors choose at each instant an optimal portfolio of investments in home and foreign production processes and contingent claims and optimal consumption rates in order to maximize their expected lifetime utility function of the form

$$\max \; E_0 \int_t^T U\{\,[c_i(t), i = 1, \ldots, n]\,, X(t), t\} \; dt \tag{15.7}$$

where $c=(c_1,\ldots, c_n)'$ is the vector of consumption rates of n goods produced in the world economy and U is a von Neumann—Morgenstern utility function assumed to be strictly concave in c_i, increasing and twice continuously differentiable with respect to c_i. It is assumed that marginal utility of consumption in each good approaches infinity as consumption of that good approaches zero. This assumption guarantees an internal solution. The expectation operator E_0 is conditional on the current state variables and wealth.

Let $a_N=(a_1,\ldots, a_N)'$ and be the vectors of the optimal shares of wealth W of the home consumer-investor invested in N home and N^* foreign technologies, respectively; $b_K=(b_1,\ldots, b_K)'$ and be the vectors of optimal shares of W invested in K home and K^* foreign contingent claims, respectively; and the optimal share of W invested in home and foreign nominal bonds be b_0 and b_0^*, respectively. Then the instantaneous budget constraint is

$$\sum^{N} a_i + \sum^{N^*} a_i^* + \sum^{K} b_i + \sum^{K^*} b_i^* + b_0^* + b_0 = 1 \tag{15.8}$$

Let $a=(a_N, a_{N^*})'$ and $b=(b_K, b_{K^*})'$. At each instant the domestic consumer-investor (the problem is similar for the foreign consumer-investor) selects optimal controls (a, b, b_0^*, c). The choice of a, b and b_0^* is unconstrained because of risk-free borrowing or lending. The optimal controls are revised continuously as the wealth of the domestic consumer-investor denominated in the home currency grows according to the following dynamics:

$$\frac{dW}{W} = \mu_W \; dt + \sigma_W \; dz \tag{15.9}$$

where μw is the drift of W representing the instantaneous expected rate of change of wealth; σw is the diffusion vector of order $1\times(n+k)$ representing the stochastic changes in the growth rate of wealth. Drift μw and diffusion σ_w are endogenously determined from the dynamics of rates of return[8] from industries and contingent claims as follows:

$$\mu_W = \sum_{i=1}^{N} a_i(\alpha_i - r) + \sum_{i=1}^{N^*} a_i^*\left(\alpha_i^* - r^* + \sum_{j=1}^{n+k} \sigma_{ej} g_{ij}^*\right) + \sum_{i=1}^{K} b_i(\beta_i - r)$$
$$+ \sum_{i=1}^{k^*} b_i^*\left(\beta_i^* - r^* + \sum_{j=1}^{n+k} \sigma_{ej} h_{ij}^*\right) + b_f(r^* - r + \mu_e) + r - \frac{p'c}{W} \tag{15.10}$$

where

$$P'c = \sum_{i=1}^{N} P_i c_i + \sum_{i=1}^{N^*} eP_i^* c_i^*$$
$$\sigma_{Wj} = \sum_{i=1}^{N} a_i g_{ij} + \sum_{i=1}^{N^*} a_i^* g_{ij}^* + \sum_{i=1}^{K} b_i h_{ij} + \sum_{i=1}^{K^*} b_i^* h_{ij}^* + b_f \sigma_{ej} \tag{15.11}$$
$$j = 1, \ldots, n+k$$

where

$$b_f = \sum_{i=1}^{N^*} a_i^* + \sum_{i=1}^{K^*} b_i^* + b_0^*$$

The proportion of wealth in foreign direct and portfolio investments is represented by b_f.

3
SOLUTION OF THE OPTIMIZATION PROBLEM

The optimization problem given in (15.7), (15.8) and (15.9) is a dynamic programming problem and can be solved by using standard stochastic control theory.[9] A control function on any interval $[t_0, T]$ is optimal if and only if it is optimal on every subinterval $[s, T]$, where $t_0 \leqslant s \leqslant T$. Then, the optimal controls satisfy Bellman's dynamic programming equation. Some regularity conditions[10] are specified to guarantee a well-behaved solution. These conditions ensure that the system represented by state variables $X(t)$ is well behaved and the controls chosen at each instant are admissible. The criterion of admissibility requires that consumption rates c, industry shares a and portfolio shares b and b_0^* are nonanticipating functions of W, X and t such that $c \geqslant 0$ and $a \geqslant 0$ (negative consumption is not possible and negative investment is ruled out as capital stock is assumed not to depreciate). However, portfolio shares b and b_0^* may be positive or negative. Also the wealth W is always nonnegative and the budget constraint (15.9) is assumed to have a unique solution of W.

Let the state-dependent indirect utility function of wealth be $J(W, X, m, t)$ where m is the admissible feedback control vector $(a(t), b(t), b_0^*(t), c(t))$; then if the controls $m(t)$ and function $J(W, X, m, t)$ satisfy the Bellman equation of dynamic programming given below, $m(t)$ are the optimal allocations and $J(W, X, t)$ is the optimal value of indirect utility of wealth. The Bellman equation is

$$-J_i = \max[\mathrm{D}(t)J + U(m, X, t)] \tag{15.12}$$

where D(t) is the differential operator for any stochastic process and is given by

$$\mathrm{D}(t) = W\mu_W \frac{\partial}{\partial W} + \sum_{i=1}^{k} \mu_i \frac{\partial}{\partial X_i} + \frac{1}{2} W^2 \sigma_W \sigma_W' \frac{\partial^2}{\partial W^2} + W \sum_{i=1}^{k} (\sigma_W \sigma')_i \frac{\partial^2}{\partial W\, \partial X_i} + \frac{1}{2} \sum_{i=1}^{k} \sum_{j=1}^{k} (\sigma\sigma')_{ij} \frac{\partial^2}{\partial X_i\, \partial X_j}$$

and the boundary conditions are

$$\begin{aligned} &J(W, X, T) = 0 \\ &J(0, X, t) = E \int_t^T U(0, X, s)\, \mathrm{d}s \end{aligned} \tag{15.14}$$

such that partials J_t, J_W, J_X, J_{WW}, J_{WX} and J_{XX} with respect to the subscripted variables are continuous.

A consumer-investor will derive an optimal expected lifetime utility from wealth when the state is described by (W, X) by making optimal choices at all instants in the future.

Optimal allocations

It is assumed that there exist internal solutions for value function J and controls m which satisfy the Bellman equation. The necessary and sufficient first-order conditions give the optimal allocations of the home consumer-investor as follows:

$$\begin{aligned} &\frac{U_{c_i}}{P_i} - J_W = 0 \qquad i = 1, \ldots, N \\ &\frac{U_{c_i^*}}{eP_i^*} - J_W = 0 \qquad i = 1, \ldots, N^* \end{aligned} \tag{15.15}$$

$$\begin{aligned} &WJ_W \begin{pmatrix} \alpha - r1_N \\ \alpha^* - r^* 1_{N^*} + G_{N^*}\sigma_e' \end{pmatrix} + W^2 J_{WW}(GG'a + GH'b + b_f G\sigma_e') \\ &\quad + WJ_{WX}G\sigma' = 0 \end{aligned} \tag{15.16}$$

$$\begin{aligned} &WJ_W \begin{pmatrix} \beta - r1_K \\ \beta^* - r^* 1_{K^*} + H_{K^*}\sigma_e' \end{pmatrix} + W^2 J_{WW}(HG'a + HH'b + b_f H\sigma_e') \\ &\quad + WJ_{WX}H\sigma' = 0 \end{aligned} \tag{15.17}$$

$$\begin{aligned} &WJ_W(r^* - r + \mu_e) + W^2 J_{WW}(\sigma_e G'a + \sigma_e H'b + b_f \sigma_e \sigma_e') \\ &\quad + WJ_{WX}\sigma_e\sigma' = 0 \end{aligned} \tag{15.18}$$

where 1_N, 1_{N^*}, 1_K, 1_{K^*} are unit vectors of the order given by the subscripted variable. The first-order conditions are a set of simultaneous equations which can be solved for optimal allocations (a, b, b_0^*, c) and value function J as functions of (W, X) for given dynamics of goods prices (P, P^*), asset prices (V, V^*), exchange rate *(e)* and interest rates (r, r^*). For given optimal controls, market clearing and equilibrium conditions will enable us to solve for the endogenous dynamics of all prices as functions of (X, t).

From the first-order conditions (15.16)–(15.18), the optimal allocations in home and foreign technologies and contingent claims may be obtained as

$$wW = T^a \sigma_a^{-1} \mu_a + \sigma_a^{-1} \sigma_X T^X \qquad (15.19)$$

where $T^a = -J_W/J_{WW}$ is the investor's absolute risk tolerance and $T^x = -J_{WX}/J_{WW}$ is the vector of compensating variations in wealth for a change in state variable vector that is required to maintain the current level of marginal utility of wealth. The demand vector w, excess return vector μ_a and variance-covariance matrices σ_a and σ_x are given as

$$w = \begin{bmatrix} a_N \\ a_{N^*} \\ b_K \\ b_{K^*} \\ b_f \end{bmatrix} \qquad \mu_a = \begin{bmatrix} \alpha - r1_N \\ \alpha^* - r^*1_{N^*} + G_{N^*}\sigma_e' \\ \beta - r1_K \\ \beta^* - r^*1_{K^*} + H_{K^*}\sigma_e' \\ r^* - r + \mu_e \end{bmatrix}$$

$$\sigma_a = \begin{bmatrix} GG' & GH' & G\sigma_e' \\ HG' & HH' & H\sigma_e' \\ \sigma_e G' & \sigma_e H' & \sigma_e \sigma_e' \end{bmatrix} \qquad \sigma_x = \begin{bmatrix} G\sigma' \\ H\sigma' \\ \sigma_e \sigma' \end{bmatrix}$$

The demand functions given in the system of equations (15.19) are of well-known form originally derived for a single-good closed exchange economy by Merton (1971, 1973) followed by Breeden (1979) for a multiple-good closed exchange economy. In the present work, these demand functions pertain to a multiple-good production-exchange open economy. The first term in (15.19) represents the most efficient portfolio in mean-variance space. There is no other portfolio which dominates the most efficient portfolio by having a higher mean for the same variance or a lower variance for the same mean. The second term refers to the demands which allow hedging against the changing investment opportunity set in an intertemporal dynamic stochastic economy. The hedging demands will be most highly correlated with the changes in the state variables. The last term in (15.19) gives the total foreign investment (in foreign industries, claims and nominal bond) of the home investor. The first component of the holdings which is mean—variance efficient does not depend upon the consumption preferences of the consumer-investor. He includes foreign nominal bonds in his portfolio of foreign industries and contingent claims if these bonds improve the efficiency of his portfolio. This happens when the expected excess return on foreign investment given by $r^* - r + \mu_e$ is positive. The second component corresponds to hedging demands with respect to changes in state variables. For instance, suppose there is only one state variable and exchange rate is perfectly correlated with this state variable then the second component of the foreign investment will be hedged against any random changes in exchange rate.

4
CHARACTERIZATION OF EQUILIBRIUM

Equilibrium in the production-and-exchange world economy is obtained when the following conditions are satisfied.

1 It equilibrium, all the output of goods must be held by the firms owned by the consumer-investors. This condition implies that, in the general equilibrium framework, production is endogenous. With aggregate consumption being also stochastic the inventories of goods are endogenous and optimal investment planned in production at any time t should be adjusted for the inventories carried up to the time t.

2 With identical consumer-investors in the world economy net demand for contingent claims and risk-free borrowing and lending is zero and all the capital stock is invested in the production processes. With identical investors financial markets can be closed without affecting Pareto optimality. The market clearing conditions are

$$a'1 = 1 \qquad b_0 = b_0^* = 0 \qquad b_i = 0 \qquad i = 1, \ldots, k \tag{15.20}$$

3 Markets clear instantaneously. There are no international barriers to trade or capital transfer and no barrier to entry into or exit from the home and foreign industries so that perfect competition is obtained.

4 Consumer-investors have rational expectations. This condition closes the model and requires that optimal intertemporal pricing functions obtained from market clearing conditions (15.20) and as implied by Itô's lemma are precisely those which are anticipated by continuously optimizing consumer-investors.

With the above conditions holding, the rational expectation equilibrium can be defined as a set of stochastic processes $(r, r^*, e, V, V, P, P^*, J; a, c)$ satisfying optimality conditions in equations (15.12) and (15.15)–(15.18) and the market clearing conditions in (15.20). The existence of equilibrium is guaranteed by the necessary and sufficient first-order conditions and the uniqueness of equilibrium is ensured by uniqueness of J as assumed earlier.

The rational expectations general equilibrium requires solution of first-order conditions (15.15)–(15.18) and Bellman equation (15.12) for optimal allocations and optimal indirect utility function, respectively. Further, using market clearing conditions (15.20) equilibrium prices of goods, contingent claims and equilibrium interest rates and exchange rates are simultaneously determined. Itô's lemma gives the stochastic dynamics of all the pricing functions which depend upon the exogenous distribution of rates of return on production processes and the endogenous intertemporal distribution of wealth. An optimizing consumer-investor anticipates stochastic pricing functions exactly as implied by Itô–s lemma. In equilibrium the dynamics of endogenized pricing functions follow a fundamental valuation equation.

Composition of risks in the economy

The growth of wealth or capital stock in the economy is stochastic because the productivity in production processes is stochastic. At any instant an investor faces productivity risk, or the risk of uncertain output from home and foreign production processes. In addition, to the extent that the unanticipated changes in the exchange rate affect the output directly or indirectly, there is exchange risk. In equilibrium, when all the output is invested in production processes, equations (15.10) and (15.11) give the instantaneous variance of the rate of change of the home investor's wealth as follows:

$$\sigma_W^2 = \sigma_I^2 + 2a_f\sigma_{Ie} + a_f^2\sigma_e^2 \qquad (15.21)$$

where a_f is home investor's equilibrium optimal foreign investment and σ_{Ie} is the covariance of the rate of change of exchange rate and the expected rate of return on optimally invested wealth in world technologies. The variability in wealth is made up of three components. The first component, , is the variance of the rate of return from an optimal investment of the home investor's wealth in world technologies and is equal to $a'GG'a$. This is productivity risk. The uncertainty in exchange rates contributes to the volatility of average rate of return from the world technologies measured in home currency via the direct effect of the exchange rate volatility itself and via the indirect effect of covariance with the optimally invested wealth. The second and the third components are the indirect effect, $2a_f\sigma_{Ie}$ and the direct effect, , respectively. In the event that the equilibrium foreign investment is zero, there is no exposure of assets to the unanticipated changes in exchange rates and hence no impact on the uncertain output.

Unanticipated changes in wealth also occur due to the fact that output and exchange rates are sensitive to the unanticipated changes in the state variables. This risk is given by

$$\sigma_W\sigma' = (a'A + a_f\sigma_e)\sigma' = \sigma_{IX} + a_f\sigma_{eX} \qquad (15.22)$$

where σ_{IX} is the covariance of optimal rate of return on world technologies with changes in state variables. This is technology risk which is a measure of sensitivity of average productivity in the economy to the technological shocks provided by changing state variables. The covariance of the rate of change of the exchange rate with changes in state variables is σ_{eX} and this is the market foreign exchange risk. Finally, the systematic risk associated with changes in state variables is $\sigma\sigma'$. This is the undiversifiable risk in the integrated world economy. Investments in technologies expose investors to productivity risk but allow hedging against the technology risk and exchange risk.

Equilibrium interest rates

Theorem 1 In equilibrium the instantaneously risk-free interest rate in the home country is given as

$$r = a'\alpha + a_f\mu_e + \sigma_{I'e} - A^r(\sigma_I^2 + 2a_f\sigma_{Ie} + a_f^2\sigma_e^2) - \sum_{i=1}^{k} A^{X_i}(\sigma_{IX_i} + a_f\sigma_{eX_i}) \quad (15.23)$$

where $A^r=-WJ_{WW}/J_W$ is the coefficient of relative risk aversion and $A^X=-J_{WX}/J_W$ is the vector of coefficients of risk aversion with respect to changes in state variables.

In equilibrium, the instantaneously risk-free interest rate[11] in the home country may be more or less than the expected rate of return when wealth is optimally invested in world technologies, which, in home currency, is $\mu_I=a'\alpha+a_f\mu_e+\sigma_{I'e}$. The last two terms arise due to conversion of the rate on foreign investment in the home currency. This expected return is adversely affected if the rate on foreign technologies is negatively correlated with the rate of change in the exchange rate or if the home currency is expected to appreciate. The expected excess return on optimally invested wealth over the risk-free home interest rate r is a premium determined by the productivity risk, exchange risk on foreign investment, technology risk and market exchange risk. The first component of this premium is proportional to the variance of home wealth and the second is proportional to the covariance of the average return on optimal investments and the rate of change of exchange rate with state variables. Because of the covariance terms, the risk-free rate may be more or less than the expected return on optimally invested wealth. The home investor faces uncertainty of output from the world technologies and also the uncertainty in the value of foreign output due to the unanticipated changes in exchange rates. These investments, however, provide a hedge against the technological shocks by changing state variables. These observations suggest that risk-free borrowing and lending though not exposed to productivity risk is unhedged against technology risk and exchange risk.

Corollary 1 In equilibrium the instantaneously risk-free interest rate in the foreign country is given as

$$r^* = a'\alpha - (1-a_f)\mu_e + \sigma_{I^*e} - A^r[\sigma_I^2 - (1-2a_f)\sigma_{Ie} - a_f(1-a_f)\sigma_e^2] - \sum_{i=1}^{k} A^{X_i}[\sigma_{IX_i} - (1-a_f)\sigma_{eX_i}] \quad (15.24)$$

Alternatively,

$$r^* = (\mu_I - \mu_e) - A^r(\sigma_I^2 - \sigma_{Ie} - a_f\sigma_e^2) - \sum_{i=1}^{k} A^{X_i}[\sigma_{WX_i} - \sigma_{eX_i}] \quad (15.25)$$

The foreign investor's riskless borrowing or lending rate may be different from the expected rate on his optimally invested wealth , where $1-a_f$ is the optimal share of wealth invested by the foreign investor in home technologies. This can be said because of the assumption of homogeneous investors. From the alternative expression above, it may readily be seen that the foreign risk-free rate is closely related to the exchange rate. The optimal average return μ_I is adjusted for the expected instantaneous rate of change of exchange rate.[12] The first component of the premium is adjusted for foreign exchange risk on foreign investments. The second component of the premium is adjusted for the market foreign exchange risk.

Corollary 2 In equilibrium the forward differential in favor of the home country is given by

$$r - r^* = \mu_e - A^r(\sigma_{Ie} + a_f \sigma_e^2) - \sum_{i=1}^{k} A^{X_i} \sigma_{eX_i} \tag{15.26}$$

The above expression is a dynamic version of the international Fisher effect. The interest rate differential may not be equal to the expected rate of change of the exchange rate, μ_e, in a continuous-time model. For risk-averse investors, this difference is due to the uncertainty of the exchange rate and its impact on expected return on optimally invested wealth and the co-movement of exchange rates with the state variables.[13] Whether the forward rate will be an unbiased predictor of the future spot rate will be determined by covariance terms.[14]

Equilibrium prices of contingent claims

The first-order conditions and market clearing conditions (15.20) together with endogenously derived dynamics of contingent claims may be simultaneously solved for equilibrium rates of returns on claims available in both the countries.

Theorem 2 In equilibrium, the expected excess rate of return $\mu_{j\beta}$ on any contingent claim expressed in terms of the home currency is given by

$$\mu_{j\beta} = \varepsilon_{jW}\theta_W + \sum_{i=1}^{k} \varepsilon_{jX_i}\theta_{X_i} \qquad j = 1, \ldots, k \tag{15.27}$$

where $\varepsilon jw=(\partial V_j/V_j)/(\partial W/W)$ is the wealth elasticity of the price of the jth contingent claim with respect to optimally invested wealth and is the percentage change in the price of a claim in home currency for a unit percentage change in the home investor's wealth. Similarly, state variable elasticity $\varepsilon_j X_i=(\partial V_j/\partial X_i)/V_j$ measures the percentage change in price for a unit change in the state variable X_i. Factor risk premia θ_W and θ_{Xi} are given as

$$\theta_W = A^r(\sigma_I^2 + 2a_f\sigma_{Ie} + a_f^2\sigma_e^2) + \sum_{i=1}^{k} A^{X^i}(\sigma_{IX_i} + a_f\sigma_{eX_i})$$

$$\theta_{X_i} = A^r(\sigma_{IX_i} + a_f\sigma_{eX_i}) + \sum_{i=1}^{k} A^{X_i}\sigma_{X_iX_j} \tag{15.28}$$

Equation (15.27) says that the excess rate of return on any contingent claim in terms of the home currency is a linear combination of ε_{jW} and ε_{jXi}. The weights of this linear combination are the premia θ_W and θ_{Xi} which are identical for all contingent claims in the home and foreign country.[15] These factor risk premia depend upon the home investor's degree of risk aversion and the fundamental sources of risk as discussed earlier. Investors make foreign investments not only to hedge against the uncertain output and technological shocks due to state variables but also to hedge against unanticipated changes in the exchange rates.

The instantaneous expected rate of return on home and foreign claims in their respective currencies can now be written as

$$\beta_j = \mu_I + \theta_W(\varepsilon_{jW} - 1) + \sum_{i=1}^{k} \varepsilon_{jX_i}\theta_{X_i} \qquad j = 1, \ldots, K \tag{15.29}$$

$$\beta_j^* = \mu_I - \mu_e + \theta_W^*(\varepsilon_{jW}^* - 1) + \sum_{i=1}^{k} \varepsilon_{jX_i}^*\theta_{X_i}^*, \qquad j = 1, \ldots, K^* \tag{15.30}$$

where

$$\theta_W^* = \theta_W - A^r[\sigma_{Ie} + a_f\sigma_e^2] - \sum_{i=1}^{k} A^{X_i}\sigma_{eX_i}$$

$$\theta_{X_i}^* = \theta_{X_i} - A^r\sigma_{eX_i}$$

Note that the factor risk premia for the foreign investor are accordingly reduced for the variability of the exchange rate and its co-movement with optimal rate on technologies and state variables. Also note that if the wealth elasticity of price of a claim is unity which is possible when the price changes are perfectly correlated with wealth changes, then, *ceteris paribus,* investment in the contingent claim provides a perfect hedge against unanticipated changes in wealth. The corresponding risk premium is zero.

Theorem 3 In equilibrium, the price of any contingent claim, home or foreign, measured in home currency units, is given by the following stochastic differential equation (subscript V denoting a certain claim is dropped for notational convenience):

$$\begin{aligned}
0 = V_t &+ \sum_{i=1}^{k} V_{X_i}\left\{\mu_i - \left[A^r(\sigma_{IX_i} + a_f\sigma_{eX_i}) + \sum_{i=1}^{k} A^{X_i}\sigma_{ij}\right]\right\} \\
&+ WV_W\left\{\mu_I - \frac{P'c}{W} - \left[A^r(\sigma_I^2 + 2a_f\sigma_{Ie} + a_f^2\sigma_e^2)\right.\right. \\
&\left.\left.+ \sum_{i=1}^{k} A^{X_i}(\sigma_{IX_i} + a_f\sigma_{eX_i})\right]\right\} + \frac{1}{2}\sum_{i=1}^{k}\sum_{j=1}^{k} \sigma_{X_iX_j}V_{X_iX_j} \\
&+ \frac{1}{2}W^2V_{WW}(\sigma_I^2 + 2a_f\sigma_{Ie} + a_f^2\sigma_e^2) + \sum_{i=1}^{k} WV_{WX_i}(\sigma_{IX_i} + a_f\sigma_{eX_i})
\end{aligned}$$

The partials V_t, V_W, V_{WW}, V_{WX}, V_{XX} are assumed to exist for a smooth function $V(W, X, t)$. The above partial differential equation is applicable for the pricing of any contingent claim in home or foreign countries with appropriately specified initial and boundary conditions.[16]

5
CONCLUSION

A general equilibrium model for open economies has been constructed in which an international consumer-investor makes his portfolio choices and production decisions simultaneously. Equilibrium interest rates and the prices of international assets are determined endogenously. Major findings of the study are summarized below.

1 The model posited here advances a theory of the fundamental sources of variations in returns of international assets. The risk premia are based on productivity risk, technology risk, exchange risk and systematic risk. One premium corresponds to the productivity risk which arises due to random variations in the rate of return from world technologies when wealth is optimally invested in them. A second premium is due to the unanticipated changes in exchange rate and its impact on average rate of return. A third premium is due to the co-movement of wealth with state variables. This premium can be decomposed in two parts. The first is due to the technology risk measured by the co-movement of the average return on optimal investment in world technologies with state variables. The second is the market exchange risk which is measured by the co-movement of the exchange rates with state variables. Finally, a premium exists because of systematic risk due to variations in state variables themselves.
2 Risk-free interest rate in a country may exceed or fall short of the expected rate of return when wealth is optimally allocated among home and foreign technologies. The difference arises due to the premia associated with the productivity risk, technology risk and the exchange risk.
3 A dynamic version of the international Fisher effect is derived. It is shown that a premium separates the expected rate of change of the exchange rate and the expected forward differential. The first component of this premium is determined by foreign exchange risk on investments due to direct volatility of exchange rates and its impact on rate of return on investments in real processes in the world. The second component is determined by the market exchange risk due to the co-movement of exchange rates with the state variables.
4 Excess returns on contingent claims in home currency are shown to be a linear combination of the wealth elasticity and state variable elasticities of the domestic price of a contingent claim. The weights of the linear combination are the factor risk premia which are the equilibrium prices of the productivity risk, technology risk, systematic risk and exchange risk. These risk premia depend upon the coefficient of relative risk aversion and the fraction of wealth invested in the foreign technologies. Also the factor risk premia are identical for home and foreign contingent claims and do not

depend upon contractual conditions of the claims. The expected rates of return on claims in the currency of their denomination are also derived.

5 It is shown that the value of a contingent claim, home or foreign, in terms of home currency follows a partial differential equation which can be solved for stipulated initial and boundary conditions.

APPENDIX 15A
PROOF OF THEOREMS

Theorem 1:
Equilibrium interest rates

Proof

From first-order conditions in equations (15.16) and (15.18) and market clearing conditions in (15.20) we have

$$a'\begin{pmatrix}\alpha - r1_N \\ \alpha^* - r^*1_{N^*} + G_{N^*}\sigma_e'\end{pmatrix} + \frac{W^2 J_{WW}}{J_W}\,(a'GG'a + a_f a'G\sigma_e') + \frac{WJ_{WX}}{J_W}\,a'G\sigma' = 0 \tag{15A.1}$$

$$r^* - r + \mu_e = -\frac{W^2 J_{WW}}{J_W}\,(a'G\sigma_e' + a_f\sigma_e\sigma_e') - \frac{WJ_{WX}}{J_W}\,\sigma_e\sigma' \tag{15A.2}$$

Solving the above equations simultaneously for r and r^*, the results of Theorem 1 and Corollaries 1 and 2 are obtained.

Theorem 2:
Expected excess returns on contingent claims

Proof

First-order conditions in equation (15.17) and market clearing conditions (15.20) give

$$\begin{pmatrix}\beta - r1_k \\ \beta^* - r^*1_{K^*} + H_{K^*}\sigma_e'\end{pmatrix} = -\frac{W^2 J_{WW}}{J_W}\,(HG'a + a_f H\sigma_e') - \frac{WJ_{WX}}{J_W}\,H\sigma' \tag{15A.3}$$

The dynamics of the price of a claim by applying Itô's lemma and using the equilibrium values of μ_W and σ_W are

$$\frac{\mathrm{d}V}{V} = \frac{1}{V}\left[V_W W\left(a'\alpha + a_f\mu_e + \sigma_I{}^*{}_e - \frac{P'c}{W}\right) + \sum_{i=1}^{k} V_{X_i}\mu_i\right.$$
$$+\frac{1}{2}\sum_{i=1}^{k}\sum_{j=1}^{k}\sigma_{X_iX_j}V_{X_iX_j} + \frac{1}{2}V_{WW}W^2(\sigma_I^2 + 2a_f\sigma_{Ie} + a_f^2\sigma_e^2)$$
$$\left.+\sum_{i=1}^{k}V_{WX_i}W(\sigma_{IX_i} + a_f\sigma_{eX_i} + V_t)\right]\mathrm{d}t$$
$$+\frac{1}{V}\sum_{j=1}^{n+k}\left[V_W W(a'A_j + a_f\sigma_{ej}) + \sum_{i=1}^{k}V_{X_i}\sigma_{ij}\right]\mathrm{d}z_j$$

Diffusion terms give the endogenous matrix H which is substituted in (15A.3). Use equation (15.28) and the definitions of wealth and state variable elasticities of V to get the result.

Theorem 3: Valuation equation

Proof

Equate the drift term in equation (15.31) and expected returns from (15A.3) and rearrange the terms to get the result.

NOTES

1 For instance see Solnik (1974), Grauer *et al.* (1976), Fama and Farber (1979), Stulz (1981), Sercu (1980), Hodrick (1981) and Adler and Dumas (1983).
2 Black (1990) shows that investors hedge against the world market risk as well as exchange risk because of Siegel's paradox derived from Jensen's inequality.
3 In heterogeneous society wealth is a state variable and investors need to hedge against the changes in wealth. For portfolio choice and equilibrium of capital markets for logarithmic and isoelastic investors see Dumas (1989). Also see Constantinides (1982).
4 In this sense the model is Ricardian.
5 For heterogeneous investors, consumption patterns in the two countries will be different and the possibility of nontraded goods will violate purchasing power parity.
6 One good per technology is not a restrictive assumption. When many technologies are available to produce one good, risk-averse investors can diversify across all risky technologies. In CIR (1985) a single good is produced by many using multiple technologies. This implies intra-industry competition as against inter-industry competition in the case of one technology per good in a multiple-good economy.

7 In a heterogeneous society the capital markets are complete in the Arrow— Debreu sense if the number of firms and contingent claims is equal to the number of state variables. Then, there exists for a risk-averse investor a perfect hedge against unanticipated changes in each state variable. In the case of a homogeneous society, markets for all or some financial claims may be closed without affecting Pareto optimality because homogeneous investors need not trade with each other. Here, the number of state variables need not be equal to $n+k$.

8 In order to derive the dynamics of home investor's wealth, returns from foreign assets must be first converted to home currency. Using the dynamics of the exchange rate in equation (15.2) and Itô's lemma, dynamics of a foreign asset in home currency may be obtained.

9 See Arnold (1974:211–14), Fleming and Rishel (1975: Ch. VI) and Merton (1973).

10 See Fleming and Rishel (1975) and Friedman (1975) for details.

11 The expression for interest rate derived here is the open economy analogue of the closed economy version in CIR (1985). The differences arise due to conversion of foreign returns in home currency and an additional exchange risk premium.

12 The endogenous dynamics of the exchange rate may be obtained from Itô's lemma provided that e is a continuously smooth function of (W, X, t).

13 In Stulz (1981), the inequality is due to the covariance of the price of a commodity basket with exchange rate and with an observable market portfolio. In Hodrick (1981) the inequality is due to time-varying risk premia arising from investing in nominal assets of different countries.

14 For a detailed discussion see Puri and Philippatos (1993).

15 The open economy factor risk premia are different from those obtained in CIR (1985) because of additional uncertainty in exchange rates.

16 Foreign exchange forward, futures and options contracts are maturity contracts with differing payoffs on or before the maturity. Their terminal and boundary conditions are accordingly different. Valuation of these foreign exchange contracts using a similar model is done in Puri and Philippatos (1993).

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16
The relative valuation of Japanese and US stock markets

Jongmoo Jay Choi

A notable feature of the Japanese stock market is its seemingly unreasonably high valuation ratios relative to those of other industrialized stock markets such as the United States. As shown in Table 16.1, the average price-earnings ratio *(P/E)* is more than 2.5 times higher in Japan than in the United States for the period December 1974 to February 1989.[1] This difference in relative valuation of the two markets is also borne out in terms of other valuation ratios such as the price-cash flow ratio and the price-book value ratio. The average price to cash flow ratio is 9.0 for Japan compared with 6.0 for the United States during the same sample period, while the average price to book value ratio is 2.5 and 1.4 for Japan and the United States respectively.

It is true that the valuation gap between the Japanese and US stock market has narrowed since 1991 because of asset price deflation in Japan in that period. Even so, a significant gap still exists. At any rate, a long period of high relative valuation of Japanese stocks prior to the period demands explanation.

One plausible answer to high Japanese valuation is found in the institutional peculiarities of the Japanese financial markets. Ziemba (1990), and Constand *et al.* (1990) found a high correlation between stock prices and land prices in Japan. French and Poterba (1990) examined the impact of Japanese accounting practices: (a) Japanese firms generally report earnings for the parent firm only, while US firms report consolidated earnings; (b) cross-corporate ownership, a common practice in Japan, inflates the aggregate share values of Japanese firms; and (c) Japanese firms use the accelerated depreciation method for financial statements as well as for the calculation of taxes, while US firms generally use a slower depreciation method for financial statements purposes. These practices tend to understate earnings and overstate share prices of Japanese firms over what they would be if US methods were followed. However, French and Poterba show that accounting differences only explain a portion of the relative price-earnings ratios, not the full disparity.

An alternative, supplementary answer lies in differences in economic fundamentals of the two countries. Ando and Auerbach (1988) and

Table 16.1 Relative valuation of the US and Japanese stock markets (January 1975 to February 1989)

	United States	*Japan*
Price-earnings ratio		
High	20.3	64.0
Low	7.0	14.0
Average	10.9	27.3
Price-cash flow ratio		
High	9.5	18.4
Low	4.2	5.0
Average	6.0	9.0
Price-book value ratio		
High	2.3	5.2
Low	1.0	1.6
Average	1.4	2.5
Capital gains (%)		
High	51.5	78.5
Low	−30.9	−14.8
Average	9.0	16.8
Dividend field (%)		
High	6.6	2.9
Low	2.8	0.5
Average	4.6	1.6

Source: Morgan Stanley, *Capital International Perspectives*
Note: Capital gains rates are based on 12-month holding period.

