Money Market: An Introduction

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Contents

1 Context: the financial system

1.1 Learning objectives

After studying this text the learner should / should be able to:

- Describe the elements that make up the financial system.
- Know of the existence of the allied non-principal participants in the financial system.

1.2 Introduction

The debt market is an important element of the financial system; in fact there are three main sets of financial market instruments: debt, deposits (which is a form of debt) and shares (or equities). The money market and the bond market make up part of the debt market. The bond market is usually seen as the market for long-term marketable debt instruments (called bonds), and the money market as the market for short-term marketable debt instruments, such as commercial paper (CP) and treasury bills (TBs).

Thus, the bond market is the market in which governments and the prime members of the corporate sector are able to issue long-term bonds, and investors can invest in and trade in these bonds. This description is adequate.

This usual description of the money market, however, is not adequate because this market is much more than the market for short-term marketable debt instruments. The outstanding amount of short-term marketable debt instruments is small compared with the outstanding amount of short-term non-marketable debt instruments, such as short term bank loans, overdraft facilities[1] utilised and so on. These are also debt instruments (the assets of banks) issued by the ultimate borrowers (as are CP and TBs).

Interest rates (the price of debt) are determined in the entire market and not just in the marketable securities market. The "entire" market includes not only non-marketable debt but also the significant interbank market. It is in this market that interest rates have their genesis. There are two main interbank markets: one where the rates are set administratively (by the central bank), and the other where banks compete amongst one another for cash reserves (called Federal Funds in the US) in order *not to borrow* from the central bank (at the *repo* – also called *discount* – rate). The third "market" is represented by the cash reserve requirement; it is a one-way "market" like the first-mentioned.

This interbank activity ensures that the bank-to-bank interbank rate closely follows the Key Interest Rate (KIR) of the central bank – called the discount rate, base rate, bank rate, repo rate, etc. The central bank (by ensuring that the banks are always indebted to it) is thus able to ensure that the repo rate is at all times *made effective* – which means that the central bank essentially "pinpoints" the short end of the yield curve. This is significant in that the central bank has a major influence on bank deposit rates (the majority of which are short-term) and therefore (via the bank margin) on bank lending rates (and generally on asset prices – which plays a major role in consumer behaviour – the main driver of the economy).

The level of bank lending rates influences the demand for credit, and growth in the latter is the main driver of the growth rate in the money stock. This significant money creation role of the banks is played out in the money market.

Given the significance of the money market and money market interest rates, it is important to begin the series of modules on this market with a brief description of the financial system. This is the context of the money market

1.3 The financial system

1.3.1 Introduction

The financial system is essentially concerned with borrowing and lending; it may be depicted simply as in Figure 1.

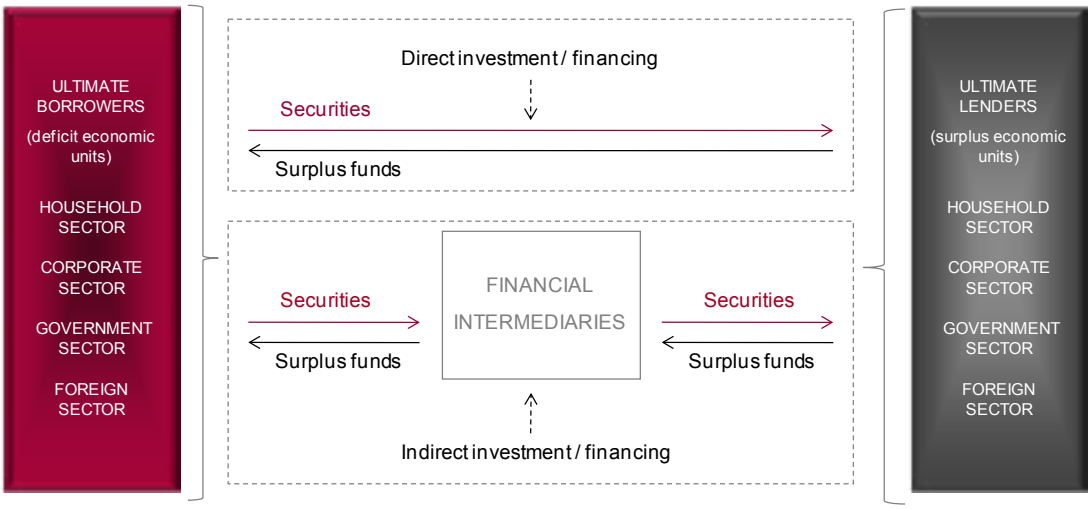


Figure 1: ultimate lenders & borrowers

The financial system has six elements (not all of which are visible in Figure 1):

- First: *lenders* (surplus budget economic units) and *borrowers* (deficit budget economic units), i.e. the non-financial economic units that undertake the lending and borrowing process. They may also be called the *ultimate* lenders and borrowers (to differentiate them from the financial intermediaries which also lend and borrow).
- Second: *financial intermediaries* which intermediate the lending and borrowing process; they interpose themselves between the ultimate lenders and borrowers.
- Third: *financial instruments*, which are created to satisfy the financial requirements of the various participants; these instruments may be marketable (e.g. treasury bills) or non-marketable (e.g. utilised bank overdraft facility).
- Fourth: the *creation of money* when demanded; banks have the unique ability to create money.
- Fifth: *financial markets*, i.e. the institutional arrangements and conventions that exist for the issue and trading (dealing) of the financial instruments.
- Sixth: *price discovery*, i.e. the price of shares and the price of money / debt (the *rate of interest*) are "discovered" (made and determined) in the financial markets. Prices have an allocation of funds function.

We will touch upon each of these elements briefly.

1.3.2 Element 1: lenders and borrowers

As may be seen in Figure 1, the lenders and borrowers are categorised into the four "sectors" of the economy:

- *Household* sector (individuals).
- *Corporate* sector (companies – private and government owned.
- *Government* sector (all levels of government – local, provincial, central).
- *Foreign* sector (any foreign entity – corporate sector, financial intermediaries such as pension funds).

The members of these sectors may be lenders or borrowers or both at the same time; for example most governments are issuers of treasury bills (= borrowers) and at the same time hold large balances on accounts with banks before spending the funds borrowed (= lenders).

1.3.3 Element 2: financial intermediaries

Lending and borrowing takes place either *directly* between ultimate lenders and borrowers [e.g. when an individual buys a share (also called equity and stock) issued by a company], or *indirectly* via financial intermediaries. Financial intermediaries essentially solve the differences that exist between ultimate lenders and borrowers in terms of risk, return, term of loan, etc. For example, Johnny (a member of household sector) will prefer to place his money in a bank deposit for 30 days than lend it to his friend Peter (a member of household sector) because of the risk that Peter may default and Peter would like the loan for a year.

MAINSTREAM FINANCIAL INTERMEDIARIES

DEPOSIT INTERMEDIARIES

Central bank (CB)
Private sector banks

NON-DEPOSIT INTERMEDIARIES

Contractual intermediaries (CIs)

Insurers
Retirement funds (pension funds, provident funds, retirement annuities)

Collective investment schemes (CISs)

Securities unit trusts (SUTs)
Property unit trusts (PUTs)
Exchange traded funds (ETFs)

Alternative investments (AIs)

Hedge funds (HFs)
Private equity funds (PEFs)

QUASI-FINANCIAL INTERMEDIARIES (QFIs)

Development finance institutions (DFIs)
Special purpose vehicles (SPVs)
Finance companies
Investment trusts / companies
Micro lenders
Buying associations

BOX 1: Financial intermediaries

Financial intermediaries exist not only because of the divergence of requirements of lenders and borrowers, but for the specialised services they provide, such as insurance policies (insurance companies), retirement fund products (retirement funds), investment products (securities unit trusts – also known as mutual funds), overdraft and deposit facilities (banks), and so on.

The main financial intermediaries that exist in most countries and their relationships with one another is presented in Figure 2. A useful of classification of them is presented in Box 1.

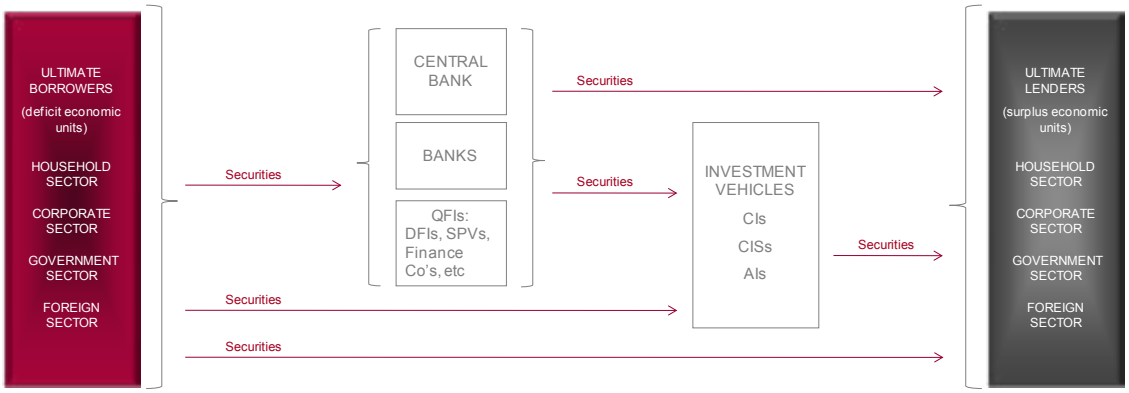
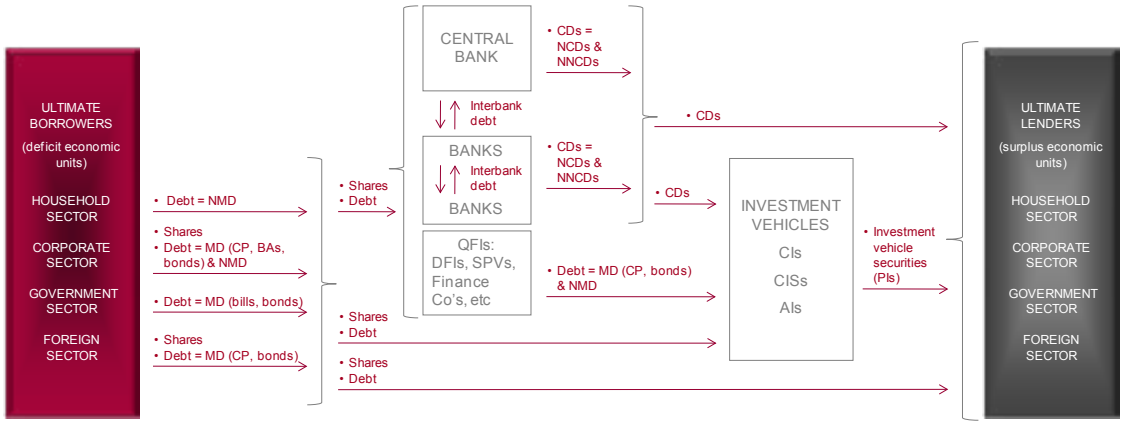


Figure 2: financial intermediaries

Note that the non-deposit intermediaries may also be seen as *investment vehicles*; most of their products are designed as investment vehicles for the household sector. Examples are endowment policies (insurers), units (securities unit trusts), participation interest(exchange traded fund).

1.3.4 Element 3: financial instruments



MD = marketable debt; NMD = non-marketable debt; CP = commercial paper; BAs= bankers' acceptances; CDs = certificates of deposit (= deposits); NCDs = negotiable certificates of deposit; NNCDs = non-negotiable certificates of deposit; foreign sector issues foreign shares and foreign MD (foreign CP & foreign bonds); PI = participation interest (units)

Figure 3: financial intermediaries & instruments / securities

Ultimate lenders exchange money for securities and ultimate borrowers exchange (issue new) securities for money. Financial intermediaries issue their own securities (e.g. deposits) in exchange for the securities of the ultimate borrowers (e.g. treasury bills). The banks have a special and unique role in this market for money in that they are able to create money (bank deposits) by making loans (buying securities); this will become clearer later

Securities are *evidences of debt or shares* that offer a return that is certain (fixed-interest debt) or uncertain (variable-rate debt and shares). The capital amount of shares and debt is either paid back (bonds and preference shares) or not (perpetual bonds and ordinary shares).