Frankel (1991), for instance, have documented a significant difference in the cost of capital of the Japanese and US corporations. It is therefore interesting to see whether this and other economic factors explain some of the valuation gap that exists between Japanese and US stock. In this chapter, the relative valuation of the Japanese and US stock markets is examined within a comparative economic valuation model using monthly data for the period 1974–89. The valuation model identifies earnings, exchange rate changes, growth rates, relative interest rates and dividend payout ratios as potential explanatory variables. Empirical analysis estimates the impact of these variables on a broad range of relative valuation ratios including relative stock prices, price-earnings ratios, price-cash flow ratios and price-book value ratios. Among the notable findings is the role of exchange rates. This is an interesting finding, because it underscores the presence of an economic exposure impact even when the currency translation effects are ostensibly absent in relative valuation ratios. Another important variable is the time dummy which measures intertemporal changes in regulatory environments between the Japanese and US stock markets. This shows the sensitivity of the valuation ratios to underlying market environments.

1
A COMPARATIVE MARKET VALUATION MODEL

Specification of a market valuation model requires assumptions on international capital markets. Owing to capital controls and other factors affecting international capital movement, it is generally regarded that the Japanese capital markets are partially segmented from the world capital markets. Gultekin *et al.* (1989) found significant differences in the pricing of risk between the Japanese and US stock markets due to government control of capital flows and other market imperfections.

Following this view, and given our interest in Japan-US valuation, we assume a two-asset, two-country model, with one composite asset each in Japan and the United States, in an environment of partially segmented international capital markets. With market segmentation, assets are not perfect substitutes and their values are partly or exclusively determined by their national economic variables. This simple two-asset bi-national model is useful for comparative valuation purposes and differs from asset pricing models that purport to value assets in the context of portfolios in a given market environment.

Relative share price indices

A parsimonious generic model of stock valuation utilizes the discounted cash flow model. It is assumed that the value of stock now, P, equals the present value of a stream of dividends per share, D_t, discounted at a capitalization rate k for both the United States and Japan, measured in their repective currency units (Japanese variables are denoted by asterisks):

$$P=\sum_{t=1}^{\infty}\frac{D_t}{(1+k)^t} \qquad P^*=\sum_{t=1}^{\infty}\frac{D_t^*}{(1+k^*)^t} \tag{16.1}$$

where contemporaneous values are presented without time subscripts for notational convenience. If one assumes a constant growth of dividends at rates of g and g^*, (16.1) is simplified to the Gordon model:

$$P=\frac{D_1}{k-g} \qquad P^*=\frac{D_1^*}{k^*-g^*} \qquad k>g,\ k^*>g^* \tag{16.2}$$

where the subscript "1" indicates one-period lead values. If needed, the dividend payout ratio can also be introduced in (16.1) by writing the dividend per share as

$$D_t=d_tE_t \qquad D_t^*=d_t^*E_t^* \tag{16.3}$$

where E_t is earnings per share and d_t is the dividend payout ratio. To introduce dividend in (16.2), one only needs to rewrite (16.3) as $D_1=d_1E_1$, .

Note that P and P^* above are expressed in their respective currency units. Hence, no currency translation is necessary. However, the concept of an economic exchange exposure suggests that, quite apart from translation effects (from the standpoint of dollar-based investors), exchange rate changes can still affect yen operating earnings and asset values through economic channels. The effect of economic exchange exposure in Japan can be expressed as

$$E_t^* = f(e_t, \beta_t^*) \approx h_t^* e_t + s_t^* E_t^* \qquad (16.4)$$

where e_t is the spot value of yen in term of dollars, β_t^* is a vector of other variables affecting yen cash flows, and h^* and s^* are arbitrary parameters. In linear approximation form, the effects of β_t^* are subsumed in . Earnings therefore consist of a component that is subject to economic exchange exposure and a component that is independent of it. The economic exposure stems from the fact that uncertain exchange rate changes can affect the relative prices and costs and hence the revenues and expenditures of the firm's overseas operation even in foreign currency units. Assessing the impact of an economic exchange exposure therefore requires an analysis of operational characteristics. At the level of the firm, the direction of the economic exposure effect depends on market demand elasticities for the firm's outputs and the firm's dependence on local inputs (Choi 1986). For an aggregate economy, is a reasonable assumption if the Marshall-Lerner condition concerning the domestic and foreign demand elasticities holds, although the *J*-curve phenomenon suggests a possibility of short-run departure from it.

So far the economic effects of exchange rates on yen cash flows in Japan have been examined. In principle, the dollar cash flow from the domestic (US) market is also subject to similar economic effects of exchange exposure:

$$E_t = h_t e_t + s_t E_t \qquad (16.5)$$

where $h_t>0$ can be assumed under similar elasticity assumptions.

It is possible that an equilibrium in the world money markets establishes a connection between some pairs of US and Japanese explanatory variables included in (16.1) or (16.2). In an environment of perfectly integrated Japanese and US money markets as well as completely flexible foreign exchange markets, the international interest rate parity, for example, would indicate a close correlation between interest rate differential and exchange rate changes. Existence of capital controls and other frictions in segmented international markets, however, would preclude such an equilibrium. By taking a ratio of two stock prices in (16.1), we obtain

$$\frac{P^*}{P} = \sum_{t=1}^{\infty} \frac{d_t^*(h_t^* e_t + s_t^* E_t^*)(1+k)^t}{d_t(h_t e_t + s_t E_t)(1+k^*)^t} \qquad (16.6)$$

Conceptually, no real harm is done if (16.6) is approximated linearly, with the use of the Taylor series with first-order terms, as follows:

$$\ln P^* - \ln P = a_0 + a_1(\ln E_t^* - \ln E_t) + a_2(k_t^* - k_t) + a_3 \ln e_t + a_4(\ln d_t^* - \ln d_t) \quad (16.7)$$

where $a_1>0$, $a_2<0$ and a_3 depends on the relative importance of Japanese and US exchange exposure effects. The sign of a_4 depends on the nature of the dividend equilibrium. In the Gordon-Lintner traditional dividend school, as well as in information signaling theory, the dividend has a positive impact on valuation ($a_4>0$). In the Miller-Modigliani (1961) perfect-market world, the dividend has no impact on values ($a_4=0$). With taxes, however, it is possible that the dividend has a negative effect on firm valuation ($a_4<0$) because dividend payment lowers after-tax stockholder's wealth.

A similar approximation in the case of the Gordon model (16.2) yields

$$\ln P^* - \ln P = b_0 + b_1(\ln E^* - \ln E) + b_2(k^* - g^*) + b_3(k - g) + b_4 \ln e + b_5(\ln d^* - \ln d) \quad (16.8)$$

where $b_1>0$, $b_2<0$, $b_3>0$, b_4? 0, b_5? 0. Here, E_1 and have been replaced by their t=0 values based on an assumption that the expected values of intertemporal earnings changes are zero under rational expectations.[2] The latter assumption is consistent with the finding from the unit root/cointegration literature that the levels of most economic variables are integrated of order one (e.g. Campbell and Shiller 1987). This suggests that the first differences of these economic variables are mostly stationary.

It is possible to view (16.7) or (16.8) as an equation that determines a component of relative systematic risk of two countries. Within a given country such as the United States, the systematic risk can be defined as a function of certain fundamental variables (Chen *et al.* 1986). Chan *et al.* (1991) estimated the pricing of fundamental factors in Japanese capital markets. Expansion of the investment opportunity set from the domestic to the global market permits the diversification of a portion of domestic systematic risk. However, given some degree of market segmentation, both domestic and world market factors are significant in an asset return equation. The present market valuation model, which includes pairs of fundamental economic factors, can therefore be thought of as indicating the relative residual systematic risks in a two-country world. This interpretation is useful to gain a broader perspective but is not strictly necessary for the empirical work that follows.

Relative valuation ratios

This section now examines the relative valuation of the two markets in terms of their relative valuation ratios, such as P/E. Equation (16.2), after substitution of (16.3) and (16.4), can be expressed as

$$\frac{P}{E} = \frac{d_1(h_1 e_1 + s_1 E_1)}{(k - g)E} \quad (16.9)$$

$$\frac{P^*}{E^*}=\frac{d_1^*(h_1^*e_1^*+s_1^*E_1^*)}{(k^*-g^*)E^*} \tag{16.10}$$

On the surface, these ratios, *P*/*E* and P^*/E^*, are neutral with respect to the monetary unit and hence are free of direct currency translation impact because they are dimensionless. However, they are not completely free of exchange rate influences for two reasons. First, to the extent that national earnings include earnings from their overseas operations, they are subject to some translation and economic impacts arising from their foreign operational earnings. Second and perhaps more importantly, domestic operations are also subject to economic exchange exposure due to the effect of exchange rates on relative prices and relative competitive positions. These effects of exchange rates, summarized by h_1 and in (16.4) and (16.5), are now included in (16.9) and (16.10).

It is relatively safe to assume that cash flows and book values are positively related to earnings, *ceteris paribus*. Then, similar valuation ratio equations can be obtained, *mutatis mutandis,* in terms of the price-cash flow ratio *(P/C)* and the price-book value ratio *(P/B)* in addition to *P/E*. Linear approximation of (16.9) and (16.10) then yields

$$\ln\left(\frac{P^*}{X^*}\right)-\ln\left(\frac{P}{X}\right)=a_0+a_1(k^*-g^*)+a_2(k-g)+a_3\ln e + a_4(\ln d^*-\ln d) \tag{16.11}$$

$$X=E,C,B;X^*=E^*,C^*,B^*$$

2
DATA AND CORRELATION PATTERNS

The empirical work in this chapter utilizes monthly data for US and Japanese markets for the period January 1975 to February 1989. This period represents a period of flexible exchange rates after the turbulence following the 1973 oil shock had subsided. Data definitions are *P,* stock price index; *E,* expected corporate earnings; *k,* cost of equity capital measured by the annualized rate of monthly price changes and dividend yields; *d,* dividend payout rate; *g,* annualized growth rate of monthly expected corporate earnings; and *e,* the US dollar per Japanese yen. Asterisks indicate equivalent Japanese variables. All variables are end-of-month data. Consistent with the assumption of the discount cash flow model, earnings and cost of equity capital are defined as expected values rather than actual values. Expected values were estimated by an ARIMA (1, 1, 1) model (autoregressive iterative moving average).[3] The growth rates used are also expected growth rates based on ARIMA-estimated corporate earnings; alternatively,

Table 16.2 Correlation among independent variables

	$\ln E^{*}-\ln E$	$k^{*}-g^{*}$	$k-g$	$k^{*}-k$	$\ln e$	$\ln d^{*}-\ln d$
$\ln E^{*}-\ln E$	1.000					
$k^{*}-g^{*}$	0.077	1.000				
$k-g$	0.125	0.211*	1.000			
$k^{*}-k$	0.072*	0.458*	−0.507*	1.000		
$\ln e$	0.343*	0.071	0.005	0.094	1.000	
$\ln d^{*}-\ln d$	−0.815*	−0.019*	−0.060	−0.056	−0.653*	1.000

Note: *, significant at 5 percent.

ARIMA was applied directly on growth rates based on actual earnings also, but with no appreciable differences.

The data source for capital market data is *Capital International Perspectives* published by Morgan Stanley. The three valuation ratios—*P*/*E*, *P*/*C* and *P*/*B*—were calculated by Morgan Stanley as a value-weighted average of 493 broad-based stocks for the United States and 489 stocks for Japan (see Morgan Stanley, *Capital International Perspectives,* for exact definitions). The exchange rate series was provided by Wharton Econometric Forecasting Associates.

Table 16.2 provides correlations among independent variables used in the regression. The correlation of particular interest is that between the cost of capital differential and exchange rates. Uncovered international interest rate parity specifies a relation between the interest rate differential and exchange rate changes. To the extent that the cost of equity capital can be measured by the risk-free interest rate plus market risk premium, a significant correlation is expected between $k^{*}-k$ and $\ln e$. No high correlation, however, is observed between these variables in Table 16.2, indicating either a changing relative market risk premium or deviations from interest rate parity.

Another interesting point is that earnings and dividends have strong negative correlations with each other. This supports a notion that high economic growth of Japan may have been fueled in part by high earnings retention and low dividend payment.

3
ESTIMATION RESULTS

This section reports estimation results on relative share price indices and relative valuation ratios between Japan and the United States.

Relative share price indices

Table 16.3 reports the time series estimation results of the relative share price indices between Japan and the United States, with and without the

Table 16.3 Estimation of relative share prices

	Generic model		*Gordon model*	
	I	*II*	*III*	*IV*
Constant	6.126*	4.833*	6.141*	4.847*
	(24.2)	(15.0)	(24.1)	(14.8)
ln E^{*}−ln E	0.534*	−0.128	0.552*	−0.112
	(6.36)	(−0.93)	(6.48)	(−0.79)
$k^{*}-k$	0.029	0.036*		
	(1.64)	(2.22)		
$k^{*}-g^{*}$			0.013	0.030
			(0.58)	(1.41)
$k-g$			−0.036	−0.032
			(−1.27)	(−1.21)
ln e	0.967*	0.737*	0.969*	0.740*
	(21.0)	(12.7)	(20.9)	(12.5)
ln d^{*}−ln d		−0.523*		−0.520*
		(−5.74)		(−5.61)
R^2	0.80	0.83	0.80	0.83
F	220.6	205.8	163.3	161.2

Notes: Numbers in parentheses are t values.
*, significant at 5 percent.

dividend payout rate, using the generic discounted cash flow model (equation (16.7)) and the Gordon model under the constant growth assumption (equation (16.8)). In the case of the latter, a positive-value constraint was imposed on $k-g$ and $k^{*}-g^{*}$ according to the assumption of the Gordon model. Estimation was done by ordinary least squares. To address the potential time dependence of errors, an autoregressive statistical procedure can be employed. An alternative method is to include time as an additional explanatory variable. The latter method is used here because, economically, time can also capture the effects of important structural changes that may have occurred after January 1981 as a result of major policy changes on both sides of the Pacific: the relaxation of capital flow controls in Japan and the enactment of the Depository Institutions Deregulation and Monetary Control Act in the United States. However, since these policy changes can affect the structural equation in a nonlinear as well as a linear fashion, time is introduced both as an intercept dummy and as a slope dummy in the coefficients of other explanatory variables.

Basically, the estimation of relative share indices in this section is *preliminary* prior to the estimation of relative valuation ratios in the next section. The reason is that relative share price is not as clear-cut a concept as the relative valuation ratio. In addition, share prices may not be as stationary as valuation ratios. The problem of stationarity, however, is somewhat mitigated in the two-country model here, because relative share prices are defined as a log difference of two share price indices rather than their absolute values. Cointegration studies indicate that most economic variables are stationary in difference form. Estimation was also performed in return form. The results, however, were unfruitful.[4] In any event, some discussion of the relative share price equation is helpful because it contains some variables, such as earnings, which are not included in the valuation ratio equations.

The estimation result in Table 16.3 indicates that, in equations without the dividend term, the level of Japanese corporate earnings has a statistically significant and positive impact on relative share prices. This implies that the firm's ability to generate earnings is one reason why stock prices are high in Japan. The relationship between earnings and share prices, of course, is nothing new and is consistent with the basic valuation model. In the context of Japan, such a result is nonetheless interesting because it counters the alternative explanation based on accounting. The accounting-based explanation attributes the high Japanese P/E ratios to under-reporting of earnings by Japanese firms.[5] The present analysis, in contrast, suggests that, even with the bias created by under-reporting, earnings still contain an economic content which adds to the explanatory power of the relative valuation equation.

The earnings term, however, becomes insignificant in regressions with dividends. The inclusion of the dividend payout rate as an additional explanatory variable was motivated by a classic debate started by Miller and Modigliani (1961) as to whether dividend payments were associated with an increase, no change, or a decrease in firm value. The descriptive statistics given earlier in Table 16.1 suggest a possibility that the impact of dividends in Japan fits the case of a decreasing firm value: compared with the United States, dividend payments are lower in Japan, while stock price increases are higher. This combination of lower dividends and higher capital gains in Japan was also shown in the correlation analysis in Table 16.2 discussed in the previous section. The same relationship is now shown in the negative and significant coefficient of dividends in Table 16.3. These results support the notion that high corporate growth financed by high retention and low dividends led to a growth in firm value in Japan.

Terms indicating k–g or k^*-k are generally insignificant at the 5 percent level; the only significant result is for the case of k^*-k in the generic cash flow model with dividend. This result suggests that the lower cost of capital—the oft-mentioned source of advantage for Japanese corporations *vis-à-vis* American firms—may not be such an important factor in explaining why the Japanese stock valuation is so high relative to the United States.[6]

A variable of particular interest is the exchange rate. The coefficient of exchange rate shows that a rise in the value of the Japanese yen against the dollar raises the price of Japanese stocks relative to US stocks. This result is consistent with an economic exposure impact in the United States: a weakening dollar against the yen stimulates US corporate earnings ($\partial E/\partial e>0$) and hence stock price due to increased export revenue under price-elastic market conditions. (It is inconsistent, however, with a similar, but opposite, economic effect on the Japanese side unless the Japanese firms face inelastic market demand abroad for their products and can therefore reap higher income by charging higher prices.) The same result is also consistent with the translation effect of net Japanese assets from the US standpoint: with a strong yen, a Japanese asset would be worth more in dollars.

Relative valuation ratios

Analyzed in the above was $\ln P^{*} - \ln P$, the relative share price indices of Japan and the United States. In this section, the log differences of three relative valuation ratios—the price-earnings ratio *(P/E),* the price-book value ratio *(P/B)* and the price-cash flow ratio *(P/C)*—of the two countries are examined.

Table 16.4 provides the estimation result of (16.11) with and without the dividend term. Compared with Table 16.3 regarding relative share price indices, $k-g$ now has a more significant sign. Of the three ratios, however, the level of significance is highest for price-cash flow ratios, suggesting a conjecture that cash flows, rather than earnings, are the more direct subject of market capitalization. Dividend payout rate has a significant negative impact on relative P/B and P/C ratios, consistent with the previous finding of a negative relation between dividends and stock price gains in Japan. The effect of dividend on relative P/E ratios, however, is insignificant. On the whole, the price-cash flow ratio and the price-book value ratio equations

Table 16.4 Estimation of relative valuation ratios

	P/E		*P/B*		*P/C*	
	I	*II*	*I*	*II*	*I*	*II*
Constant	5.679*	5.977*	4.664*	3.660*	5.127*	4.550*
	(22.9)	(17.7)	(24.8)	(15.9)	(25.3)	(16.9)
$k^{*}-g^{*}$	0.0005	−0.001	0.005	0.011	−0.022	−0.019
	(0.02)	(−0.05)	(0.28)	(0.65)	(−1.10)	(−0.96)
$k-g$	−0.058*	−0.055*	−0.032	−0.043*	−0.066*	−0.072*
	(−1.94)	(−1.83)	(−1.42)	(−2.11)	(−2.69)	(−3.02)
$\ln e$	0.894*	0.945*	0.770*	0.598*	0.882*	0.783*
	(19.5)	(15.6)	(22.1)	(14.5)	(23.5)	(16.2)
$\ln d^{*} - \ln d$		0.076		−0.255*		−0.146*
		(1.29)		(−6.38)		(−3.13)
R^2	0.70	0.70	0.75	0.80	0.77	0.79
F	128.2	97.0	165.1	163.7	186.8	150.0

Notes: Numbers in parentheses are t values.
*, significant at 5 percent.

	P/E		P/B		P/C	
	I	II	I	II	I	II

P/E, price-earnings ratio; P/B, price-book value ratio; P/C, price-cash flow ratio.

are more significant than the *P/E* ratio equations: they contain three of the four variables as significant compared with only two in the case of the *P/E* equations. This differential finding on the behavior of different valuation ratios is interesting and fits well with the work of Chan *et al.* (1991) who found cash flow yield and book-to-market ratios as the most significant determinants of the cross-sectional differences in Japanese stock returns.

Exchange rates are found to be highly significant for all three ratios. Hence, the result obtained in Table 16.3 in terms of relative share prices-a high association between yen value and stock prices in Japan relative to the United States—is carried over to relative valuation ratios. That is, a strong yen relative to the dollar is one reason why Japanese valuation ratios are high relative to those of the United States. As discussed, the significance of this result is that it largely reflects an economic effect, not the translation impact.

The above discussion is subject to qualifications due to changing market environments over time during the sample period. To address the issue of intertemporal stability, time was added in the basic model in the form of an intercept and a slope dummy. Table 16.5 examines the impact of time on relative valuation ratios in the context of an augmented regression to capture the effects of two government measures taken in 1981: the

Table 16.5 The effect of time on relative valuation ratios

	P/E		P/E		P/C	
	I	II	I	II	I	II
Constant	5.414*	3.929*	3.810*	3.836*	4.562*	5.741*
	(18.8)	(6.28)	(21.2)	(9.61)	(20.5)	(11.9)
$k^*–g^*$	−0.001	0.024	0.00003	0.023	−0.025	0.023
	(−0.05)	(0.60)	(0.002)	(0.94)	(−1.35)	(0.76)
$k–g$	−0.061*	−0.092*	−0.042*	−0.041*	−0.072*	−0.070*
	(−2.05)	(−1.91)	(−2.26)	(−1.33)	(−3.15)	(−1.89)
ln e	0.849*	0.580*	0.150*	0.633*	0.787*	1.000*
	(16.3)	(5.10)	(19.3)	(8.72)	(19.6)	(11.4)
T	0.047*	1.976*	0.150*	0.164	0.099*	1.308*
	(1.77)	(2.83)	(9.15)	(0.37)	(4.89)	(2.43)
$(k^*–g^*)T$		−0.057		−0.039		−0.067*
		(−1.15)		(−1.22)		(−1.74)
$(k–g)T$		0.048		−0.002		−0.005
		(0.80)		(−0.56)		(−0.10)

	P/E		*P/E*		*P/C*	
	I	*II*	*I*	*II*	*I*	*II*
(In *e*)*D*		0.352*		0.0006		−0.261*
		(2.76)		(0.70)		(−2.64)
R^2	0.71	0.72	0.83	0.84	0.80	0.81
F	98.2	59.8	206.9	117.4	165.5	99.6

Notes: Numbers in parentheses are t values.
*, significant at 5 percent.
P/E, price-earnings ratio; P/B, price-book value ratio; P/C, price-cash flow ratio.

relaxation of capital controls in Japan and monetary deregulation contained in the Depository Institutions Deregulation and Monetary Control Act in the United States. The estimation result shows a significant intercept dummy for five out of six equations, suggesting that an important structural shift may have occurred after January 1981. The effect of time is positive on all three relative valuation ratios, with the exception of the *P/B* equation with both intercept and slope dummies. Thus, changes in government policies on both sides of the Pacific in 1981 appear to have contributed to a rise in Japanese valuation ratios versus the United States.

The effects of slope dummies in the cost of capital term, however, are generally insignificant with the exception of the $(k^*–g^*)$ T term in the *P/C* equation. Hence, although the time-invariant static coefficient of the cost of capital term is shown to have some significance (but only for the United States), its impact does not appear to have been influenced by policy changes that occurred in 1981. Exchange rates, in contrast, are significant not only in time-invariant intercepts but also in time-varying slope coefficients (with the exception of *P/B)*.

Finally, it is interesting that the slope-time coefficients of the exchange rate term are significant in relative *P/E* and *P/C* equations. However, the signs are opposite, with a strong yen exerting a positive influence on Japan-United States *P/E* ratios and a negative one on relative *P/C* ratios. This suggests a different reaction of earnings versus cash flows to exchange rate changes. The pattern obtained here is consistent with the notion that earnings are more directly sensitive to currency translation impact while cash flows respond more directly to economic exposure impacts. That is, the translation impact of a strong yen is positive on the earnings of Japanese firms while it may hurt the operating cash flows of Japanese trading firms. The *P/B* ratios are shown to be insensitive to exchange rate changes possibly due to the presence of similar opposing forces operating on book values.[7] Empirical evidence presented here on different valuation ratios is not sufficiently broad for generalization. Nevertheless, the results are consistent with the usual definitions of translation and economic exchange exposures: earnings and book values are directly subject to translation exposure, while economic exposure operates primarily through cash flows and share prices.

4
CONCLUSIONS

The high level of Japanese stock valuation relative to other industrialized countries such as the United States is puzzling. Previous work attributes part of this valuation disparity to accounting differences in the two countries. This chapter examines the determinants of relative share prices and relative valuation ratios of Japan and the United States within a simple comparative market valuation model. The basic model includes economic fundamentals such as relative earnings, relative costs of equity capital, relative growth rates and currency values along with relative dividend payout ratios and time. Estimation results show exchange rate as the most significant and consistent factor throughout alternative model specifications. The impact of relative cost of capital or growth rate is generally weak. Earnings have some impact on relative share valuation, but their influence is diluted in the presence of dividends and a time dummy. There is also evidence that the relaxation of capital flows in Japan coupled with deregulation of depository institutions in the United States in the early 1980s caused a structural shift both in the form of an intercept shift and through changes in the slope coefficients of exchange rates and other variables.

It should be noted that the present work provides only a partial explanation based on economic fundamentals for the disparity in Japan-United States stock valuation in a comparative time series context. This chapter does not incorporate the impact of cross-country accounting differences and other institutional factors. Hence, it supplements—but does not supplant—existing institution-based explanations. A complete analysis requires simultaneous consideration of both fundamental and institutional factors.

NOTES

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1 The distribution of P/E ratios for a sample of large corporations is even more diverse: for national composites of global 1,000 stocks, *Business Week* (July 17, 1989) reports a P/E ratio of 100 for Japan and 21 for the United States.

2 This assumption also enables us to replace e_1 by its contemporaneous values. Alternatively, a forward exchange rate can be used, but cumulative empirical evidence suggests that the forward rate is a biased predictor of the future spot rate.

3 ARIMA(1, 1,1) uses the first-difference equation of the following form:

$$(X_t - \mu) - \phi_1(X_{t-1} - \mu) = e_t - \theta_1 e_{t-1}$$

where X is the variable concerned, μ is the mean of X, e is an error term, ϕ_1 is an AR(1) estimate and θ_1 is an MA(1) estimate. The following is a summary of the estimates:

	E	E^*	r	r^*
	0.9356	0.8764	−0.4022	0.7325
	(12.81)	(9.80)	(−3.72)	(5.78)
θ_1	0.8043	0.7045	−0.8293	0.4563
	(7.27)	(5.37)	(−12.78)	(2.75)

where numbers in parentheses are t values.

4 Estimation was also performed on stock return data. The results, however, proved unfruitful, with generally insignificant coefficients. An example of this estimation is

$$\underset{(0.25)}{k^* - k = 0.018} - \underset{(-1.54)}{0.171}(\hat{E}^* - \hat{E}) - \underset{(-1.21)}{2.156}(g^* - g) - \underset{(-0.66)}{5.888}\hat{e} - \underset{(-0.19)}{0.041}(d^* - d)$$

$R^2 = 0.03$ $\quad F = 1.27$ $\quad$ t values in the parentheses

where the circumflex indicates the rate of change of the variable concerned.

5 In addition to differences in accounting methods, the international comparability of earnings may suffer because of the interplay between depreciation and inflation, and differences in corporate leverage ratios.

6 See Ando and Auerbach (1988) for a comparison of Japanese and US cost of capital.

7 The high relative valuation gap between Japan and the United States, as well as the general empirical result obtained here, is not altered by the October 1987 stock market crash. If anything, the relative *P/E* has widened since the crash: the relative *P/E* ratio has increased to 4:1 in the post-crash period of October 1987 to February 1989 from 3:1 immediately prior to the crash.

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17
Cointegration and the relationship between inflation and stock prices in the emerging markets of Latin America: Argentina, Brazil, Chile, Mexico

Mitchell Ratner and Belmont F.Haydel

1
INTRODUCTION, LITERATURE REVIEW AND PURPOSE

A considerable body of empirical evidence documents the impact of inflation on stock returns in the United States. High inflation in the 1970s associated with subdued stock returns, and the subsequent growth of stock returns during the mid-1980s coinciding with a significant decline in inflation, indicate a negative relationship between inflation and stock returns. Kaul and Seyhun (1990), Kaul (1987), Geske and Roll (1983) and Fama (1981) all report that common stock returns react negatively to inflation in the United States. These findings are inconsistent with the Fisher effect which asserts that asset returns rise proportionally with the rate of expected inflation.

The international evidence generally follows the results for the United States. Gultekin (1983) finds a largely negative or insignificant relationship between inflation and stock returns in a 25-country analysis. Kaul (1987) also observes similar results in a four-country analysis. However, Firth (1979) shows that stock returns and inflation are positively related in the United Kingdom.

The purpose of this study is to examine the relationship between inflation and stock prices in the emerging stock markets of Latin America. This chapter is motivated by three factors. First, there is the question of why the Fisher effect is not robust over time or across countries. Kaul (1987) and others have indicated that the Fisher relationship changes over time. An econometric approach is used to solve this puzzle. Nelson and Plosser (1982) note that a substantial number of macroeconomic variables, including inflation, contain stochastic trends. The potential for misleading inferences due to the spurious regression phenomenon is evident when variables possess stochastic trends (Granger and Newbold 1974). Recent studies in the econometric literature suggest that cointegration tests are appropriate for examining the stochastic trends between variables (Phillips and Ouliaris 1990; Miller 1991).

Second, prior in-depth research on the Fisher effect is almost exclusively limited to the examination of US financial data. The systematic patterns demonstrated among these studies may reflect nothing more significant than the intensive analysis that this single data set has undergone. Lakonishok and Smidt (1988) and Lo and MacKinlay (1990) suggest that the best solution to any unintentional data mining is to test patterns observed in US data on foreign data sets.

Given the dynamic nature of the financial markets, the third reason for this study is to complement prior research. Emerging stock markets contain features that differentiate them from the markets of industrialized countries. In addition, the Latin American countries are presently undergoing major infrastructural changes due to deregulation and privatization of major industries.

Selected characteristics of Latin American stock markets are presented in Table 17.1. These markets are small and undeveloped compared with those of the industrial world *vis-à-vis* market capitalization. Hours of operation are limited, market access is somewhat restricted and there is a high degree of market concentration among the 10 largest stocks on the exchange. The capital markets in the four researched countries represent different combinations of issues; for instance, in Mexico the market is more equity in nature than in Brazil where the market is predominately a debtor market.

This chapter finds that the relationship between inflation and common stock in the emerging stock markets of Latin America is not positive. The remainder of this study is organized as follows. Section 2 describes the data and tests the regression relationship between inflation and common stock returns. The cointegration methodology and results are discussed in section 3. Section 4 concludes.

Table 17.1 Selected Latin American stock market characteristics

	Country			
	Argentina	*Brazil*	*Chile*	*Mexico*
Hours of operation (per day)	4.0	3.5	1.5	8.0
Market capitalization (in US $million)	4,225	44,368	9,587	22,558
Market concentration (% market capitalization of 10 largest stocks)	67.7	22.5	47.2	36.3
Number of firms per exchange	174	574	217	200
Inflation (mid-1991)	144%	367%	23%	22%

Source: Emerging Market Fact Book, Washington, DC: International Finance Corporation, 1991

2
STOCK RETURNS AND INFLATION: THE FISHER EFFECT

The data consist of monthly historical prices of stock market indices and inflation from January 1988 through October 1991.[1] The countries studied are

Argentina, Brazil, Chile and Mexico. The stock index series are obtained from Morgan Stanley. Inflation data (consumer price index) are reported in *International Financial Statistics* published by the International Monetary Fund. The dollar value of the monthly returns and inflation series are defined as

$$R_{it} = \frac{(P_{it}/X_{it}) - (P_{it-1}/X_{it-1})}{P_{it-1}/X_{it-1}} \tag{17.1}$$

$$I_{it} = \frac{\pi_{it} - \pi_{it-1}}{\pi_{it-1}} \tag{17.2}$$

where R_t is the nominal return on common stocks, P_{it} is the share price index of country *i* at time *t*, I_{it} is rate of inflation, π_{it} is the level of inflation and X_{it} is the spot exchange rate expressed as units of country i currency for one US dollar.

According to Fisher (1930), the nominal interest rate is equal to the sum of the real rate and an expected rate of inflation:

$$S_t = r_t + E(I_t) \tag{17.3}$$

where S_t is the nominal return on an asset in period *t*, r_t is the real interest rate and $E(I_t)$ is the expected rate of inflation. The Fisher effect implies that the nominal rate of interest adjusts to changes in expected inflation on a one-to-one basis. If the market is an efficient processor of information, then it will set the price of any asset at $t-1$ such that the expected nominal return on the asset from $t-1$ to t is equal to the sum of the expected real return and an appropriate assessment of anticipated inflation. Prior empirical studies have already established that the Fisher effect is not observed for common stock and inflation in US data. The question of whether changes in nominal stock returns are related to changes in expected inflation in Latin America is a separate issue.

The following four models are employed in this study to test the Fisher effect:

$$R_{it} = \alpha + \beta I_{it} + \varepsilon_{it} \tag{17.4}$$

$$R_{it} = \alpha + \beta_1 I_{it-1} + \beta_2 I_{it-2} + \beta_3 I_{it-3} + \beta_4 I_{it-4}\varepsilon_{it} \tag{17.5}$$

$$R_{it} = \alpha + \beta E(I_{it}) + \varepsilon_{it} \tag{17.6}$$

$$R_{it} = \alpha + \beta_1 E(I_{it}) + \beta_2 [I_{it} - E(I_{it})] + \varepsilon_{it} \tag{17.7}$$

The empirical tests of the Fisher effect are contained in Table 17.2. Equations (17.4) and (17.5) are suggested by Gultekin (1983). Panel A presents the contemporaneous equation (17.4). Under the null hypothesis (i.e. that

Table 17.2 Empirical analysis of the relationship between common stock returns and inflation in the emerging markets of Latin America: ordinary least squares regression estimates reported[a] (January 1988 to October 1991)

	$R_{it}=a+\beta I_{it}+\varepsilon_{it}$				
Panel A	α	β	R^2	DW	$F(H_0{:}\beta_i=0)$
Argentina	0.11^{**}	−0.07	0.01	1.80	0.36
	(2.12)	(−0.60)			
Brazil	0.15^{**}	-0.45^{**}	0.09	2.41	4.21^{**}

	$R_{it}=a+\beta I_{it}+\varepsilon_{it}$							
Panel A	α		β		R^2	DW		$F(H_0{:}\beta_i=0)$
	(2.38)		(−2.05)					
Chile[b]	0.07*		−2.09***		0.16	1.90		2.92***
	(2.76)		(−1.70)					
Mexico	0.03		1.26		0.03	1.96		1.40
	(1.05)		(1.18)					
	$R_{it}=\alpha+\beta_1 I_{it-1}+\beta_2 I_{it-2}+\beta_3 I_{it-3}+\beta_4 I_{it-4}\varepsilon_{it}$							
Panel B	α	β_1	β_2	β_3	β_4	R^2	DW	F $(H_0{:}\beta_i=0)$
Argentina	0.7	−0.10	0.48*	−0.10	−0.18	0.26	2.04	3.15**
	(1.08)	(−0.72)	(2.98)	(−0.59)	(−1.34)			
Brazil	−0.03	0.36	−0.72	0.61	0.16	0.10	2.34	1.01
	(−0.37)	(0.99)	(−1.59)	(1.36)	(0.04)			
Chile[b]	−0.01	−1.11	0.62	1.54	1.90***	0.26	1.82	1.64
	(−0.28)	(−0.94)	(0.52)	(1.32)	(1.66)			
Mexico	0.05	−1.92	1.01	−1.27	1.52	0.27	1.90	0.52
	(1.47)	(−0.83)	(0.33)	(−0.42)	(0.95)			
	$R_{it}=a+\beta E(I_{it})+\varepsilon_{it}$							
Panel C	α		β		R^2	DW		F $(H_0{:}\beta_i=0)$
Argentina	0.06		0.15		0.04	1.93		1.81
	(1.07)		(1.34)					
Brazil	0.02		0.13		0.01	2.39		0.33
	(0.23)		(0.57)					
Chile[b]	0.05*		−1.36		0.03	1.90		1.26
	(2.58)		(−1.12)					
Mexico	0.08*		−1.97*		0.10	2.10		4.59**
	(3.72)		(−2.14)					
	$R_{it}=a+\beta_1 E(I_{\text{it}})+\beta_2[I_{it}-E(I_{it})]+\varepsilon_{it}$							
Panel D	α	β_1	β_2		R^2	DW		F $(H_0{:}\beta_i=0)$
Argentina	0.08	0.05	−0.26***		0.11	1.99		2.62***
	(1.56)	(0.40)	(−1.82)					
Brazil	0.09	−0.18	−1.26*		0.31	1.98		9.57*
	(1.57)	(0.90)	(−4.32)					
Chile[b]	0.09*	−3.11***	−1.73		0.18	1.97		1.78
	(2.83)	(−1.86)	(−1.40)					
Mexico	0.08*	−2.15	−0.40		0.09	2.10		2.26
	(3.16)	(−1.62)	(−0.19)					

	$R_{it}=a+\beta I_{it}+\varepsilon_{it}$				
Panel A	α	β	R^2	DW	$F(H_0:\beta_i=0)$

Notes: *, **, ***, significant at the 1, 5 and 10 percent levels respectively.
[a] *t* statistics are in parentheses.
[b] Corrected for serial correlation using the Cochrane—Orcutt procedure.

the Fisher effect exists) α will be equal to the average realized real rate of return over the estimation period, and β will equal unity. This equation utilizes realized values of stock returns and inflation under the assumption of rational expectations. Rationality implies that the expectations of both stock returns and inflation are based upon all relevant information in period t. With the exception of Mexico, the relationship between stock returns and inflation is negative. In particular, the β coefficient for Brazil (−0.45) is significant at the 5 percent level, while β for Chile (−2.09) is significant at the 10 percent level. The null hypothesis H_0: $\beta=0$ can be rejected for only these two countries as indicated by an F test. The βs for Argentina and Mexico are insignificant.[2]

A multiple regression of stock returns on lagged inflation rates from equation (17.5) is shown in panel B. The β coefficients are insignificant for all countries except Argentina. The null hypothesis of a zero β is rejected for Argentina (F=3. 15) at the 5 percent level of significance.

Equations (17.6) and (17.7) follow the Fama and Schwert (1977) method for testing the Fisher effect. In equation (17.6) the stock returns are regressed on the expected level of inflation. Unfortunately, the proxy for expected inflation used by Fama and Schwert (the short-term Treasury Bill rate) is no longer effective. The actual level of inflation observed at t–1 is used as the measure of expected inflation at time t. The β coefficients for Argentina, Brazil and Chile are insignificant. The β for Mexico (−2.14) is significant at the 5 percent level.

Equation (17.7) examines the relationship between both expected and unexpected inflation on the stock returns. The level of unexpected inflation is calculated as the difference between the observed level of inflation at time t and the unexpected level of inflation. An F test for the joint significance of the regression coefficients for both expected and unexpected inflation provides weak significance for Argentina at the 10 percent level (F=2.62) and strong significance for Brazil (F=9.57) at the 1 percent level. The null hypothesis of nonzero β coefficients cannot be rejected for Chile and Mexico.

In sum, the relationship between inflation and stock returns is generally not statistically significant. The explanatory power of the regressors (as measured by the R^2) is low. Moreover, there is no statistically significant positive relationship between inflation and stock returns. The only significant β coefficients have negative signs. This result is inconsistent with the Fisher effect, but does concur with some prior research on other countries.

3
COINTEGRATION METHODOLOGY

Most economic variables have changed substantially in mean and variance during the last century. Consequently, the bulk of modern econometric theory is based on the assumption that the underlying data processes of aggregate time series are nonstationary (Hendry 1986). The observation that certain systematic correlations of variables may be spurious is indeed valid; therefore, many researchers have suggested differencing the data to remove any trends and ensure stationarity of the time series (Pindyck and Rubinfeld 1981). While this procedure is arguably correct, others contend that differencing data loses valuable long-run information in the time series (Engle and Granger 1987).

Although many individual economic variables may deviate over time, the notion of cointegration is that some pairs of series can be expected to move together. Certain pairs of economic variables may diverge for some time, but the economic forces of the market mechanism will bring them together in the long term.

Cointegration in the Engle and Granger (1987) sense requires that the two series being compared are of the same order of integration. The order of integration, *I(d),* refers to the number of times a series must be differenced to ensure stationarity. A stationary series is identified as 1(0), with a constant mean and variance over time. Stationarity is reached for most economic time series after one difference (X_t-X_{t-1}).

Given two 1(1) series, as identified by tests derived by Dickey and Fuller (1979, 1981), the series x_t and y_t form the linear combination

$$z_t = x_t - by_t \qquad (17.8)$$

which is also 1(1). However, it is possible that z_t is of order 1(0); if this occurs, the constant b cancels out the long-run components of x_t and y_t, and the two series are cointegrated. The univariate quantity z_t is called the equilibrium error term and can be estimated using ordinary least squares:

$$x_t = \alpha + \beta y_t + u_t \qquad (17.9)$$

where β is an estimate of b, and a plus u_t is an estimate of z_t. The residual term u_t must be tested to determine the order of integration (stationarity) of z_t.

Engle and Granger (1987) present a procedure to test for cointegration between variables. The augmented Dickey-Fuller (ADF) process is represented by

$$\delta u_t = -\sigma u_{t-1} + \sum_{p=1}^{P} b_p\, \delta u_{t-p} + \varepsilon_t \qquad (17.10)$$

where u_t is the residual from the cointegrating equation, δu_t is the first difference of u_t and p represents the number of residual lags. The number of lags, P, is large enough to ensure that the regressions have residuals that appear to be white noise. If $-\sigma$ is significantly different from zero, then u_t is stationary and the variables are cointegrated. If the null hypothesis H_0: $-\sigma=0$ cannot be rejected, there is sufficient evidence to conclude that u_t is nonstationary. A pseudo t statistic is the test statistic for $-\sigma$; however, the standard t distribution cannot be used. The appropriate critical values are provided by MacKinnon (1990).

Table 17.3 Cointegration tests of common stock returns and inflation: augmented Dickey-Fuller pseudo-t statistics reported[a] (January 1988 to October 1991)

Model[b]	*Argentina*	*Brazil*	*Chile*	*Mexico*
1	−1.34	−3.27*	−1.49	−2.07
2	−0.91	−3.02	−1.78	−2.45
3	−1.36	−3.46*	−1.44	−3.06
4	−1.37	−3.53	−1.52	−2.18

Notes: *, significant at the 10 percent level. Significant cointegration indicates the existence of a stochastic trend between the variables.

[a] Calculation of the critical values are based on sample size and number of variables in the equation. The following table contains the estimated critical values by model number derived from MacKinnon (1990):

Model	1%	5%	10%
1	−4.15	−3.47	−3.14
2	−5.47	−4.73	−4.37
3	−4.15	−3.47	−3.14
4	−4.63	−3.94	−3.59

[b] Model 1: $P_{it}=a+\beta\pi_{it}+\varepsilon_{it}$
Model 2: $P_{it}=\alpha+\beta_1\pi_{it-1}+\beta_2\pi_{it-2}+\beta_3\pi_{it-3}+\beta_4\pi_{it-4}\varepsilon_{it}$
Model 3: $P_{it}=\alpha+\beta E(\pi_{it})+\varepsilon_{it}$
Model 4: $P_{it}=a+\beta_1 E(\pi_{it})+\beta_2[\pi_{it}-E(\pi_{it})]+\varepsilon_{it}$
where P_{it} represents the share price index at time t and π_{it} is the level of inflation at time t.

ADF cointegration tests are applied to the residuals from equations (17.4) through (17.7).[3] Table 17.3 reports the ADF pseudo t statistics from the cointegrating regressions. There is no evidence for a common stochastic trend between stock prices and inflation for almost all countries in the sample. The null hypothesis of no cointegration cannot be rejected under the ADF tests at any significance level for any country with the exception of Brazil; in two of the models the t statistic exceeds the established critical value at the 10 percent level.

The cointegration findings do not indicate a common stochastic trend between stock prices and inflation. These results are consistent with the previous regression results and are not supportive of the Fisher effect.

4
CONCLUSION

The belief that asset returns are effective predictors of future inflation is commonly referred to as the Fisher effect. This paper examines the Fisher effect for common stock in the emerging markets of Latin America, specifically in Argentina, Brazil, Chile and Mexico. Regression and cointegration analysis do not support the existence of the Fisher effect from 1988 to 1991 in these countries.

The relationship between common stock and inflation is found to be either negative or insignificantly different from zero. These findings are consistent with the inferences drawn from earlier studies of US data by Kaul and Seyhun (1990), Fama (1981) and Fama and Schwert (1977), and with studies of foreign data by Gultekin (1983) and Kaul (1987). These results cannot be reconciled with Firth (1979) on UK data.

NOTES

1 Major political and economic reforms in the countries researched and the observation that Latin American stock markets were largely ignored by international institutional investors until the late 1980s substantiate the relatively short time horizon used in this study.

2 The β estimates will be biased due to the correlation of the real rate of return and the error term from equation (17.4) when using contemporaneous data. As such, these results are viewed merely as *ex post* descriptions of the correlation between stock returns and inflation, not as tests of forecastability.

3 The first step is to confirm that each series is a stationary 1(1) process (not reported here, but available upon request). The ordinary least squares regressions in equations (17.4) through (17.7) are repeated using the levels of each series (Pit, πit) instead of the first differences (R_{it}, I_{it}).

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18
From *banca* to *bolsa:* corporate governance and equity financing in Latin America

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1
INTRODUCTION

In Latin America, as in most developing countries, monetary intermediaries play a dominant role in the financial systems. In addition, in the decades following the Second World War state development financing institutions proliferated. Capital markets have remained rather thin and unimportant, even though markets for short-term securities have had an increasing importance. In the aftermath of the debt crisis, attempting to promote alternative forms of financing including the mobilization of international savings, governments from these nations are enforcing financial opening and financial liberalization. However, no amount of deregulation or re-regulation in the securities markets will bring developing securities markets out of their very secondary role in financing economic activity unless specific changes occur in the *real economy*. Highly interweaved with this issue is the nature of corporate governance. Closely held corporations, enjoying monopoly rents due to government intervention and protectionism, have restricted the supply of securities in the capital markets, limiting in turn their own development and national development in general. Moreover, closely held corporativism, an institutional feature called "groups", has led in Latin America and most developing countries to a close association between them and banking institutions, often a part of the "group", which has distorted savings and credit allocations.

Examining the nature of this problem, we offer a theoretical framework presented in three basic propositions concerning the relationship between government intervention, corporate governance, corporate financing and capital markets development. We concentrate on the Latin American (LA) case, drawing from its experience empirical examples that support our propositions.[1] However, the central ideas we present here are just as applicable to the case of other developing countries and their experiences are often mentioned.

It is considered in this chapter that one of the preconditions to promoting economic development is to launch capital markets development,[2] balancing the dynamics of their expansion with the interests of all participants, particularly minority outside investors relative to majority shareholders and management, and moving corporate financing from short-term, closed-circuit, banking credits to long-term instruments issued openly on securities markets. We also contend that reforms in the real and financial sectors should go hand in hand. Otherwise incomplete and imperfect markets would persist and bound rational decision-making. For the LA countries, and all developing nations in general, this issue is of great importance. Under current conditions of economic and financial globalization and the formation of economic blocs, to take advantage of world changes and remain competitive these nations need to strengthen local and international savings mobilization and a large and robust group of corporations that lead their economic growth. Otherwise, only a few firms will develop, becoming "export enclaves" whose impact will be nil on overall economic national development and might even lead to new forms of economic dualism. It is therefore imperative to consolidate the change from traditional bank financing to stock market financing that is emerging in Latin America and the developing world. The issue also assumes great importance in view of the complex set of liberalization, re-regulation and financial innovations that is being implemented by the developing nations. Paramount among them are the promotion of capital markets development and the emergence of "universal banking". Similarly, equity instruments are becoming, through international capital markets, a favoured form of capital mobilization to firms from the developing countries. Inappropriate policies and regulations could accentuate the closed-circuit association between banking institutions and closely held corporations, a problem which must now be overcome to accelerate economic development.

2
CAPITAL MARKETS EFFICIENCY AND DEVELOPMENT

The benefits of equities markets can be described in three basic roles:

1 a source of corporate risk financing;
2 providing prices that optimize funds allocation and production efficiency;
3 promoting the development of a wide and well-diversified corporate sector.

Expanding substantially the activity of equities markets is therefore a desirable goal for developing countries.[3] To this end, governments from the LA countries have engaged in significant financial liberalization programs. However, although a proper legislative framework is needed, the changes that will make a full development of equities markets possible consist of a virtual elimination of government-induced distortions in the goods and financial sectors that offer monopoly-rent-generating opportunities to domestic entrepreneurs.

The fundamental reason for this is that, unlike industrialized countries, separation of control and ownership are not the rule in Latin America (and other developing countries). This restricts the supply of securities to the market as entrepreneurs seek alternative forms of financing, predominantly bank financing. Similarly, the demand for corporate stock remains low because individual investors see their role limited to minority holders, which often is not a well protected position legally. The set of incentives that lead entrepreneurs either to release control and sell shares to the market or to maintain close control of the firm depends upon the level of competition in the goods and financial markets. Researchers as well as policy-makers have often assumed that the process of separation of ownership and control is associated solely with the size and complexity of the enterprise independent of the structure of the goods markets.[4] Only the forms of government intervention that *suppressed* private sector activity and unfair competition of alternative forms of financing (e.g. excess development banking activity and subsidized credit) were seen as hindering the development of the financial markets. As a result it has been implicitly assumed that the development of equities markets was simply a matter of development in the size of the economy, i.e. growth inevitably leads to dynamic equities markets, a process that should be aided by an appropriate regulatory framework. This is a naive incomplete view of the conditions that lead to the development of equities markets.

Table 18.1 presents capitalization and turnover ratios for six emerging LA capital markets and some selected developed countries. Although recently LA stock markets have had an impressive growth, these statistics, quite representative of other developing and industrialized countries, clearly reveal a different dynamic operating in the LA capital markets *vis-à-vis* stock markets from the developed countries. Turnover rates are quite revealing. The mean trading value for LA stock markets is 10.22 percent of the mean value traded in the equities markets of industrialized countries and 0.4 percent of stock trade in US markets. This situation is perplexing, considering that most LA securities markets were founded over a century ago (Buenos Aires, 1854; Montevideo, 1864; Rio de Janeiro, 1876; Santiago, 1892; Mexico, 1894; Lima, 1896; Bogota, 1926; Caracas, 1947). Contemporaneous or even later exchanges have done much better (e.g. Toronto, 1858; Tokyo, 1878; Korea, 1911, 1946; Malaysia, 1930, 1973; Singapore, 1960, 1973). One reason behind the underdevelopment of the LA exchanges is market inefficiency. There are four conditions which characterize market efficiency that are by no means exclusive to financial markets. Markets (real or financial) are efficient if

1 the products (shares) being exchanged are reasonably standardized;
2 there is legal freedom for buyers and sellers to enter/leave the market;
3 there is a large number of buyers and sellers; and
4 there is sufficient information symmetry about the value of assets.

Table 18.1 Latin American and developed countries stock markets

	Number of companies	*Market capitalization (millions of US dollars)*	*Trading value (millions of US dollars)*	*Trading value/GDP (%)*	*Trading value/GNP per capita (%)*
Argentina	174	18,509	4,824	4.4	143.6
Brazil[a]	570	42,759	13,373	2.7	413.9
Chile	221	27,984	1,900	4.4	58.6
Colombia	83	4,036	203	0.7	23.4
Mexico	209	98,178	31.723	12.8	1,127.0
Venezuela	66	11,214	3,240	6.1	123.3
Mean		33,780	9,211	5.2	315.0
France	839	374,093	118,218	8.9	503.0
Germany	1,204	393,453	818,603	47.7	3,079.0
Japan	2,107	3,130,863	995,939	27.5	3,412.3
United Kingdom	1,915	1,003,184	317,866	29.5	1,700.5
United States	6,742	4,180,210	2,254,983	39.8	10,061.3
Mean		1,816.361	901,122	30.7	3,751.2

Sources: Compiled from *Emerging Stock Markets Fact Book 1992,* IFC: *International Financial Statistics,* July 1992, IMF: *Economic Survey of Latin America,* 1991, ECLA; *The Guide to World Equity Markets 1992,* Euromoney
Note: [a]Sao Paulo.

It is reasonably safe to assume that the first two conditions are met in most LA (as well as other developing countries) equities markets. It is the last two conditions that pose a challenge;[5] they are not satisfactorily met in Latin America and their insufficiency leads to market inefficiency. An alternative explanation is offered next, presenting and discussing three propositions.

3
CORPORATE GOVERNANCE AND EQUITIES MARKET DEVELOPMENT

Proposition 1 A necessary but not sufficient condition for the development of an efficient equities market is the existence of an adequate supply of risk-bearing securities with a suitable information set about return payoff and risk.

This proposition simply restates the last two conditions of market efficiency presented above. In the absence of a critical collection of entrepreneurs willing to sell residual risk-bearing securities *and* to produce the information set necessary for the market to assess the intrinsic value of these securities, no efficient market can develop.

The production and sale of residual risk-bearing securities is associated with the existence of incentives that motivate the investor/entrepreneur to seek this form of financing. These incentives only exist if markets are competitive and offer opportunities for corporate growth. The absence of these incentives will encourage the use of alternative means of financing (internally generated funds, bank loans, government budgetary subsidies etc.). If a critical mass of entrepreneurs chooses to abstain from raising funds through equities, no efficient market can develop. Unfortunately, this has been the prevailing situation in Latin America. There, the number of firms listed in the stock markets is extremely small (see Table 18.1). Moreover, corporations, particularly large industrial groups, remain closely held, issuing only marginal amounts of shares in the markets. The turnover and capitalization ratios shown in Table 18.1 confirm this assertion; liquid shares in developed markets correspond to 50 percent of total capitalization, while in LA markets they correspond to only 27 percent.[6] Entrepreneurs largely remain as owner-managers because traditionally they have operated in small and protected markets. Thus, they have enjoyed neomonopoly positions and above average returns. Restricted competition and protected market niches have simply induced owner-managers to invest to the "size of the market" in multiple products, which is precisely a characteristic of the "groups", without promoting product and technology innovations from within the firm; financing for the projects comes from internal resources and high leverage levels derived from bank-affiliated institutions and preferential loans from government development banks.

The production of a suitable information set is basically the responsibility of the issuer, who must generate the information that reveals to potential investors the value of the assets. However, production and dissemination of information about the firm has two major implications: (i) it is costly to produce and disseminate; (ii) it reveals to the market information that is private to the firm. If the preferred form of financing is not through the securitized financial markets, firms have no reason to incur the costs of generating and disseminating the information. Furthermore, if maintaining secrecy about the source of the competitive edge of the firm is crucial, generating and disseminating this information may harm the viability of the firm or project. That is, in the absence of incentives to generate and disseminate information about the value of the assets, the information will not reach the market. However, if incentives are sufficient to create and disseminate that information, firms will produce it and actively disseminate it to the market of potential investors.

A number of cases can be brought in to support our proposition. Two situations must be mentioned in relation to Mexico. First, the nationalization of commercial banking in 1982 made evident the close ties existing between those banks and large industrial groups. Soon, bank-owned corporations and stock brokerage houses were returned to their owners. Then firms increased their securities offerings and stock market activity and financing to corporate activities increased rapidly, clearly showing that banks previously substituted capital markets.

More recently, along with introducing changes to transform and open the economy to foreign trade and investments, the government has promoted financial market liberalization. As a result competition has increased, but market opportunities have increased too. This has led to an important, healthy change of attitude among many Mexican entrepreneurs, achieving high levels of competitiveness and seeking market opportunities at both local and international levels. Moreover, the North American Free Trade Agreement (NAFTA) has given them a concrete vision on the challenges that must be met. As a result, corporations are seeking additional financing in the capital markets and are disclosing more information about their financial performance and plans. The number of risk-bearing securities has also increased in the Mexican Stock Market, to the extent that warrants are now traded and other forms of derivatives are in the making. Along with these changes there has been an explosive growth of corporate financial information. Stock market reports are more frequent, ample and reliable and the stock market is highly automatized. In addition five daily papers report market activity. Two weekly papers, one in English, report market activity and present lead articles. The market has responded favourably, confirming that when an issuer decides to raise funds in the market and releases a suitable set of information about the risk-return payoffs of the securities, investors (the demand side of the market) respond favorably. In this process the internationalization of the Mexican Stock Market and its firms has played an important role. Liberalization of the international financial markets, particularly US markets, has favored this change, but it could never have happened unless Mexican entrepreneurs had been willing to issue ADRs, GDRs, neutral funds and free subscription shares, and release more information, in particular detailed prospectuses in English following US accounting standards.

The Chilean experience offers additional insights about our first proposition. Reforms in the financial sector began in the mid-1970s. Before liberalization reforms began to be enforced stock markets played a marginal role in corporate finance and economic development. Financial deepening was rather small. Total financial activity represented 12.0 percent of GNP. Corporations, particularly groups, financed their investments from internal resources, suppliers, state commercial banks, a couple of foreign banks, four development banks and some other public financial intermediaries. A steady course of action decontrolling both the real and financial sectors has led to significant changes. As a result financial deepening expressed in relation to GNP increased to 56.2 percent in 1981. By 1989 total financial liabilities represented 165 percent of GNP, 92.1 percent corresponding to banking liabilities, 108 percent to financial savings and 75 percent to stock market activity.[7]

Moreover, groups, although still controlling banks, began using the stock market to finance their investments. However, funds allocation was highly concentrated during the first stages of financial reform which later coincided with the financial crisis of 1982–3.[8] To overcome limits on credit rationing imposed on commercial banks, groups issued stock and debt in the securities markets and established other forms of intermediation, allowed by the law, which invested in securities issued by the group. Towards the end of 1982 two groups controlled 50 percent of private banking credit allocations, 68 percent of the portfolios from pension funds, 98 percent of the portfolios from mutual funds and almost 100 percent of commercial paper. In addition, their corporations represented 38 percent of total trade in the Santiago Stock Market. Economic recuperation and further reforms in the markets led to a strengthening of the securities markets. Their participation in savings mobilization became more important. The share of nonbanking intermediaries in relation to total financial liabilities changed from 20.4 percent in 1984 to 44.2 percent in 1989. Similarly, corporate financing patterns continued to move from *banca* to *bolsa*. Up to the mid-1980s banking credits represented 41 percent of total corporate financing in Chile. Bond and stock financing only accounted for 7 percent of corporate financing. The remainder was financed by accounts payable and retained earnings. This has changed in the last few years. During the second half of the last decade, stock offerings increased 2.9 times and bond offers 1.7 times in relation to the first half of that period. As a result corporations are less dependent on commercial, short-term, bank credits, and resource allocation has been more efficient, inducing high levels of economic growth.[9]

In the case of Turkey, the virtual elimination of control of interest rates and unlimited "bail-out" guarantees to banks had made bank borrowing expensive. This, in conjunction with rapidly growing export opportunities to the European Union market led a number of family owned industrial conglomerates to seek finance in the equities markets, creating a near flood of new issues. The stiff disclosure requirements resulting from the reforms guaranteed that the issues were accompanied by an adequate information set about the value of the assets being financed. Despite the unusually high level of activity in the primary market, the issues were readily absorbed and the Istanbul Stock Exchange index steadily maintained the level it had attained over the bull market of the late 1980s.

Proposition 2 A supply of risk-bearing securities and the information set about their value will be sufficient to allow the development of an efficient equities market if the public corporation is the preferred mode of corporate governance for a significant number of firms.

This proposition as well as its validity is somewhat less obvious. However, it is fundamental to understand the factors that lead to the development of an efficient equities market. The key concept in this proposition is the *significant number of firms*. In each economy, only a finite subset of firms meet, in terms of size, economics and information production ability, the standardization requirements necessary to qualify for listing. In the absence of a significant number of these firms willing to issue residual risk-bearing securities no substantive market for these securities can develop. However, for a corporation to be willing to issue these securities and at the same time make them liquid, the public corporation must be the preferred form of corporate governance. The size and significance of an equities market is ultimately determined by the number of qualified firms supplying residual risk-bearing securities to the market for trading.

The choice of public corporation as the form of corporate governance implies, at its most fundamental level, the separation of ownership and control. If market conditions are such that the closely held form of corporate governance is preferred for most entrepreneurs, the shares issued by the corporation will not be available for trading, whether or not they are listed on an exchange. In Latin America public corporations have not been the common form of corporate governance. Firms, even large industrial groups, have remained closely held. In Mexico almost every known major company or group of companies (Alpha, Vitro, Cemex, Televisa etc.) is a closely held enterprise.[10] Moreover, in spite of trade and investment opening and deregulation (monopoly or oligopoly) groups dominate in the economy. Less than four firms lead in each sector.[11] Despite its remarkable growth and deregulation, only 163,896 investors participate in the Mexican Stock Market, less than 0.7 percent of the economically active population and 0.19 percent of the total population.[12] Holdings average $513.000 dollars, but a select elite owns 60–85 percent of corporate capital.

In Chile, the number of registered shareholders of corporations listed in the Santiago Stock Market has increased significantly in the last few years, but is still small: 371,778 in 1984 and 629,329 in 1989. The Santiago Stock Market estimates that each individual investor holds shares of three firms, on average, which means that there were about 269,774 individual share-holders in 1989, 2.1 percent of the total population. Corporate ownership is even more concentrated. Twelve corporate shareholders control 72.5 percent of total equity in the market. Assuming that 12 shareholders are majority holders in the 213 corporations listed in the market, there are 2,556 majority shareholders, 1.2 percent of total investors in the market, leaving around 207,218 minority holders. This figure might be a bit overestimated because majority holders often have majority interests in more than one firm.[13]

Three reasons can be discerned as the cause for the restricted acceptance of public corporations in developing countries: cultural and political factors, and market limitations. Cultural factors have emphasized traditional family values as a source of social status, security and economic well-being. Political factors led in this century to high intervention from the state in the economy. As a result, besides some repressive policies towards private business activity, state corporations proliferated and became the preferred form of corporate organization for key "strategic" economic activities. Current privatization programs are reversing this trend and a "democratization" of capital is present in some cases, for privatization schemes include the distribution of shares to workers and "popular" offerings.[14] Finally, market imperfections have induced owner-managers to strengthen corporate control and seek further protectionism.

Paradoxically, a vicious circle has ensued in the capital markets. In the absence of arm's length financial markets and limited corporate information, valuation in imperfect markets has often been imprecise or manipulated. Consequently, owner-managers have been reluctant to issue capital stock. Finally, it must be mentioned that, because of the limited alternatives for diversifying risk, aiming to manage it they have diversified outside their own capital markets: in real assets (the root of the multi-enterprise group) and by investing abroad—capital flight—thus limiting securities market development.[15]

Proposition 3 A necessary condition for public corporations to be the preferred mode of corporate governance is the existence of competitive goods and financial markets in which rent-generating opportunities are based on technological (production, marketing, etc.) innovation and are transient.

Ever since Berle and Means (1932) observed that ownership and control in large (US) corporations were often separated, this view of the corporation has become the paradigm for analysis. Indeed, for the mature US corporate entity, ownership and control held in the same hands is the exception not the rule. The largest closely held corporation in the United States is Cargill Inc. of Minneapolis, held by the Koch family. This is a name unknown to most people and enjoys quite a low ranking in the *Fortune* 500 listing. Moreover, privately held corporations in the United States face a competitive market, which forces them constantly to seek technological innovation. This, however, is not the case for the majority of other countries, and certainly not for Latin America. There, groups are owned and managed by a tight circle of family members and friends, and enjoy a monopolistic situation. According to Schumpeter [1934] monopoly may be conducive to innovation by allowing the technologically innovative corporation to capture high profits (which in a competitive situation would lead to lower consumer prices). In turn, profits would be reinvested in further innovations. However, in Latin America, and developing countries in general, corporate research and development is almost non-existent. LA firms rely on imported technology for innovation. Indeed, developing countries invest less than the 1 percent of GNP recommended by UNESCO for research and development activities. In 1991, Mexico invested 0.37 percent of GNP on research and development activities; corporations only devote 1 percent of sales to those activities, which is only 15 percent of total national expenditures on research and development. Moreover, only 5 percent of Mexican firms can be considered modern, concentrated in 12 industrial groups, while 65 percent operate with obsolete equipment. This, along with protectionism, which makes monopoly profits persist, cause the negative effects of monopoly to prevail over possible positive effects.[16]

Why does a mature corporation evolve into a public corporation in, say, the United States and into a family holding in most developing countries?

The production and sale to the public of risk-bearing securities is a function associated with the financing of the enterprise. It is one of several forms available to the investor-entrepreneur to accomplish the goal of financing the growth opportunities available to the enterprise. Competing forms of financing are available in the market, including self-financing, debt financing or even government subsidies. Each form of financing implies contractual obligations to the entrepreneur which he will take into consideration when selecting a vehicle. These obligations imply different sets of claims on the use of the firm's cash flows, including restrictions on the allocation of those cash flows for future projects, i.e. its governance. These potential restrictions should be viewed as costs associated with the particular contractual form used for financing. The entrepreneur will choose that particular form of financing that, given the conditions in the market, place the least burden in terms of "out-of-pocket" expenses and restrictions on his ability to choose future allocation of funds. Ultimately, this implies that the form of corporate governance—in our case closely held versus public corporation—will be the result of a set of contractual choices of financing. At each point in the decision-making process, the entrepreneur will minimize the bundle of costs associated with the various forms of financing contracts available to him.[17]

This framework of analysis confirms the validity of our third proposition. To analyze it further we present a subset of two additional propositions. First we put forward the theory of the standard evolution of the public corporation (proposition 3.1). This is the accepted view in modern finance and corporate governance theory. Then we proceed to describe the evolution of the corporation in a market environment in which rent-generating opportunities based on government-induced market distortions exist and information asymmetries in the financial markets are severe (proposition 3.2).

The evolution of the public corporation

Proposition 3.1 In the presence of competitive real and financial markets, separation of ownership and control is the preferred form of corporate governance.

This is a result corroborated in the finance literature (Jensen and Meckling 1976; Fama and Jensen 1983). The focus of our attention is on firms which Bhagwati (1982b) called the "technically progressive Schumpeterian industry" because they represent the essence of the dynamics of the capitalist system as described by Schumpeter (1934).

A firm begins as an entrepreneurial experiment based on some technological or marketing opportunity. If the idea is good and management is sound, the firm, by all odds, will survive and grow. Competent management relying on the findings of solid research and development and careful capital budgeting results naturally in growth of the firm. This scheme is illustrated in Figure 18.1. On the left vertical axis we represent the growth in external financing needed and on the right vertical axis the firm's profits. The horizontal axis represents the passage of time and the parallel π_n represents the long-run normal rate of return available to

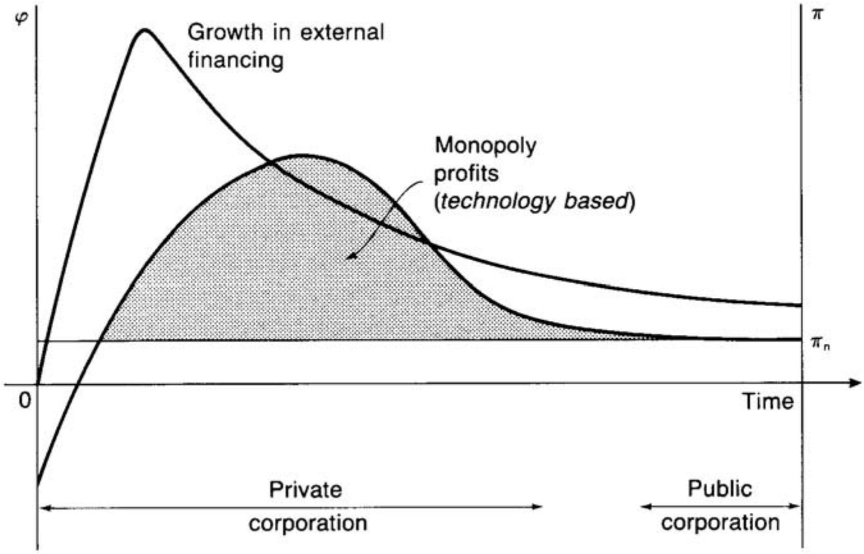

Figure 18.1 Corporate governance, competitive goods markets

the enterprise in a competitive market. The shaded area under the profit curve represents the transient rent available to the entrepreneur holding a monopoly over a production or marketing technology.