	Debt (& deposits)		Shares		
	Non-marketable debt and deposits	Marketable debt and deposits	Non-marketable	Marketable	
			Non-listed ordinary shares*	Listed ordinary shares	Listed preference shares
ULTIMATE BORROWERS					
Household sector	OD & mortgage loans from banks	-	-	-	-
Corporate sector	OD & mortgage loans from banks	Corp bonds, CP, BAs, PNs	YES	YES	YES
Government sector	OD loans from banks	Govt bonds, TBs	-	-	-
Foreign sector	-	Foreign bonds	-	YES (inward listing)	YES (inward listing)
FINANCIAL INTERMEDIARIES					
Central bank	NNCDs	NCDs**, notes & coins	-	-	-
Private sector banks	NNCDs	NCDs	-	-	-
Quasi-financial intermediaries	OD loans from banks	Corp bonds, CP	-	-	-
Investment vehicles	Participation interests (PIs)	-	-	-	-

OD = overdraft); CP = commercial paper; BAs = bankers' acceptances; PNs = promissory notes; Corp = corporate; NNCDs = non-negotiable certificates of deposit; NCDs = negotiable certificates of deposit.
* Non-listed preference shares do exist but are rare. ** Central bank (CB) securities, which are akin to NCDs.

Table 1: financial instruments / securities

The instruments of the financial system are as shown in Figure 3 and summarised in Table 1.

The household sector issues:

- Debt securities [non-marketable debt only (NMD, e.g. utilised overdraft facility from a bank = a loan = debt)].

The corporate sector issues:

- Share securities [ordinary shares (aka "common" shares), and preference shares (aka preferred shares)]. They are either marketable shares (MS = listed) or non-marketable shares (NMS = unlisted).
- Debt securities [NMD, e.g. loan from bank, and marketable debt (MD e.g. bonds; commercial paper – CP; bankers' acceptances – BAs; promissory notes – PNs)].

The government issues:

- MD securities [treasury bills (TBs or T-bills) and bonds (also called T-bonds)].

The foreign sector (foreign corporate entities) issues MD only (into the local markets):

- Foreign share securities.
- Foreign debt securities.

The deposit financial intermediaries (central bank and private sector banks) issue:

- Deposit securities:
  - Non-negotiable certificates of deposit (NNCDs, e.g. fixed deposits, savings deposits, call deposits).
  - Negotiable certificates of deposit (NCDs). In the case of the central bank these are notes and coins and central bank securities[2].

The investment vehicles issue:

- Investment securities, for example:
  - Endowment policies (life insurers).
  - Annuities (life insurers).
  - Membership interests (retirement funds).
  - Units [securities unit trusts (also called mutual funds)].
  - Participation interests (exchange traded funds).

For the sake of simplicity we refer to them all as participation interests (PIs).

The quasi-financial intermediaries issue:

- Debt securities [NMD (e.g. loan from bank) and MD (e.g. bonds, commercial paper – CP)]. An example is a development finance institution (DFI) such as a development bank and a finance company.

1.3.5 Element 4: creation of money

As we will see in some detail later, the commercial banks have the unique ability to create money "out of thin air". Money is defined as anything that serves as a medium of exchange[3]; the "items" that are used as a medium of exchange are bank notes and coins (usually issued by the central bank) and bank deposits. As is well known, in most countries notes and coins make up a small proportion of money; individuals and institutions make the vast majority of their payments in bank deposit transfers.

When banks make new bank loans (= buy new NMD and MD securities), they create deposits (= money). The referee in this game is the central bank which controls the growth rate in money creation (= new bank deposits resulting from new bank loans) by influencing the interest rate on banks loans (= bank assets) via the interest rate (repo or discount rate) it charges for its loans to the banks (= bank liabilities), which it "forces" the banks to take. In most countries this is the style of monetary policy followed.

We will return to this significant matter, which amounts to there being a virtually unlimited supply of bank credit [which leads to deposit (= money) creation]. The "limit" exists in the form of the price of money to the public – the bank lending rate.

1.3.6 Element 5: financial markets

In the discussion above, it will have been noticed that financial instruments are either marketable of non-marketable. Examples are non-negotiable certificates of deposit (NNCDs) (= an ordinary deposit receipt) and negotiable certificates of deposit (NCDs) issued by the private sector banks (the latter are also called just CD in some countries).

There are two market types or forms (see Figure 4):

- Primary market.
- Secondary market.

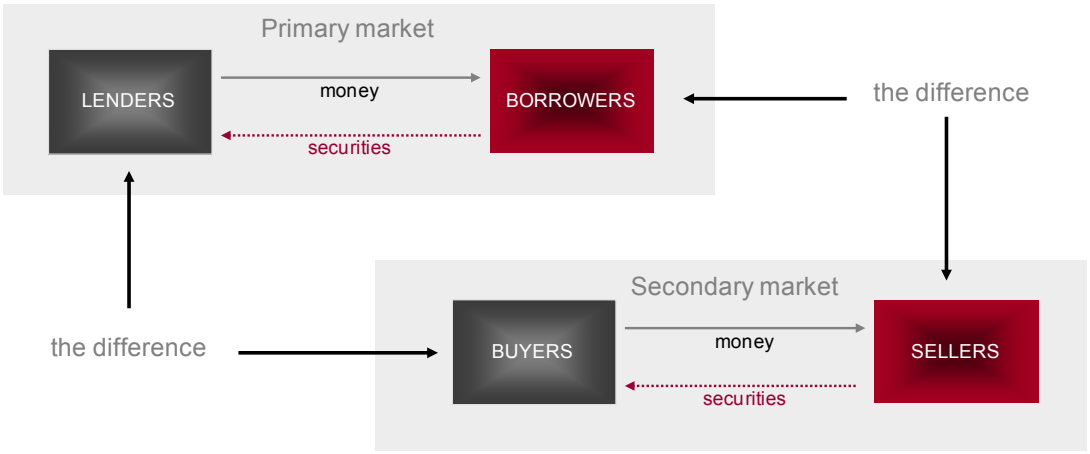


Figure 4: primary & secondary markets

All securities are issued in their primary markets and the marketable ones are traded in the secondary markets. In the primary market the *issuer* receives the money paid by the *lender / buyer*. In the secondary market the *seller* receives the money paid by the *buyer*.

The financial markets can be depicted as in Figure 5.

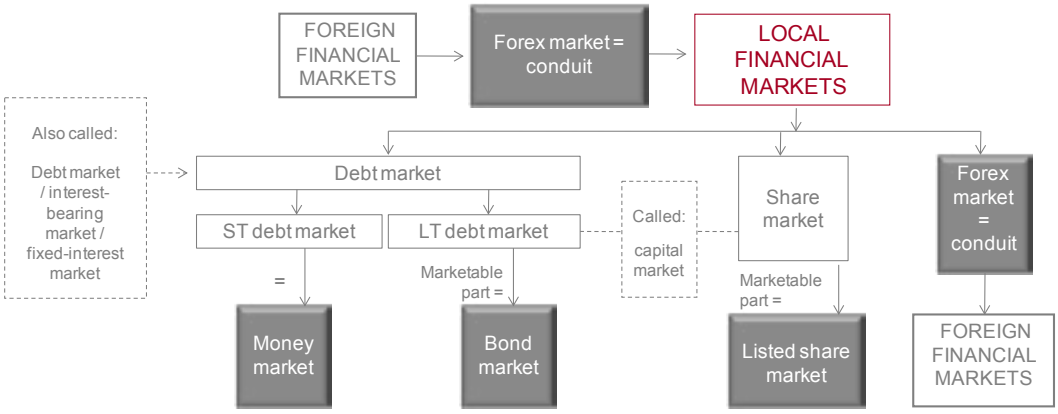


Figure 5: financial markets

The debt market is made up of the:

- Short-term debt market (= the money market according to our definition); it includes all short-term debt, i.e. marketable debt (ST MD) and non-marketable debt (ST NMD), and bank deposits because deposits are a form of debt (the majority of deposits is short-term). We call deposits *certificates of deposit* (CDs), and they are marketable / negotiable (NCDs) or non-marketable / negotiable (NNCDs).
- Long-term debt market, i.e. long-term marketable debt (LT MD) and non-marketable debt (LT NMD); the bond market is the marketable part of the long-term debt market (= LT MD).

The debt market is also known as *the interest-bearing market* and the *fixed-interest marke*t. The terms *interest-bearing* and *fixed-interest* differentiate the debt market from the share market because the returns on shares are dividends and dividends are not fixed – they depend on the performance of companies. The term *fixed-interest*, strictly speaking, is a misnomer because interest can be fixed or floating (= reset frequently).

Generally, the foreign exchange market is called a financial market. But, strictly it is not a financial market, because lending and borrowing does not take place in this market. Rather, it is a *conduit* for foreign importers, commercial entities, etc into local financial markets and for local investors, commercial entities, etc into foreign financial markets.

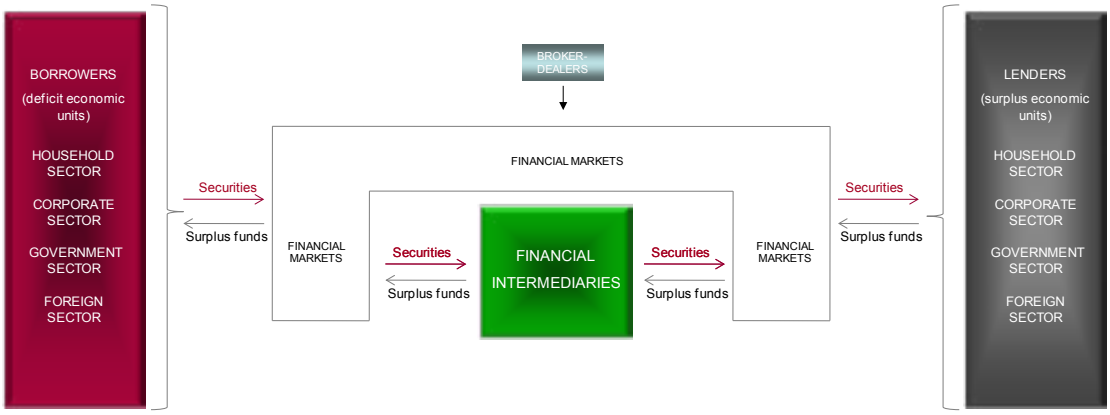


Figure 6: financial markets

In addition to these *cash* or *spot* markets [= where settlement of deals take place on, or a few days after, transaction date (T+0)] we have the so-called derivative markets (= where settlement of deals take place on days beyond spot settlement dates). The derivatives market is comprised of instruments (forwards, futures, swaps, options and "others" such as weather derivatives) that are *derived* and get their value from the spot financial markets.

Secondary markets are either over-the-counter (OTC), also called "informal markets" (such as the foreign exchange and the money markets) because there is no exchange involved (there are exceptions), or exchange-driven (or formal) markets, such as the share (or stock) exchange. The place of the financial markets in the financial system may be depicted as in Figure 6.

The financial markets do not intermediate the financial lending and borrowing process as do financial intermediaries such as banks; they merely facilitate the primary and secondary markets.

1.3.7 Element 6: interest rates and the prices of equities

Secondary markets are important for a number of reasons, the most important of which is *price discovery*, i.e. the establishment of interest rates for various terms and the prices of equities. Interest rates, as we will see, have an important role to play in the pricing of all assets.

As we have seen, the central bank plays a significant role in the establishment of interest rates in the financial system. We will return to these issues later.

1.4 Allied participants in the financial system

From the above discussion it will be evident that there are a number of allied participants on the financial system. By this we mean participants other than the *principals* (those who have financial liabilities or assets or both). As we now know, the principals are:

- Lenders.
- Borrowers.
- Financial intermediaries.

The allied participants, who play a major role in terms of facilitating the lending and borrowing process (the primary market) and the secondary markets are the financial exchanges and their members. Also we need to mention the fund managers, who are actively involved in sophisticated financial market research and therefore play a major role price discovery, and the regulators of the financial markets. Thus the allied non-principal participants in the financial markets are:

- Financial exchanges.
- Broker-dealers.
- Fund managers.
- Regulators.

1.5 Summary

This introductory section sketches the environment of the money market, i.e. the financial system. There are 6 elements to the financial system:

- Lenders and borrowers.
- Financial intermediaries.
- Financial instruments.
- Money creation.
- Financial markets.
- Price of money and shares.

In addition, there are a number of participants that play an important allied by non-principal role in the financial system:

- Financial exchanges.
- Broker-dealers.
- Fund managers.
- Regulators.

The money market is a fundamental part of the financial system and the foundation of all other financial markets, including the derivative instrument markets, through interest rates which are established in this market.

1.6 Bibliography

Faure, AP, 2007. **The money market**. Cape Town: Quoin Institute (Pty) Limited.

2 Overview

2.1 Learning objectives

After studying this text the learner should / should be able to:

- Evaluate the various definitions of the money market.
- Examine the components of the money market.
- Define the time value of money.
- Calculate present values, futures values, effective rates and so on that apply to the money market.
- Elucidate the organisational structure of the money market.
- Appreciate the existence of money market derivative instruments.
- Explain the economic role of the money market.

2.2 Definition

2.2.1 Introduction

We present Figure 1 as a reminder of the financial system and its financial markets. All lending and borrowing takes place via financial markets which are either formalised in exchanges or informal (called OTC). An example of the OTC market is an individual placing money on deposit at a bank, and the market price is the rate that s/he will be earning (which was compared with other banks' rates).

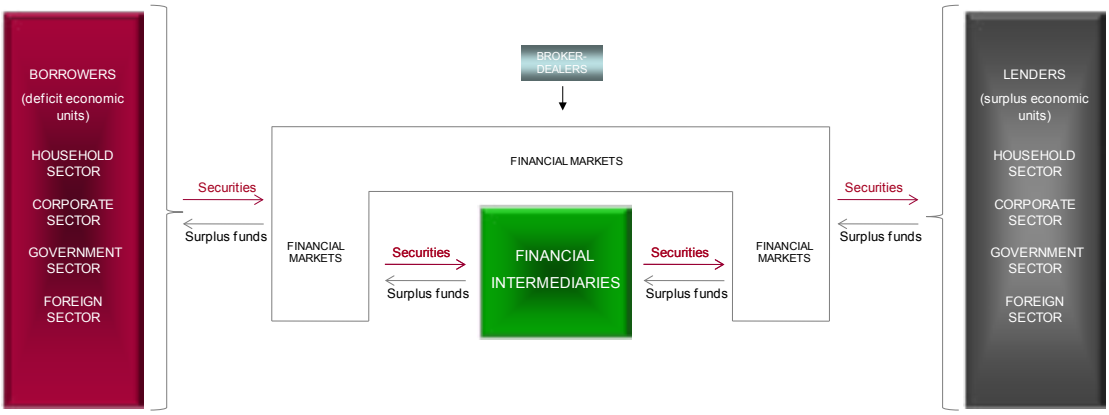


Figure 1: financial markets

The markets of the financial system are depicted in Figure 2. The money market is part of the debt (and deposit) market.

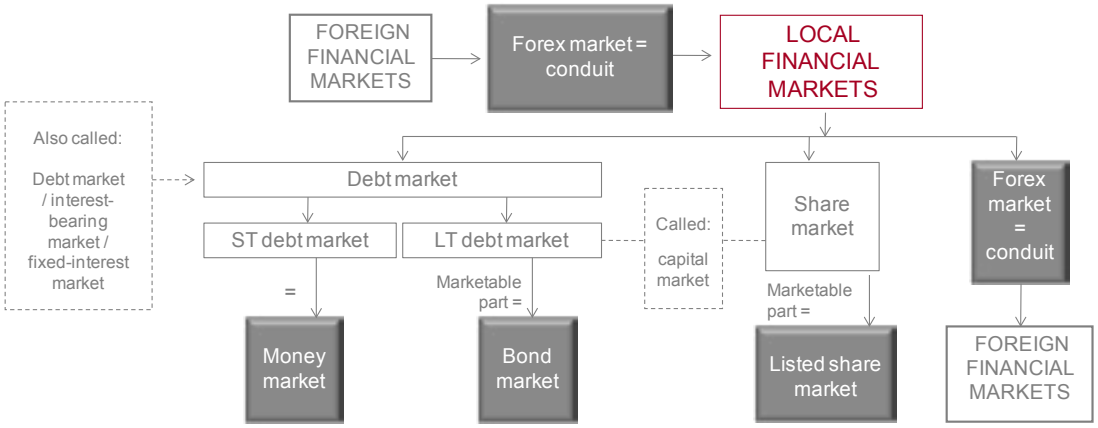


Figure 2: financial markets

The money market is usually defined as the market for *short-term marketable debt instruments*, and *short-term* is an arbitrary one-year period. Following from this is that the bond market is usually defined as the market for marketable debt instruments that have a maturity beyond the one-year term to maturity period.

The bond market definition is not a shabby one, but the money market definition is not sound because the money market is much more than indicated in the above definition. The following presents the various definitions of the money market and ends with the appropriate one (which is a *description* rather that a definition – because it cannot be simply defined). The following are the sections:

- Broad definition.
- Less-broad definition.
- Narrow definition.
- An appropriate definition / description.

2.2.3 Broad definition

Some scholars describe the money market as encompassing:

- All forms of short-term lending and borrowing.
- The exchange of existing short-term debt instruments.

It can therefore also be described as the market for *short-term debt* (marketable and non-marketable). Non-marketable debt only has a primary market whereas marketable debt is issued in the primary market and traded in the secondary market.

Following from this is that the remaining lending and borrowing activity of the financial system should be called the *long-term debt market*. The *bond market* would then be a part of this market and be described as the market for the issue and trading of *marketable* bonds.

2.2.4 Less-broad definition

The less-broad definition is the same as above, but with the retail market excluded. Thus, small deposits with banks, small borrowings from banks, etc can be left out, leaving the money market as encompassing:

- The market that brings together the supply of wholesale short-term funds and the demand for wholesale short-term funds.
- The market in which existing marketable short-term instruments are traded (they are wholesale).

2.2.5 Narrow definition

The narrow definition is: the money market is comprised of the market in the short-term *marketable* securities. There are two types of marketable securities: debt securities issued by ultimate lenders (such as the commercial paper and treasury bills), and deposit securities issued by financial intermediaries (such as negotiable certificates of deposit).

2.2.6 An appropriate definition / description

In our opinion the appropriate definition is the broad one, and this is because the narrower ones ignore important parts of the money market. What are the important parts of the money market?

In our view the important parts are where *price-making / price-discovery* takes place, i.e. where interest rate determination takes place. All interest rates have their genesis in the money market, including longer-term rates.

It is important at this stage to understand the composition of interest rates. In this regard we present a yield curve[4]in decomposed format in Figure 3.

We begin with the 1-day risk-free[5] rate (rfr). Risk-free rates are the rates on government securities (treasury bills and bonds). The 1-day rate rfr is composed of the real rfr and the current rate of inflation. As the term to maturity lengthens, the risk-free rates are made up of:

- The 1-day rfr
- Current inflation (which gives way to expected inflation as term increases)
- Liquidity-sacrifice premium [i.e. compensation for investors giving up liquidity (= command over their money) and their sacrificing consumption now for consumption in the future].

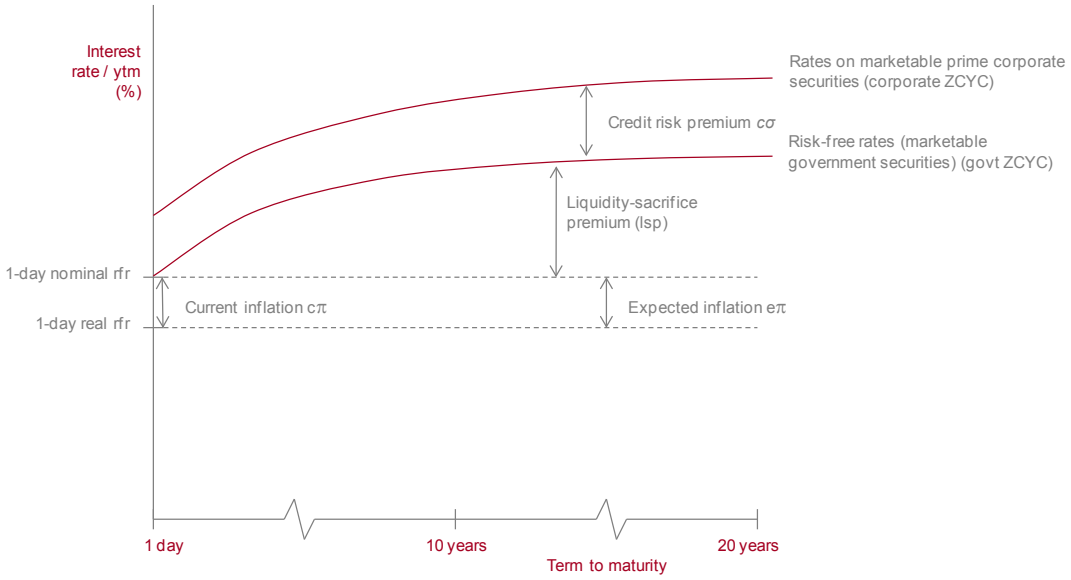


Figure 3: composition of nominal rates (2)

The rates on non-government prime securities (i.e. CP and bonds of large companies) are represented by the highest curve in Figure 3. Thus these rates are composed of the abovementioned three factors plus a credit risk premium.

The shorter interest rates (up to one year) are determined in the money market and the longer rates are determined in the bond market, but the latter have as their starting point the money market rates.

The bottom end of the yield curve (specifically the one-day rate[6]) can be said to be heavily influenced (almost "set" as we shall see later) by the central bank through "manipulating" the *liquidity condition* of the banks. Through open market operations the central bank ensures that the banks at all times are in *liquidity shortage* (LS) condition (called the "money market shortage" – MMS). This means that they are kept (by the central bank) perennially short of liquidity and the central bank supplies the required liquidity (also called *reserves* or *cash reserves*) at the KIR, thus *making the KIR effective*.[7]

The above will be covered in more detail later, but we present here striking evidence of the effectiveness of the KIR in "determining" the prime lending rate of the banks. It is presented in Figure 4 (for a particular country over a period of 50 years): the correlation coefficient is 0.99 (i.e. a change in the KIR is immediately followed by a commensurate change in the prime lending rate of banks).

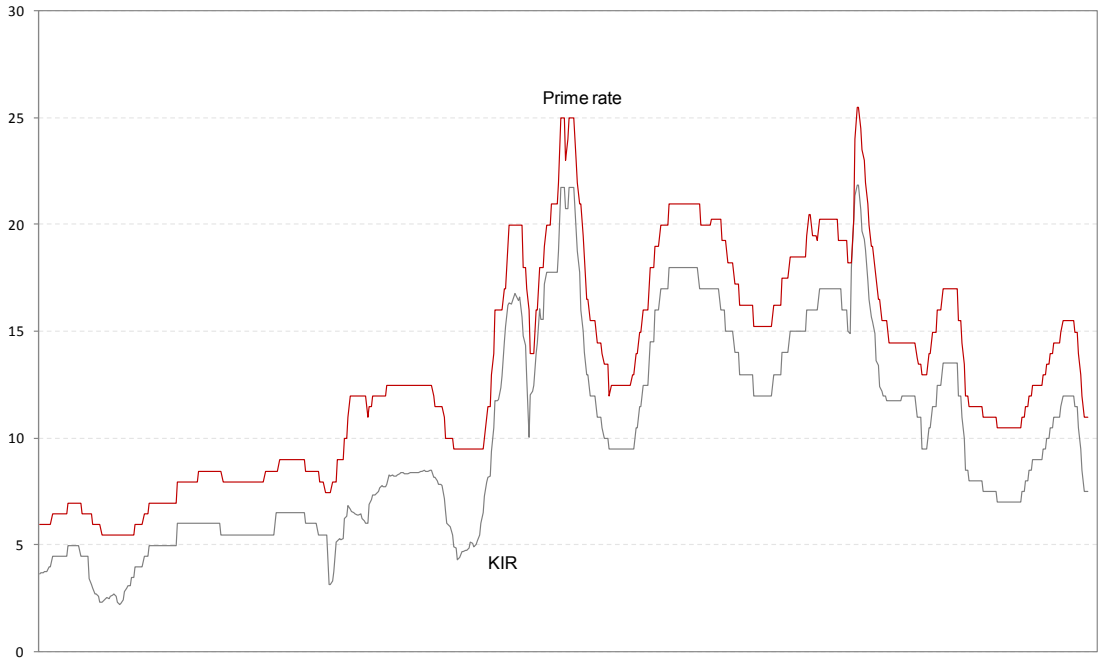


Figure 4: KIR & prime lending rate

We return to Figure 3; this portrayal of the terms structure of interest rates in decomposed form indicates another significant matter: the nominal rate is higher than the real rate. This is a critical condition in monetary policy. If the real rate is negative on a sustained basis the consequence is likely to be increasing and high inflation, which impacts negatively on economic output in the long term. From this it should be evident that the central bank has a key role to play in the money market and the economy as a whole.[8]

Thus, the central bank has virtual "control" over the money market, especially in the very short end. This essential pursuit of the central bank is played out in the interbank market. There are two interbank markets:

- The private sector bank / central bank interbank "market" which is an "administrative" market. The flows are from the banks to the central bank (the cash reserve requirement, the balances of which earn no interest), and from the central bank to the banks (the borrowed reserves) at the KIR. The former can be given the acronym *b2cb IBM* and the latter *cb2b IBM*.
- The private sector bank to private sector bank interbank market (*b2b IBM*), which takes place after the interbank clearing process at the end of the business day (which takes place over the banks' settlement accounts with the central bank[9]). In this b2b IBM the banks place funds with or receive funds from other banks depending on the outcome of the clearing. Surpluses are placed at the *interbank rate*; this rate is closely related to the KIR because banks endeavour to satisfy their liquidity needs in this market before last resort borrowing from the central bank at the KIR.