In these initial stages, the company typically is closely held by the entrepreneur and, possibly, his venture capitalists. However, growth leads to two types of problems which ultimately lead to the separation of ownership and control. These problems are (i) the need to finance growth opportunities and (ii) incentives to diversify business risk through financial markets. The entrepreneur must find and implement a structure of corporate governance that allows him to attain corporate goals most efficiently. This implies an explicit consideration of the impact, in terms of costs and contractual obligations he assumes, of alternative forms of financing *available*.

Growth financing

The need of funds to finance growth opportunities of the firm may outpace the entrepreneur's ability to self-finance. If he owns a monopoly on an idea, e.g. a new product, monopoly profits can go a long way toward financing growth. To the extent possible, the entrepreneur will make use of internally generated funds so as to maintain maximum control over the monopoly idea. However, internal funds available may not suffice to totally finance the growth opportunities of the project. For the mature firm that has a large set of information already in the marketplace, it is easy to attract additional capital at prices that are well known. For entrepreneurial firms with a relatively small set of information about its opportunities already available in the marketplace, it is more difficult to attract capital. To obtain financing, the entrepreneur may have to contract financing that implies both a sharing of the monopoly profits and control over the use of funds generated. Even for these types of firms, the monopoly profits eventually dry up as competitive firms enter the field.[18] After some time entrance of competitors starts to squeeze profitability of the project while maintaining the demand for external funding at a relatively high level. This evolution is represented by the down-sloping portion of the profit curve in Figure 18.1. Reduced profits force the firm to continue seeking external financing if growth and market share is to be maintained along with market-accepted financing ratios (debt—equity ratios). As this happens, more often than not, the entrepreneurs are forced to relinquish more and more control in exchange for obtaining additional capital. That is, to materialize the growth potential of the firm, the owner-manager must relinquish control. In fact, the greater the potential for growth, the greater the potential for loss of control. The proposition that growth opportunity is a factor in the diffusion of ownership is empirically corroborated by Demsetz and Lehn (1985). They find a significant negative relationship between firm size and insider ownership in the United States. If we make the reasonable assumption that firm size is a reasonable proxy of realized growth opportunities, the implication is quite straightf orward.

At the macroeconomic level, in the Schumpeterian vision of corporate innovation and growth, financing is provided by short-term borrowing from credit-creating banks. Inflation and "forced savings" follow.[19] Complementing this view, the development finance literature asserts that the availability and quality of funding depends on the level of financial deepening. In an underdeveloped economy financial deepening is low, showing a limited existence of financial liabilities in relation to GNP. As an economy grows, financial intermediaries grow in importance and corporations finance their investments through indirect debt, i.e. titles issued by financial intermediaries; financial liabilities increase in relation to GNP. Monetary intermediaries—banks —become the more important financial institutions. Because their liabilities and credits are short term in nature, at more advanced stages of financial development non-monetary financial intermediaries grow in importance to meet long-run needs of households (insurance, long-run wealth management) and corporations (investment financing). Capital markets become the core of these activities. Thus, corporations are able to acquire and structure their financing according to their short-term and long-term needs. Corporate capital budgeting moves from bank financing to bond and stock financing through the capital markets—a situation, now normal in the industrialized countries, which is emerging in the developing countries and needs to be promoted, not only through deregulation but also by implementing reforms in the real sector, as postulated in this work.

Diversify business risk through financial markets

Even if the entrepreneur is able to supply enough internal financing to maintain growth, he may no longer wish to do so. Absolute risk aversion on the part of the entrepreneur will lead him not to increase the absolute size of the bet (the stake in the firm) as his wealth increases with the size of the firm. He has more to lose than in the early days. Relative risk aversion on the part of the entrepreneur will persuade him to attempt to lower the size of the bet as a proportion of his total wealth. These incentives grow as monopoly profits from the original ideas dry up. That is, there will be a natural economic motivation on the part of the entrepreneur to diversify risk relative to the holdings in his asset portfolio.

In a well-developed, arm's length financial market, the entrepreneur seeking to give up control and diversify his portfolio finds it relatively easy to accomplish this. A well-developed market for corporate control and risk-bearing financial commodities, where information asymmetries are minimal and pricing is efficient, allows the entrepreneur to sell some part of his stake in the firm at a fair market price. Simultaneously, he can acquire a preferred portfolio of risk-bearing securities, also efficiently priced and protected by a network of minority-investors protection laws. Risk bundling is done automatically in the marketplace. Intermediaries such as insurance firms, commercial banks and investment banks are the primary creators of instruments which bundle subsets of the total variation of the cash flows generated by the real assets of the firm. The price at which these instruments are traded in the market is a function of the investors' evaluation of the risk-return tradeoff inherent in the subset of cash flows upon which each instrument holder has a claim. The value of the firm is ultimately established in the market.

Conditions in financial markets of most industrialized countries provide for opportunities for risk dispersion by giving up control in favour of diversification into many firms. The common stock of open corporations allows residual risk to be spread across many residual claimants. Each claimant, in turn, chooses the extent to which he is willing to bear risk by diversifying through equity positions in the open capital markets. Portfolio theory asserts that by spreading risk across corporations the cost of bearing that risk can be reduced to the cost of bearing the risk inherent in the economy as a whole.

Thus, it is clear that separation of ownership and control and long-term equity financing requires an environment of efficient financial markets. In such efficient markets, most firms find it easy to communicate information, and consequently financial claims are priced correctly relative to their risk characteristics. In turn, corporations find it advantageous to issue further stock to finance their investment opportunities. Provided that a "critical mass" of well-informed or rational investors operate in the market, prices reflect reasonably accurately the true value of financial assets as a function of the expected value and risk characteristics of the underlying cash flows.[20] These prices, in turn, become a signaling instrument to uninformed investors who are also active in the market ("noise or irrational traders").

The evolution of the private (closely held) corporation

The evolution of the corporation and the preferred form of corporate governance is quite different for most developing countries (as well as *some* industrialized economies). Imperfect and incomplete markets have led to this situation. It can be summarized in the following proposition.

Proposition 3.2 Under market conditions characterized by the presence of government-induced rent opportunities and lack of competition in financial markets, corporate technological innovation is limited and closed ownership is the preferred form of corporate governance.

Discussion: Successful entrepreneurial experiences under current liberalization programs in the developing nations confirm this proposition. The wave of deregulation and liberalization initiated by the Indian government in the early 1980s led to a boom in industrial activity in almost all sectors of the economy. Reliance Industries and Bindal Agro are a first-generation group of enterprises that grew through a smart exploitation of some technological niches (communications and petrochemicals) and managed to open in the Indian market. Given massive growth opportunities in these markets during the high growth period, these groups chose to raise capital at "grass-roots level", tapping "popular savings", an investor group neglected in financial practice, as well as in most studies of financial markets. For this purpose they undertook to actively participate in the marketing of the issue through an "open book" campaign of disclosures about the finances and the growth opportunities of the companies. The result was an oversubscription of most issues by the groups with substantial participation of the investor strata targeted in the campaign. This aggressive policy of raising funds and informing the market about growth opportunities made the two entrepreneurs (Messrs Ambani and Oswal) the leading fund raisers in India during 1989. Similarly, in Mexico rapid economic changes, liberalization and favorable perspectives due to the NAFTA are changing management attitudes. "Nostalgic" entrepreneurs still seek the old prevailing order of government protection, high profits and minimum risks, but many have promoted and demanded liberalization of real and financial markets; to overcome technological limitations some are establishing strategic alliances with US and Canadian business. As a result, growth opportunities are many and to meet them they are resorting to equity financing in the local and international capital markets.

These situations, however, are still uncommon. Figure 18.2 provides the theoretical framework to explain the prevailing phenomena of government intervention and closely held corporatism, underlying the need for integral reforms in the real and financial markets. To develop it we must first make some

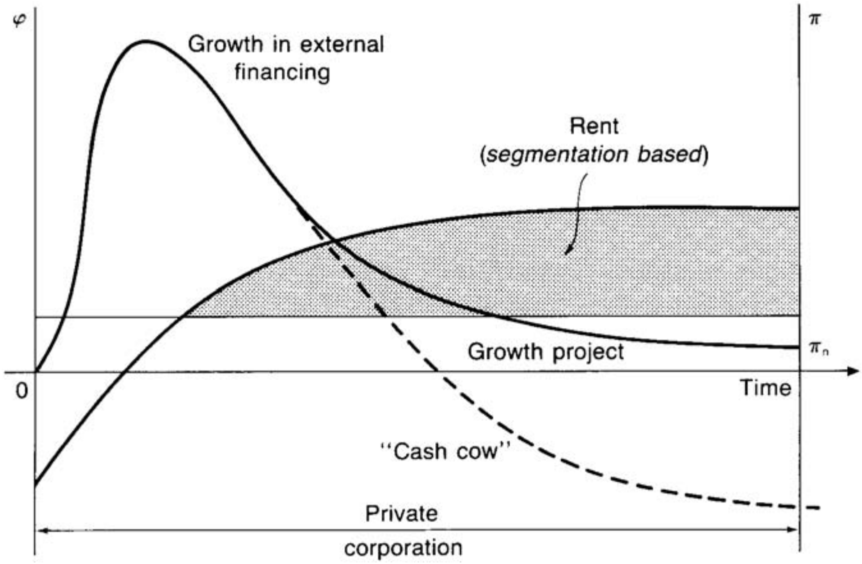

Figure 18.2 Corporate governance, controlled goods markets

assumptions about the structure of the market. These are "boundary conditions" for the model.

A1 Goods and financial markets are subject to government-policy-induced distortions that create rent opportunities.

A2 Information asymmetries in financial markets about the value of assets are "severe".

A3 There is no highly atomized pool of risk-taking investors; potentially available equity capital is concentrated in the few hands of the major entrepreneurs in the economy.

Market distortions induced by government policies and the opportunities they create to extract rents have been widely studied. Bhagwati (1982a), in a now classic article on rent-seeking activities, provides a comprehensive review of the sources of monopoly rents and the activities in which market participants engage to maintain them—in the words of Bhagwati, "directly unproductive profit seeking" (DUP) activities.[21] They include (Bhagwati 1982b) many areas of government economic policy such as trade policies (quotas on imports, production licences etc.); quotas on supply of foreign exchange; government spending and preferential purchasing policies; preferential tax systems; various forms of market controls; and credit policies.

To develop our case, assume that we start with the same entrepreneur as we did before, who holds monopoly over some idea—which may now be an import substitution good. If financing is available, the idea is followed by sound management *and* the entrepreneur is capable of exploiting to his advantage some existing market distortions, the venture is likely to succeed. There is where the similarities with the competitive case stop.[22]

As just noted, one important condition for this budding entrepreneur to succeed is to be able to exploit to his advantage the existing market distortions. This will allow him, first, to grow under the umbrella of the market distortion, and later, persistently to extract monopoly rents from the project. There are two important aspects to the nature of the monopoly rents. First,

> the rent opportunities available to investor entrepreneurs in a market dominated by government-induced distortions are abiding.

It is easy to see that this form of rent will remain accruing to the investor-entrepreneur as long as there is no change in the structure of the market. This will occur only if the government itself modifies the specific distortion that creates the rent opportunity. The abiding nature of this form of rent is represented in Figure 18.2 by a profit curve that does not descend to the level of long-run "normal returns", π_n, available in competitive markets.[23]

Second, an important difference exists in the risk structure of profits compared with the competitive case. In competitive markets, return variance is dependent on market responses such as consumer tastes, market fluctuations, technological innovations etc. In other words: market risk. In a market distorted by government controls, these market forces play a lesser role in determining profits. Instead, it is the continuity of the government in maintaining a specific (set of) market distortion(s) that determines the variance of profits. This is equivalent to stating that

> an additional form of risk to which enterprises are subject in markets with government-induced distortions is political risk. The severity of this risk exposure is directly related to the severity of the government-induced distortion.

This issue is argued in detail in Fischer *et al.* (1993), pinpointing the implications of political risk in the modeling of investor-entrepreneur behavior in developing countries. Here we focus on the implications of the non-transient nature of monopoly rents in an environment characterized by assumptions A1-A3 on growth financing and risk diversification opportunities available to the investor-entrepreneur.

Growth financing under imperfect markets

Under these conditions, internally generated cash flows may go a long way toward financing projects even with demanding requirements (a "growth" project) —if not all financial needs, at least a substantive portion of the equity component of growth financing. In some instances the project will generate cash flows well beyond the financing growth requirements (e.g. a "cash cow" like a brewery). One first result is that the pressure to seek financing in the market by issuing equity is relieved or lessened. Using internally generated funds, the entrepreneur does not need to share a rent which results from his ability to manipulate the government-induced market distortions. Also, this prevents him from assuming contractual obligations that may hinder his ability to allocate funds as he sees fit to enhance the enterprise's position in the market. This may very well include engaging in Bhagwati's DUP activities. This continued availability of rents eliminates or diminishes one of the two main motives for the entrepreneur operating in competitive markets to seek financing through equities markets.

Reduced pressure to raise financing also reduces the incentives to produce for the market the necessary information about the nature of the project that makes public financing possible.

A similar result on growth financing needs can be established by dropping the assumption of government-induced distortions and assuming instead the existence of limited growth opportunities. Limited growth opportunities can arise from a number of different scenarios. One is the presence of market distortions induced by governments; empirical evidence shows that a negative relation exists between the level of market distortions and growth opportunities (Agarwala 1984; World Bank 1991). Another is the presence of "natural" factors such as geographical conditions and poor economic development conditions (including the availability of natural resources and communication systems). In the absence of reasonable economic development small monopolies are easy to develop, leading to a similar corporate governance preference structure. In the first case, growth opportunities can be reinstated by modifying or eliminating the market distortions that cause it. In the second case, no set of government controls will eliminate the lack of growth opportunities and modify substantially the incentives for closed ownership control.

However, the existence of growth opportunities alone is not sufficient to force the entrepreneur to seek external equity financing, giving up control in the process. That is, growth opportunities are not a sufficient condition for a preference for a system of corporate governance based on public ownership.[24]

Diversify business risk through financial markets

The second component of the decision of our budding entrepreneur, that of diversifying his risk position in the financial markets, is complicated by two conditions found in the undeveloped financial market: its structure (i.e. assumption A2), and the nature of the equity held by our entrepreneur.

The state of financial markets

In most LA economies arm's length primary or secondary markets in financial claims are either absent or underdeveloped. There are many reasons for this, but certainly there are four fundamental ones: first, government intervention; second, limited corporate participation; third, the institutional mechanisms to produce information about the stochastic characteristics of individual firm cash flows are poorly developed; fourth, there is an absence of a large pool of risk-taking investors who seek to reduce their risk exposure through a well-diversified portfolio of securities. Instead, equity is held by a small group of large investors who possibly have the power to influence price formation.[25] The first fact leads to "financial repression" which restricts the development of financial markets and institutions. In addition, post-Second World War economic policies in Latin America led to the direct participation of the state in medium-term corporate financing through a proliferation of developing banks and trusts. Funds obtained from taxes and international credit agencies "substituted", at least partially, securities markets.[26] The second, as proposed in this work, restricts the supply of financial assets in the market. The third fact contributes to large information asymmetries in the marketplace. The last one contributes to a relatively thin and perhaps manipulated market for financial claims.

Thin markets imply that the financial instruments traded in them may not be correctly priced and might be manipulated. Therefore, market prices routinely do not reflect the true value of the asset to the entrepreneur. For our budding entrepreneur this implies the following.

(a) There are large information asymmetries, and the total absence of markets or thin markets for equity and debt instruments makes the entrepreneur's rational choice to diversify difficult to implement. The true value of the entrepreneur's assets cannot be reliably priced in the market.
(b) In the absence of a large pool of risk-taking investors, potentially available equity capital is concentrated in the hands of the few major entrepreneurs in the economy. This has two implications: first, these major equity investors become "price makers" with the ability to manipulate securities prices; and second, these investors, are most probably "rival" entrepreneurs and thus giving up control of the firm means giving it to a competitor.

The reason for the lack of development of institutional mechanisms to generate information is not just, or perhaps at all, a matter of evolutionary backwardness, but rather the result of explicit intention. In societies where monopoly and rent profits are highly dependent on political factors such as the allocation of import quotas, preferential taxation and financing, the allocation of development construction projects etc., corporate secrecy and even intentional misinformation becomes a *need* for corporate survival. Secrecy is, of course, one of the idiosyncrasies attributed to developing country's managers. Lack of or unreliability of information has also been one of the factors which has hampered research on business finance in these markets.

The above are powerful disincentives contributing to the discouragement of corporate growth and the continuation of the structure where ownership and control remain in the same hands.[27]

One important point remains to be made. Entrepreneurs in these markets circumvent the difficulties of diversifying their business risk position in the financial markets through an alternative strategy. The strategy includes diversification through real markets, exports of capital etc.,[28] which allows investor-entrepreneurs to attain a level of diversification and risk-return tradeoff with which they can operate comfortably.

The value of equity

We will develop this idea using the options pricing model framework of analysis. It is an established concept that equity can be viewed as a *call option* on the value of the firm's assets (e.g. Mason and Merton 1985). In a one-period framework and referring to Figure 18.3, the value of equity at expiration date is

$$V_e(V_f, T, C) = \max(V_f - C, 0)$$

where V_e is the value of the equity, V_f is the value of the firm, T *is* the time to maturity and C is the value of all contingent claims on the firm. This equation simply states that the value of the equity is the maximum of $V_f - C$ and zero. Although the model is usually applied to leveraged firms only, Thomadakis and Usmen (1991) have made the point that the model applies to any firm with a bundle of contingent liabilities with market value C. This includes debt, supplier credits, customer service liabilities, taxes, employees salaries etc.

Assume that the expected value of the firm in a competitive environment is equal to $V_f(\pi_n)$, while the exploitation of existing rent opportunities allows it to command an expected value $V_f(\pi_r) > V_f(\pi_n)$. This is reflected in an increased value of the equity to the shareholder from $V_e(\pi_n)$ to $V_e(\pi_r)$. In the option pricing framework one would say that the call option equity is "deep in the money".[29,30]

In a competitive market with small information asymmetries there is no reason why this investor-entrepreneur could not sell his equity position at a price that reflects the true value of $V_e(\pi_r)$ given the rent opportunities. This is not the case, however, in a market with distortions.

Two reasons exist for this. The first and most important is related to the *source and management of rents*. The continued ability of the enterprise to extract rents resulting from market distortions may be fundamentally dependent on the entrepreneur's talent for manipulating the political environment which generates them. It is precisely this talent to outmaneuver competing entrepreneurs and to impose upon the government policies that benefit the business he owns that

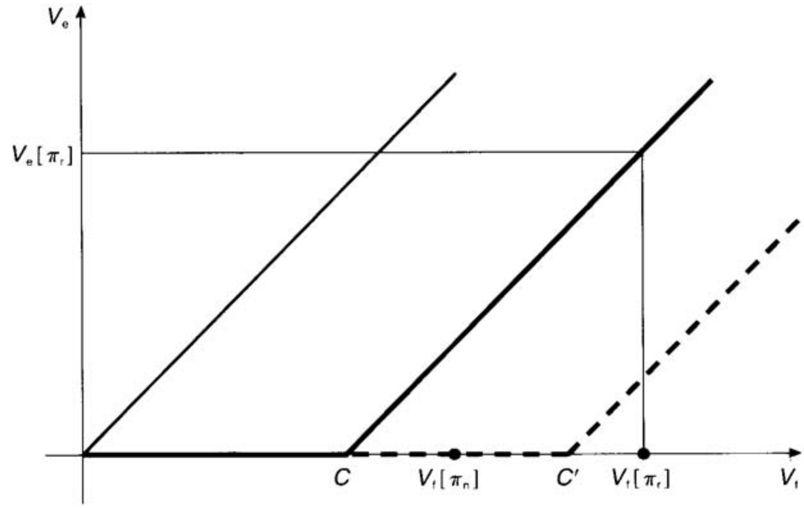

Figure 18.3 Value of equity

guarantees the permanence of rent opportunities. The second is associated with the *structure of financial markets*. Given the severe information asymmetries it is difficult for the market to price the shares to reflect their true value to the entrepreneur.

Why are there firms that DO list?

The main propositions presented in the previous section yield the result that firms operating in markets distorted by government intervention will be discouraged from listing securities in the national stock exchanges. Yet, it is possible to observe that many firms *do* list shares in the local exchanges. As usual in these matters not all is just black and white. In fact, a number of incentives exist that encourage firms to issue and circulate in the market a *non-controlling* portion of the total outstanding package of shares. The most important are as follows.

Liquidity Under market conditions represented by assumptions A1–A3, a portfolio of (real) projects (corporate projects, real estate etc.) rather than a portfolio of financial assets is the rational form of diversification for investor-entrepreneur operation under distorted goods markets. However, just as with portfolios of securities, periodic rebalancing is required to maintain the preferred risk-return payoff relation. Projects are, by definition, highly illiquid. Projects with financial assets representing the residual claims on the project's cash flows can be easily divided into many parts and sold to many investors. In contrast, projects for which no contingent claims are traded in the market must be sold in one piece—they are lumpy assets —and to a limited number of potential buyers at a price that must be bilaterally negotiated. Thus, disposing of projects is subject to substantially higher transaction costs and price fluctuations than contingent financial assets. Listing the firm and noncontrolling portions of the stock being traded in the local exchanges enhances the liquidity of the project without risking loss of control.

Increasing/settling debt financing Groups channel deposits from affiliated banking institutions to their corporations. However, savings formation might be low, limiting credit availability. In addition, governments enforce credit rationing. Listing is a way to overcome these problems. Corporations are able to issue debt in the securities markets. Owner-managers increase leverage levels beyond banking possibilities and maintain control of the corporation. This is why bonds markets are more important than equity markets in Latin America. A less obvious situation taking advantage of listing is when groups issue stock not to finance investments but to pay debts. This is not an infrequent event in Latin America. Moreover, this situation is even arising at the international level. Televisa, Mexico's TV group, owned mainly by the Azcarraga family, issued $650 million in ADRs by the end of 1991, nearly 30 percent of total capital. Its financial situation, reported in the Prospectus, revealed high debt levels and losses amounting to $200 million.

Mobilizing international savings This motivation is recent in developing countries. Deregulation in the developing countries has made it possible for firms in these countries to make private placements or issue bonds and ADRs and GDRs on international markets. Regulation 144-A of the US Securities Exchange Commission (SEC) makes these equity movements possible. The SEC also gives the recognition "designated foreign markets", which is the case of the Mexican Stock Exchange, and "ready markets" to firms from foreign markets which meet some minimum standards. Last year 11 Mexican corporations benefited from this designation (28 in total), which led to placements of $3,419 million.[31] To take advantage of this situation some firms have requested listing on the stock market. Televisa, the corporation previously mentioned, joined the market in the last quarter of 1991.

Taxation This argument is associated with the liquidity argument. Certain taxation regimes tax transfers of ownership performed through shares traded in a stock exchange at a much lower rate than direct transfers of ownership. This is the case, for example, in Argentina, where no transfer taxes exist for shares while a stiff transfer tax is charged on direct property sales. Clearly, having the project listed in a local exchange and a small non-controlling portion circulated in the market allows divestment (portfolio rebalancing) at substantially lower cost.

Political risk control Listing of a group's companies may be used to hedge political pressures towards nationalization and democratization of the economy. Conflicts between the private sector and governments in developing countries are recurrent, generally as a result of severe downturns in the economic cycle. Under these circumstances social unrest increases and governments might respond with populist policies which include nationalization, to make some goods or services more accessible to lower income groups through state enterprises. Conflicts might also arise as a result of different views about policies to be taken. Listing in the stock market acts as a shelter, for corporations keep a façade of a wide distribution of ownership, which deters the government from taking punitive actions against "one owner". In addition, actions against a listed corporation will reflect unfavorably in stock market indices, which governments will try to avoid to prevent further downturns in the economy.

Prestige and social legitimization Belonging to the "big league" adds prestige to owner-managers, particularly among peers. However, in Latin America this can become a pressing need to seek social approval. Entrepreneurs have often been subject to severe criticisms as exploiters and antinationalistic. Listing at stock exchanges can help to damp these criticisms. Although the opposite might result—owners do not remain unknown—public exposure through these markets improves relations with the business community and promotes more efficient public relations with other groups.

4
REGULATION AIMED AT INCREASING THE SUPPLY OF EQUITIES

The preceding discussion suggests that fundamental changes in the structure of incentives that rule the supply and demand of financial instruments can only be achieved by modifying conditions in the market for *real* goods. Thus, significant changes in the evolution of equities markets cannot be achieved via regulation/deregulation of financial markets alone. A balanced equilibrium of changes in the financial market and in the market for real goods is needed.[32] Entrepreneurs will have an incentive to offer equity instruments and to give up control of group member firms (a condition for true public ownership) if the following three conditions in the market are promoted:

1 Growth opportunities are created so that the demand for funds outstrips the supply of internally generated funds.
2 Competition in the market of goods is increased and regulatory monopolies (including the so-called protection of the domestic industry) are eliminated. This is aimed at reducing the incentives to maintain control over the firm.
3 Simultaneously, the fairness of operating in financial markets is increased for all players, to encourage risk diversification via financial markets rather than goods markets.

Policies that encourage supply must be carefully designed. A particular policy aimed at augmenting the supply of equities can produce exactly the opposite effect. If the proportion of shares that the supply-promoting policy requires is larger than what the owner-entrepreneur considers safe in terms of maintaining control over the enterprise, he may forgo the benefits of listing—or even of making full use of economies of scale—in the interest of maintaining a firm hold over the enterprise. It should be kept in mind that what is a "safe" controlling position can vary quite substantially from market to market. In a market like the United States, in which public ownership is the rule, a control of no more than, say, 20 percent of the stock may easily guarantee control over a firm with otherwise atomized ownership. In contrast, the same percentage is totally inadequate in markets like those of most LA countries, where a high concentration of ownership is the rule. In this case, any relatively large control of the stock in hands other than that of the owner-entrepreneur may be the source of potentially troublesome coalitions and disturbances in the management process or the continued exploitation of the rent of which the enterprise may be benefiting.

It is customary for reforms aimed at promoting the development of securities markets to address formal issues such as listing and disclosure requirements, minority protection, insider trading etc. It is generally assumed that a "fairer" market—i.e. a more transparent market where minority interests are protected and rip-offs by insiders are prevented—will encourage trading activity. Unfortunately, the good intentions may not yield the desired result. Thomadakis (1992) has rightly noted that stiff disclosure requirements and minority protection laws can be a strong deterrent for investor-entrepreneurs to list their firms on stock exchanges. Disclosure requirements are not only costly to implement but can be viewed by the entrepreneur as threatening to the perceived need of secrecy of the firm's business. The result would be an incentive to *reduce* the supply of tradeable securities in the market. Ojo (1992) has noted that, apart from the rather high cost, the disclosure and listing requirements of the stock exchange have been viewed as constituting a deterrent to public quotation, especially by wholly-owned Nigerian companies. Furthermore, easing listing requirements alone did not appear to open the doors to substantive increases in listing. This was evident from the lack of success of the Nigerian Second-Tier Securities Market, despite the substantially easier listing requirements in this market.

Thus, regulations that tend to encourage a competitiveness in both the goods and the financial markets are the ones with the highest chances of succeeding. Most policies that will successfully promote the supply of securities have little to do with regulation of the market itself. Instead, they attack the fundamental problem of reducing or eliminating distortions in the goods and financial markets that encourage closed ownership. None will be efficient enough to promote a *competitive* (which does not necessarily mean *laissez-faire*) business environment with elimination of government-induced rent opportunities in the goods and financial markets. Most other policies that do not attack the fundamental problem of competition will probably not force a transition from close-held ownership to public ownership—the only guarantee of a dynamic and significant role in financial intermediation for stock exchanges. Nevertheless, a review of experiences undertaken worldwide leads us to suggest a few major policies that will tend to encourage the supply of securities, at least of noncontrolling portions of the stock.

Liquidity shares rules

Liquidity shares are shares which are made available for trading in the market, providing liquidity to the market and increasing the liquidity of the underlying assets. Regulation can aim at increasing liquidity shares. These rules require companies to maintain a minimum proportion of total stock outstanding for trading by the public. The proportion of liquidity shares can be set at a point that does not threaten the goal of the investor-entrepreneur to maintain a solid control over the firm and yet increases the supply of shares to the market. This proportion can be set at the higher limit of the current practice of allowing the trading of between 5 and 20 percent of the outstanding stock. The Thailand Stock Exchange offers an excellent example of a successful liquidity shares policy. This exchange requires that listed companies must not have more than 80 percent of non-liquid shares.[33] Companies that exceed this limit are given three years to correct the situation or face delisting. In addition, nontrading companies, i.e. companies for which less than 10 percent of their shares are traded in one year, are delisted immediately. Mexico offers another important example. The Comision Nacional de Valores (Mexico's Securities Exchange Commission) established in 1991 a program to increase stock trading from individual corporations. No trading limits have been set yet, but corporations should issue more stock. As a result, 67 corporations were identified as having low trading problems, 16 applied for delisting and another 35 went under a similar process; three agreed to issue additional shares; and 13 agreed but asked for postponement. The number of listed corporations decreased, but the market became more robust. In addition, new firms are joining the market, but to participate actively, not to use it as a marginal source of financing.[34]

Required listing of large firms

Large firms, i.e. firms with a certain paid-up capital, can be "required" to be listed in the stock exchange. This policy can be accompanied by that of liquidity shares to avoid "token listing" and is likely to have a similar effect to that of liquidity shares. Required listing will not alter the closely held nature of enterprises but it will encourage the supply of shares to the market. The entry of these large and presumably well-managed firms will have the joint effect of increasing the supply of tradeable securities *and* increasing investors' confidence in the market.

As with liquidity shares, care must be taken not to produce an antithetical result. An entrepreneur forced to give up as liquidity shares more than he or she considers to be a safe proportion of the shares outstanding may be encouraged to engage in activities that damage the efficiency of the enterprise for the sake of maintaining a safe close control. These activities may include forgoing economies of scale and scope; undertaking uneconomic atomization of the production process (fictitious subcontracting) to maintain the size of each unit below the critical value; and forgoing growth opportunities such as the development of new products and/or exports.

One should also be clear about the limitations of this policy. Most regulations requiring the listing of securities in exchanges will result in a marginal increase in shares available for trading unless a substantive liquidity share clause is attached to them. For example, Ojo (1976) shows that during the period of highest growth in the number of securities listed on the Nigerian Stock Exchange, this growth was not associated with the need to raise funds by the issuing companies. Rather, these sporadic growths in securities listed resulted from the Nigerian Enterprises Promotion Decrees of 1972 and 1977. On these occasions, the major reason for seeking public quotation was to comply with the requirements of the decrees rather than for the purpose of raising funds. In most cases shares held by proprietors and other former shareholders were offered to the public (Ojo 1992) and only a marginal proportion of the shares outstanding were made liquid.

Create incentives for going public

Firms should be given incentives for going fully public. These can range from moral suasion and tax incentives to strict tax supervision and credit rationing. The Amman Stock Market is a relevant example. There, limited liability status is granted only to firms ready to place at least 50 percent of their capital with the public. Similarly, one reason why capital markets expanded rapidly in Korea was the government requirement on corporations to issue shares or face credit rationing, rigorous tax inspections and other restrictions.[35]

Stimulate equity financing

Freer markets should lead entrepreneurs to seek an optimal capital structure, based on the costs of debt and equity. Highly leveraged groups should be stimulated to issue equity rather than debt. Similar mechanisms to those outlined above for going public should be used. Above all, counseling on capital budgeting should be introduced for corporations applying to issue additional amounts of securities at exchange markets. Equity could be the best alternative.

Strengthening minority shareholder's protection laws

Strengthening minority protection rules would help to increase demand from a special niche of investors. However, supply of securities will also be favored. Owner-managers would have a clearer vision of their own position. They would issue equity without fear of losing control; they would also decide to take minority positions (protected by minority investors laws) to diversify their holdings through risk-bearing securities sold at the securities markets. Continuous dilutions, as the corporation, and the market develop, would lead to the consolidation of the public corporation as the preferred form of corporate governance.

Equalize and stimulate disclosure rules

Authorities should set minimum disclosure rules applicable to all limited liability corporations. This would remove concerns about going public and would induce greater competitiveness. Corporations seeking additional financing to maintain a competitive edge would go public, for it would not necessarily involve the release of more information.

Privatization through public offerings

Changes in economic policy by LA governments are leading to a wave of privatization of state-controlled enterprises. This wave can be expected to continue during the rest of the 1990s. This is an excellent opportunity to enhance the supply of equity securities to domestic financial markets. It would be unfortunate that this wave of privatization culminates in a high level of concentration of ownership of risk capital either in domestic or foreign hands, while denying citizens of these countries the opportunity of participating in the ownership of the wealth-producing infrastructure of society. Let us not forget that the assets of many of these enterprises were built on the shoulders of all the taxpayers (small and large) of the country, through subsidies, capital injections etc. It is only fair to give these same taxpayers an opportunity to continue to participate, as residual claimants, in the wealth of the enterprises.

It is much more difficult, however, to sell a state enterprise through a public offering than to sell it to a large national or international company or consortium. In the latter case the negotiation and bidding process allows the establishment of a price which is acceptable to both parties (the state and the purchasing consortium). Privatization through public offerings requires a much more refined evaluation exercise to establish the price of the shares—a process even more difficult perhaps than initial public offerings (IPOs) of new enterprises in more developed capital markets.[36] Incorrect pricing can lead to failure and discrediting of the privatization exercise by overpricing, or to an unjustified transfer of social wealth to private investors by underpricing the shares offered.

Also, many enterprises, given the characteristics of the production function, may not be suitable candidates for privatization via public offerings. High-tech firms, such as communications, are dependent on linkages with multinational enterprises to maintain competitiveness and an acceptable level of technological sophistication of the services provided. In cases such as this, governments may have no option but to sell to a private (domestic or international) consortium.

An alternative that must be considered is the sale of stocks through buy-now pay-later programs. Offerings could be made by selling share certificates competitively via banks and even lottery outlets. Sellers would receive a commission. Payments could be made through utilities services. Once they are covered, investors would receive the shares they invested in. Market intermediaries would support these operations through their established mechanism for issuing and clearance. Much can also be learned from the experience of countries outside the continent. Portugal is an interesting case. There a conscious effort is being made to offer state-controlled productive assets to investors through the local stock exchange.[37] Foreigners were limited to 10 percent of privatized shares.