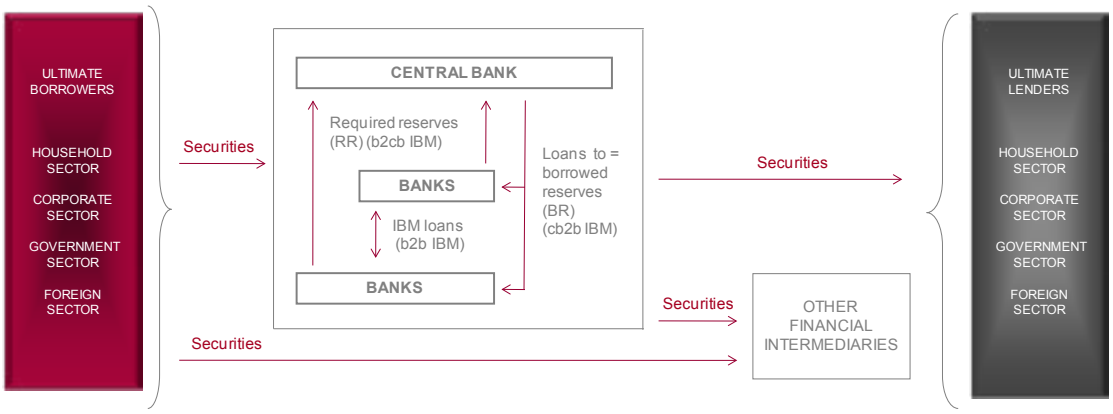
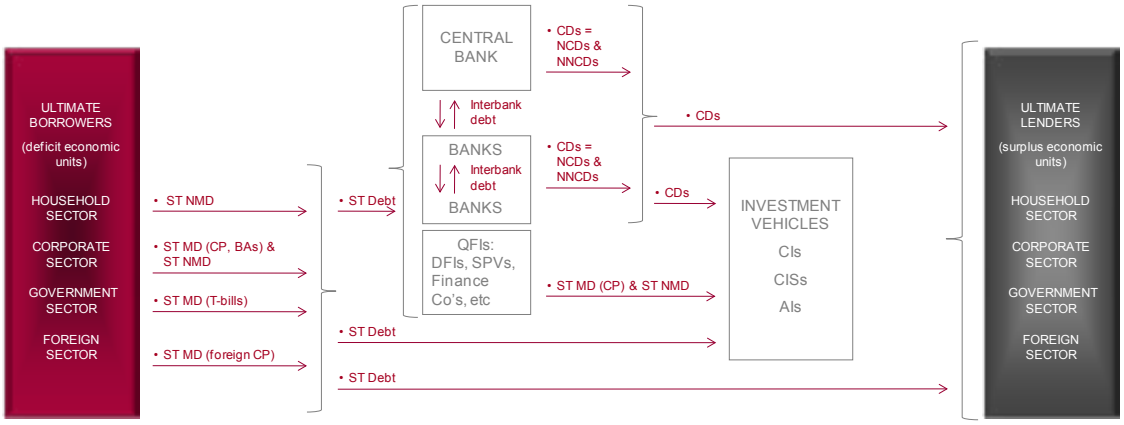


Figure 5: interbank markets

In the b2b IBM no new funds are created; existing funds are merely shifted around. New funds (cash reserves) are created in the cb2b IBM (in the long term). The latter is a function of the ability of banks to create money in the form of deposit money[10]. This they are able to do without constraint[11] and the central bank supports this by the creation of the additional required cash reserves (a function of deposit growth).

It is difficult to portray the interbank market; our attempt is presented in Figure 5.

Thus the money market is comprised of the lending and borrowing of short-term funds, the interbank market (which is a part thereof), and the creation of new money by the banks (supported by the central bank). The money market derivative markets are not part of the market because lending and borrowing does not take place in this market: rather they are an addendum to the mainstream money market. The entire money market may be portrayed as in Figure 6.



MD = marketable debt; NMD = non-marketable debt; CP = commercial paper; BAs= bankers' acceptances; CDs = certificates of deposit (= deposits); NCDs = negotiable certificates of deposit; NNCDs = non-negotiable certificates of deposit;

Figure 6: money market

The lending and borrowing of short-term funds takes place *mainly* via the banking system. The word *mainly* is appropriate because while virtually all short-term lending and borrowing is executed with the banks, funds that flow to the investment vehicles [like retirement funds (CIs[12]) and unit trusts (CISs[13])] are *investment funds* and not short-term *deposits / loans,* short-term debt securities (representing short-term borrowing) are not only held by the banks but by retirement funds, money market unit trusts and others.

However, the majority of short-term lending and borrowing takes place via the banks. Thus, the banks are at the very centre of the money market. For the intermediation benefits they offer (payments system, lower risk as a result of diversification for the lender, etc.) the banks charge a fee in the form of a "margin": the banks charge a higher rate for loans than what they offer for deposits, and this margin they endeavour to maintain.

The bank (see Figure 7) margin is an important element in the money market and in monetary policy (which is played out in this market): the KIR paid by the banks for central bank money "at the margin" (i.e. borrowed reserves) affects what they pay for deposits and, given the margin that they enjoy (and therefore endeavour to maintain), what they charge for loans. A proxy for the bank margin is the differential between the KIR and the banks' prime lending rate (which is always the same for all banks) as depicted in Figure 4. In fact in reality the banks' lending and deposit rates are benchmarked to these rates.

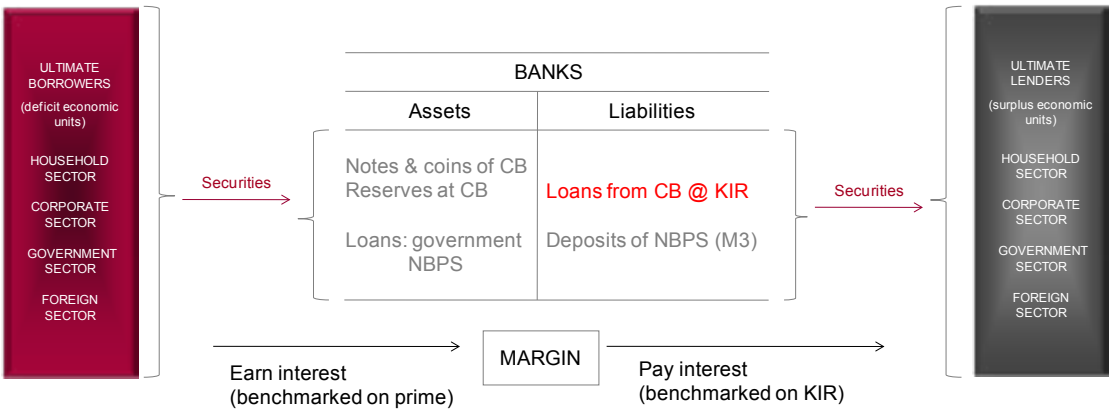


Figure 7: bank margin

It will be apparent that there are retail and wholesale elements to the money market. The wholesale market participants are "price (interest rate) makers" (always with reference to the KIR), whereas the retail market participants are "price takers". (This is the reason that some scholars leave the retail market out of the definition.)

In the *retail* money market on the *lending* side there exist only non-marketable instruments of debt (i.e. only primary markets), and these are *bank deposits*, the instrument of which we refer to as non-negotiable certificates of deposit (NNCDs). On the borrowing side there are also only non-marketable borrowings and these are loans from the banks in their various guises (short-term fixed-period loans, overdrafts and so on). We refer to these securities (issued by the borrowers and held by the banks – as lenders) collectively as non-marketable debt (NMD) securities.

In the *wholesale* money market there are non-marketable debt (NMD) securities and marketable debt (MD) securities and here the banks intermediate to a lesser degree. Here we also remove the household sector (except the high net worth members of the sector). The corporate sector borrows by the issue of NMD "securities"[14] (such as overdrafts) as well as MD securities such as commercial paper (CP) in the case of the larger companies. The various levels of government issue NMD securities and MD securities. The foreign sector is a small issuer of securities at this stage and they are all marketable. The financial intermediaries issue a number of different securities (which is discussed in some detail later).

The term *market* in money market means the conventions that exist for the bringing together of lenders and borrowers of short-term funds and the "discovery" of the rate of interest. This market (as we have seen) is firmly in the domain of influence of the banks and the central bank which uses this market effectively for its monetary policy ends. It is an OTC market.[15]

We conclude that the money market should be defined as encompassing:

- The primary markets that bring together the supply of retail and wholesale short-term funds and the demand for wholesale and retail short-term funds.
- The secondary market in which existing marketable short-term instruments are traded.
- The creation of new money (deposits) and the financial assets that lead to this (loans in the form of NMD securities and marketable debt securities).
- The cb2b IBM and the b2cb IBM where monetary policy is played out and interest rates have their genesis (i.e. where repo is implemented).
- The b2b IBM where the KIR has its secondary impact, i.e. on the interbank rate.
- The money market derivative markets (= an addendum).

We now examine a little deeper these elements that make up the money market.

2.3 Primary money market: supply of and demand for short-term funds

2.3.1 Introduction

The supply of short-term funds is synonymous with the demand for financial instruments (marketable and non-marketable). Supply is forthcoming from the ultimate lenders and certain financial intermediaries.

The demand for short-term funds is forthcoming from the ultimate borrowers and certain financial intermediaries. Demand is synonymous with the supply of financial securities (marketable and non-marketable).

Of the suppliers of and demanders for short-term funds, the banks play the dominant role. This is a reflection of the banks performing their function of satisfying the financial requirements of ultimate lenders and borrowers in terms of return, risk, size and maturity of financial assets.

In addition to the matching of financial requirements, the banks are able to create money (their liabilities) by additional lending or purchasing new issues of securities (which is also lending). This unique function / ability of the banks makes for the supply of wholesale short-term funding being virtually "unlimited". The only "limits" that exist are bank vetting of the business for which funding is sought, and the borrowing rates applied by the banks which are a reflection of risk.

2.3.2 Supply of short-term funds

The supply of short-term funding is forthcoming from (illustrated in Figure 8[16]):

- All the ultimate lenders.
- All the financial intermediaries.

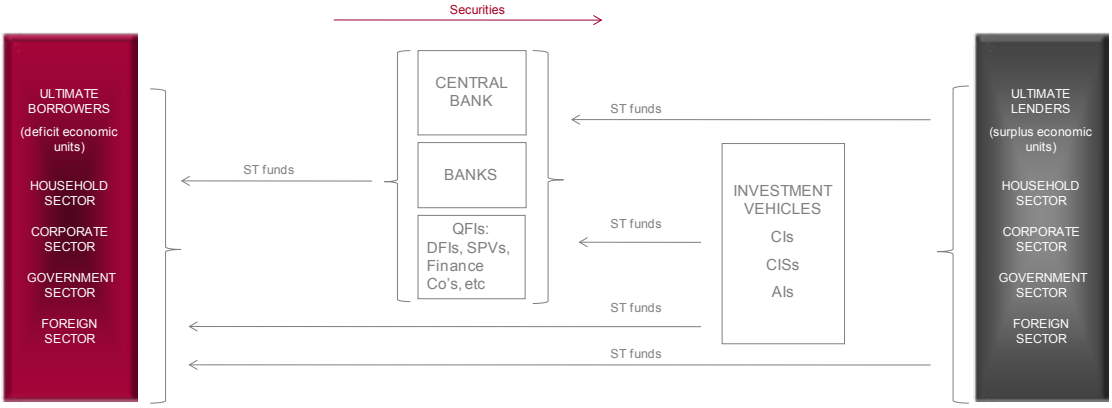


Figure 8: supply of funds in the money market

Keynes' famously described the motives / reasons for holding short-term funds: for transactions, precautionary and speculative reasons. To these we add *investment*, because *speculative* does not cover the *investment* of existing funds. Thus, there is/are one or more of four *reasons* to hold short-term funds:

- Transactions.
- Precautionary.
- Investment.
- Speculative.