Deregulation of the bank loan market

One of the most common sources of market distortions is the control of the bank loan market by the government.[38] Typical among these controls are interest rate ceilings, subsidized loans to priority sectors, portfolio selection, preferential rediscount rates, budgetary subsidies, and credit floors (minimum proportion of deposits that must be lent to specific priority borrowers). Not only are they a source of rents but they also encourage a high leverage financing policy. Deregulation of the bank loan market would reduce the incentive for bank loan financing, encouraging other forms of financing including public offerings.

An example where deregulation of the financial market led to an increase in stock market activity is Turkey. In 1980 and again in 1982, the Turkish government undertook a drastic process of *decontrolling* both the real and the financial sectors. Since then the government has maintained a steady course of action along the original trust. One component of the deregulation process was the elimination of interest rate ceilings and subsidized credits and a drastic narrowing of the priority sectors for lending. Thus, industrial conglomerates were deprived of one important source of cheap debt capital, as banks, group controlled or otherwise, were forced to compete for funds in the market. These reforms had two simultaneous effects. First, they increased substantially the cost of bank loan financing. Second, due to enhanced growth opportunities resulting from the elimination of controls in the real sector, they increased external financing needs. The combined effect of high borrowing costs and growth opportunities encouraged group-based companies to shift away from debt financing and release both information and equity, once jealously guarded by the controlling families, to raise funds through the incipient stock market.

Clear legal separation in "universal banking"

The trend towards "universal banking" is unequivocal in Latin America. Several patterns are emerging, but they have two ideas in common: (1) to improve services to customers—"one window services"—which should enhance savings mobilization and credit allocations; and (2) to achieve efficiency and competitiveness through economies of scale.[39] That reasoning is correct, particularly considering that in the past specialized LA financial institutions have been plagued with insolvency and illiquidity. Excessive government intervention in the financial sector and mismanagement are the main reasons behind those failures. But it became evident also that specialized institutions were too sensitive to these problems. However, universal banking poses a big challenge to regulating authorities. Not only is this a new "hybrid" monetary-nonmonetary type of financial intermediary, which creates problems for monetary authorities and their policies, but in addition conflicts of interest could arise, deforming supply (and demand) of securities in the financial markets.[40] Supply could be hindered by the creation of informal mechanisms that link commercial bank credits to investment bank activities from another unit of the universal banking holding company: or through favored purchases to the investment unit from portfolio account managers from the banking unit or from a mutual fund management unit.

To avoid these sorts of problems proper regulation is required. Accountability to the public and the authorities should be clearly established via legally separated entities whose responsibilities, including disclosure, are well defined. Here, regulation authorities in Latin America face an important challenge: (re) defining their own structure and responsibilities, for traditional banking and securities activities have been carried out by different agencies. In Mexico, there are three different commissions to supervise and regulate commercial banking, insurance and securities markets. An alternative would be to merge them, establishing a regulatory framework for universal banking in general and specialized subsets of regulations for each kind of intermediary, enforced by specialized departments. Similar objectives could also be achieved by establishing formal linking mechanisms among existing commissions.[41]

Separation between corporations and universal banks[42]

As postulated in this work, and demonstrated in many studies, one reason groups restrict their supply of stocks in the markets is their ability to channel savings to investments via group-owned banks. In effect, the holding industrial group owns a bank, albeit the opposite situation could happen. This situation could become more severe if traditional closed circuits are established between groups and universal banks. Supply of stock by groups would continue to be low, and fund allocation could become more inefficient, as (more) intermediaries from the group favor their own firms. To overcome this problem a clear regulatory system is needed to promote legal separation between corporate ownership and activity from universal banking.

Two types of policies should be followed. First, neither firms nor financial intermediaries should be allowed to own, as legal institutions, the other type of business activity. Second, individual investing in both banking and business firms should be allowed, but no majority position by shareholders of a firm should be allowed in financial institutions, and vice versa.

5
CONCLUSION

The working of the *financial markets* is a question of supply and demand. Entrepreneurs provide the *supply* side of capital markets. We put forward the proposition that in Latin America and most developing countries entrepreneurs have had little incentive to support the development of securitized financial markets. Through the mechanisms available to them, entrepreneurs are able to extract risk-adjusted returns and control risk exposure of their portfolio of projects, while at the same time raising the funds needed to meet investment opportunities. Thus, no incentives exist to offer securities to the domestic equity and bond markets. As a result, industrial groups have evolved into closely held corporations.

Under current conditions of economic and financial globalization, to achieve steady economic growth LA nations need a viable number of internationally competitive corporations. Necessary conditions to achieve this goal are capital market development—investment financing moving from *banca* to *bolsa*—and the development, through those markets, of strong publicly held corporations. Traditional patterns of corporate governance could restrain these changes if they are allowed to continue owing to lack of incentives for corporations to go public.

The development of securitized capital markets in developing countries is a question of both demand and supply of risk-bearing securities. But supply is more important because it implies the need, not only for deregulation and re-regulation of financial markets, but above all to carry out parallel reforms in the real markets. Recent reform experiences aimed at eliminating the effect of financial repression and the distortion induced by it in financial markets tend to support this opinion. A capital market development policy aimed at improving the supply of securities should create incentives that make it more appealing for entrepreneurs to raise funds and diversify risks through domestic financial markets.

Securities and reliable information about them will be available to investors at large if entrepreneurs are willing to give up control of the firm and engage in portfolio diversification through financial markets. This will occur when growth opportunities are available to the firm which the entrepreneur is not willing to self-finance, either because the financing mechanisms available to the entrepreneur are insufficient for the funding needs, and financing instruments are realistically priced, i.e. not subject to the distortions induced by financial repression; or because the proportion of wealth committed to the project is too large from the perspective of the owner's ability to diversify his portfolio of assets. Much of it can be achieved by eliminating financial repression which means establishing mechanisms to allow business decisions to become cleared by the market rather than by government intervention. When this is the case, it becomes in the best interests of the entrepreneurs to seek a competitive edge based on technology advancements, and to create the proper amount of information about the capital projects of the firm that outside investors can be attracted at a reasonable price to supply the external capital needs of the firm.

NOTES

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1 We emphasize the cases of Mexico and Chile. Their impressive changes depict best the problems of transition towards full development of LA capital markets.
2 Albert (1992) affirms that the Rhenish capitalist (North European) model, where bank financing and closely held corporations are not uncommon, is superior to the American model, characterized by capital markets financing and publicly owned corporations. We differ from Albert's view, particularly for the case of today's developing countries. A conceptual framework on this matter has been developed by Ortiz (1994) in relation to the take-off development and financial development stages.
3 See for example van Agtmael (1984) and Ortiz (1993).
4 We quote van Agtmael (1984:6) in his well-known publication *Emerging Securities Markets:* "The size of the operation becomes too great for the original owner(s) to manage. The owner-manager tie, incorporated in the traditional entrepreneur, is broken, and professional managers begin to play an increasing role."
5 The parameters "large" (number of participants) and "sufficient" (market information) refer to a critical value. We assume that in Latin America and most developing countries the current value of those parameters is below the critical value while among industrialized countries it is above.
6 We quote the most recent statistics. They show a remarkable change that is currently taking place in LA emerging capital markets. During 1991, returns from the markets in Chile, Brazil, Venezuela and Colombia ranked among the top seven in the world. The boom started in 1987. Then, trading value amounted to 10–15 percent of total capitalization; this is still the case for most developing country stock markets.
7 See Marshall (1991).
8 Severe liquidity and solvency problems affected banks from many LA countries during the 1980s, mainly due to the debt crisis, ill-adjusting policies and mismanagement. Huge rescaling operations and restructuring of the sector was enforced. See Morris *et al.* (1990) and Bendesky and Godinez (1991).
9 Marshall (1991).
10 For some studies on LA groups, see for example, Alder-Lomitz and Perez-Lisau (1990), Camp (1990), Cardera *et al.* (1983), Martines (1968), Martinez Nogueira (1984), Nuncio (1984), Veron (1987) and Vinhas de Queiros (1965).

11 Study by Instituto Nacional de Estadística, Geografía e Informática (INEGI), reported in: "Grupos Monopólicos, Motor de la Economía; Menos de 4 Firmas, Líderes en Cada Sector", *El Financiero* (Mexico), Viernes 7 de agosto de 1992.
12 Study made by Mexican Stock Market Investment Houses, reported in "163 mil 896 personas, universo de inversionistas de la Bolsa", *La Jornada* (Mexico), Miércoles 9 de septiemmbre de 1992.
13 Marshall (1991).
14 Privatization schemes in Mexico have included the distribution of shares to employees and workers. In addtion the government has contemplated making "popular" equity offerings of Telmex, following formulas used in Great Britain under Margaret Thatcher for firms such as Cable and Wireless, British Aerospace, British Gas, British Airways, Rolls-Royce etc.
15 This is not non-rational decision-making. This issue is discussed extensively by Fischer *et al.* (1993). There we offer a theory of risk management by owner-managers in Latin America, applicable to the case of other developing countries.
16 See "Solo 0.37% del PIB se destina a Investigacion Tecnologica", *El Financiero,* Jueves 17 de septimebre de 1992, p. 31; "Destina Mexico 150 veces menos gasto a Investigación que Estados Unidos", *El Financiero,* Jueves 22 de octubre de 1992, p. 39; "Solo 5% de la empresa mexicna es moderna; 65% muy atrasada". The latter release, based on a report elaborated by Mexican public relations executives, warns about the polarization of industrial innovation. This fact, common to all LA countries, the excessive export concentration in a few firms, and the highly unequal socio-economic conditions in Latin America reported recently are symptomatic of the "dualistic" conditions and new "enclave" syndromes to which we referred in our Introduction. This situation could worsen unless real changes and proper regulation are implemented.
17 See Williamson (1988) and the references mentioned therein for a review of the transaction cost economics.
18 According to Schumpeter (1934) monopoly may be conducive to innovation by allowing the innovating firm to capture high profits, which in a competitive situation will lead to lower prices to consumers. However, in Latin America, and developing countries in general, corporate research and development is almost nonexistent, as previously reported. LA firms rely on imported technology for innovation. This, along with protectionism, which makes monopoly profits persist, causes the negative effects of monopoly power to prevail.
19 This was a practice consciously followed by LA governments before the debt crisis, and during the 1950s to 1970s led to vigorous debates between structuralists, who favored inflation-induced growth, and monetarists, who disfavored it. Works compiled in *Inflation and Growth in Latin America* (edited by Baer and Kerstenetzky 1964) are a fine historical testimony about this debate.
20 Empirical studies and finance theory point to plenty of cases in which this statement, i.e. that asset prices reflect the true value of underlying cash flows, can be questioned. However, in most cases the distortions are small deviations or anomalies of the purely competitive and perfect market model. Overall, it remains a tested and accepted fact that prices reflect all publicly available information or that the market is a "fair game".
21 An earlier precursor of this field of study was Krueger (1974).

22 Projects that are based on a technological innovation are much less frequent in most developing countries. Instead, most productive ventures are destined for import substitution and/or exports. In some cases there may exist cost advantages over local production. In many other cases local ventures prosper under the shelter of tariff and non-tariff barriers. Most likely, this venture is initiated by a local merchant or national resources owner. This is not a weakness in our analysis. In fact, the case would be much easier if we started with an already established entrepreneur. He will most probably be an efficient player of the market distortions available to him and a beneficiary of the resulting monopoly-rent-generating opportunities.

23 We are aware that this is not the situation of every new starting enterprise. However, it is also true that a substantial proportion of LA industries have grown under the shelter of some government-induced market distortion, be this in the real sector (import restrictions, production licensing, government contracts etc.) or in the financial sector (subsidized credit, direct subsidies, controlled lending rates etc.). Also, changes in the *demand* for goods of a particular rent-generating enterprise, induced by a shift in demand, technological evolution etc., will limit the duration of the rent opportunity. However, this is a quite different case from the scenario described above in which competition—a change in the *supply* side of the market—eliminates the rent opportunity.

24 Although growth opportunities are greater in larger LA countries (Argentina, Brazil, Mexico), industrial groups are still a characteristic of their economies.

25 This issue is also related to income distribution patterns. Here, we underline financial facts. However, we acknowledge this problem. World Bank studies show that in Latin America income per capita is below 1979 levels now and income distribution has worsened. See World Bank, *World Development Report 1991*.

26 This does not mean that developing banks and similar institutions have had a negative effect on economic development. After the Second World War financial institutions acting as a "supply-leading" sector for investments were obviously necessary to promote economic growth, just as much as they are needed now. The problem is that state financial institutions proliferated and in addition became ill managed.

27 An interesting fact in the evolution of the public corporation in industrialized countries tends to corroborate that, in the presence of market imperfections, separations of ownership and control may not be the optimum response. Jensen (1989) has argued that when costs resulting from agency conflicts between shareholders and management—a form of market imperfection—become large enough, incentives exist to eliminate the separation between ownership and management through a leveraged buyout (LBO) by a raider or an LBO management firm. Interestingly, this new institutional development does not eliminate the ability of individual investors to hold customized risk portfolios, since a substantial portion of LBO financing has been provided by large pools of funds such as pension funds, insurance companies etc., many times through a quasi-equity instrument such as "junk bond funds".

28 For a detailed analysis of risk diversification and portfolio management by owner-managers in Latin America, and other developing nations, see Fischer *et al.* (1993).

29 This would also suggest that, for a listed company with a small proportion of its outstanding stock being traded in the market, the value of the shares closely held by

the entrepreneur is *higher* than the market price of liquid shares. Interestingly, this is also a condition which must probably hold for an equilibrium in this two-tier market to hold. If the reverse were true, i.e. the market price is higher than the value of the shares to the entrepreneur, the entrepreneur would sell his shares and reap an opportunity profit. If the market price is the same as the value of the shares to the entrepreneur, he would be indifferent between holding and selling. In the latter case we should observe a market in which the closely held positions would be randomly distributed over the 0–1.0 range. This is certainly not what we observe in these markets where the expected value of the closely held postion is around 85–90 percent of the stock outstanding.

30 It is possible to show that investor-entrepreneurs operating in a market with market distortions such as financial repressions (i.e. the price of assets does not reflect the risk exposure) can reap arbitrage profits (an increase in value of V_e) by increasing costlessly the level of contingent liabilities from, say, C to C'. The higher the political risk exposure they are subject to, the larger is the increase in value.

31 See Comision Nacional de Valores, *Perspectivas para 1992*. *Informe Anual de Actividades 1991,* Mexico, D.F.: CNV, 1992.

32 It is unlikely that most developing economies are so fragile that it is not possible to operate with a reasonably wide band of "trial-and-error" margins. However, what *is* needed is a decisive policy of increasing competition in domestic markets, a reduction of financial repression policies together with a progressively increasing regulation of the rules of participation in financial markets with an emphasis on the generation of public information.

33 In the Thailand Stock Exchange's regulatory framework, non-liquid shares are shares owned by the 10 largest shareholders.

34 See note 31 above.

35 Roe and Popiel (1990).

36 In the case of IPOs investment bankers are able to draw on much information already available in the market, e.g. by studying the prices of shares of companies belonging to the same or a similar industry and which already have shares traded in the market. Also, a deep knowledge of the investment community allows investment bankers to rate the interest that a particular IPO may attract among investors. This evaluation, even for an experienced American investment banker, is much more difficult in emerging markets.

37 In 1989 the government of Portugal successfully undertook to privatize in part a brewery (Unicer), a bank (Banco Totta & Acores) and two insurance companies (Alianca and Transquilidade). Each share issue was substantially oversubscribed and the government raised over $470 million from the sale. In 1990 this was followed with the privatization in part of a cement company (Cimpor), another state-owned commercial bank (Banco Portugues do Atlantico), another brewery (Centralcer) and a daily newspaper (Jornal de Noticias). More than 70 other companies spanning a wide range of activities are stilly fully owned by the state.

38 They are part of a bundle of market distortions which in the finance literature has been called "financial repression". See Basant (1986) and Dooley and Mathieson (1987) for excellent summaries of the various manifestations of financial repression.

39 For the Mexican case see Palencia Gomez (1992).

40 For a thorough exposition on universal banking and regulating authorities see Deutsche Bundesbank (1991).

41 Ortiz (1992) offers this suggestion in a thorough set of policy suggestions for capital market reforms in Latin America.

42 This issue is a matter of concern among developed economies too. See for example Baums (1992) for a German perspective.

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19
Patterns of corporate leverage in selected industrialized countries

Rama Seth

It is well established that the United States is the only major industrialized country in which firms have experienced increases in both leverage and interest burden over the 1980s (Remolona 1990). Researchers have also argued that they do not find the increase in corporate leverage in the United States disturbing, since sectors with highly leveraged firms have been the noncyclical ones. Does this then imply that the leveraging up by firms in the United States should not raise any concern? In addition, has the deleveraging by firms in the rest of the industrialized world uniformly rendered firms more resilient? The answer depends not only on the *level* of leverage of firms in cyclical sectors but also on the *change* in leverage of cyclical firms.

Previous studies have analyzed the distribution of corporate debt across sectors, but only in the United States. This chapter examines six major industrialized countries, including the United States. Earlier studies of the United States concluded that, to the extent that a pattern is discernible, highly indebted firms are concentrated in sectors that have been "the bedrock of economic stability in this country" (Roach 1988; see also Bemanke *et al.* 1990). Whereas this finding is valid, the potentially destabilizing influence arises from the fact that firms that have been *increasing* their leverage most rapidly have been concentrated in cyclical sectors. Studies that examined a slice of the highly leveraged activity also concluded that we have observed a case of "debt without disaster". This follows from the finding that "most of the highly leveraged corporate takeover activity is skewed toward industries that have been relatively unaffected by general economic downturns over the last 40 years" (Giordano 1988–9; see also Borio 1990). Whereas this may also be true, highly leveraged corporate takeover activity forms only a part of all the highly leveraged activity in the United States.

Previous work, including those that examined the differential *increase* in leverage, have suffered from the problem created by grouping firms into two types of sectors: cyclical and noncyclical (see, for example, Roach 1990). The cutoff point in such a grouping is necessarily arbitrary, and moving the point would change the composition of the two groups.[1] Moreover, dividing the entire economy into two sectors—stable and unstable—obscures shifting patterns within these two broad categories. This study circumvents the problem of a bipartite *ad hoc* grouping by estimating sector-specific cyclicality coefficients and using these in the analysis.

Many of the previous studies also suffer from the problem created by using industry level data. These data, available from the Department of Commerce, do not represent a consistent group of firms across years. This inconsistency would tend to make the interpretation of the data difficult, since the composition of the industry itself is likely to be changing over the years. By using firm-specific data, this study is able to examine a consistent sample of firms across time.

Firm-specific data reveal that the patterns of corporate leverage in at least some of the countries bear watching. In the United States, firms in cyclical industries have been *increasing* their leverage at a more rapid pace than firms in noncyclical industries. As a result, firms with high interest burdens have become more concentrated in cyclical industries. This could be worrisome especially if firms in cyclical sectors continue to have a stronger *growth* in leverage than those in noncyclical sectors. In other industrialized countries, the decrease in leverage made some economies more resilient than others. Japanese firms have decreased their leverage roughly uniformly across sectors. Noncyclical Canadian and German firms, by contrast, have decreased their debt more rapidly than cyclical firms. This pattern of deleveraging has made their economies less resilient than would appear at first sight.

1
LEVERAGE AND CYCLICALITY: WHY HIGH LEVERAGE IS A PROBLEM

The potential magnitude of the problem of leverage for the economy as a whole is related to the vulnerability of highly leveraged firms to economy-wide activity.[2] If highly levered firms are also cyclical, i.e. if the firms' ability to repay varies positively with the level of economic activity, a slow-down in economic activity would adversely affect these firms' outputs. The stronger the economic downturn, the greater the decline in output in cyclical firms. The more leveraged are these firms, the faster they may reach the point where they are unable to meet their fixed income obligations. Firms faced with diminishing cash flows could respond, on the one hand, by continuing to service their debt at the expense of cutting investment outlays or laying off workers (see, for example, Cantor 1990). Such expenditure reduction would directly feed the incipient recession. On the other hand, firms could respond by restructuring their debt obligation or even declaring bankruptcy. Either response could cause a credit squeeze in the economy as financial institutions become illiquid and/or bondholders face a decrease in wealth. Healthy corporations would thus be deprived of credit and this could intensify recessionary pressures in the economy.

High debt may make bankruptcy less likely (Jensen 1989) but at the same time intensify the adverse effects of macroeconomic shocks. A fall in the asset value of a firm resulting in insolvency might require creditors to liquidate a previously low leverage firm, since its going concern value at insolvency, when the firm's debt-asset ratio exceeds unity, is not much different from its liquidation or salvage value. Creditors may be persuaded, however, to restructure the fixed income obligations of a highly levered firm whose asset value at the point of insolvency is sufficient large. In any event, were the economy tipping towards a recession, creditors would still have to contend with large amounts of debt restructuring if highly levered firms are concentrated in cyclical industries.

There is some evidence that highly leveraged firms in the United States would be exposed to bankruptcy risk in the event of a recession (Bemanke and Campbell 1988). A deterioration in the debt-asset ratios and interest burdens of firms is evident when effects of recessions like those of 1973–4 and 1981–2 are simulated. Moreover, the vulnerability of US firms to a recession appears to have increased in recent years. When the simulations are performed using the 1988 capital structure of corporations as the base, the deterioration in leverage ratios and interest burden is more striking than when the 1986 capital structures are used as the base. This suggests that the changing capital structure of firms has made them even more vulnerable to recession in recent years.

2
METHODOLOGY

The analysis consists of three parts. First, the economy is divided into 10 relatively homogeneous sectors and the cyclicality of each of the sectors is estimated. Second, the degree of leverage and interest burden, both level and growth, of firms in each of the sectors is measured. Finally, the co-movement in leverage and cyclicality and interest burden and cyclicality is computed. A positive correlation between the *level* of leverage (interest burden) and cyclicality implies that firms with high leverage (interest burden) are also concentrated in cyclical sectors. A negative correlation implies the reverse, i.e. firms with high leverage (interest burden) are concentrated in sectors that are relatively noncyclical. Changing patterns in leverage (interest burden) are revealed by the correlation between the *growth* in leverage (interest burden) and cyclicality. Again, a positive correlation implies that firms that are increasing their leverage (interest burden) most rapidly are concentrated in cyclical sectors.

3
MEASURES OF LEVERAGE AND CYCLICALITY

Leverage is measured as the ratio of the book value of debt to assets in a sample of firms, for which data are available, in each sector in each country. The interest burden is measured by the ratio of the interest payments to cash flows. The interest burden is probably a better measure of sectoral vulnerability than is leverage, since, if cash flows are not strong enough to cover interest payments, a restructuring may be required even if the insolvency point is not reached.

A sector can be thought of as cyclical if its performance is in tandem with the economy as a whole. Performance indicators include output, earnings and equity, and asset returns. We define seven measures of cyclicality, two based on output/income (for the United States only), three on earnings, one on equity returns and one on asset returns.[3] Each measure is the regression coefficient relating an indicator of sectoral performance to a corresponding indicator of economy-wide performance (in the case of earnings, equity and asset returns, economy-wide performance is proxied by the performance of firms in our sample). The resulting regression coefficient measures the sectoral sensitivity to economy-wide activity. The greater the sensitivity, the more cyclical the sector. We could classify a sector as cyclical when the sectoral regression coefficient is equal to or greater than the corresponding coefficient, the cutoff point, calculated for all sectors taken together.[4]

To appropriately ascertain sectoral vulnerability to macroeconomic shocks, a measure of cyclicality should not be sample or leverage dependent. The measure that satisfies both these conditions is the sectoral sensitivity to output. It is derived by regressing the sectoral change in output on the percentage change in private sector GNP. This measure is free from sampling bias since it relies on data for the whole economy as opposed to our sample of firms. The sectoral sensitivity to output is also independent of firms' leverage since sectoral output is the performance indicator used to construct it. This measure, however, is not computable in a comparable way across countries. We therefore estimate several measures of cyclicality for the United States and choose the one that correlates the most with the income sensitivity to output. Since the correlation is highest with the coefficient derived from the regression relating the ratio of firm earnings to assets to the percentage change in GNP, we choose the earnings sensitivity to output as our preferred measure of cyclicality for all countries (see Table 19.1). It is noteworthy that balance sheet data better reflect sectoral vulnerability than do stock market returns.

4
DATA DESCRIPTION

The empirical analysis is based on a sample of financial and nonfinancial firms in six countries for which data are available in Global Vantage, including the United States, and for the United States only from Compustat.[5] We use Compustat primarily for the empirical work done on the United States, since it offers data for a larger sample of firms and a longer time period.[6] Data in Global Vantage are available only as far back as 1982. While data in Compustat are available as far back as 1969, we chose to go

Table 19.1 Correlation between the sectoral sensitivity to output and the other cyclicality measures (United States)

	Sectoral sensitivity of equity returns to		*Sectoral sensitivity of earnings to*		
	Stock market returns[a]	*Asset returns*[b]	*Full sample earnings/assets*[c]	*GNP*[d]	*GNP*[e]
Compustat data	0.08	0.32	0.70	0.79	0.85
Global Vantage data	0.09	−0.02	0.71	0.53	0.79

Notes: [a]Stock market beta.
[b]Beta derived from regressing sectoral asset returns on market asset returns.
[c]Ratio of earnings to assets averaged across firms in each sector regressed on the ratio of earnings to assets across all firms.
[d]Percentage change in earnings regressed on the percentage change in GNP.
[e]Ratio of sectoral earnings to assets regressed on the percentage change in GNP.

back only until 1977 since this encompasses two business cycles and going back further restricted our sample size.

Firms are grouped together under a 10-industry classification scheme. An industry classification suggested by a two-digit SIC code is not possible given the relatively smaller sample of foreign firms for which we have the relevant data. The industry classification chosen aims to group together industries that have a similar cycle, either because firms in these industries produce similar end-products or because they are vertically linked.[7]

5
EMPIRICAL RESULTS

Our results indicate that the changing nature of corporate leverage could potentially be problematic in the United States. Moreover, the decrease in corporate debt in most other countries has not made firms uniformly more resilient to adverse economic shocks. In Figures 19.1 and 19.2 we group countries in four quadrants in order of potentially problematic areas. Our results, as also those of most previous studies, are that cyclical industries in the United States have had a concentration of low levered firms.[8] The firms in the more cyclical industries, however, have been the ones to *increase* their leverage the most rapidly. This differential rate of increase is also evident when the sectors are grouped into two categories: cyclical and noncyclical. The average annual growth, between 1977 and 1988, of sectoral debt-asset ratios averaged across the cyclical group is significantly higher than the growth averaged over the noncyclical group (Table 19.2). This conclusion is at variance with some

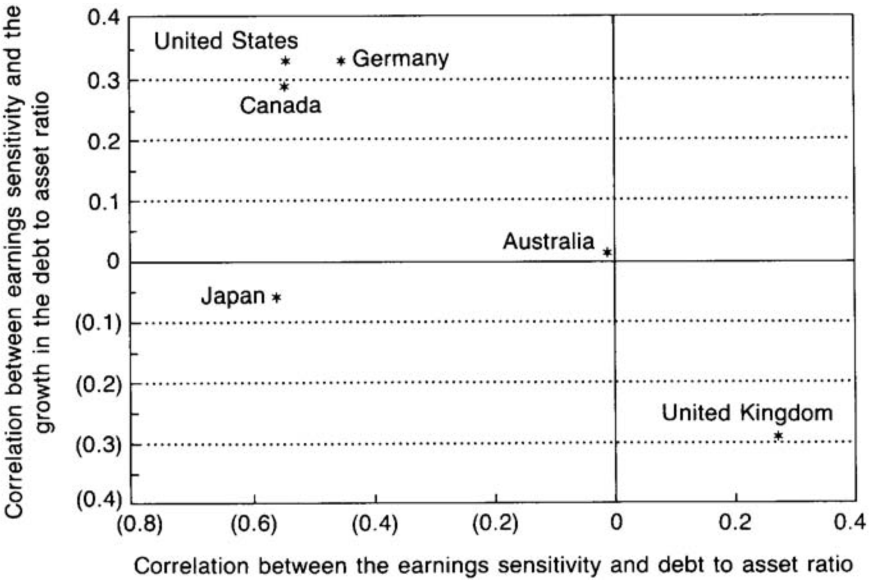

Figure 19.1 Relationship between firms' leverage and the earnings sensitivity to output in selected industrialized countries. Figures are averages for the period 1982–8 except for the United States in which the period is 1977–88

Source: Global Vantage, Compustat (for the United States)

previous results that only look at the manufacturing sector. In particular, agriculture and mining and services are excluded in these studies (see Roach 1990:5; Giordano 1990:12) When we exclude these sectors from our study, the difference in average growth rates of debt-asset ratios, between the cyclical and noncyclical group, is no longer significant. As a result of the differential rate of *increase* in leverage, firms that have had the most rapid *increase* in interest burden have also been concentrated in the more cyclical industries.

Our results do not appear to depend on our choice of sectoral aggregation. We have evidence that cyclical firms, independent of sectoral groupings, have become increasingly leveraged. The earnings sensitivity of firms in the ninety-fifth percentile of the leverage distribution (using debt-asset ratios) was less than the average level, 0.5, of all firms taken together until 1983 but rapidly increased thereafter. This indicates that the leverage of firms that were most cyclical has increased. Moreover, the most cyclical firms were increasingly becoming the most leveraged. This shifting trend is revealed by the fact that the earnings sensitivity of firms in the uppermost tail of the leverage distribution increased even more rapidly than

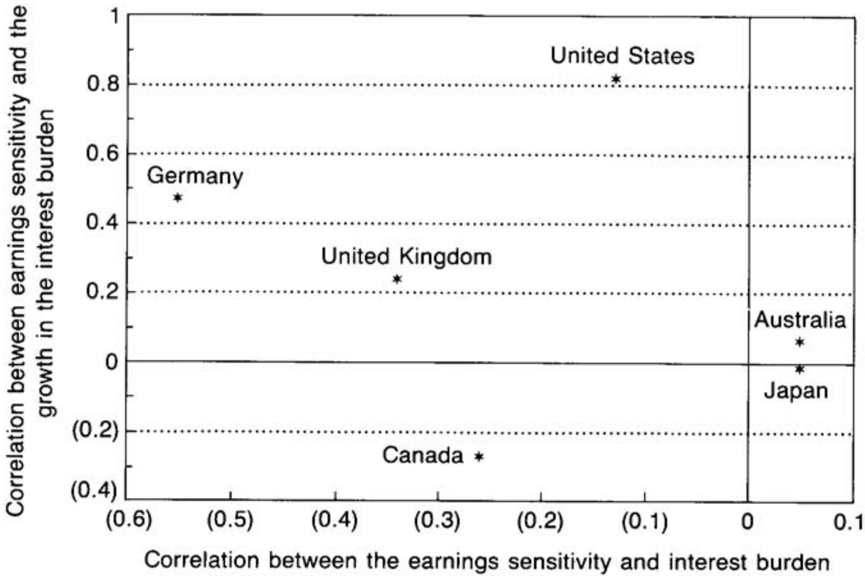

Figure 19.2 Relationship between firms' interest burden and the earnings sensitivity to output in selected industrialized countries. Figures are averages for the period 1982–8 except for the United States in which the period is 1977–88

Source: Global Vantage, Compustat (for the United States)

Table 19.2 Average annual growth in sectoral debt to asset ratios in the United States (1978–88)

	Number of companies	*Average growth in debt to asset ratios*
Cyclical sectors	861	2.2
Primary metals and transportation	108	3.7
Construction	71	3.0
Printing and paper	78	2.0
Mining and other	69	1.9
Other durable manufacturing	393	1.7
Petrochemical manufacturing	142	0.8
Non-cyclical sectors	729	1.0
Other nondurable manufacturing	115	2.3
Services except finance	341	1.0

	Number of companies	*Average growth in debt to asset ratios*
Banking, insurance, finance	92	0.6
Utilities	181	0.1

Note: Average of growth in debt to asset ratios for cylical industries is significantly higher than the average for non-cyclical industries at the 10 percent level of significance.

that of firms in the upper half of the distribution (see Table 19.3). Once again, merely looking at the average figures would have been somewhat misleading. Since the earnings sensitivity of high leverage firms, both in the ninety-fifth and the fiftieth percentile, have on average been close to zero, using average figures we might simply have concluded that these firms have been noncyclical. The important point is that the picture has been changing, i.e. more cyclical firms have also become highly leveraged in the recent past.

This evidence appears to be contrary to that presented in some previous studies that focus on highly leveraged takeover activity. These studies, referred to earlier, conclude that most of the leveraged buyouts (LBOs) occurred in noncyclical industries and thus highly leveraged activity may not be so damaging to corporate America after all. We have three counter-points to this argument. First, LBOs represent a relatively small proportion of the many different types of highly leveraged activity in corporate restructurings.[9] Our study includes all highly leveraged activity except that involving firms going private, as in LBOs. Our sample includes, for example, the \$2.7 billion stock repurchases by United Airlines in 1988 which formed 70 percent of the market capitalization but which would not have been included in any sample used in a study of takeover activity. Second, it would appear that we cannot make any generalizations about highly leveraged activity based on results obtained by examining LBO activity alone. One study that examined the relation between increasing leverage and LBO activity in a sample of US manufacturing industries found none (Blair and Litan 1989). The absence of a positive relationship between increase in

Table 19.3 Earnings sensitivity to output by percentile distribution of leverage in various years

Year	*95th*	*50th*	*Full sample*
1978	−0.40	−0.55	0.47
1979	−1.76	−0.49	0.47
1980	−1.03	0.41	0.47
1981	−0.24	−0.03	0.47
1982	−0.92	0.67	0.47
1983	0.10	0.86	0.47

Year	*95th*	*50th*	*Full sample*
1984	0.96	0.13	0.47
1985	0.80	0.99	0.47
1986	1.75	0.37	0.47
1987	1.75	1.11	0.47
1988	2.15	1.26	0.47
Average	0.02	0.23	0.47

Notes: Since the last column includes all companies, the sample remains the same each year, and hence beta is the same each year.