Short-term funds are held in deposit securities (NNCDs or NCDs) or short-term debt securities (TBs, CP, short-term bonds, etc.).

Household sector. This sector is a large holder of short-term funds, and they hold them for all four of the reasons. The emphasis is perhaps on the fist-mentioned because the majority of individuals utilise current bank accounts for this reason. To a lesser degree *precaution* is a reason, although the majority rely on bank overdraft facilities in this regard.

Corporate sector. This sector is also a large holder of short-term funds. The motivations are the same as above, with the last one being excluded. The *investment* reason in respect of the corporate sector refers to further business opportunities.

Government sector. The government sector is also a large holder of short-term funds, purely for transactions reasons. Central government collects revenue and issues securities to cover the deficit and does not spend the funds immediately. It also supplies the provincial governments with funds to meet their expenditure; therefore they also at times are holders of short-term funds, but the amounts are small. Local government entities also collect revenue and some issue securities to cover their deficits; therefore at times they are also holders of short-term funds.

Foreign sector. This sector is a small holder of short-term funds and the motivation is usually speculative, i.e. awaiting opportunities for profit in portfolio securities (bonds and shares).

Financial intermediaries. All financial intermediaries are holders of short-term funds (some to a large degree and some to a small degree):

- The *banks* are at the very centre of the money market. They are the largest suppliers of short-term funds. Their reasons are transaction, precaution and speculative, with the emphasis on a toned down version of the latter.
- The *central bank* is usually a relatively small supplier of short-term funds; however, it is a large participant in the interbank market.
- *Contractual intermediaries* (CIs – retirement funds and insurers) hold short- term funds for all three reasons.
- The *collective investment schemes* (CISs – securities unit trusts and exchange traded funds) and the alternative investment funds (private equity funds and hedge funds) hold small amounts of short-term funds (with the exception of the Money Market Securities Unit Trusts (MMSUTs) which focus on the supply of short-term funds).
- The *quasi-financial intermediaries* (QFIs) are also small holders of short-term funds (mainly bank deposits) for transaction and precautionary reasons.

We repeat that the majority of new short-term funds (new bank deposits) are forthcoming from new bank loans; banks are "fully lent" (equity and liabilities = assets), and new funds arise from money creation. This is a significant and essential part of the financial system.

2.3.3 Demand for short-term funds

Demand (see Figure 9) is represented by the issue of securities, which are either marketable (applies only the large borrowers) or non-marketable. As we will see, there are various marketable securities issued (treasury bills, commercial paper and so on). The non-marketable securities issued by the financial intermediaries we call non-negotiable certificates of deposit (NNCDs) (such as savings deposits), and the non-marketable securities issued by the ultimate borrowers we refer to as non-marketable debt (NMD) securities (such as short-term fixed loans, utilised overdraft facilities).

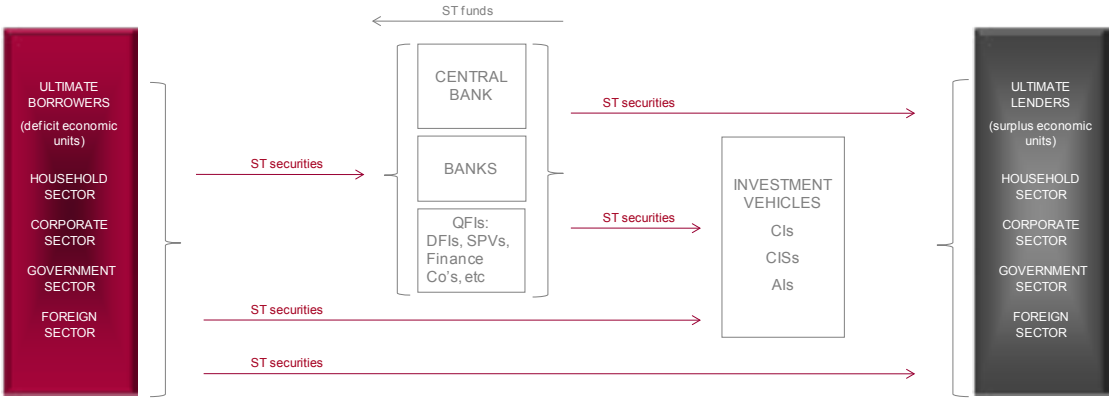


Figure 9: demand for funds in the money market

On the demand side of the money market the banks are the dominant force; in fact this is largely their *raison d'être*.

The other financial intermediaries that borrow in the money market (= demand) are:

- *Central bank*. The central bank borrows in various forms (such as the cash reserves of the banks); of importance for the money market is that many central banks issue their own marketable securities for monetary policy purposes.
- Members of the *QFIs*. Certain of the DFIs borrow by issuing marketable debt. The special purpose vehicles (SPVs – products of securitisations) fund their assets by issuing bonds and short-term debt securities (usually in the form of CP). Certain finance companies also issue securities but they do so mainly in the bond market.
- The members of the group investment vehicles (CIs, CISs and AIs). None of the members of this group (with the exception of some hedge funds) issue short-term securities. They are involved and compete in different investment markets.

As far as the ultimate borrowers are concerned:

- Household sector. This sector is a large borrower of short-term funds, mainly for the purpose of consumption and investment (in the form of housing). They borrow almost exclusively from the banks and issue securities (evidences of debt) to the banks in the form of non-marketable debt (NMD) securities. An example is a debit balance on a current account with a bank (it is much like an IOU). They borrow at rates benchmarked to the banks' prime rate.
- Corporate sector. The members of this sector are also large borrowers of short-term funds. The majority of these debt securities are in the form of short-term fixed loans, overdrafts and so on, at rates linked to prime rate. The larger companies are able to borrow in marketable security form at lower rates (see next section).
- *Government sector*. All levels of government borrow in the money market. Central government borrows a portion of its deficit requirement in the money market in the form of treasury bills (marketable debt). The other levels of government usually borrow in the form of NMD (e.g. bank overdrafts), although the larger entities (such as the large local authorities) are able to borrow by the issue of marketable debt.
- *Foreign sector*. Foreign entities are permitted to issue short-term securities locally in certain countries (termed foreign CP in some countries).

As we said above, the majority of new short-term funds (new bank deposits) are forthcoming from new bank loans.

2.3.4 Wholesale short-term *marketable* securities (demand)

Certain of the large borrowers (ultimate borrowers and financial intermediaries) are able to issue *marketable* short-term securities in the wholesale money market at lower rates than non-marketable securities. The rates are lower because of the lower risk and marketability. These are usually called *money market securities* (although short-term NMD are also money market securities) and they are as follows:

Household sector: not able to issue.

Corporate sector (in most countries):

- Bankers' acceptances (BAs).
- Commercial paper (CP).
- Promissory notes PNs).

Government sector:

- Central government: treasury bills (TBs).
- Provincial governments: in most countries this level of government is not permitted to borrow as they are funded by central government).
- Local authorities: in most countries this level of government is permitted to borrow and most issue NMD.

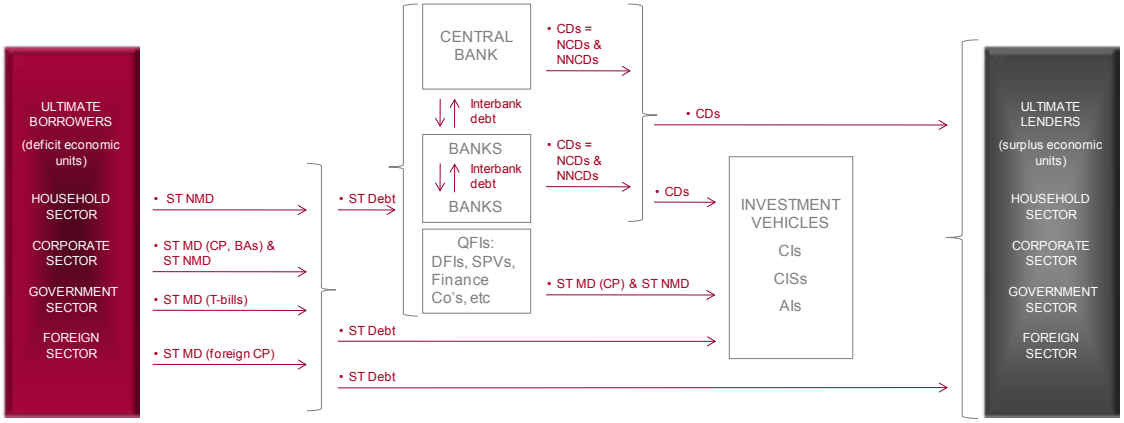
Foreign sector:

- Foreign commercial paper (CP).

Financial intermediaries:

- Private sector banks: negotiable certificates of deposit (NCDs).
- Central bank: central bank (CB) securities (in South Africa: SA Reserve Bank debentures; in Malawi Reserve Bank of Malawi bills; in Botswana Bank of Botswana certificates).
- Quasi-financial intermediaries: some issue CP, securitisation SPVs issue paper (in the form of CP); development entities issue marketable paper under their respective statutes[17].

All the issuers and securities of the money market may be depicted as in Figure 10.



MD = marketable debt; NMD = non-marketable debt; CP = commercial paper; BAs= bankers' acceptances; CDs = certificates of deposit (= deposits); NCDs = negotiable certificates of deposit; NNCDs = non-negotiable certificates of deposit;

Figure 10: money market

2.4 Organisational structure of the money market

Now that we have discussed the primary money market in some detail it is appropriate to examine the organisational structure of the money market, particularly the secondary market (see Figure 11).

Like all marketable securities markets, the spot (cash) money market is comprised of a *primary market* and a *secondary market*. The markets for non-marketable instruments such as NNCDs and bank loans are entirely primary markets. Marketable instruments trade in the secondary market.

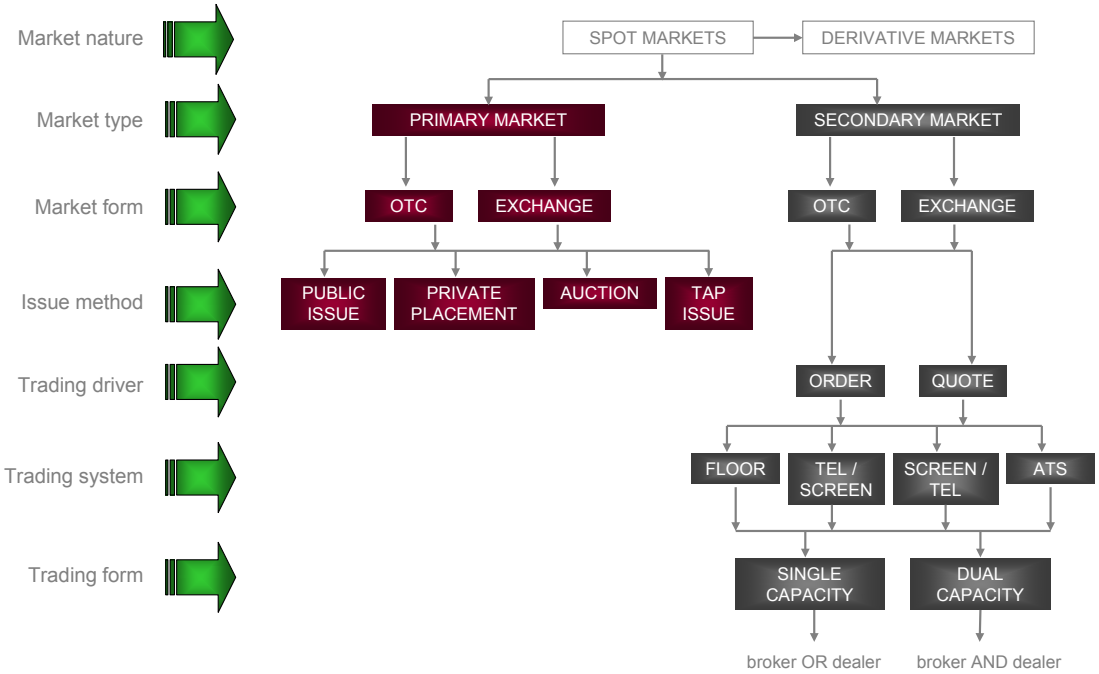


Figure 11: organisational structure of spot financial markets

The spot money market is an over-the-counter (OTC), as opposed to the futures markets which are organised in the form of an exchange. All money markets around the world are OTC markets, and the reason for this is that the money market is firmly in the sphere of activity of the banks, and the banks are the most solidly regulated financial intermediaries.