Computation: The debt-asset ratio is calculated for each company for each year and averaged across years for the bottom row; companies are ranked by their debt-asset ratio each year and grouped into percentiles; the earnings sensitivity to output is calculated.

corporate leverage and LBO activity means that results obtained from examining LBOs are not necessarily representative of highly leveraged transactions. Finally, previous studies have estimated that up to two-fifths of the takeover activity has been related to firms in cyclically sensitive sectors.[10] While this fraction does not represent *most* of the mergers and acquisitions, as well as LBOs, it suggests that a fair amount of highly leveraged takeover activity is in fact taking place in the more vulnerable sectors.

Firms in most other industrialized countries decreased their leverage between 1982 and 1988. While Australian firms increased their leverage during this time, data indicate that they also had a healthy increase in their cash flows. This growth in cash flows actually surpassed the growth in interest obligations, resulting in a decline in interest burden of Australian firms in our sample. It is hard to reconcile firms' lower interest burden with the corporate distress that was recently evident in Australia. The relatively small number of firms, 72 for Australia as opposed to nearly 1,600 for the United States, may form a sample that does not fully represent the corporate sector. There is no evidence, however, of a correlation between the earnings sensitivity to output and the average *level* or the *growth* in leverage of firms in Australia. The absence of a positive correlation suggests that the increase in leverage may potentially be less destabilizing than if leverage had increased uniformly in all sectors.

In Japan, the decrease in corporate leverage appears to have had more of a stabilizing influence than in Germany, Canada or the United Kingdom. In Japan, corporate leverage seems to have declined uniformly across

Table 19.4 Distribution of firms across industry groups in major industrialized countries (percent in 1988)

Sector/Country	*Australia*	*Canada*	*Germany*	*Japan*	*United Kingdom*	*United States*
Mining and other	36	22	1	N.A.	3	4
Construction	14	5	15	8	12	4
Petrochemical manufacturing	5	5	15	14	8	9
Printing and paper	5	9	1	2	4	5
Other nondurable manufacturing	5	7	9	7	15	7
Primary metals and transportation	5	11	12	11	6	7
Other durable manufacturing	9	10	25	37	18	25
Utilities	9	6	12	1	0	11
Banking, insurance, finance	N.A.	1	N.A.	N.A.	N.A.	6
Services except finance	14	25	11	21	33	21
Percentage of firms in cyclical industries	32	27	63	50	31	54

Sources: Compustat; Global Vantage.

industries. In Germany and Canada, however, firms in the more cyclical industries decreased their leverage more slowly than did other firms. Firms in cyclical industries in the United Kingdom have had, on average, high *levels* of debt. Even though UK firms in cyclical industries decreased their leverage rapidly, their interest burden did not decline as rapidly as that of firms in less cyclical industries.

The slower decline in the leverage of cyclical firms in Germany and in Canada meant that the most cyclical of German and Canadian firms also had the slowest decline in their interest burden. On the one hand, this may be of some concern to Germany, a country that has also had the highest concentration of firms in cyclical industries (see Table 19.4). On the other hand, institutional arrangements in Germany may make corporate bankruptcies less likely. It is difficult to conclude which of the two opposing factors is the stronger one at this time.

6
CONCLUSIONS

Our results indicate that, first, the recent *increase* in leverage in the United States may be more disconcerting than previous work has led us to believe. Second, the *increase* in leverage in Australia is potentially not as destabilizing as may appear at first glance. Finally, in terms of its effect on reducing financial fragility, the *decrease* in leverage has benefited some countries more than it has others; in particular, Japan has benefited more than has Germany, Canada or the United Kingdom.

The stronger are the barriers to foreign financial institutions in any economy, the greater is its vulnerability to a domestic credit squeeze. By contrast, the stronger is the interpenetration of the banking system, the easier it is to compensate declines in domestic liquidity by capital inflows. It follows that the destabilizing influence of an increase in leverage in cyclical industries could be mitigated by, and the beneficial effects of a decrease in leverage reinforced by, a breakdown of the nationality barriers to financial institutions. The beneficial effects of foreign penetration would be reduced in the event of a global credit squeeze. Only if the rest of the world was facing more stringent credit conditions than the domestic economy, however, would the deleterious effects swamp the beneficial effects of greater penetration by foreign financial institutions.

APPENDIX 19A
EFFECT OF LEVERAGE ON *r, Er, , β*

Let A_i be firm i's total assets, D_i firm i's total debt, E_i firm i's total equity and I_i, firm i's total earnings. Also $A_i=D_i+E_i$. (We drop the subscripts in what follows.)

Let x be the percentage of A that is debt. Then $1-x$ is the percentage of A that is equity. Let i be the interest rate, r the return on equity for the firm, r_{m} the market

return, r_{f} the risk-free rate and $i=r_{\mathrm{f}}$. Then, total interest paid by the firm i is xAi. Therefore

$$r=\frac{I-xAi}{(1-x)A} \qquad (19A.1)$$

$$\mu_r=Er=\frac{1}{(1-x)A}(EI-xAi) \qquad (19A.2)$$

$$\sigma_r^2=\frac{1}{(1-x)^2A^2}\sigma_I^2 \qquad (19A.3)$$

$$\begin{aligned}\frac{\partial\sigma_r^2}{\partial x}&=\frac{-\sigma_I^2 2(1-x)(-1)}{(1-x)^4A^2}\\&=\frac{2\sigma_I^2}{(1-x)^3A^2}\end{aligned} \qquad (19A.4)$$

For Also

$$\frac{\partial Er}{\partial x}=\frac{(1-x)(-Ai)-(EI-xAi)(-1)}{(1+x)^2 A}$$

$$=\frac{\mu_I - A_i}{(1-x)^2 A} \qquad (19A.5)$$

$$\frac{\partial Er}{\partial x}>0 \text{ iff } \mu_I > Ai$$

From the capital asset pricing model

$$E_{ri}=r_f+(Er_m-r_f)\frac{\sigma_{im}}{\sigma_m^2}$$

$$\frac{\sigma_{im}}{\sigma_m^2}=\beta_i=\frac{Er_i-r_f}{Er_m-r_f}$$

Then

$$\frac{\partial \beta_i}{\partial x}=\frac{\partial Er_i/\partial x}{Er_m-r_f}$$

We expect that $Er_m - r_f > 0$. Therefore

$$\frac{\partial \beta_i}{\partial x}>0 \text{ if } \frac{\partial Er_i}{\partial x}>0 \text{ or if } \mu_I > Ai$$

Since we generally assume that the return on assets, or μ_I/A, is greater than the opportunity cost of funds, i.e. $\mu_I/A>i$, it follows that

$$\frac{\partial \beta_i}{\partial x}>0$$

APPENDIX 19B
ADJUSTED BETA DERIVATION

Let ρ_i be the return on firm i's total assets A_i, i_i be the interest paid on its debt D_i and r_i be the return on firm i's equity E_i. Since $A_i=D_i+E_i$

$$\rho_i A_i = i_i D_i + r_i E_i = i_i(A_i - E_i) + r_i E_i$$

or

$$(\rho_i - i_i)A_i = (r_i - i_i)E_i$$

or

$$r_i - i_i = (A_i/E_i)(\rho_i - i_i) \qquad (19B.1)$$

We can estimate the systematic risk component of a firm's equity return by

$$r_i - i_i = \alpha_i + \beta_i(r_m - i_m) + \varepsilon_i \qquad (19B.2)$$

Substituting (19B.2) in (19B.1), we have

$$\frac{A_i}{E_i}(\rho_i - i_i) = \alpha_i + \beta_i\frac{A_m}{E_m}(\rho_m - i_m) + \varepsilon_i$$

or

$$\rho_i - i_i = \alpha_i\frac{E_i}{A_i} + \beta_i\frac{E_i}{A_i}\frac{A_m}{E_m}(\rho_m - i_m) + \frac{E_i}{A_i}\varepsilon_i \qquad (19B.3)$$

The coefficient of $(r-i)_m$ in equation (19B.2) does depend on the leverage of firm i, whereas the coefficient of $(\rho-i)_m$ in equation (19B.3), β_{ai}, should be independent of firm i's leverage. Since β_{ai} is hard to estimate, we first estimate β_i using equation (19B.2) and then calculate β_{ai} using the formula

$$\beta_{ai} = \beta_i \left(\frac{E}{A}\right)_i \left(\frac{A}{E}\right)_m$$

NOTES

1 For an illustration, see Lee (1990).
2 By virtue of higher leverage, the corporate sector may be exposed to risks other than those caused by the concentration of highly levered firms in cyclical industries. See Lee (1990).
3 The measure based on equity returns is leverage dependent, whereas the measure based on asset returns is independent of leverage. For a proof, and the computation of the asset measure, see Appendix 19A and Appendix 19B respectively.
4 The cutoff point for cyclicality as measured by output is then necessarily equal to one. The cutoff points for cyclicality as measured by earnings and equity returns, however, are sample dependent. It should be noted that the exact cutoff point that determines which sectors are cyclical is to some extent arbitrary. As will be obvious later, however, a particular choice of a cutoff point is not central to the analysis.
5 Global Vantage, Standard and Poor's international version of Compustat, provides data on publicly traded companies in several countries.
6 The aggregates figures for the United States reveal qualitatively similar trends whether we use data from Global Vantage or those from Compustat.
7 Our grouping, NSIC, is as follows:

NSIC Group		*Component SICs*
1	Agriculture, forestry, fishing, mining	1–2, 7–9, 10–14
2	Construction and construction materials	15–17, 24–25, 32
3	Chemicals and chemical products	28–30
4	Paper and printing	26–27
5	Nondurable manufacturing	20–23, 31
6	Primary metals and transportation equipment	33, 37
7	Fabricated metals, machinery, and	
	miscellaneous	34–36, 38–39
8	Utilities	49
9	Financial industries	60–67

NSIC Group		*Component SICs*
10	Services	40–48, 50–59, 70–89

8 One recent study, Bemanke *et al.* (1990) found that there was no particular concentration of highly levered firms in cyclical or in non-cyclical industries. This conclusion differs from ours, and is probably due to the different measure of cyclicality used. They regressed growth in real earnings on growth in real GNP to obtain the cyclicality coefficient. Table 1 in this study suggests that their measure of cyclicality may be inferior to one obtained by regressing the growth in earnings to assets on the growth in GNP.

9 According to Giordano (1988–9), LBOs represented only 20 percent of "all restructurings involving the substitution of debt for equity."

10 Giordano (1988–9:10–11). See also the Statement by Alan Greenspan, Chairman of the Board of Governors of the Federal Reserve System, before the Senate Finance Committee, January 1989.

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20
External financial pressures on UK companies, 1978–91: an examination of the impact of interest rates in two recessions

A.A.Lonie, C.D.Sinclair, D.M.Power and R.M.Michaelson

1
INTRODUCTION

The United Kingdom has experienced two severe economic recessions, separated by almost exactly 10 years, in 1980–2 and 1990–2. On each occasion the government has deliberately exerted serious pressure on the company sector by a policy of raising—and maintaining at high levels—short-term interest rates (see Figure 20.1). In each instance the government has justified its course of action by reference to the long-run policy objective of steady growth achievable only by the maintenance of a stable business environment characterized—as the Governor of the Bank of England recently explained—by "stability of prices and stability of policy" (*Bank of England Quarterly Bulletin (BEQB),* 1991c:496). The difficulty is that the two forms of stability are often incompatible. Moreover, as Keynes noted,

> It is much easier to preserve stability than to restore it quickly after a serious state of disequilibrium has set in. Thus, if we are asked to start control operations in a situation which is already unstable, we may find that the position has got, for the time being, beyond effective control.
>
> (Keynes 1930: II, 351)

This chapter examines the experience of a random sample of 230 UK companies, grouped according to size and interest sensitivity,[1] over the period 1978–91; all of the companies in the sample have been included in the Datastream database of accounting information since January 1969. Industries are similarly classified according to their sensitivity to increases in interest rates, and the profile of annual company liquidations in interest-sensitive industries is contrasted with that of all UK industries. A questionnaire survey sent to both the interest-sensitive (IS) and the non-interest-sensitive (NIS) companies in the sample was designed primarily to throw light on (a) the importance of short-term relative to long-term strategic considerations for such companies, (b) the importance to company strategy of different functions such as finance, marketing and human resources,

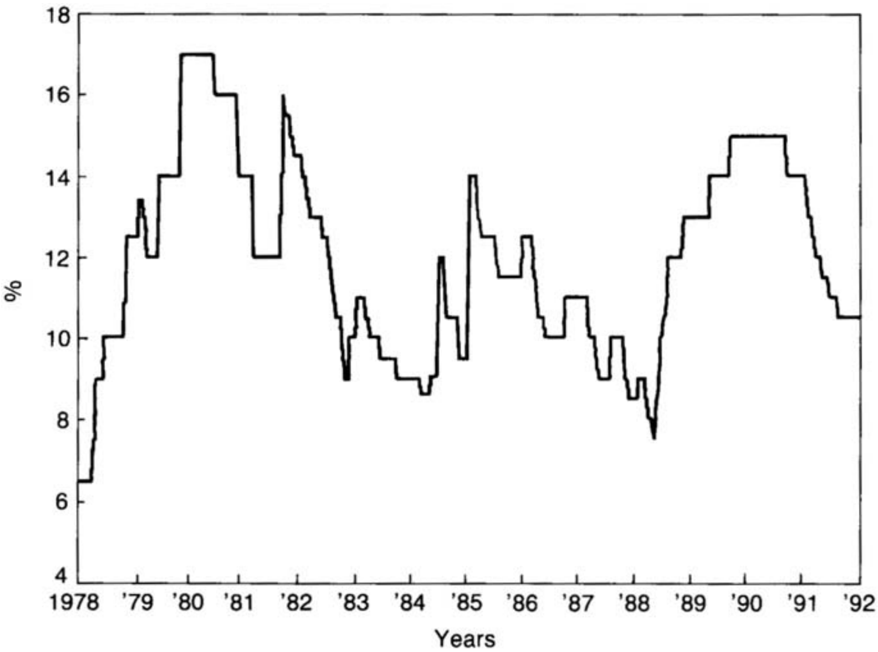

Figure 20.1 London clearing banks base rate

(c) perceived areas of competitive advantage, (d) the relative importance of different sources of cash flow pressure, 1988–92, (e) company priorities in cutting capital expenditures and (f) whether IS companies which had experienced severe cash flow pressures in 1980–2 had pursued policies designed to ensure that such traumas would not be repeated on any future occasion of high interest rates and recession.

We adopt a "neo-Keynesian" perspective based on a number of propositions.

1 Financial management is most appropriately studied in the context of a business cycle characterized, *inter alia,* by variable interest rates.
2 High interest rates have a discriminatory effect on industries and companies.
3 Small firms (and new firms) are especially vulnerable to heightened interest charges, but their distress may be masked by the aggregation procedures commonly adopted by the Treasury and the Bank of England.
4 Cash flow interdependences within and among firms, which become crucial for financially vulnerable firms in a recession, are likely to exert pressures which will trap such firms in a position of balance sheet disequilibrium.
5 Myopia and short-termism[2] by companies, lending institutions and government eventually give rise to abrupt policy changes which result in differential credit and equity rationing of vulnerable companies.

This chapter attempts to relate insights developed in the liquidity literature of the late 1950s and early 1960s to more modern analysis of capital structure and financial distress. It also attempts to highlight the importance of corporate culture in companies subjected to severe short-term financial pressure.

2
SIMILARITIES AND DIFFERENCES IN THE 1980–2 AND 1990–2 RECESSIONS

A number of commentators have pointed out that the causes and character of the two most recent UK recessions appear to be quite different, as have the main points of impact. However, there are important similarities between the two. Each recession has been unusually severe and protracted compared with the experience of other major industrialized countries and on each occasion the government has greatly underestimated the likely impact on industrial output and employment of high interest rates and other counter-inflationary policy measures. Patterson (1989) has noted that although the decline in conventionally measured corporate income over the period 1980–2 was 25 percent in real terms, the real decline in stock-flow consistent income, which takes into account the effects of relative prices (including the prices of capital goods and inventories), interest rates and exchange rates on company balance sheets, was of the order of 65 percent. In other words, the reduction in corporate financial strength was grossly underestimated by standard income measures; the differential impact on relatively vulnerable companies was, it is reasonable to assume, greater still. In the 1990–2 recession company liquidations have increased more quickly, and risen substantially higher, than in 1980–2 in spite of a lower (so far) contraction in industrial production, suggesting either that stock-flow pressures or the discriminatory impacts of such pressures on vulnerable companies are even more severe in the present recession.

The differences between the two recessions are also notable. The financial vulnerability of UK companies in 1980–2 was attributable not so much to extraordinary levels of company indebtedness (the sector was generally in surplus in 1978–84) as to the very low average levels of the return on capital in the company sector. This low point followed several years of absolute and relative decline in returns[3] and occurred at a time when the contractionary effect of an international recession was greatly reinforced by high interest rates, an overvalued exchange rate and a fiscal squeeze (measured on a cyclically adjusted basis) initiated when the economy was already known to be contracting. In the present recession the influence on the company sector of each of these factors, except interest rates, appears to be less pronounced than in 1980–2. If we focus on the company sector, the most significant differences between the two periods are the record levels of corporate indebtedness in 1989 and in 1990[4] and the heavy impact of the more recent recession on the southeast of England, which was affected less than most other regions by the economic downturn in 1980–2.

To an economic historian or a student of the views of Irving Fisher (1932) the present recession is the familiar outcome of the impact of high interest rates on an economy rendered fragile (or ripe for contraction) by excessive borrowing and lending in the late stages of the boom.

The sequence was competently summarized by Hyman Minsky in 1972:

> Success of the economy breeds optimistic views as to the likelihood of success and downgrades the possibility of failure. Endogenously generated euphoria breeds an investment boom financed to an ever increasing extent by debt. This debt financing leads, in time, to financial difficulties.
>
> (Minsky 1972:184)

Keynes's advice that when the economy is experiencing a boom the monetary authorities should avoid high interest rates "as we would hell-fire" (Keynes 1937) is one that no government has found practicable since 1951 when bank rate was reactivated. However, given the central importance of interest rates to the government's counter-inflationary efforts it is worth asking whether there were good reasons for suspecting that the belief expressed by the Treasury and, as late as February 1989, by the Bank of England that company sector "investment demand should hold up" might have been misconceived. Since the trade cycle has been studied so assiduously and since these studies are readily accessible to government advisors as well as to bankers, businessmen and cabinet ministers themselves it is reasonable to enquire why the UK economy (and also, for example, the US and Canadian economies) has fallen once again into the classic sequence of "boom" and "bust".

One reason may have been that too much attention was given to econometric studies of aggregates and too little to the balance sheet position of individual companies.[5] Around the same time that the Treasury and the Bank of England were maintaining that company investment was unlikely to be affected by high short-term interest rates Bernanke and Campbell noted in their article "Is there a corporate debt crisis?" that aggregate debt measures yield no useful information about the distribution of debt across firms, arguing:

> [Aggregate] debt measures tell us nothing about the distribution of debt across firms. Yet for anyone who is concerned about the implications of an aggregate shock for bankruptcy rates or financial distress, the debt burdens of firms in the upper tail of the distribution are more important than average measures.
>
> (Bernanke and Campbell 1988:85)

The point is an old one and it was made with equal cogency 25 years earlier by Kuh and Meyer, also in connection with the US economy:

> All appraisals of monetary policy depend in a more important way on the micro distributions. It is possible that the distribution of quick ratios, current ratios, and quick asset-sales turnover ratios, plus the other measures, change systematically over the cycle. For instance, even though the aggregate quick ratio deteriorates during the cyclical upswing, the effects of monetary policy might be much greater than those indicated if a few firms became progressively more liquid while the vast majority of firms became increasingly illiquid in the late recovery stage. It is to be hoped that subsequent analyses of the relationship between financial policies and investment will utilize micro distributions in addition to the aggregate figures.
>
> (Kuh and Meyer 1963:403)

In fact, the impact of high interest rates on the UK company sector has also been exacerbated by one of the most interesting financial phenomena of the late 1980s —the rise in the dividend payout ratio of UK companies to levels that hardly seem warranted by improvements in these companies long-term growth prospects and which are substantially higher than the dividend payout ratio of German companies (Mayer and Alexander 1990).[6] These findings reveal that the average dividend payout ratio of UK companies was 30.3 percent between 1982 and 1988 compared with an average payout ratio of 13.9 percent for German companies over the same time period. According to Bank of England data UK dividends rose by 20 percent in 1990, although the contraction in output in the second quarter of 1990 was the sharpest of the recession. UK company sector payout ratios of 39 percent in 1989 and 47 percent in 1990 which diminished the capacity of these companies to finance capital expenditure from retained earnings were associated with unprecedented levels of company indebtedness, signs of "a widespread belief among companies [in the late 1980s] that debt service would not be difficult in future" (*BEQB* 1991a). A modern way of looking at the euphoria of the boom is to interpret this over-optimism as an example of "disaster-myopia" or, more precisely, of "recession myopia".[7]

3
TREASURY OPTIMISM

In the *Economic Progress Report* for June 1988, published by the Treasury shortly before one of the great movements in interest rates in modern times, it was strongly implied that the "stop-go" sequence, so characteristic of the policies of earlier UK administrations, had at last been conquered. Writing about previous decades in an article entitled "Steady growth" the Treasury noted that:

> [A]rtificial boosts to demand led to problems with inflation and the balance of payments, which meant that demand had to be reined back again, creating the phenomenon known as "stop-go".

The article continued:

> The present Government have therefore adopted a different approach, designed to create the conditions for steady, sustainable growth. No attempt is made to regulate demand in the short term…. And to facilitate healthy growth, the Government have concentrated on removing restraints on the supply side of the economy.
>
> (*Economic Progress Report* 1988a:1)

Economists have long known the prescription to avoid domestic inflationary pressures. Keynes spelled it out in the *General Theory* and Brechling and Wolfe explained precisely what was required in their 1965 article "The end of stop-go". To eliminate the "stop" the monetary authorities must maintain proper control of the "go". In other words, to achieve sustained growth the Treasury and the Bank of England must ensure that British industry is given sufficient time to increase its capacity to meet prospective demand. The Treasury's error in permitting an unsustainable, debt-financed boom was compounded by a misconception of fundamental importance: the authorities believed that high short-term interest rates would curb excessive consumption and prick the bubble of the property boom in the south east, while leaving company investment virtually unscathed.

Government advisors sustained their belief that high short-term interest rates would not inhibit company investment until May 1990 or beyond. According to the *Bank of England Quarterly Bulletin* for that month, short-term interest rates on their own are "rarely critical" for decisions about fixed investment. This stance was based on in-house empirical research which suggested that rises in short-term interest rates would have no significant impact upon the investment plans of the UK manufacturing company sector provided that long-term rates did not rise in sympathy—and, in practice, they did not do so. Yet, there is a considerable literature devoted to explaining the links between large increases in short-term interest rates and capital expenditure by companies, to which we now turn.

4
HIGH INTEREST RATES, CASH FLOW INTERDEPENDENCES AND INNOVATIONAL INVESTMENT

The modern theory of financial management makes a useful distinction between financially strong and financially vulnerable firms (Ravid 1988). The former are more or less impervious to the financial pressures exerted by high interest rates; asymmetries of information between managerial "insiders" and shareholders, creditors or other important classes of "outsider" do not present a problem; agency costs are not regarded as significant; the companies' impressive net worth ensures that they will not experience credit rationing or equity rationing (although considerations of timing etc. remain relevant); companies of this type can adapt their balance sheets to new economic circumstances without difficulty; decisions about dividends, new capital expenditures and financing may in practice be made jointly but it is not essential that this occurs.

In the case of financially vulnerable firms the arguments are reversed: asymmetries of information and agency costs operate as important constraints on their access to external funding; their balance sheets and cash flows are unusually susceptible to financial pressure; they are liable to be subject to both credit and equity rationing in conditions of high interest rates; in so far as they have access to external funds their marginal cost of funds schedules rise in a series of discrete steps; they suffer discrimination from institutional lenders; their weak bargaining position *vis-à-vis* suppliers and customers may require them to become net suppliers of credit as their cash flow position deteriorates. Financially vulnerable firms are liable to find themselves trapped by rising interest rates in a situation of portfolio imbalance, unable to adapt their actual to their preferred asset and liability structures, and experiencing financial distress. Because such firms are liquidity constrained, interest rate pressure may compel them to cut their dividends or to postpone capital expenditure plans, or both. "Financial control" companies (Goold and Campbell 1987) are more likely to respond to cash flow pressure by cutting risky investment than "strategic planning" companies which adopt a more long-term perspective. The strategic management style therefore influences the way that managers respond to external pressures such as high interest rates (Demirag and Tylecote 1992). US evidence (Kahn 1989), UK evidence supplied by the Bank of England (*BEQB* 1992) and casual empiricism based on the UK investigation of the present work suggests that very substantial changes have taken place in the interest sensitivity of industries and companies in the course of the 1980s. Recent Bank of England evidence on company profitability and liquidations suggests that civil engineering and construction, together with related sectors such as building materials, have been especially hard hit since 1988, as have the non-food retail and financial services sectors. In the 1980–2 recession heavy engineering industries (including metals and metal forming) were particularly affected (Lonie *et al.* 1990). The companies and industries which suffered the greatest contraction in the first half of the 1980s have presumably lost their most vulnerable elements and have taken precautions against future financial emergencies.

Of the 75 IS companies in our sample only 25 (or 33 percent) remained interest sensitive in 1991; of the 155 NIS, 30 (or 19 percent) had become interest sensitive by 1991.[8] As the responses to our questionnaire survey have demonstrated, many of our sample companies changed radically in product mix and market orientation during the 1980s. Also, the finance directors of many IS companies in particular went out of their way to mention measures their company had taken which were designed to enable the company to weather another recession with much less perturbation. As noted earlier, since all of the

UK companies in the sample were in existence in 1969, by 1991 they were not only mature but in many cases large and financially strong. The total assets of the average IS and NIS companies in 1991 were roughly £600 million and £1 billion respectively in value; the total assets of the smallest quintiles of IS and NIS companies were approximately £30 million and £16 million in this year. Preliminary indications suggest that the most interest-sensitive elements in 1989–91 may be among small companies in non-manufacturing sectors (*BEQB* 1991a).

The linkages between sharp rises in short-term interest rates and company expenditures have been examined by modern writers such as Taylor and O'Connell (1985), Lavoie (1986) and also by ourselves in some detail (Lonie and Power 1989; Lonie *et al.* 1990). However, the issue of cash flow interdependences is both fundamental and contentious and was given an edge by Fama's 1974 article in which he questioned the appropriateness of the methodology of earlier studies and concluded that "whatever imperfections are present in the capital market are not sufficient to cause our data to reject the [Miller and Modigliani] hypothesis that there is a rather complete degree of independence between the dividend and investment decisions of firms". Several subsequent studies (e.g. by Guerard and Stone 1978; McCabe 1979; Peterson and Benesh 1983; Jalilvand and Harris 1984; Fazzari *et al.* 1988) have supplied impressive evidence that cash flow interdependences within the firm may be significant. The position adopted in this chapter is simply that for vulnerable companies under cash flow pressure it is probably appropriate to regard dividend and investment decisions as jointly determined; for large financially strong companies it is reasonable to treat such decisions as independent. As writers such as McKean (1951), Gaskin (1960), Roe (1973), Tybout (1983) and Huberman (1984) have demonstrated, the relationship may be established without reference to the modern literatures on asymmetries of information or the costs of financial distress. However, writers who have combined the insights developed in the two approaches into a single model (e.g. Bernanke and Gertler 1986, 1987; Greenwald and Stiglitz 1986) have developed an analytically richer paradigm.

5
EVIDENCE ON THE INTEREST SENSITIVITY OF UK INDUSTRIES AND COMPANIES

The rough-and-ready nature of our approach must be fully acknowledged. No attempt is made to model relationships or to determine lags, although it is generally recognized that dividends, investment and liquidations are best explained by lagged variables. As noted elsewhere, possibly important considerations relating to the reallocation of wealth or income arising from changes in the price level or the exchange rate are not explicitly considered. In partial justification of the procedure adopted, the advantage of using ratios is that it is possible to make comparisons over time without paying any special heed to inflation. Moreover this approach has the Keynesian virtue of employing the magnitudes that businessmen are obliged to take into account as economic indicators.

By focusing only on interest rates as a cost which has to be deducted from operating profit, we may identify a number of industrial sectors that exhibited an unusual degree of “interest sensitivity”. By classifying such industries as interest sensitive we imply that any rises in interest rates inflicted a much more severe penalty on their operations than on the average company. We attempt to measure this sensitivity by employing the interest to operating profit ratio; industries for which this ratio rose to a figure in excess of 40 percent between 1980 and 1982 are classified as interest sensitive. This figure of 40 percent represents the approximate peak percentage for the interest to operating profit ratio for all UK manufacturing companies in the record year for such ratios, 1974.

A random sample of 230 companies is also used to test the hypothesis that changes in base rate had different effects on IS and NIS companies. All of the companies chosen were included in the Datastream database of accounting information from January 1969 onwards. This sampling procedure avoided any problems that might arise from the inclusion of new companies in the IS and NIS groups. Also, since new companies tend to be especially vulnerable to financial pressure, the results presumably understate the consequences of high interest rates. One hundred and fifty-five of these companies were classified as NIS and 75 were identified as IS. A definition similar to our industry criterion was used to classify IS companies; IS companies are those firms for whom the interest to operating profit ratio was either greater than 40 percent or negative in 1980–2. Such a classification is arbitrary but it has the advantage of separating the most financially vulnerable companies from the rest.

Datastream was used to obtain the financial profiles of all companies selected, using data for the period 1978–91. The data were analyzed to discover any changes that took place when base rate was changing in a fashion associated with “ease” or “squeeze” periods. There are well-known problems in identifying periods of monetary ease and stringency. Annual data are often inappropriate since interest rates may fall and rise dramatically in the course of a year, as occurred in the UK in 1988. Also interest rate levels may rise by significant amounts without apparently exerting any severe financial pressure on the economy as seemingly happened in 1984. In this chapter we adopt a procedure of defining the years 1980–2 as a period of monetary squeeze in the UK and to categorize the remaining years of 1978–88 as years of monetary ease. 1989 presents a problem in the sense that the most recent sequence of base rate increases began on 2 June 1988 and culminated in a 15 percent base rate on October 5, 1989. Although British industry was suffering an indubitable “squeeze” in 1989, it is difficult to define 1989 as a “squeeze” year with reference to industry as opposed to company data.

Five financial variables were examined in evaluating the association between interest rate changes and changes in company investment: liquidity (quick asset ratio), profitability (net profit margin and return on capital employed), gearing, dividend patterns and capital investment expenditure. Three different measures of capital expenditure are included. First, actual capital expenditure as measured by the change in the book value of plant and machinery between two balance sheet dates is considered. Second, contracted capital expenditure is examined. This figure includes contracts entered into for the future purchase of capital items. Finally, annual authorized capital expenditure is analyzed over the years 1978–91. Data for all three items are divided by total assets to control for size differences across groups. The behavior of dividends is also examined from two separate but related perspectives: the percentage change in nominal dividends and the proportion of companies cutting dividends are each outlined. All the data for IS and NIS groups of companies are analyzed to determine whether any change occurs in the respective groups of companies' investment strategy

Table 20.1 Financial characteristics of interest-sensitive industries

	Interest-operating profit ratio		*% change in dividend*	
Year	*IS*	*ALL*	*IS*	*ALL*
1978	28.50	19.50	15.60	18.50
1979	30.70	20.30	21.00	26.60
1980	41.70	26.30	−14.40	6.40
1981	49.10	30.90	−2.10	8.60
1982	56.50	35.60	−8.20	−3.80
1983	40.50	28.10	34.90	42.30
1984	33.40	24.20	25.20	21.40
1985	30.80	25.20	17.50	30.90
1986	23.10	21.40	28.30	30.90
1987	18.10	17.60	28.60	29.00
1988	16.00	15.60	29.50	30.40
1989	18.90	19.80	33.40	23.00
1990	25.10	26.00	12.50	15.50
1991	32.70	38.30	2.40	11.40

Note: Included are the profiles of interest-sensitive industries (IS) and all consumer and capital goods industry (ALL) for the years 1978–91. The interest-sensitive industries include Metals and Metal forming, Chemical, Mechanical engineering, Motors, Textiles, Shipping and transport. After 1987, data for Mechanical engineering were replaced with data from Engineering (General) as the former category disappeared. Interest-sensitive industries are defined as those industries for whom the interest-operating profit ratio rose to a figure in excess of 40 percent between 1980 and 1982. This cutoff point of 40 percent represents the approximate peak percentage for the interest—operating profit ratio of all UK manufacturing companies in 1974. The data were obtained from Datastream.

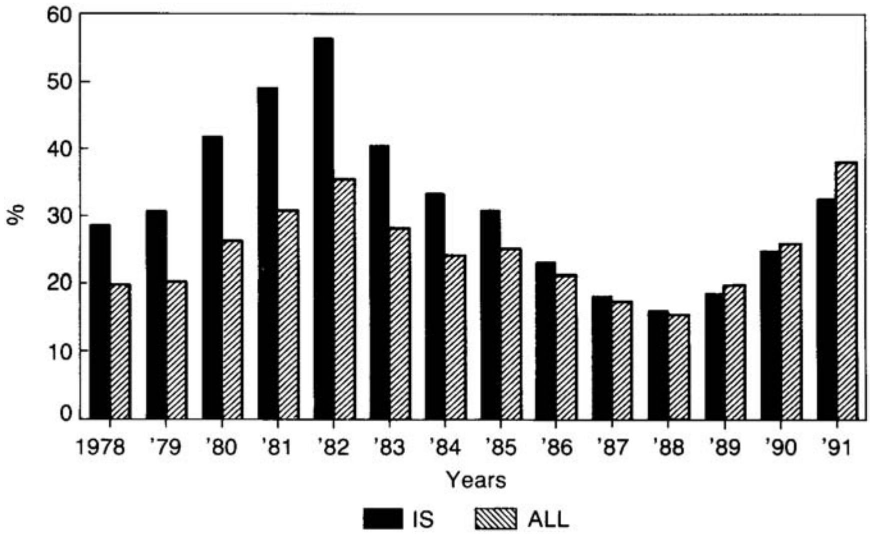

Figure 20.2 Interest to operating profit ratio, industry data

between years of "ease" and "squeeze". Of particular interest is whether the evidence seems to support the view that capital investment plans were modified by IS companies in response to financial pressure exerted by high short-term interest rates.

6
VULNERABLE INDUSTRIES AND THE ECONOMY AS A WHOLE

Two features of the interest to operating profit ratio data for industries (Table 20.1 and Figure 20.2) are worth noting. Although the ratios for the groups were not dissimilar in 1978, in the period 1980–2 they were dramatically different with the ratios for IS industries almost doubling in size. By 1984 the disparity between the two was less than in 1978 and by 1989 the two were virtually identical. The dividend data also exhibit clear signs of the distress of IS industries in the years 1980–2.

The pattern of capital expenditure of IS industries (Table 20.2) showed much greater variation than that for the combined consumer and capital goods sectors over the period as a whole. Actual, contracted and authorized capital expenditures generally dropped in 1980 and again in 1982 in the "squeeze" period.

As Figure 20.3 reveals, the percentage of company liquidations was approximately twice as high for IS industries than for all UK industries in the years 1983–6. In the present recession liquidations appear to have risen more quickly in response to the "squeeze", liquidations in "all industries"

Table 20.2 Investment pattern of interest-sensitive industries

	Capital expenditure authorized		*Capital expenditure contracted*		*Capital expenditure actual*	
Year	*IS*	*ALL*	*IS*	*ALL*	*IS*	*ALL*
1978	2.84	1.95	2.48	1.93	3.52	4.35
1979	2.10	2.04	1.90	2.01	4.64	4.61
1980	1.65	2.47	1.33	1.97	3.46	4.01
1981	1.74	2.67	1.65	2.29	6.47	5.33
1982	1.46	2.25	2.42	2.03	−2.60	−0.64
1983	1.70	2.68	1.53	1.90	10.08	11.04
1984	2.88	3.31	1.34	2.11	5.00	4.03
1985	1.90	3.12	1.85	2.31	0.24	1.76
1986	1.81	2.91	1.58	2.06	6.19	4.47
1987	2.88	3.82	4.81	3.25	3.25	4.58
1988	2.56	4.00	4.83	3.27	6.90	6.82
1989	3.15	3.77	4.47	3.30	6.16	5.48
1990	2.57	3.23	2.27	2.25	1.99	3.17
1991	2.39	2.63	3.85	2.41	2.78	2.69

Note: Included in the table are capital expenditure, capital expenditure contracted and capital expenditure authorized for interest-sensitive industries (IS) and all consumer and capital goods industries (ALL). Capital expenditure is defined here as the change in the amount of cost of plant, machinery, motor vehicles, equipment and furniture and fittings between two balance sheet dates. Capital expenditure contracted includes contracts entered into for the future purchase of capital items: expenditure on machinery, equipment, plant, buildings and vehicles. Capital expenditure authorized shows expenditure which the directors have authorized for the future purchase of capital items but where no contracts have yet been signed. The data for all these items have been divided by total assets to control the size differences across groups.

rising to approximate parity with the level of IS industries, suggesting perhaps that IS industries, purged of their weakest elements—largely by financial pressures—have been "normalized".

7
THE EXPERIENCE OF VULNERABLE AND NON-VULNERABLE COMPANIES

For our sample of 230 companies it emerged that size was an important characteristic as well as interest sensitivity. The very high interest to operating profit ratios of IS companies in 1981 and 1982 (Table 20.3 and Figure 20.4) indicate that the survival of some of these companies must have been temporarily precarious. The very low ratios of the smallest quintile of the NIS companies

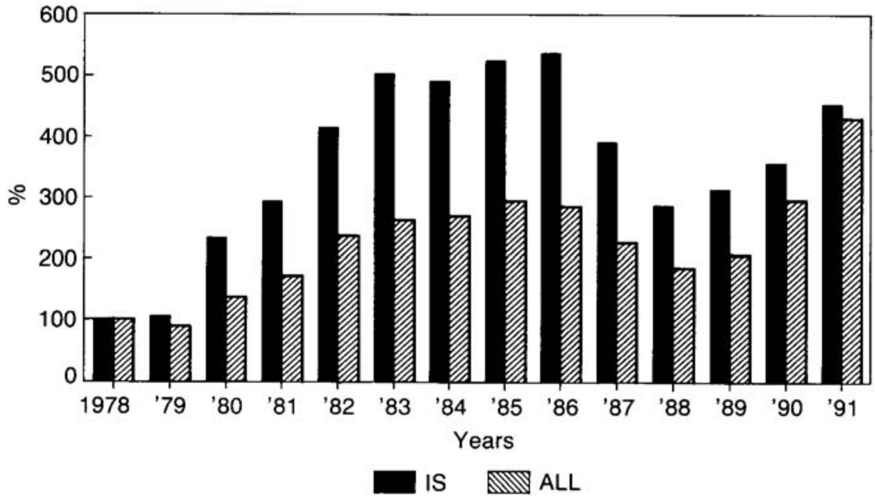

Figure 20.3 Index of company liquidations; base year 1978=100

Source: Economic Trends, various editions

suggests that a number of them may well have had no recourse to external finance whatsoever. The pattern of dividend change over 1980–2 for IS and NIS companies (Table 20.4 and Figure 20.5) bears only a rough resemblance to that of their industry counterparts. It is interesting to note from Figure 20.6 that approximately 10 percent of both IS and NIS companies cut their dividends in 1978 while 65 percent and 31 percent respectively reduced their dividends in 1981. Such results for IS companies are very much in accordance with the findings of De Angelo and De Angelo (1990) for distressed companies.

The differences in the capital expenditure figures for IS and NIS companies (Table 20.5 and Figure 20.7) are much more clear-cut than in the

Table 20.3 Interest to operating profit ratio for company data

	Total sample		*Largest quintile*		*Smallest quintile*	
Year	*IS*	*NIS*	*IS*	*NIS*	*IS*	*NIS*
1978	24.0	7.3	27.1	15.9	31.9	0.7
1979	27.1	8.0	37.8	16.9	21.1	0.7
1980	52.3	12.8	50.6	20.2	37.4	1.5
1981	136.7	15.9	57.0	23.5	182.7	2.5
1982	75.8	15.3	59.9	24.6	343.3	2.4
1983	56.1	14.9	47.7	22.2	63.5	3.8
1984	33.6	11.4	38.1	18.7	24.3	6.4
1985	35.4	13.4	35.4	21.7	37.0	4.8
1986	26.8	13.7	24.2	19.7	41.8	7.1

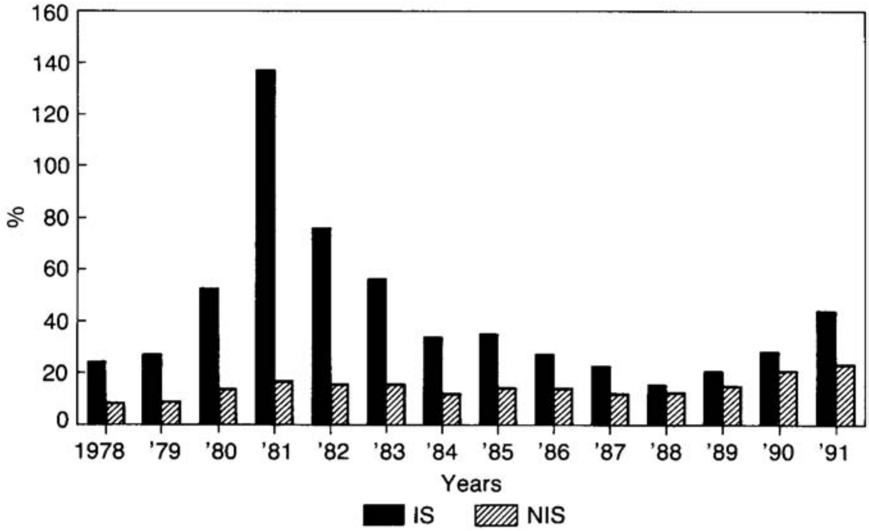

Figure 20.4 Interest to operating profit ratio, company data

	Total sample		*Largest quintile*		*Smallest quintile*	
Year	*IS*	*NIS*	*IS*	*NIS*	*IS*	*NIS*
1987	22.8	11.5	21.8	15.9	23.9	7.1
1988	15.3	12.0	20.8	13.7	13.2	5.7
1989	20.4	14.5	20.4	16.9	13.7	24.0
1990	28.3	20.4	30.1	22.4	30.4	24.0
1991	43.9	23.3	29.6	26.1	31.6	18.7

Note: The median interest-operating profit ratio (×100) for Interest-sensitive (IS) and Non-interest sensitive (NIS) companies is shown. Companies with negative ratios were treated as if their ratios were large and positive. Interest-sensitive companies are those companies for whom this ratio was either greater than 40 percent or negative in 1980–2.

Table 20.4 Dividend payout characteristics of interest-sensitive and non-interest-sensitive companies

	Dividend percentage change		*Percentage cutting dividend*	
Year	*IS*	*NIS*	*IS*	*NIS*
1978	12.04	11.94	10.67	8.39
1979	18.73	26.25	12.00	8.39
1980	0.45	14.29	48.00	18.71
1981	−3.70	9.62	65.33	30.97
1982	0.00	10.68	52.00	23.23

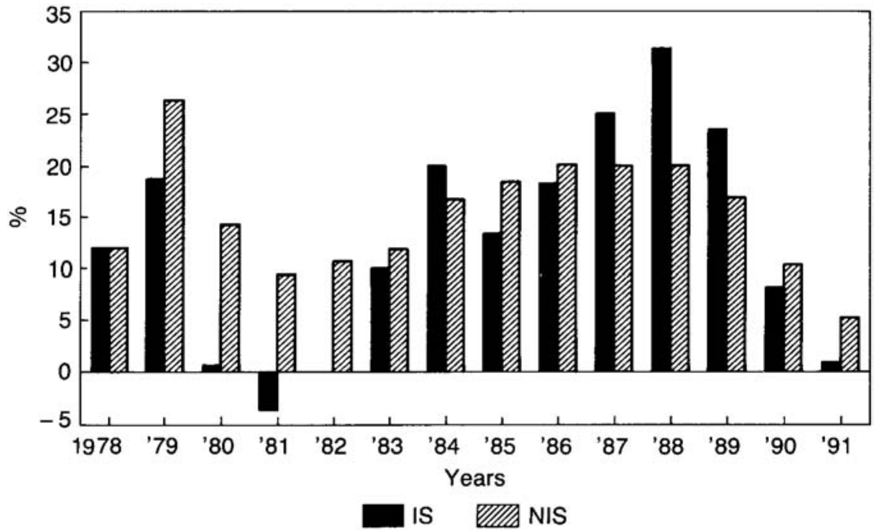

Figure 20.5 Percentage change in dividend, company data

	Dividend percentage change		*Percentage cutting dividend*	
Year	*IS*	*NIS*	*IS*	*NIS*
1983	10.00	11.80	24.00	16.77
1984	20.00	16.67	13.33	10.97
1985	13.39	18.44	17.33	9.68
1986	18.23	20.03	10.67	10.32
1987	24.88	19.99	12.00	7.74
1988	31.30	20.03	9.33	6.45
1989	23.48	16.86	5.33	12.90
1990	8.15	10.22	20.00	18.06
1991	0.90	5.09	37.33	26.45

Note: The data included are the percentage change in dividend and the percentage of companies cutting their dividend in nominal terms for interest-sensitive and non-interest-sensitive companies. The percentage change in dividend is the change in dividend between two years divided by the dividend of the first year for the median company in the group.

Table 20.5 Investment patterns of interest-sensitive and non-interest-sensitive companies

	Capital expenditure actual		*Capital expenditure contracted*		*Capital expenditure authorized*	
Year	*IS*	*NIS*	*IS*	*NIS*	*IS*	*NIS*
1978	3.62	4.15	0.85	0.99	0.86	1.09

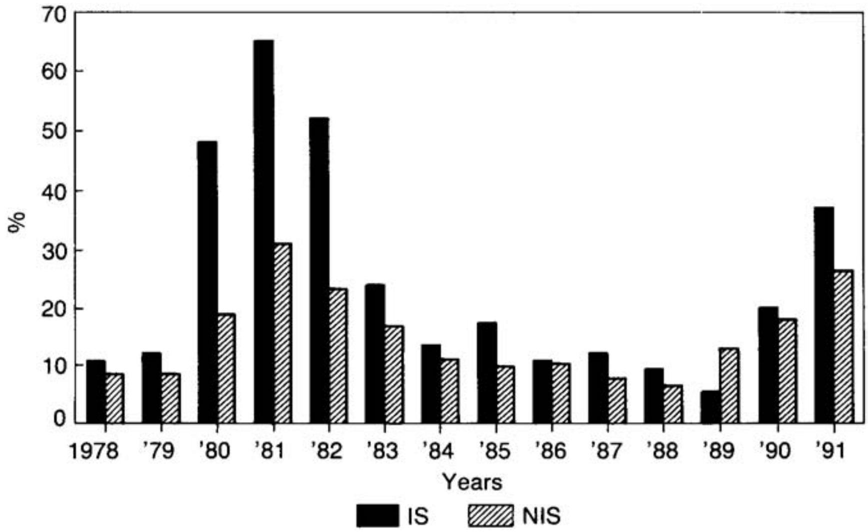

Figure 20.6 Percentage cutting dividend, company data

	Capital expenditure actual		*Capital expenditure contracted*		*Capital expenditure authorized*	
Year	*IS*	*NIS*	*IS*	*NIS*	*IS*	*NIS*
1979	3.44	3.76	1.16	1.42	1.31	1.12
1980	2.17	3.74	1.70	1.12	0.96	1.50
1981	1.59	2.83	0.63	1.63	1.05	1.63
1982	−0.17	3.20	0.77	1.31	1.01	1.84
1983	0.37	3.37	1.09	1.50	1.04	1.92
1984	1.74	3.64	1.22	1.73	1.51	2.20
1985	2.05	3.73	1.35	1.66	1.69	2.04
1986	3.15	3.97	1.03	1.12	1.88	2.02
1987	3.13	4.11	1.31	1.97	1.83	2.72
1988	4.72	4.02	1.63	2.02	1.84	2.71
1989	5.56	4.53	1.74	1.55	1.93	2.30
1990	1.89	2.04	1.04	1.48	1.50	1.75
1991	3.51	2.58	0.65	0.98	1.18	1.20

Note: See Table 20.2 for notes and definitions.

industry data. The actual capital expenditure of IS companies fell steeply between 1979 and 1982, while authorized and contracted capital spending for IS companies showed much less fluctuation. By comparison all three forms of capital expenditure showed considerable stability for NIS companies.

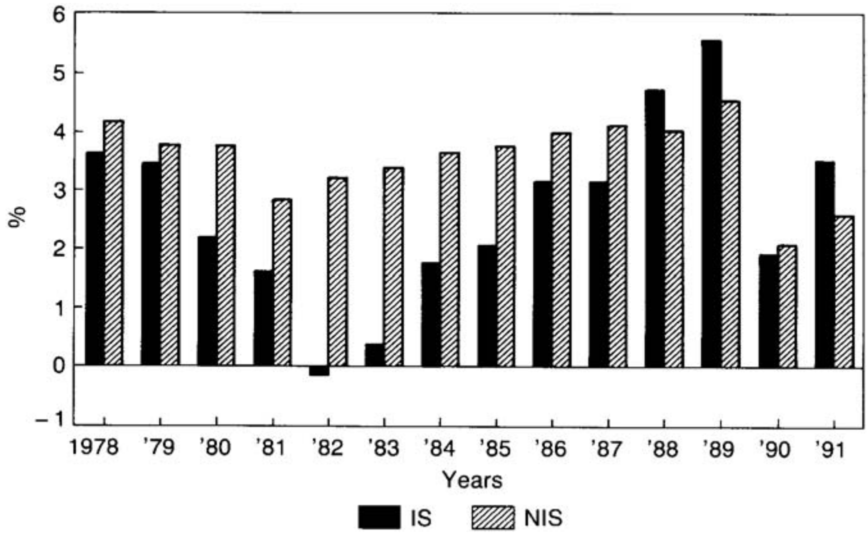

Figure 20.7 Capital expenditure, company data

The profiles of IS and NIS companies (Table 20.6) were as one might expect from financially distressed and financially strong companies: the profits and profitability of the former declined abruptly in the period of “squeeze” 1980–2; their quick asset ratio was lower; their capital gearing ratio was higher, peaking in 1982 and again in 1991. Interestingly, NIS companies maintained their advantage in profitability throughout the 1978–91 period, but by 1988 the differential had diminished, partly due no doubt to the reduction in sensitivity of many of the companies that were IS in 1980–2. There is *prima facie* evidence of mean reversion in the profitability of the formerly aberrant IS companies (see Whittington 1971; Clayman 1987; Power *et al.* 1991).

Table 20.7 highlights statistical differences in selected financial performance ratios and in dividend and capital expenditure data between IS and NIS companies for various “ease” and “squeeze” years. The second column lists the years in which the financial characteristics of IS and NIS companies are statistically different. The differences between the two categories are highly significant for their interest to operating profit ratios, with a p value of less than 0.0005 for each year from 1978 to 1987 — an unsurprising result

Table 20.6 Financial characteristics of interest-sensitive and non-interest-sensitive companies

	ROCE		*NPM*		*QUICK*		*GER*	
Year	*IS*	*NIS*	*IS*	*NIS*	*IS*	*NIS*	*IS*	*NIS*
1978	13.47	22.12	2.51	4.66	0.86	1.01	29.16	18.52
1979	13.66	21.37	2.19	4.61	0.83	0.96	30.55	18.01

	ROCE		*NPM*		*QUICK*		*GER*	
Year	*IS*	*NIS*	*IS*	*NIS*	*IS*	*NIS*	*IS*	*NIS*
1980	9.78	20.37	0.60	4.38	0.82	0.94	31.76	18.43
1981	5.20	16.84	−0.65	3.72	0.82	0.98	35.12	16.72
1982	6.70	16.11	−0.14	3.88	0.78	0.99	36.73	17.22
1983	9.09	16.36	0.49	3.71	0.84	1.01	34.80	18.67
1984	12.46	17.34	1.68	4.27	0.84	0.96	32.15	19.39
1985	12.85	18.17	1.97	4.86	0.92	0.96	31.30	20.53
1986	14.19	19.38	2.71	5.63	0.95	0.99	30.59	21.19
1987	16.25	19.47	3.37	5.93	0.96	1.07	26.35	20.62
1988	18.04	21.15	4.52	6.57	0.94	0.99	31.20	24.93
1989	18.04	22.36	4.48	6.29	0.89	0.97	33.72	43.81
1990	15.53	20.46	3.95	5.64	0.93	0.97	35.02	33.19
1991	11.98	15.77	2.07	4.49	1.02	1.01	35.45	28.59

Note: Included are return on capital employed (ROCE), net profit margin (NPM), quick asset ratio (QUICK) and gearing ratio (GER) for interest-sensitive and non-interest-sensitive companies. The data were obtained from Datastream.

Table 20.7 Comparisons of differences between IS and NIS companies for ease and squeeze years

Financial characteristics	*Years with significant differences between IS and NIS companies*	*Differences between first set of ease and squeeze years, p values*		*Differences between second set of ease and squeeze years, p values*	
	IS	*NIS*	*IS*	*NIS*	
Interest/ operating profit	1979–91	0.000	0.002	0.325	0.000
Interest/ operating profit, largest quintile	1978–85	0.002	0.079	0.118	0.018
Interest/ operating profit, smallest quintile	1978–87	0.029	0.825	0.834	0.007
Dividend percentage change	1979–82, 1984, 1988, 1989	0.000	0.000	0.000	0.000

Financial characteristic s	*Years with significant differences between IS and NIS companies*	*Differences between first set of ease and squeeze years, p values*		*Differences between second set of ease and squeeze years, p values*	
	IS	*NIS*	*IS*	*NIS*	
Percentage of companies cutting dividend	1980–2	0.000	0.001	0.816	0.725
Capital expenditure	1979–85	0.063	0.001	0.169	0.019
Capital expenditure contracted	1981, 1982	0.086	0.658	0.871	0.059
Capital expenditure authorized	1982, 1983	0.611	0.440	0.030	0.001
ROCE	1978–87, 1991	0.000	0.000	0.382	0.284
NPM	1978–91	0.000	0.000	0.020	0.771
QUICK	1978–84	0.019	0.628	0.057	0.156
GER	1978–89, 1991	0.010	0.013	0.090	0.000

Note: The test applied was the two-sample Mann—Whitney, except in the case of the percentage of companies cutting dividend where the χ^2 test was applied to the number of companies cutting dividend. The first set of ease years were 1978, 1979, 1983, 1984; the first set of squeeze years were 1980–2. The second set of ease years were and the second set of squeeze years were 1989–91.

since the firms were grouped on the basis of this ratio; the difference is not as significant in the smallest and largest quintiles (each containing only a few companies) over the same time span. Only the years of peak interest rates elicited different responses to financial pressure—measured by their *p* values—from IS and NIS companies.

A similar pattern emerges from the dividend, capital expenditure and financial profile data. For most of the "ease" years in the 1978–89 period only a few of the series exhibited statistical differences between the IS and NIS groups. However, the ratios differed sharply between IS and NIS companies for each year of the "squeeze" period when interest rates were exerting their greatest pressure on the company sector. The basis of the classification adopted in this chapter, therefore, appears to be robust.

The third and fourth columns provide further evidence that the two groups of companies reacted differently according to whether interest rates were high or low. Most of the characteristics of IS companies revealed significant differences in the 1980–2 years compared with 1978–84. The exceptions to this generalization are the three forms of capital expenditure (actual, contracted and authorized). However, these exceptions once again reinforce the primary findings of this study that distressed IS companies were unable to improve their liquidity to the degree that they would have wished either by reducing the proportion of earnings paid out as dividends or by repaying outstanding debts accumulated in periods of relatively low interest rates.

IS companies were, as a rule, unable to adjust their illiquid balance sheets to take account of the altered economic circumstances. The evidence from the *p* values of the ratio indicates that NIS companies may not have been subject to comparable constraints. The *p* values for the authorized and contracted (though not for the actual) capital expenditure of NIS companies suggest that the investment agreed to and undertaken by these companies was less affected by financial pressures associated with high interest rates.

The comparison between IS and NIS companies (classified with reference to the 1980–2 period) for the second "squeeze" phase 1989–92 and preceding "ease" years 1985–8 is less clear-cut than for the earlier "squeeze" partly because 70 percent of the companies designated IS in 1980–2 have an interest to operating profit ratio which is less than 40 percent during the second squeeze and 20 percent of the companies designated NIS in 1980–2 have an interest to operating profit ratio which is greater than 40 percent in 1989–91.

As the low *p* value (Table 20.7) indicates, the interest to operating profit ratio, dividend, capital expenditure and capital gearing have altered significantly between "ease" and the second "squeeze" for NIS companies; by contrast dividend, authorized capital expenditure, net profit margin and quick ratio changed significantly for IS companies, suggesting a possibly more alert response to the onset of the second "squeeze" phase.

8
THE RESULTS OF A QUESTIONNAIRE SURVEY OF THE IS AND NIS COMPANIES

A questionnaire entitled "Reactions to cash flow pressures" was sent to the finance directors of all the IS and NIS companies in our sample in March 1991 and replies were received from 26 IS companies (35 percent of IS companies approached) and 44 NIS companies (28 percent of NIS companies considered). Space does not permit detailed comments on the responses, which are tabulated in Appendix 20A. However, certain brief remarks may be made:

1 The typically large and mature companies which responded (survivors of three recessions) claimed to give greater priority to the short term and

medium term than to the long term in their planning (Question 5). This emphasis is borne out by the importance attached to the financial and marketing functions compared with research and development and design and engineering.

2 IS companies appeared to place more importance on capital expenditure programs than NIS companies and were less likely to defer the replacement of machines and equipment or spending on training under financial pressure. Both classes of respondent in general seemed to exhibit a pragmatic rather than a doctrinaire approach to cuts in different types of investment (Questions 8 and 10).

3 There was considerable evidence that, following 1980–2, finance directors of both IS and NIS companies had been determined to reduce their companies' risk exposure in the event of another severe squeeze, contributing to a recession. A number of respondents also claimed to have been much less tolerant of loss-making subsidiaries in the present recession. It is probable that in a number of IS companies the corporate culture has moved away from strategic management and towards financial control. Responses to Question 9 tend to confirm the Bank of England argument (*BEQB* 1991b) that, in contrast with the reactions of these mature companies, the lack of experience of recession conditions may have contributed to the insolvency of a number of newly formed companies.

4 The great majority of both IS and NIS companies state that they adopt flexible rather than fixed annual capital expenditure limits and so the managing director of a line company may be allocated additional funds by head office if a sufficiently cogent case can be made, obviating the need for "internal rationing" of finance.

5 A substantially greater proportion of IS than NIS companies claimed to have increased dividends since end-1988, a claim which conflicts with the information on dividend cuts contained in Table 20.3, casting some doubt on how representative our 26 IS respondents were of the 75 IS companies in the sample.

6 As anticipated, our attempts to elicit comparisons between companies' experience of cash flow pressures in 1980–2 and 1990–2 met with limited success. Many respondents felt unable to essay such a comparison, explaining that they were not with the firm during the earlier recession or, in one case, still at university.

In general, therefore, the responses to the questionnaire supported the inference that has been drawn from our analysis of company data that IS companies which survived the trauma of the 1980–2 recession subsequently adopted firmer financial control of their operations to avoid any repeat of the experience. The essentially "short-termist" approach conveyed by the answers to questions on planning priorities appears to confirm a widely held impression of British industry.

9
CONCLUSION

A number of conclusions emerge from this study. First, economic policy-makers should take account of the problems of individual companies. A more disaggregated approach should yield greater insights because financial distress is experienced at company level. Any degree of aggregation, including that of this study, may mask a condition of potential bankruptcy, but grouping companies according to their financial vulnerability must represent some degree of progress in diagnosing the ills of the economy. Second, the literature which is most relevant to the short-termism debate in a period of high short-term interest rates is the one which combines stock-flow considerations with modern analyses of capital market imperfections. Third, the severe cutbacks in dividends and capital spending by vulnerable companies in the past recession provides clear-cut evidence of the discriminatory impact of high interest rates on company cash outflows. Finally, an entrepreneurial culture may keep investment expenditure plans intact in companies experiencing some of the most severe financial pressure. However, the risks of bankruptcy associated with managers' adherence to such strategic plans may be formidable.

APPENDIX 20A
ANALYSIS OF QUESTIONNAIRE RESPONSES ON CASH FLOW PRESSURES

Question 5

Please indicate the importance of the following planning horizons in your company's strategy			*Not important*			*Very important*			
1	*2*	*3*	*4*	*5*	*Mean*	*p value*			
(a)	Short term	NIS IS	– –	2.27 7.69	22. 73 15. 38	15. 91 23. 08	59. 09 53. 85	4.32 4.23	0.72
(b)	Mediu m term	NIS IS	– –	– –	15. 91 15. 38	52. 27 46. 15	31. 82 38. 46	4.16 4.23	0.68
(c)	Long term	NIS IS	13. 64 3.85	9.09 11. 54	29. 55 30. 77	22. 73 42. 31	25. 00 11. 54	3.36 3.46	0.73

(i) All cell contents are expressed as percentages for each table.

Please indicate the importance of the following planning horizons in your company's strategy			*Not important*			*Very important*
1	*2*	*3*	*4*	*5*	*Mean*	*p value*

(ii) Responses to the questions included here are set out according to a five-point scale and were compared for IS and NIS companies using Student's *t* test on mean response. We report the *p* value for the test with the null hypothesis that the populations of IS and NIS companies have the same mean response, versus the alternative hypothesis that the means are not equal.
Similar results were obtained using the equivalent nonparametric test. A *p* value that is less than 0.05 indicates that the means are significantly different at the 5 percent level of testing.

(iii) Questions 1–4 sought details about the company and Questions 9 and 12 requested qualitative comparisons about company experience in the 1980–2 and 1990–2 recessions.

Question 6

Please indicate the relative importance of the following functions in your firm's overall strategy			*Not important*			*Very important*			
1	*2*	*3*	*4*	*5*	*Mean*	*p value*			
(a)	Financial	NIS IS	– 8.00	13.4 64.00	31.82 32.00	54.55 60.00	– –	4.41 4.44	0.88
(b)	Marketing	NIS IS	2.27 –	– –	15.91 8.00	27.27 48.00	54.55 44.00	4.32 4.36	0.82
(c)	Manufacturing	NIS IS	30.23 3.85	2.33 3.85	13.95 11.54	32.56 34.62	20.93 46.15	3.12 4.15	0.00
(d)	Engineering and design	NIS IS	30.23 4.00	6.98 4.00	34.88 28.00	6.98 36.00	20.93 28.00	2.81 3.80	0.00
(e)	Human resources	NIS IS	2.27 –	2.27 16.67	36.36 29.17	36.36 37.50	22.73 16.67	3.75 3.54	0.40
(f)	Research and development	NIS IS	34.15 11.54	14.63 19.23	24.39 19.23	12.20 30.77	14.63 19.23	2.59 3.27	0.05

Question 7

In which area does your company believe it has a competitive advantage over other companies?			*No advantage*				*Strong advantage*		
			1	*2*	*3*	*4*	*5*	*Mean*	*p value*
(a)	Engineering and design	NIS	36.59	14.63	19.51	19.51	9.76	2.51	0.00
		IS	4.00	8.00	24.00	44.00	20.00	3.68	
(b)	Accumulated technological competence	NIS	17.00	7.32	29.27	24.39	21.95	3.27	0.01
		IS	4.00	–	16.00	48.00	32.00	4.04	
(c)	Scientific expertise	NIS	52.50	17.50	20.00	5.00	5.00	1.93	0.01
		IS	28.00	24.00	32.00	12.00	4.00	2.40	
(d)	Strategic vision	NIS	9.30	4.65	20.93	51.16	13.95	3.56	0.54
		IS	–	20.00	32.00	36.00	12.00	3.40	
(e)	Marketing	NIS	4.55	9.09	31.82	25.00	29.55	3.66	0.10
		IS	–	16.00	66.00	8.00	16.00	3.24	
(f)	Distribution	NIS	19.51	7.32	19.51	31.71	21.95	3.29	0.24
		IS	12.50	20.83	33.33	29.17	4.17	2.92	
(g)	Quality of workforce	NIS	5.00	2.50	42.50	40.00	10.00	3.48	0.69
		IS	–	12.00	24.00	60.00	4.00	3.56	
(h)	Administration ability of executives	NIS	4.76	2.38	33.33	50.00	9.52	3.57	0.56
		IS	–	12.00	44.00	32.00	12.00	3.44	
(i)	Customer care	NIS	6.98	4.65	13.95	37.21	37.21	3.93	0.61
		IS	–	–	16.67	62.50	20.83	4.04	

Question 8

Please indicate what happened to your capital investment program between the end of December 1988 and the present time		*IS*	*NIS*
A cutback of more than 50 percent	1	9.09	7.69
A cutback of 0–50 percent	2	34.09	30.77
No effect	3	11.36	23.08
An increase of 0–50 percent	4	18.18	23.08

Please indicate what happened to your capital investment program between the end of December 1988 and the present time		*IS*	*NIS*
An increase of more than 50 percent	5	27.27	15.38
Mean		3.21	3.08
p value		0.69	

Question 10

Please indicate the relative importance of the following pressures on your company's cash flow in the period 1988 to date			*Not important*			*Very important*			
1	*2*	*3*	*4*	*5*	*Mean*	*p value*			
(a)	Increased working capital needs	NIS	15.91	18.18	34.09	20.45	11.36	2.93	0.78
		IS	11.54	34.62	23.08	19.23	11.54	2.85	
(b)	Capital expenditure requirements	NIS	9.09	18.18	27.27	31.82	13.64	3.23	0.01
		IS	3.85	–	34.62	30.77	30.77	3.85	
(c)	Market contraction	NIS	13.95	20.93	23.26	23.26	18.60	3.12	0.33
		IS	20.00	20.00	28.00	24.00	8.00	2.80	
(d)	Interest payments	NIS	22.73	20.45	27.27	18.18	11.36	2.75	0.74
		IS	20.00	32.00	24.00	12.00	12.00	2.64	
(e)	Extend credit taken by customers	NIS	18.18	27.27	20.45	22.73	11.36	2.82	0.98
		IS	23.08	19.23	26.92	15.38	15.38	2.81	
(f)	Dividend payments	NIS	18.60	30.23	34.88	11.63	4.65	2.54	0.21
		IS	15.38	26.92	23.08	19.23	15.38	2.92	

Question 11

Please indicate the types/ categories of capital expenditure that your company might reduce/ defer if it were subject to severe and sustained cash flow pressure			*Definitely reduce/ defer*	*Likely to reduce/ defer*	*Uncertain either way*	*Unlikely to reduce/ defer*	*Definitely not reduce/ defer*	
1	*2*	*3*	*4*	*5*	*Mean*	*p value*		
(a)	New acquisition of companies	NIS	36.59	39.02	4.88	14.63	4.88	2.12	0.68
		IS	34.62	50.00	3.85	3.85	7.69	2.00	
(b)	Replacement of machines/ equipment	NIS	9.52	50.00	14.29	21.43	4.76	2.62	0.36
		IS	11.54	34.62	11.54	38.46	3.85	2.89	
(c)	The research and development budget	NIS	27.03	27.03	13.51	27.03	5.41	2.57	0.10
		IS	4.17	33.33	20.83	33.33	8.33	3.08	
(d)	Investment in state-of-the art production technology	NIS	23.08	38.46	20.51	17.95	–	2.33	0.10
		IS	8.00	36.00	28.00	28.00	–	2.76	
(e)	Investment in new office equipment	NIS	28.57	40.48	16.67	14.29	–	2.18	0.53
		IS	30.77	30.77	11.54	26.92	–	2.35	
(f)	Training expenditure	NIS	7.14	33.33	30.95	21.43	7.14	2.88	0.39
		IS	–	29.17	33.33	37.50	–	3.08	

Questions 13 and 14

Please indicate how internal capital allocation operates in your company		*IS*		*NIS*
(a) Adhere to a fixed annual limit	1	19.05		8.00
(b) Additional funds may be made available	2	80.95		92.00
Mean		1.81		1.92
p value			0.80	
Have you changed your practice in the last 10 years?		*IS*		*NIS*
(a) Yes	1	16.22		26.09
(b) No	2	83.72		73.91
Mean		1.84		1.74
p value			0.38	
Did your company behave similarly in 1980–2?		*IS*		*NIS*
(a) Yes	1	80.56		64.29
(b) No	2	29.24		35.71
Mean		1.19		1.36
p value			0.29	

Questions 15 and 16

What happened to your company's ds dividend payout since the end of 1988?		*IS*		*NIS*
(a) Increase in trend	1	69.05		50.00
(b) No change	2	14.29		23.08
(c) Decrease in trend	3	16.67		26.92
Mean		1.48		1.77
p value			0.16	
In the 1980–2 period did the trend in dividend payout?		*IS*		*NIS*
(a) Increase	1	39.47		37.27
(b) No change	2	36.84		45.45
(c) Decrease	3	23.68		27.27
Mean		1.84		2.00
p value			0.45	

NOTES

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1 Companies and industries were arbitrarily classed as "interest sensitive" if the interest to operating profit ratio rose above 40 percent between 1980 and 1982. This figure of 40 percent represents the approximate peak percentage for this ratio for all UK manufacturing companies in 1974, the record year for such rations.