In the primary money market there are three methods of issue (in most countries):

- Private placement: the best example is NCD issues by banks.
- Tender (auction): examples are treasury bills and central bank securities.
- Tap issue: most CP issues are "tapped" out to investors. Many CP issuers make markets in their own securities by quoting buying and selling rates simultaneously and investors approach them by telephone; they purchase the CP if they are happy with the selling rates. When the issuers sell / issue CP in this fashion they are said to be "tapping" out their paper.

In the secondary money market, the trading drivers are *order and quote*. Money market brokers (see next section) receive *orders* from investors and make firm buying *quotes* to principals (banks and other holders of money market paper). Alternatively, the brokers receive *orders* from the principals and make firm *quotes* to other principals. Banks, however, usually deal on a quote basis (but they also broke on an order basis). Investors approach the banks and they quote firm selling rates to them.

It must be stated here that very few banks or other participants in the money market (if any at all) that quote buy and sell rates simultaneously, as in the case of the bond market where the trading driver is *quote* in the form of firm "two-way prices" or "doubles". The terms mean that firm buying (or bid) and selling (or offer) rates are quoted simultaneously by market makers[18]. A consequence of not having market makers in the money market is that the money market will be illiquid (as it is in many countries).

The trading system in the money market is *telephone-screen* or *screen-telephone*. The former means that certain broker-dealers (usually brokers and banks) "advertise" indication rates on communications systems such as the Reuters Monitor Service. Principals telephone them to ask if they will deal at the advertised rates (given an amount). They either confirm the advertised rates or negotiate.

Screen-telephone trading involves the advertising by broker-dealers of firm prices / rates for specified maximum amounts of securities on a communications system; deals are consummated on the telephone.

The trading form of the money market is both dual capacity and single capacity, depending on the participant. The banks, for example, deal in dual capacity, i.e. deal as principals and brokers, while certain brokers deal only as non-principals (i.e. single capacity). As the market is OTC, there is no exchange that stipulates the trading form, etc.

In conclusion we present a synopsis of the significant role the secondary money plays in the financial system:

- It facilitates price discovery. As we know, the central bank "pinpoints" the bottom end of the yield curve. While longer money market rates are discovered in the secondary market, they reflect the one-day rates.
- It facilitates the operation of the primary market, i.e. the ease with which issuers of money market securities may place these securities. This is so because investors have the comfort that they are able to dispose of securities if and when they so desire.
- It lowers borrowing costs, i.e. lenders are prepared to pay a premium (higher price / lower rate) for marketability.
- It provides the basis or benchmark for determining the rates to be offered on new money market issues.
- It registers changing market conditions rapidly and thus indicates the receptiveness of the market for new primary issues of money market securities.
- It enables rapid adjustments by investors in their portfolios in terms of size, risk, return, liquidity and maturity.
- It enables the central bank to execute its operations in the open market, called open market operations (OMO).

2.5 Money (deposit) creation in the money market

Perhaps the most elegant feature of the financial system is that the demand for short-term funds can be satisfied by the banks through their ability to create money virtually "out of thin air".

In this respect we dispel two longstanding myths:

- Banks have much of money to lend because they have many deposits.
- Money creation starts with a bank or banks receiving deposits.

The banks are fully lent at all times.[19] Their assets (loans-out) are matched by their liabilities (deposits and loans-in) and equity, but the definitive proof is the existence of a perennial liquidity shortage, as reflected in the accommodation provided by the central bank to the banks at the KIR.

Money creation starts with bank lending. The deposit that is supposed to "put the banks in money" actually comes from bank lending, and the increase in bank liabilities and assets are therefore matched. Therefore, unless there are repayments in the banking system, banks are able to create money by accounting entries (assuming the demand exists). This is one of the wonders of the economic world (because there is virtually an unlimited supply of funds) and will be made clear below.

There are two provisos to new money creation:

- The creditworthiness of the individuals (members of the household sector) asking the bank manager for (demanding) credit, and the feasibility of the projects for which money is demanded by the corporate sector, given the prevailing rate of interest (linked to prime rate) at which the funds are available.
- The willingness of the central bank to supply the additional cash reserves that are required as a result of the increase in bank deposits (on which the cash reserve requirement is based). A significant feature of the modern financial system is that cash reserves are available in unlimited quantities from the central bank (provided that banks have the collateral – which is not an issue). It is the price (the KIR) of the cash reserves (central bank loans) supplied and not the quantity that is the cornerstone of monetary policy in most countries.[20]

It will be apparent that the banks are in the business of providing as much credit as is demanded (subject to the first proviso) (after all they do operate in a competitive environment!) and that this is centred on the fact that the public accepts bank deposits as a means of payment (medium of exchange). The proviso here of course is that the money maintains its value, i.e. that its value is not eroded by inflation, which is the primary objective of monetary policy. This means that it is the central bank's responsibility to ensure that the extent of money creation does not exceed the economy's ability to supply the goods and services demanded. This the central bank executes by influencing the banks' lending rates via the influence of the KIR on bank deposit rates.

An example of money creation follows: Company A sells goods of value LCC[21]100 million to Company B. The latter did not have the funds and acquired an overdraft facility from its bank for this amount. The facility was granted by the bank and Company B duly completes a cheque for LCC100 million which is handed to Company A. The latter deposits the cheque at his bank. The bank credits Company A's account, sees the cheque is drawn by Company B and debits Company B's account; this of course is a bank loan to Company B.

COMPANY A (LCC MILLIONS)			
Assets		Liabilities	
Goods Deposits	-100 +100		
Total	0	Total	0

COMPANY B (LCC MILLIONS)			
Assets		Liabilities	
Goods	+100	Loan from bank	+100
Total	+100	Total	+100

PRIVATE SECTOR BANKS (LCC MILLIONS)			
Assets		Liabilities	
Loans (Company B)	+100	Deposits (Company A)	+100
Total	+100	Total	+100

Both sides of the banks' consolidated balance sheet increase by LCC100 million. The money stock (= private sector deposits) has increased by this amount and the statistical cause of change is the amount of bank credit extended. The actual cause or real driver of the increase in both credit and money was the demand for credit. Behind that of course is a business deal. Thus, money creation (= accounting entries) allowed this to take place.

The LCC100 million increase in bank deposits, given an assumed cash reserve requirement of 10% of deposits, means of course that the banks have to hold an additional amount of required cash reserves of LCC10 million. This is supplied by the central bank at the KIR. The balance sheets change as follows:

CENTRAL BANK (LCC MILLIONS)			
Assets		Liabilities	
Loans to banks (LS) @ KIR	+10	Bank cash reserves Reserve accounts Settlement accounts	+10 -
Total	+10	Total	+10

PRIVATE SECTOR BANKS (LCC MILLIONS)			
Assets		Liabilities	
Bank cash reserves Reserve accounts Settlement accounts	+10 -	Loans from central bank	+10
Total	+10	Total	+10

Thus, the supply of funds (credit) in the money market is virtually unlimited and a supply of credit executed brings about the creation of money (deposit – representing demand for short term funds). It does not work the other way round: banks do not need a new deposit to provide credit.[22]

The above may be a little bewildering to learners at this stage. It will become clearer later.

It will be evident from the above brief discussion on money creation that the implementation of monetary policy starts in the interbank market, to which we now turn.

2.6 Interbank deposit / loan market

As we saw earlier, there are two interbank markets:

- Bank / central bank interbank market (cb2b IBM and b2cb IBM) (which can also be called the cash reserve funds market).
- Bank-to-bank interbank market (b2b IBM) (in the US called the Fedfunds market).

As we have seen, the bank / central bank interbank market is a two-way market: the banks' cash reserve requirement (a ratio of their deposits required by statute), on which interest is not paid (b2cb IBM), and central bank loans to the banking sector at the administratively-determined KIR (cb2b IBM). Thus, this particular interbank market is not a market in which prices are determined by supply and demand; rather they are determined by decree (0%[23] in the b2cb IBM and KIR in the cb2b IBM)

This is the starting point of monetary policy and its central theme of interest rate influence / determination. The central bank in many countries (including South Africa) follows the policy of creating a liquidity shortage and accommodating this shortage by supplying loans (in the form of repurchase agreements – repos) at the KIR to cover the shortfall. The KIR is determined by the monetary policy committee (MPC) of the central bank based on a multitude of factors.

Lending to the banks at the KIR is the starting point of the monetary policy transmission mechanism (MPTM). The central bank ensures that the banks are at all times indebted to it in order to make KIR effective. The KIR represents the cost of money at the margin and exerts a powerful influence in the first instance on the other interbank market, the b2b IBM and from here on to the other money market rates and on to the longer rates, asset prices, the exchange rate, and so on until, ultimately, to price developments.

We present a notional central bank balance sheet below. Banks have two accounts with the central bank: reserve accounts (in which the cash reserve requirement funds are held) and settlement accounts (also called current accounts). The latter are used for interbank clearing (and are usually kept at zero by the banks[24]).

During the day the customers of banks and the banks themselves undertake many transactions leading to some banks owing money other banks. This process is settled electronically over the bank's settlement accounts. The surplus banks lend to the deficit banks at the interbank rate. This is where the central bank intervenes – in the interbank market. It also deals in the markets and brings about a permanent (= every day) liquidity shortage and it supplies the funds (called cash reserves) to the banks in order for them to settle. This means that the banks owe the central bank, as represented by item H in the balance sheet (this is the cb2b IBM). The funds are supplied at the KIR.

CENTRAL BANK (LCC MILLIONS)			
Assets		Liabilities	
		A. Notes and coin	1 000
F. Foreign assets	1 000	B. Deposits	
		1. Government	900
G. Domestic assets	1 000	2. Banks (= cash reserves)	
		a. Reserve accounts	500
H. Loans to banks @ KIR	400	b. Settlement accounts	0
		C. Foreign loans	200
I. Other assets	500	D. Central bank securities	200
		E. Other liabilities	100
Total	2 900	Total	2 900

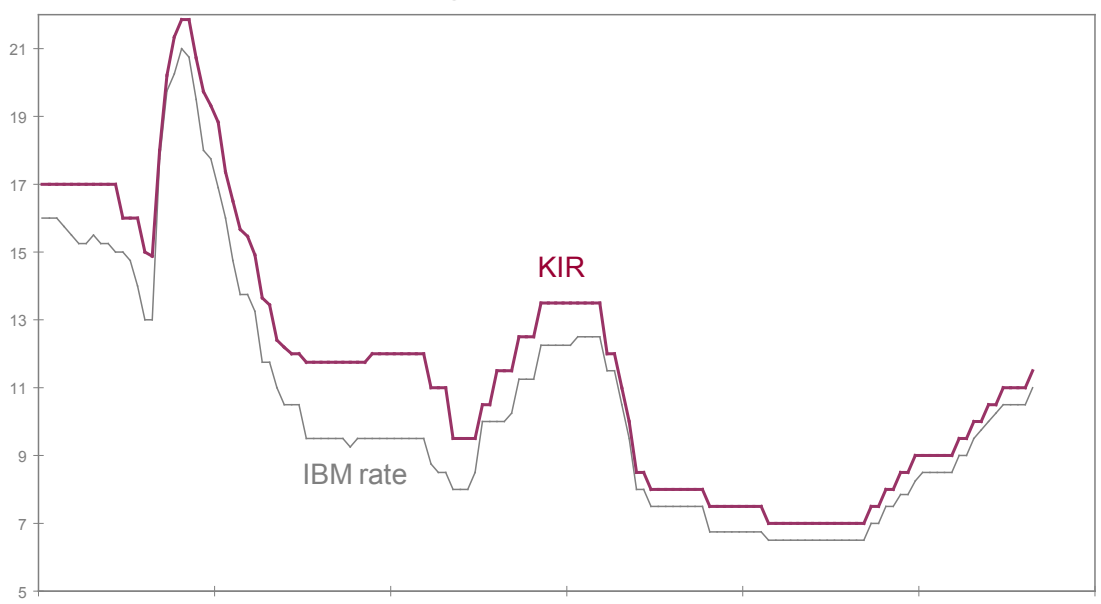


Figure 12: IBM rate & KIR

Because in the settlement process in the interbank market the banks endeavour not to borrow from the central bank, the b2b IBM is the first market affected by the KIR. The interbank rate established in the b2b IBM remains close to, but below, the highest rate in the 1-day "market": the KIR. The relationship between the interbank rate and the KIR is portrayed in Figure 12 (this is for a particular country for a period of six years; note that without exception the interbank rate is below the KIR).

The bank / bank interbank market has another leg: the smaller banks endeavour to close off their cash reserve positions before the final interbank clearing takes place. They do so with the large banks (who lend to them against collateral) at interbank lending rates which reflect the large banks' acute awareness of the KIR level.

2.7 Money market interest rates

Money market rates are determined (with reference to the KIR) in the two major markets of the money market (marketable and non-marketable):

- The wholesale short-term bank deposit market.
- The wholesale short-term debt market.

It should be apparent that there are competing forces in these two markets that make for fine pricing (indicating an efficient market):

- Ultimate lenders and non-bank financial intermediaries (investment vehicles and certain QFIs) that have wholesale short-term funds have a choice:
  - to deposit with banks [non-marketable (NNCDs) or marketable (NCDs)]
  - to buy the money market securities of the ultimate borrowers.

- Ultimate borrowers and non-bank financial intermediaries (certain QFIs) that have wholesale short-term funding requirements have a choice:
  - to borrow from the banks (issue NMD securities)
  - to issue marketable money market securities.
- Banks themselves have the desire to capture as much business as possible (at rates that reflect risk, etc); their business is financial *intermediation* which means that they want to remain *intermediated*; therefore they are inclined to price their products (deposits and loans) finely in order to discourage disintermediation (depositors buying securities with their bank deposits).

These competing forces, and competition between banks, make for competitive pricing in the money market. Although this is the case, as we saw earlier, the starting point for interest rates is the KIR made effective in the in the bank / central bank interbank market. The KIR impacts on the b2b IBM rate, and on call money and other money market rates.

The benchmark rate of interest in the wholesale short-term debt market is the prime lending rate of the banks. This is the rate at which the banks are willing to lend to prime customers. It is a high profile rate in that it is published by all banks. All other lending rates are benchmarked against the prime rate, for example the mortgage rate and the rates for non-prime customers (e.g. prime + 2%).

The ultimate aim of monetary policy is that the KIR should have a strong influence on bank lending rate (via the bank margin) (and therefore on the demand for credit). The prime lending rate of the banks and its relationship with the KIR is shown again in Figure 13 (for a particular country for a period of sixty years). It is quite apparent that the banks' prime rate takes its cue from the KIR, and that monetary policy is effective.

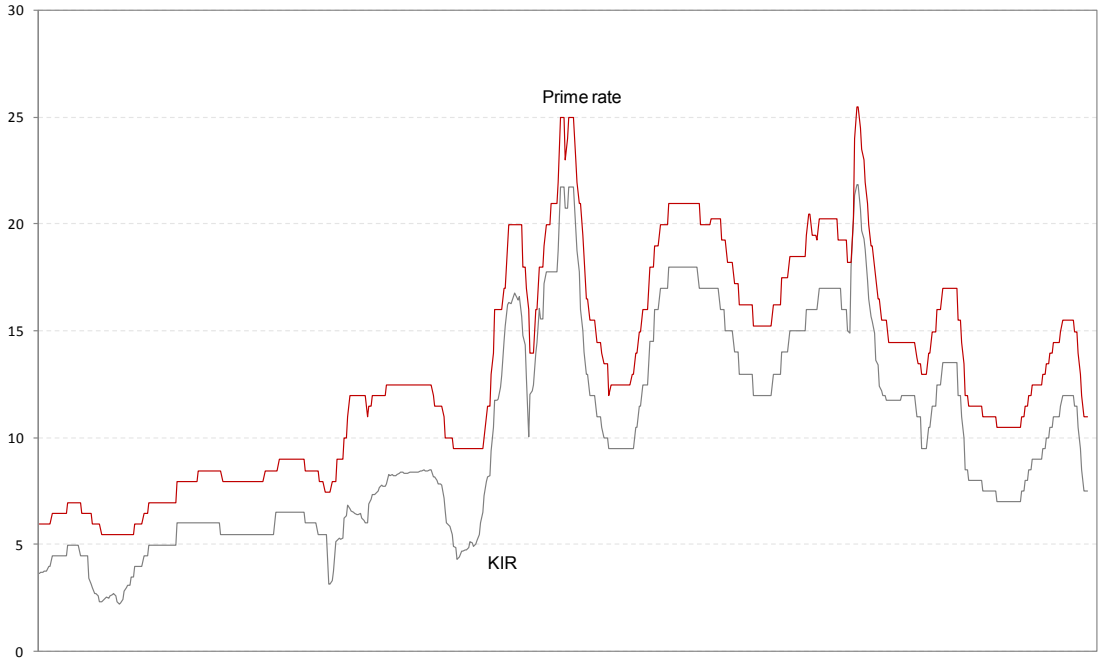


Figure 13: KIR & prime lending rate

This all important interbank market is accorded a separate module, which should make the above synopsis of the interbank market clearer.

2.8 Money market derivative markets

Although derivative instruments do not represent lending and borrowing (they are used for hedging, a substitute for market exposure, and speculation) we mention them here for the sake of completeness.

The money market derivative instruments are derived from (or take their value from) the spot (cash) market money market instruments (marketable and non-marketable), and they provide the means for transferring risk (hedging) or for speculation. They are:

- Forwards:
  - Forward interest rate contracts.
  - Repurchase agreements.
  - Forward rate agreements (FRAs).
- Futures:
  - Short-term interest rate futures.
- Options:
  - Options on interest rate futures.
  - Options on money market instruments.
  - Interest rate caps and floors.
- Swaps:
  - Interest rate swaps.

2.9 International aspects of the money market

2.9.1 Introduction

Money markets are not confined within the borders of countries. International money market dealers (i.e. the banks) seek out the best return around the world and international trade is financed in the money market.

This brief section discusses the international aspects of the money market, under the following sections:

- Foreign exchange market.
- Bankers' acceptances in foreign trade.
- Eurocurrency markets.
- Foreign investment in the South African money market.

2.9.2 Foreign exchange market

It is well known that the foreign exchange market is one of the most active of all financial markets. Each wholesale foreign exchange transaction has a money market leg because a foreign exchange transaction is effected in a bank deposit in the first instance, which then leads to an investment in a security or the purchase of commodities, property and so on.

2.9.3 Bankers' acceptances in foreign trade

International trade increases each year, and this trade is financed in the money markets of the world. The instruments used for trade are the faithful overdraft facility and the bank acceptance, and in the past also the trade bill. As noted before, the overdraft facility is a most convenient facility because funds are available on demand and the debt can be repaid as funds are received.

Internationally (although the market is dwindling), bankers' acceptances are used in foreign trade. The main reason for this is, for example, that exporters often are not informed as to the creditworthiness of the importer of their goods. Other good reasons for the use of acceptances are that the country exported to may be experiencing political turmoil which could affect repayment.

The use of acceptances essentially shields exporters from potential hazards. They shift part of the risk of trade on to the bank. Certain banks are professionals in the assessment of risk and are ready to take on this type of risk for a fee.

2.9.4 Eurocurrency market

The Eurocurrency market developed as a result of regulation on interest rates in the US and concerns in the past about the holding US deposits by non-US citizens. The Eurocurrency market is thus a market in financial instruments issued in Europe (originally, but now also in other countries) that are denominated in US dollars (again originally, because this practice has extended also to other currencies).

The major instruments of the Eurocurrency market are:

- Eurodollar certificates of deposit or "CD" (or NCD). These are NCDs issued in dollars by non-US banks and by the branches of US banks in other countries, mainly in Europe. Other currencies are also used in this market.
- Euronotes, i.e. medium-term debt instruments. The notes are the debt obligations of companies, and they are denominated in many different currencies.
- Eurocommercial paper, i.e. short-term debt instruments issued by companies. These instruments are also denominated in many different currencies.

2.10 Economics of the money market

2.10.1 Introduction

The economic functions of the money market were implicit in the foregoing. Here we make them explicit, in the following sections:

- Provision of short-term funds.
- Outlet for short-term funds.
- Genesis of interest rates.
- Secondary money market.
- Open market operations.

2.10.2 Provision of short-term funds

The most obvious, but significant, function of the money market is the provision of short-term funds to borrowers when required by them – mainly for bridging finance purposes. The funds are forthcoming from the ultimate lenders either directly to the borrowers, but more usually via the financial intermediaries, particularly the banks. (This is an ex post view.)

The large corporates are able to borrow at lower rates in the money market securities market (CP, BAs, PNs) than the rates offered by the banking sector (for bank loans).

Government borrows at the lowest rates in the money market, because it issues risk-free securities (TBs).

The money creation function of banks makes for the supply of funds to be virtually unconstrained. This of course depends on the creditworthiness of individuals (who apply for credit), the viability of the projects of companies (who apply for credit), and the level of lending interest rates.

2.10.3 Outlet for short-term funds

Corporates, banks and the institutions hold money market investments for numerous purposes, but the main purposes usually are:

- As a temporary haven for funds earmarked for other investment classes.
- Institutions: to meet investment outflows (e.g. unit trusts).
- Banks: to meet deposit outflows.
- Banks: to meet the statutory liquidity (liquid asset) requirement (which applies in most countries)
- Banks: to allow for central bank borrowing (accommodation). The securities that are eligible for use as "repo securities" (i.e. to use for accessing central bank accommodation) in most countries are treasury bills, government bonds, central bank securities and securities that are government guaranteed.

2.10.4 Genesis of interest rates

As we have seen, interest rates have their genesis in the money market. Rates start with the KIR (cb2b IBM) and the b2b IMB and spread out from here to other rates, including longer rates.

2.10.5 Secondary money market

An active secondary market in money market securities is imperative for a number of reasons, particularly price discovery, reduction in borrowing costs, and the portfolio opportunities created. (This was covered in detail earlier.)

2.10.6 Open market operations

The money market plays an important role in monetary policy in that it enables the central bank to perform its functions with ease. The central bank is able to operate in the interbank market (to implement KIR) and the primary and secondary money markets in order to influence the liquidity of the banking sector.

The importance of the primary market lies therein that the central bank is able to issue its own securities and in so doing reduce bank liquidity. Central banks that do not have this facility are able to issue treasury bills for this purpose (assuming that the proceeds are sterilised).

The importance of the secondary market lies therein that the central bank is able to operate in the market in existing securities, i.e. sell from portfolio or buy for portfolio (OMO), in order to influence bank liquidity.

2.11 Summary

Demand in the money market is forthcoming from the ultimate borrowers and the financial intermediaries (other than the investment vehicles; they demand "investment funds"), and supply is forthcoming from the ultimate lenders and all the financial intermediaries. The banks have a unique role in that they are able to create money (deposits = demand) by making new loans (= supply), a case of supply creating its own demand.

The secondary money market is of the OTC variety and the issues methods are private placement, auction and "tap". Broker-dealers generally operate a screen-telephone trading system and the trading driver is order and quote.

There are two interbank markets: the bank / central bank interbank market (made up of the b2cb IBM and the cb2b IBM) and the b2b IBM. Monetary policy is played out in these markets and the very short-term interest rates have their genesis here.

The money market has derivative markets and some of the derivatives are unique to this market (repos, caps and floors, and FRAs).

The money market has an international dimension, and plays a significant role on the financial system and the economy.

2.12 Bibliography

Faure, AP, 2007. The money market. Cape Town: Quoin Institute (Pty) Limited.

3 Interbank market & monetary policy

3.1 Learning outcomes

After studying this text the learner should / should be able to:

- Define the interbank market.
- Describe the role of the bank / central bank interbank market in the implementation of monetary policy.
- Describe the role of the central bank in interbank clearing.
- Examine the role played by the bank / bank interbank market in the facilitation of liquidity management by banks.
- Examine the role played by the bank / bank interbank market in the context of monetary policy transmission.