2 There is now a substantial literature on "short-termism". See Lonie *et al*. (1991) for a brief review of this literature.

3 See, for example, *Economic Progress Report* (1988b:2), Miles (1991). By contrast in the current recession, UK company profitability has remained near its 20-year average despite falling sharply since 1988 (*BEQB* 1992:24).

4 The capital gearing of UK industrial and commercial companies (net debt at book value as a percentage of replacement cost capital stock) was 19 percent in 1990 compared with 9 percent in 1980; their gross income gearing (gross interest payments as a percentage of post-tax income) was also higher, although less emphatically so—37 percent in 1990 compared with 34 percent in 1980 (*BEQB* 1991b: 535).

5 In an article entitled "Alternative measures of aggregate company liquidity" (*BEQB* 1988) the Bank considered the possibility that large companies might account for most of the high level of liquid assets and small companies for most of the bank borrowing but noted that "the extent of this divergence is difficult to gauge, other than by inspection of individual company accounts" (p. 247).

6 Companies in Germany (and Japan) appear to have low dividend payout ratios by the standards of advanced industrialized countries. Allen (1992) reviews the evidence from past studies. Although a payout ratio of 50 percent represents a "normal" level for US or Australian companies, the increase in dividend payout in the UK to such levels in the teeth of a recession seems illogical.

7 Insights from cognitive psychology, in particular those contained in the writings of Tversky and Kahneman (1982, 1986), have illuminated the analysis of the impact of macroeconomic "shocks" on a financially fragile economy by Guttentag and Herring (1984) who identified the "fundamental problem" of financial crises as the fact that policy-makers are likely to share the disaster myopia of bankers and other creditors. The cognitive basis of the argument is examined in greater detail in Lonie *et al*. (1991). To "recession myopia" one should perhaps add the "delusion of recovery", a cognitive phenomenon evident in successive pronouncements by Chancellor of the Exchequer Norman Lamont in the course of the most protracted recession experienced in the UK for more than 50 years; "recovery will begin in the second half of this year" (June 1991); "dramatic progress towards recovery has begun" (October 1991); and, memorably, "the green shoots of economic spring are appearing again" (October 1991).

8 When this research project commenced early in 1989 the original sample of 308 companies was divided almost equally into IS and NIS enterprises; between 1989 and 1990 36 companies originally identified as IS and six originally classed as NIS disappeared from the Datastream database, reducing the sample to 266. By end 1991 the number of these companies was 230. This reduction is almost certainly the result of mergers and acquisitions rather than insolvencies in view of the size of the companies considered.

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21
Financial accounting statements and foreign exchange risk management

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1
INTRODUCTION

The Financial Accounting Standards Board (FASB) adopted Financial Accounting Statement Number 8 (FAS 8) in 1976. The distinctive feature separating FAS 8 from previous methods of treating translation gains and losses was that FAS 8 disallowed the deferral of these gains and losses and forced US multinational corporations (MNCs) to include them in current income. Consequently, MNCs allegedly faced greater volatility in their reported earnings (Selling and Sorter 1983). Dissatisfaction with FAS 8 led the FASB to alter the standard and issue a new pronouncement, FAS 52. In contrast to FAS 8, FAS 52 deferred translation gains and losses by placing them in a special equity account labeled equity adjustment from translation.

This chapter reports the findings of a survey of 250 chief financial officers (CFOs) of MNCs. The goal of the survey was to determine the current hedging strategies used by CFOs and their motivations for using those strategies in the current FAS 52 environment. Of particular interest is the hedging of economic exposure, as this exposure has an impact on the long-term cash flows of the firm and its subsidiaries. There were a total of 60 respondents to the survey, which was a response rate of 24 percent.

To review several important exchange risk exposure issues, a brief discussion follows of the implications that FAS 8 and FAS 52 have had on translation, transaction and economic exposure of MNCs. The findings of our survey are then reported.

As Eiteman and Stonehill (1989) and Shapiro (1991) discuss, translation exposure arises from accounting-based changes in consolidated financial statements that are caused by exchange rate changes. Transactions exposure occurs when exchange rates change between the time an obligation is incurred and when it is settled, thus affecting actual cash flows. Economic exposure is a change in the present value of the firm’s expected future cash flows as a result of an *unexpected* change in exchange rates.

Translation, transaction and economic exposure under FAS 8

FAS 8 induced great volatility in the earnings of US MNCs in the late 1970s. Exchange rates were volatile at this time, and FAS 8 allegedly helped create high variability in MNC earnings (Selling and Sorter 1983). Since translation losses entered the MNCs' income statement, it was reasonable to assume that CFOs would undertake actions to restrict or eliminate the probability of such losses.

Stanley and Block (1978) report that 52 percent of CFOs hedged against translation exposure during this time. Their survey results indicate that 31 percent of the respondents were pursuing the same exchange rate risk management techniques that they had followed before the introduction of FAS 8.

In Stanley and Block's paper, economic exposure included the concepts both of transactions exposure and of economic exposure. This can, in fact, be appropriate. Both of these foreign exchange exposures deal with cash flows and their variability is a result of changing exchange rates. Essentially transactions exposure results in short-run variations in cash flows, whereas economic exposure creates changes in the long-run cash flows of the firm because of *unexpected* fluctuations in exchange rates. According to Stanley and Block, the concept of economic exposure is not sufficiently understood by MNCs. As stated in their paper,

> Among those who stressed the management of economic exposure rather than translation exposure, one could infer widely differing definitions of "economic exposure." A sizable number of respondents indicated that they were making studies to determine the nature of their economic exposure, did not know what it was, or how to define it and/or…were conveniently ignoring it.
>
> (1978:93)

In the context of FAS 8, hedging translation exposure may at times contradict proper economic exposure coverage. For example, cash flow losses could be created from hedging by altering the structure of the balance sheet, using the forward markets or using the money markets. In fact, Stanley and Block report that 23.2 percent of their respondents answered that management of translation exposure resulted in an increase in economic exposure. This implies that funds were misallocated for noneconomic or nonproductive purposes.

Transactions, translation and economic exposure and FAS 52

Management attitudes and desires toward hedging translation exposure should be different from the situation that existed under FAS 8. FAS 52 defers translation gains/losses when the functional currency is not the US dollar and when there is no hyperinflation in the foreign nation. *A priori,* CFOs will not be concerned with covering translation exposure under FAS 52. However, CFOs should still be interested in covering transactions and economic exposure because of their impact on cash flows. Indeed, these are some of the findings of Houston and Mueller (1988).

Stanley and Block (1978) conclude that CFOs neither fully understand nor appreciate the impact of economic exposure on the firm in the FAS 8 environment. *A priori,* CFOs should have a better understanding of economic exposure under FAS 52. First, more time has passed since the formulation of these concepts in the 1970s. As knowledge requires time to be disseminated, CFOs should be aware of and more concerned about economic exposure under FAS 52 in the late 1980s. FAS 8 led many CFOs to hedge against translation exposure because of the effect of translation gains/losses on the firms' earnings. FAS 52 should have the effect of almost eliminating earnings variability as a motivation for translation exposure hedging.

However, CFOs may not hedge against economic exposure to the extent that one might expect. First, many CFOs may not differentiate between the concept of economic exposure, which focuses on long-term cash flows, and the concept of transactions exposure, which focuses on short-term cash flows.

Second, the expense of properly hedging economic exposure may discourage firms from having adequate protection. The management of economic exposure requires the following policy measures: (a) diversification of production, raw materials sources and operations; and (b) diversification of financing sources (Eiteman and Stonehill 1989). The costliness of diversifying production and its perceived net benefit may not be sufficient to convince the firm's management to properly hedge against economic exposure. CFOs may, however, choose to diversify financing sources as this is relatively cheaper than diversifying operations.

2
THE SURVEY AND FORMULATION OF HYPOTHESES

The hypotheses of this study

1 CFOs understand the different types of foreign exchange exposure, especially the translation and transactions types. However, they may not be as knowledgeable in the intricacies of economic foreign exchange exposure.
2 CFOs emphasized translation foreign exchange exposure more under FAS 8 than under FAS 52. The reason for this is that some firms have adopted FAS 52 as their method of translating financial statements of a foreign subsidiary of a US parent MNC. Consequently, CFOs will hedge the firm less against

translation foreign exchange exposure in the context of FAS 52 than they hedged under FAS 8.

3 CFOs emphasized transactions foreign exchange exposure less under FAS 8 than they do under FAS 52. The reason for this is that if they are using FAS 52 and the foreign currency as the functional currency, they do not have to report any translation gains or losses on their income statements. This gives them more leeway and time to devote to transactions foreign exchange exposure.
4 CFOs should hedge their firms against economic foreign exchange exposure more under the regime of FAS 52 than they did under the regime of FAS 8. The reasons are as follows.

   (a) More time has passed since the explanation of economic exposure by theorists in the 1980s. CFOs could have familiarized themselves and have taken action toward addressing it.
   (b) Given the fact that FAS 52 does not force CFOs to report gains and/or losses due to translation, CFOs do not need to address translation foreign exchange exposure.
   (c) In addition to the above, there is no contradiction between hedging against economic and transaction foreign exchange exposure since they do not care about managing translation foreign exchange exposure.

5 The goals that CFOs have in mind, as well as the techniques they use to cover any of the foreign exchange exposures, should agree with their expressed views on how they address the foreign exchange exposure and which foreign exchange exposure they emphasize more.

Purpose of study and individual questions

We present our survey as Appendix 21A. The motives that led to the development of the survey questions are as follows:

In Questions 1–3 we want to know whether management does understand well the three different foreign exchange exposures. Of course, this is their perception or, better stated, their answer on the subject and not necessarily the truth. However, we shall ask them further questions about their actions and thus determine the objectivity of their perception.

Question 4 is concerned with the actions taken to deal with the different exposures. If we "hedge" against translation foreign exchange exposure, the answer is less clear. To cover against foreign exchange economic exposure one has to do any of the following:

1 Diversify plant and production.
2 Diversify sales areas (or markets).
3 Diversify sourcing.

4 Diversify financing.

It is not clear how the above four actions will complement or contradict translation exposure hedging.

If CFOs said that they pursue complementary actions to hedge, we would know that they care about all exposures—13 kinds at least. Answer D means that they would probably like to hedge against all three, but it may be beyond their control due to the magnitudes of exchange rate fluctuations.

Question 5 will definitely answer whether CFOs primarily emphasize (under FAS 52) translation, economic or transaction exposure.

We can express our results in terms of how many respondents answer that they hedge translations, transactions, economic or all exposures primarily. Thus, this is a key question in verifying the importance placed on the different foreign exchange exposures.

Question 6 tries to identify the amount of emphasis put on foreign exchange exposure under FAS 8. Specifically, we want to know what the main emphasis was by CFOs on the different types of foreign exchange exposures in the regime of FAS 8.

With Question 7, we want to know the intensity with which CFOs pursue economic exposure versus translation exposure in the regime of FAS 52.

Question 8 is identical to 7 except that it deals with the regime of FAS 8, whereas Question 7 deals with FAS 52. In Question 8, we want to know the intensity of the emphasis of CFOs on the type of foreign exchange exposure in the environment of FAS 8.

Question 9 is the crux of our survey, as it directly compares the financial world of Stanley and Block (that of FAS 8) with the present regime of FAS 52 and asks the intensity of emphasis on economic exposure. We expect to find that CFOs emphasize economic exposure more in the context of FAS 52 than they did under FAS 8.

Question 10 is basically the same as 9 except that it refers to translation exposure rather than economic exposure. We feel that 10 relates intimately with 9. That is, CFOs, because they could defer translation gains and losses and not realize them, will not be as concerned with translation management in FAS 52 as they were within FAS 8.

Question 11 is extremely important. Questions 7 and 8 ask CFOs to indicate their preferences between economic and translation foreign exchange exposures in the regimes of FAS 52 and FAS 8.

Question 9 asks CFOs to indicate their preferences to *economic* exposure between the two financial accounting statements (52 and 8). Question 10 is similar in that it asks CFOs to express their emphasis on *translation* exposure between the two.

Question 11, though, asks CFOs to think and express their preferences both toward the two types of foreign exchange exposure (i.e. economic and translation) and toward the two types of financial accounting statements (i.e. 52 and 8).

It is possible that CFOs emphasized translation exposure more than they emphasized economic exposure in both FAS 52 and FAS 8. It is also possible that CFOs protect themselves more against economic exposure under FAS 52 than under FAS 8 *and* more against translation exposure under FAS 52 than under FAS 8. This, however, does not tell us if there has been relative emphasis between FAS 52 and FAS 8.

Question 12 examines a second issue of this chapter: the goals of the MNC. The first possible response indicates that the top management maximizes the price of the stock of the firm in the short run. The second possible response indicates that top management is interested mainly in raising the profitability of the company in the long run. If top management answers according to possible response C, then it disregards the long run and basically concentrates on the short run. Possible response D would indicate that top management does not really understand its foreign exchange exposure and its management goals.

Finally, possible answer E is similar to D in that management does not comprehend how goals of their firm relate to their foreign exchange exposure and its management.

Question 12 acts as a touchstone upon the answers on whether CFOs truly know the meaning of the diverse foreign exchange exposures. If the answer is A and/or B then they should be emphasizing economic and/or transaction exposure. If the answer is C then they should be relatively emphasizing translation exposure. If they answer mainly D and E, then it is unclear whether or not they know the different types of foreign exchange exposures.

Question 13 addresses the techniques that top managers use to cover their firms against exposure. We are interested in the techniques which they use first as an end in itself. That is, we want to know the popularity of each of the hedging techniques they use.

Question 13 is another touchstone upon the answers on CFO knowledge of foreign exchange exposure. A and B choices tell us they emphasize translation and/or transactions exposure. A, B, C and D tell us they emphasize transactions and economic exposure.

If top managers clearly differentiate between economic and transactions exposure then they will utilize money market and forward hedges to cover against transactions, but also against translation foreign exchange exposure.

As far as economic exposure is concerned, however, top managers would use either diversification of sales or international financing as a risk coverage technique.

Interpretation of the survey

As indicated earlier, there were sixty respondents to the survey which represents 24 percent of the CFOs in the survey.

Table 21.1 provides the results of the survey for Questions 1–3. These questions were concerned with the understanding of the different kinds of exposure. A discussion of the results is provided below.

Table 21.1 Understanding exposures (questions 1–3)

	Transactions exposure (%)	*Translation exposure (%)*	*Economic exposure (%)*
Completely	51.67	51.67	40.00
Substantially	43.3	46.67	46.67
Somewhat	5.0	1.67	13.33
Not at all	0.00	0.00	0.00
Unsure	0.00	0.00	0.00
Total	100.00	100.00	100.00

The majority of CFOs understand well the concept of transactions exposure. Ninety-five percent understand it "completely" or "substantially". The importance of this lies in the fact that we can pursue our survey only if our respondents understand well the concept of transactions exposure. An overwhelming majority, 98 percent, of CFOs know translation exposure well. This is important because any hedging questions on translation exposure presuppose that they know that type of exposure. Eighty-six percent of the CFOs answered that they understand economic exposure quite well. However, relative to translation and transaction exposure, fewer CFOs understand economic exposure "completely" and more understand it "substantially". Nevertheless, their answers give us enough evidence that they understand economic exposure well and therefore they know how to cover their firms' exposure.

Question 4 asked if managements' actions (diversify plant and production, diversify sales area, diversify sourcing and diversify financing) would contradict exposure hedging. Table 21.2 provides the results.

Stanley and Block give evidence that 23.2 percent of the CFOs they questioned were pursuing covering their firm against translation exposure, which was detrimental to the economic side of the firm. In our study 12.2 percent agreed with Stanley and Block's research findings. However, 12.2 percent were unsure whether their covering actions for translation

Table 21.2 Economic and translation exposure actions (question 4)

Actions	*Percent of respondents*
Complementary	44.3
Contradictory	12.2
Unsure	12.2
Depends on economic fluctuations	22.6
Complementary and contradictory	5.2

Actions	*Percent of respondents*
Not applicable	4.3
Total	100.0

exposure were contradictory to economic. Additionally, 22.6 percent said that contradiction versus complementarity depends on exchange rate fluctuations.

We see in the above evidence that there still exist cases where hedging for economic exposure creates translation exposure.

The 12.2 percent who take actions to hedge economic exposure which are contradictory to translation exposure must choose economic above translation exposure hedging. Unfortunately, we cannot know what would happen if those respondents were to choose translation exposure to their changed economic exposure.

There has been a change of mind of CFOs from the time of Stanley and Block. In fact, all together, approximately 10 percent of our respondents emphasized translation exposure mainly from question 5. Thus, at most, only 10 percent of CFOs would choose translation above economic exposure.

What is striking is the fact that most of our responses indicate that CFOs pursue *both* economic and translation coverage. Forty-four percent do so and 12 percent are unsure. Twenty-two percent respond that complementarity and contradiction depends on the magnitude of economic fluctuations. Given the aforementioned expressed actions of CFOs, we can infer that the great majority would like to pursue both economic *and* translation coverage but, if they may not, then they will give priority to economic exposure.

Questions 5 and 6 addressed the amount of emphasis by the CFOs on the different types of exposures under FAS 52 and FAS 8. Table 21.3 provides the results of the survey.

Respondents to Question 5 answered that they would rather protect their company against all three foreign exchange kinds of exposure, but if they had to choose, they would choose either economic or transactions exposure or both, and would not choose translation exposure. From this we can conclude that if CFOs can help it they would hedge all exposures, but if they have to choose they will most probably hedge against economic and transactions exposure.

Table 21.3 Emphasis of types of different exposures under different environments (questions 5 and 6)

Type of exposure	*FASB 52*	*FASB 8*
Translation	6.3%	24.56%
Economic	27.8%	21.05%
Transaction	30.4%	12.28%
All three	19.1%	24.56%
Economic and transaction	11.3%	7.01%

Type of exposure	*FASB 52*	*FASB 8*
Translation and transaction	4.4%	7.89%
N/A	0.8%	2.63%

The importance of this question lies in the fact that 19.1 percent of the respondents want to cover against all exposures. But, when it comes to a choice, they will choose transaction exposure first (30.4 percent) and economic exposure (27.8 percent) second, and only 6.9 percent will choose translation exposure in the framework of 52. This indicates that CFOs do not completely disregard translation exposure.

From Question 6 it is clear that translation hedging was preeminent in FAS 8. About 25 percent chose it in contrast to economic and transactions exposure, which received 21 percent and 12 percent respectively. Also, we see that respondents answered quite differently from Question 5 where approximately 6 percent felt that translation exposure was preeminent. There has been a noticeable change in hedging against translation exposure. A comparison of responses to Questions 5 and 6 shows that CFOs did not change their attitude too much with reference to economic exposure. In particular, they *decreased* their emphasis on economic exposure by 27.8–21.05 percent, or 6.75 percent. But, anyway, the change is not substantial.

What is astounding, though, is the increase in emphasis on transactions hedging which rose from being the least important under FAS 8 (12 percent) to a high of 30 percent under FAS 52. The increase is substantial, and of opposite sign to the change that occurred in translation hedging. That is, translation emphasis fell from 25 percent to 6 percent (a drop of 19 percent) and transactions emphasis rose about 18 percent from the regime of FAS 8 to that of FAS 52.

In conclusion, we think we can derive that transactions and translation exposures are contradictory. So, under FAS 8 prime emphasis was on translation exposure and by definition not on transaction exposure as the different exposures do not match. But with the advent of FAS 52, CFOs could, with peace of mind, forsake emphasizing translation exposure, and so they put their prime emphasis on transaction exposure and raised it by 150 percent; they raised only slightly their economic foreign exchange emphasis.

This alteration of emphasis of management from translation to transaction makes even more sense if looked at from the viewpoint of the results of the Stanley and Block (1978) article. According to Stanley and Block, under FAS 8 economic foreign exchange exposure covering, which we have interpreted as transactions foreign exchange exposure covering, was forsaken in order to hedge against accounting foreign exchange exposure (and economic exposure). Stanley and Block reported that about 23 percent of responses were pursuing accounting foreign exchange covering to the detriment of transactions foreign exchange covering. It is interesting to note that our responses showed that hedging against translation foreign exchange exposure fell by 18 percent of the total whereas transactions exposure rose 18 percent.

The conclusion drawn from this is that the percentage of respondents that forsook transactions exposure in order to look good by covering against translation exposure under FAS 8 reversed their policy under FAS 52.

Table 21.4 summarizes the results for Questions 7–11. In general, these questions addressed the intensity of the emphasis on the different types of exposures under the different regimes. Cross-tabulations were performed of the size of the firm and the level of protection. χ^2 tests were performed. A discussion of the results is provided below.

With Question 7, we want to know the intensity with which CFOs pursue economic exposure versus translation exposure in the regime of FAS 52. The results tell us that 51.8 (13.91+37.90) percent of the CFOs protect their firms much more to avoid economic exposure than translation exposure in the context of FAS 52. Clearly, then, CFOs emphasize economic protection of foreign exchange exposure.

There is a respectable percentage, however—about 31 percent (the "equally" and "unsure")—who cover their firms against translation foreign exchange exposure as much as against economic foreign exchange exposure.

Also, about 12 percent of the respondents answered that they protect their firms less against economic exposure versus translation exposure in the regime of FAS 52.

The null hypothesis that the attitude of the CFOs is unrelated to the size of the firm under FAS 52 was rejected at the 0.10 level of significance.

Question 8 deals with the intensity of the emphasis of CFOs on the type of foreign exchange exposure in the environment of FAS 8. Thirty-four percent of CFOs emphasized economic and translation exposure equally; equally and unsure responses were 29.46 percent and 4.46 percent, respectively. Thirty-two percent answered that they emphasized economic exposure more or much more under FAS 8. However, 29 percent answered that they covered their firms more or much more against translation foreign

Table 21.4 Level of protection (questions 7–11)

Protection	*Question 7*	*Question 8*	*Question 9*	*Question 10*	*Question 11*
Much more	13.91%	9.82%	0.89%	2.68%	8.05%
Much less	2.61%	4.46%	0.0%	12.50%	2.68%
More	37.39%	22.32%	20.53%	11.60%	25.89%
Less	12.17%	24.11%	6.25%	25.00%	8.93%
Equally	27.82%	29.46%	65.17%	38.39%	42.86%
Unsure	2.61%	4.46%	2.17%	5.35%	5.36%
N/A	3.48%	5.35%	4.46%	4.46%	6.25%
χ^2	17.32*	4.82	6.97	10.34	3.12

Protection	*Question 7*	*Question 8*	*Question 9*	*Question 10*	*Question 11*

Note: *, significant at the 0.1 level with 10 degrees of freedom.

exchange exposure in comparison with economic exposure in the context of FAS 8.

The null hypothesis that the attitude of the CFOs is unrelated to the size of the firm was accepted at the 0.1 level of significance. This is in sharp contrast with Question 7.

Interestingly, the same approximate percentage of CFOs covered themselves equally against translation and economic foreign exchange exposure under the two regimes of FAS 8 and FAS 52 (34 and 31 percent respectively).

Question 9 asks the intensity of emphasis on economic exposure. Respondents clearly pay more attention to economic exposure in the context of FAS 52 than in FAS 8 (20.5 percent). However, what is also impressive is the response rate to "equal attention", which was 65.17 percent. The answer could be found in Question 7. There, respondents stated that they cover against economic exposure about one-third of the time. What essentially has happened is that CFOs decreased their attention to translation exposure but did not alter how much attention was paid to economic exposure.

A cross-tabulation of the size of the firm in terms of consolidated annual sales with the level of protection CFOs give to the economic exposure under FAS 52 comparatively to a period under FAS 8 was performed. The null hypothesis was that the size of the firm does not influence the decisions of the CFOs in protecting their firms against economic exposure. As can be seen from Table 21.4, the null hypothesis was accepted.

Question 10 is similar to Question 9 except that it refers to translation exposure rather than economic exposure. Even though the responses of paying equal attention to translation exposure under FAS 52 and FAS 8 is high (38.39 percent), the responses of paying less or much less attention to it in FAS 52 versus FAS 8 was also greater than the response of paying more or much more attention to translation exposure (37.5 versus 14.28 percent). It seems that translation exposure coverage did not disappear under FAS 52 in comparison with FAS 8.

The reason for this could be that in certain circumstances MNCs still use FAS 8. Those circumstances are:

1 in hyperinflation countries;
2 in foreign subsidiaries where MNCs have chosen the US dollar as their functional currency (instead of the foreign currency).

A cross-tabulation of the size of the firm in terms of consolidated annual sales with the level of protection CFOs give to translation exposure under FAS 52 comparatively to a period under FAS 8 was performed. The null hypothesis tested was that the size of the firm does not influence the decisions of the CFOs in protecting their firms against translation exposure. The null hypothesis was accepted at the 0.1 level of significance.

Question 11, as indicated above, is extremely important. CFOs were asked to express their preferences both toward economic and translation exposures and towards FAS 52 and FAS 8. Very few (8.04 percent) of CFOs paid much more attention to economic versus translation exposure in FAS 8 than in FAS 52. However, 34 percent of CFOs pay "more" and "much more" attention to economic exposure versus translation exposure in FAS 52 in comparison with FAS 8.

But what is interesting is that a substantial percentage (42.86 percent) paid the same attention to the two foreign exchange exposures, relatively speaking, under FAS 8 as under FAS 52.

The preponderance of the evidence indicates not much change. Thus, if we put 11 together with 7–9, then we get a clear picture of the fact that CFOs have not greatly altered their hedging toward economic exposure, but have changed their hedging toward translation exposure.

Interestingly the net gain of more emphasis on economic exposure is +33−11 percent or +22 percent and the net gain of more emphasis on translation exposure is (−37.5)+14.28 percent or a net loss of about −23 percent.

A cross-tabulation of the size of the firm in terms of consolidated annual sales with the level of protection CFOs give to economic exposure relative to translation exposure under FAS 52 comparatively to a period under FAS 8 was also performed. The null hypothesis was that the size of the firm did not influence the decisions of the CFOs under the comparative periods. The null hypothesis was accepted at the 0.1 level of significance.

Question 12 attempts to find out if CFOs understood the meaning of the different foreign exchange exposures. Table 21.5 provides the results of the survey.

Only around 10 percent of the respondents answered that short-term results determine the way in which financial analysts evaluate results. We thus expect only 10 percent of the respondents to emphasize protection of a short-term nature (like translation and transactions).

Table 21.5 Corporate objectives (question 12)

Corporate objective	*Percent of respondents*
Long-run wealth maximization	47.75
Long-run earnings per share	22.52
Short-run worthiness	9.00
Unsure of corporate goal	3.57
Understand only one type of foreign exchange exposure	2.70
Maximize wealth, earnings per share and evaluation by financial analysts	2.70
Maximize wealth and earnings per share	6.30

Corporate objective	*Percent of respondents*
Maximize wealth and evaluation by financial analysts	4.50
Total	100.00

The most popular answers were the maximization of wealth and profit maximization, answered by about 48 percent and 22 percent respectively.

If CFOs by a wide majority choose to maximize the wealth of the firm (47.75 percent) or to maximize earnings in the long run (22.52 percent), then they should be mainly emphasizing economic and transactions exposure and hedging. In the present FAS, i.e. FAS 52, if they are facing hyperinflation or they choose US dollars as their functional currency for their foreign affiliates, they have to use the precepts of FAS 8 and so they would hedge against translation exposure to avoid facing a possible loss in their income statement. If they were mainly concerned with translation exposure, they could emphasize answer C: "Financial analysts evaluate management based on short-term results". However, as CFOs chose choice C only 9 percent of the time, they must not take action to please financial analysts and thus they do not overemphasize translation exposure (except 9 percent of the time).

Therefore, 12 corroborates basic information that they do not emphasize translation exposure much in FAS 52.

Question 13 addresses the techniques used by top management to cover their firms against exposure. Table 21.6 provides the results for that particular question.

The main forms of hedging that CFOs use are forward contracts and financing diversification. Both of these techniques protect firms mainly against transactions foreign exchange exposure. Of course, financing diversification also addresses economic foreign exchange exposure and forward

Table 21.6 Hedging techniques (question 13)

Hedging technique	*Percent of respondents*
Money market hedge	1.75
Forward market hedge	28.07
Diversify operations and sales internationally	6.14
Diversity financing internationally	4.38
Forward market hedge and diversify operations, sales and financing internationally	10.52
Money market hedge, forward market hedge and diversify financing internationally	5.26
Money market hedge, forward market hedge and diversify sales, operations and financing internationally	5.26
Forward market hedge and diversify financing internationally	24.56
Money market hedge and forward market hedge	7.89

Hedging technique	*Percent of respondents*
Money market hedge, forward market hedge and diversify operations and sales internationally	4.38
Other technique	0.87
Not applicable	0.87
Total	100.00

contracting deals with translation foreign exchange exposure. Because financing diversification can only be used against transactions and economic exposures, however, we can determine again that in the present regime of FAS 52 firms care mainly about transactions and economic foreign exchange exposure.

3
CONCLUSION

1 MNCs protect themselves more against foreign exchange economic exposure than against foreign exchange translation exposure under FAS 52. The reason for this is that protection of firms against translation foreign exchange exposure fell precipitously from FAS 8 to FAS 52.
2 In the regime of FAS 8, MNCs hedging of translation foreign exchange exposure was approximately equal to their protection against economic foreign exchange exposure.
3 There was a precipitous drop in protection against translation exposure from FAS 8 to FAS 52.
4 Coverage by CFOs for economic foreign exchange exposure remained high and did not alter substantially between the two financial accounting regimes.
5 Coverage against transactions exposure rose substantially under FAS 52 in comparison with the period of FAS 8.
6 There is consistency among the hedging emphasis of CFOs and the hedging techniques which they use. They mainly hedge in the forward market and diversify the company’s financing internationally.
7 Stanley and Block (1978) had reported that there was some lack of understanding of economic foreign exchange exposure and that top managers were misallocating the resources of the firm. There are two reasons that this subsided in the regime of FAS 52. First, the comprehension of the different types of foreign exchange exposure has risen substantially. The main reason, however, is that misallocation of resources has been reduced substantially in that CFOs do not pursue translation foreign exchange exposure management primarily but they pursue transaction and economic foreign exchange exposure.
8 In contrast to the FAS 8 era, CFOs in the era of FAS 52 understand rather well the different types of foreign exchange exposure, i.e. economic,

transactions and translation. In Stanley and Block's study about 23 percent said they did not know what economic exposure was.

9 The most popular hedging techniques are forward contracts and financing diversification.
10 The predominant goals that top managers pursue are wealth and earnings per share maximization.
11 There was no relationship between the level of exposure and the size of the firm.

APPENDIX 21A
SURVEY QUESTIONNAIRE

1 How well do you understand the concept of transaction exposure?

A	Comple tely	D Not at all
B	Substan tially	E Unsure
C	Somew hat	

2 How well do you understand the concept of translation exposure?

A	Comple tely	D Not at all
B	Substan tially	E Unsure
C	Somew hat	

3 How well do you understand the concept of economic exposure?

A	Comple tely	D Not at all
B	Substan tially	E Unsure
C	Somew hat	

4 If you have taken actions to decrease economic exposure, have they been complementary or contradictory to actions you have or would have taken to decrease translation exposure?

A	Comple tely
B	Contrad ictory
C	Unsure
D	It depends on the magnitude of economic fluctuations

5 Under FAS 52, which is presently implemented, you primarily protect your company against

A	Translation exposure	C Transaction exposure
B	Economic exposure	D All three

6 Under FAS 8, which was in effect until December 1981, you were primarily concerned about protecting your company against

A	Translation exposure	C Transaction exposure
B	Economic exposure	D All three

In your evaluation:	*Much more*	*Much less*	*More*	*Less*	*Equally*	*Unsure*
7 Under FAS 52, how well does your company protect itself against economic exposure in contrast to translation exposure?	_____	_____	_____	_____	_____	_____
8 Under FAS 8 how well did your company protect itself against economic exposure in contrast to translation exposure?	_____	_____	_____	_____	_____	_____
9 Under FAS 52, how well does your company protect itself against economic exposure as compared to the period* under FAS 8?	_____	_____	_____	_____	_____	_____

10 Under FAS 52, how well does your company protect itself against translation exposure as compared to the period* under FAS 8?	_____	_____	_____	_____	_____	_____
11 Under FAS 52, how well does your company protect itself against economic exposure	_____	_____	_____	_____	_____	_____

relative to translation
exposure as compared to the
period* under FAS 8?

12 Why do you emphasize protection against the particular exchange exposure that you do?
A It maximizes the wealth of the firm in the long run (3–5 years).
B It maximizes the earnings per share of the company in the long run.
C Financial analysts evaluate management based on short-term results.
D Unsure why I emphasize the particular foreign exchange exposure which I do.
E I only understand one type of foreign exchange exposure.

13 What actions does your company take to protect itself against the exposure(s) that you emphasize?
A Hedge in the money market.
B Hedge in the forward market.
C Diversify the company's operations and sales internationally.
D Diversify the company's financing internationally.
E Other: please briefly describe.____________________________

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Note: *, period refers to time.

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