3.2 Introduction

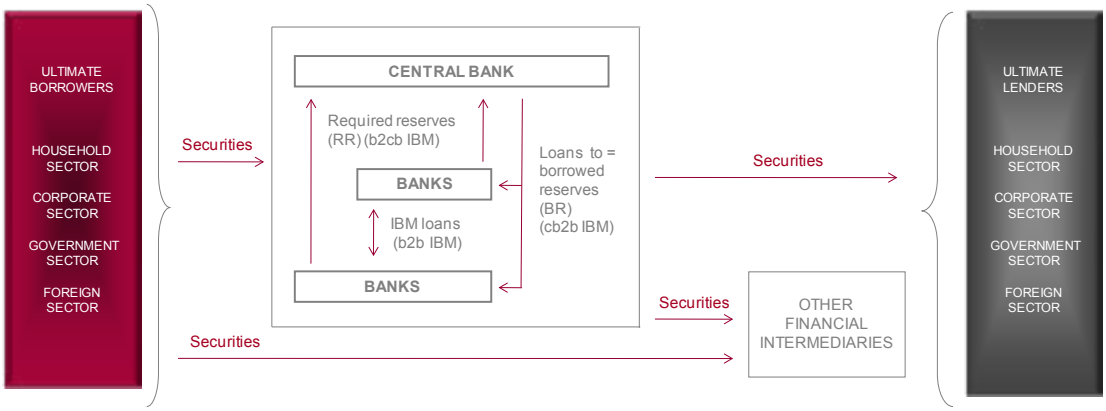


Figure 1: interbank markets

The money market encompasses:

- The primary markets that bring together the supply of retail and wholesale short-term funds and the demand for wholesale and retail short-term funds.
- The secondary market in which existing short-term MD instruments are traded.
- The creation of new money (deposits) and the financial assets that lead to this (loans in the form of NMD securities and MD securities).
- The bank / central bank interbank market (cb2b IBM and the b2cb IBM) where interest rates have their genesis (i.e. where monetary policy is implemented).
- The bank / bank interbank market (b2b IBM) where the KIR has its secondary impact, i.e. on the interbank rate.
- The money market derivative markets (= an addendum).

Here we focus on the interbank market (see Figure 1). As the name indicates, the interbank market is the market for bank loans to, or deposits with, other banks. “Banks” means the central bank and the private sector banks. For the sake of simplicity, here we call the central bank as is and the private sector banks “banks”.

The interbank market is entirely a *primary* market[25]; it is made up of three sub-markets:

- The bank to central bank interbank market (b2cb IBM), which is an administratively-driven market, and covers the flow of cash reserves (R) (deposits with the central bank are termed cash reserves or just reserves) that banks are required to hold with the central bank in terms of the statutory reserve requirement (RR).
- The central bank to bank interbank market (cb2b IBM) which encompasses the lending of reserves by the central bank to the banks, the outstanding amount of which at a point in time is called the *money market shortage* (MMS) or the liquidity shortage (LS) or *borrowed reserves* (BR); central bank loans are provided at the KIR.
- The bank to bank interbank market (b2b IBM), which is the market in which banks lend funds to one another. As this takes place over the banks' settlement accounts with the central bank it can be called *cash reserves* market or the *cash reserve funds* market or just the *reserve funds* market. The rate that is discovered in this market is the *interbank rate*. In the US this market is called the *Fed Funds* market and the rate the *Fed Funds* rate.

In the interbank markets *no new funds are created*; existing funds are merely shifted around the banking system. We discuss this significant market under the headings:

- Bank to central bank interbank market (required reserves).
- Bank to bank interbank market at the final interbank clearing (reserve funds market).
- Bank to central bank interbank market (liquidity shortage).
- Other bank / bank interbank markets.

3.3 Bank to central bank interbank market (required reserves) (b2cb IBM)

All banks are statutorily required (usually in terms of the statute governing the central bank) to maintain an amount of funds with the central bank based on the size of their deposits or liabilities (deposits make up the large majority of *liabilities). This is called the cash reserve requirement or just the reserve requirement* (RR; we also use RR for *required reserves*) and the funds held at the central bank are usually termed *cash reserves* or just *reserves*. The RR differs from country to country and ranges from 0% to 25%[26].

The *required* reserves of banks are held in *reserve accounts*[27] with the central bank and are increased or decreased on a monthly basis as the banks' deposits (liabilities) rise or fall, or the reserve requirement ratio (r) is increased or decreased (which occurs infrequently in most countries). As we will see below, in most countries, banks also have settlement or current accounts with the central bank, over which interbank settlement takes place. On these accounts banks may hold excess reserves (ER) although this is rare (in most countries). In some countries banks have just one account on which RR and ER are held. In this discussion we assume the banks have just one central bank account on which they keep their *total reserves* (TR), therefore TR = RR + ER.

It is important to note that, usually, no interest is payable on these balances (we assume this in this text).

BALANCE SHEET 1: CENTRAL BANK (LCC MILLIONS)			
Assets		**Equity and liabilities**	
E. Foreign assets	1 500	A. Notes and coins	1 000
		B. Deposits	
		1. Government	900
F. Domestic assets	1 000	2. Banks (TR)	500
		RR (500)	
G. Loans to banks @ KIR	400	ER (0)	
		C. Foreign loans	200
		D. Central bank securities	300
Total	**2 900**	**Total**	**2 900**

An example will assist comprehension. We present simplified balance sheets[28] of the central bank and the private sector banks with notional numbers, and assume that the *r* is equal to 10% of deposits (see Balance Sheets 1–2). It will be seen that the banks' RR are exactly equal to 10% of deposits (LCC[29]500 million = 0.1 × LCC 5 000 million) which is close[30] to reality because no interest is paid on these deposits. This means that the banks do not hold excess reserves with the central bank.

BALANCE SHEET 2: PRIVATE SECTOR BANKS (LCC MILLIONS)			
Assets		**Equity and liabilities**	
C. Bank notes and coins	100		
D. Reserves with CB (TR)	500		
RR (500)		A. Deposits	5 000
ER (0)		B. Loans from CB @ KIR	400
E. Loans (NMD + MD)	4 800		
Total	**5 400**	**Total**	**5 400**

3.4 Bank to bank interbank market at the final interbank clearing (reserve funds market) (b2b IBM)

3.4.1 Introduction

The reserve funds market is a particularly significant market because it is in this market that the earliest point of the yield curve is determined, i.e. short-term rates. As noted, the US equivalent of the cash reserve funds market is the *Federal Funds market* one often hears about in terms of US monetary policy. In order to understand this market, it is necessary elucidate the interbank clearing process at the close of business on a day.

3.4.2 Central bank in function as "bank of central clearance and settlement of claims"

As noted above, in addition to their reserve accounts, the clearing (mainly commercial) banks in many countries maintain *settlement accounts* (also known as *current* and *free balance accounts*) with the central bank. The banks generally do not maintain balances on these accounts (except in error) because the central bank does not pay interest on such balances). These settlement accounts are at the very centre of the financial system. As above, we assume just one account on which RR is held and over which the interbank settlement takes place.

It will be apparent that some sort of system must be in place to cater for the clearing and settlement of claims that banks have on one another each day at the close of business. This has been one of the functions carried out by central banks from their inception, and it is closely allied with its monetary policy function.

The need for central clearing and settlement facilities arises from the fact that a cheque drawn on (or EFT[31]) made from) a particular bank will most likely be deposited by the recipient with (or EFT funds transferred to) a different bank. Until many years ago cheques held by the various clearing banks against one another were physically exchanged, i.e. *cleared*, in a physical place, i.e. a *clearing house*, where representatives of each of these banks gathered at specific times each day (usually twice). The central bank served as the *clearing house* in centres in which it had branch offices.

The modern systems that cater for this process are twofold:

- An electronic system that sets (or nets) off the claims that banks have on one another (for the clearing of the smaller cheques and EFTs).
- An electronic system that operates on a real time gross settlement (RTGS) basis for large amounts.

We refer in this text to the clearing / settlement system as IBCH[32].

At the centre of the clearing / settlement process is the central bank. It provides for the *central clearance and settlement of claims*. This simply means that at the end of the final interbank clearing, the clearing banks end up with a *net cash reserve position* on their accounts with the central bank. These *positions* may be negative or positive, i.e. they reflect the *amounts owed to the central bank or by the central bank*. This bewildering situation will become clearer as this discussion progresses.

A negative (deficit) clearing amount will reduce the TR balance and put the bank in contravention of the statutory cash reserve requirement.[33] A positive clearing amount will increase that bank's TR to an amount in excess of that required (RR), i.e. it will have ER. ER balances are of course allowed but this does not make good business sense – because, as noted, reserve balances with the central bank earn no interest.

3.4.3 Bank to bank interbank market after interbank clearing and settlement

The final reserve funds market operation is set in motion immediately after the clearing / settlement process is completed, i.e. when the banks are advised as to the balances on their accounts at the central bank. As noted, the clearing amounts are positive or negative, making TR > RR = ER + or TR < RR. The latter is not permitted.

The banks with TR < RR (negative clearing amounts) will endeavour to borrow reserves from the other banks that have a TR > RR = ER+ balances on their central bank account. The reason for this is that the only other alternative is to borrow the reserves required to make up the shortfall from the central bank at the KIR, i.e. the central bank's accommodation rate, *which is the highest call (or short-term) rate in the market*.

A bank which has ER at the end of the clearing process, which is indebted to the central bank, will repay the central bank by the amount of its ER. On the other hand, a bank with ER, which is not indebted to the central bank, will endeavour to lend these reserves to the deficit bank/s. As noted, the motivation for this is the *opportunity cost*, i.e. interest is not paid by the central bank on excess balances.

The reserve funds market is a telephone-based market. The dealers in the treasury departments of the banks simply telephone one another and play the "cat and mouse" game of not sounding too desperate or keen (depending on whether they are surplus or short in terms of reserves), all in an effort to secure the best rates, i.e. the lowest in the case of a borrower, and the highest in the case of a lender.

3.4.4 Example of bank to bank interbank transaction

It may be useful at this stage to provide a simple example of the interbank market between private sector banks after the final IBCH clearing, and how this impacts on the banks' reserves at the central bank.

Mr A banks with Bank A and Mr B banks with Bank B. Mr A buys goods to the value of R100 million from Mr B by presenting him with a cheque for this amount, which is of course drawn on Bank A. Mr B deposits the cheque with Bank B. The cheque is put through the IBCH system. At the close of business the two banks' treasurers are confronted with electronic information on the changes in their accounts with the central bank, as indicated in Balance Sheet 3.

BALANCE SHEET 3: CENTRAL BANK (LCC MILLIONS)			
Assets		**Equity and liabilities**	
		Bank reserves Bank A Bank B	 -100 +100
Total	**0**	**Total**	**0**

The banks' balance sheets of course changed as indicated in Balance Sheets 4–5.

BALANCE SHEET 4: BANK A (LCC MILLIONS)			
Assets		**Equity and liabilities**	
Reserves at CB	-100	Deposits (Mr A)	-100
Total	**-100**	**Total**	**-100**

BALANCE SHEET 5: BANK B (LCC MILLIONS)			
Assets		**Equity and liabilities**	
Reserves at CB	+100	Deposits (Mr B)	+100
Total	**+100**	**Total**	**+100**

Bank A is in contravention of the cash reserve requirement to the tune of LCC 100 million (read the negative balance as having reduced its TR which is now less than RR, while Bank B has surplus reserves (ER) of this amount (assuming it is not indebted to the central bank) on which it will not earn interest. The interbank market now swings into operation, and the outcome of the cat and mouse game is that Bank B will lend the reserves to Bank A. Balance Sheets 6–7 indicate the balance sheets changes (including the original transaction).

BALANCE SHEET 6: BANK A (LCC MILLIONS)			
Assets		**Equity and liabilities**	
Reserves at CB (TR) Reserves at CB (TR)	-100 +100	Deposits (Mr A) Loan (from Bank B)	-100 +100
Total	**0**	**Total**	**0**

BALANCE SHEET 7: BANK B (LCC MILLIONS)			
Assets		**Equity and liabilities**	
Reserves at CB (TR) Reserves at CB (TR) Loan (to Bank A)	+100 -100 +100	Deposits (Mr B)	+100
Total	**+100**	**Total**	**+100**

This is given effect with an instruction by Bank B to the central bank to debit its account by LCC 100 million and to credit Bank A's account by LCC 100 million. This may be depicted as in Balance Sheet 8 (including the original transactions):

BALANCE SHEET 8: CENTRAL BANK (LCC MILLIONS)			
Assets		Equity and liabilities	
		Bank reserves Bank A Bank B Bank A Bank B	 -100 +100 +100 -100
Total	0	Total	0

Mr A's and Mr B's balance sheets changed as indicated in Balance Sheets 9–10.

BALANCE SHEET 9: MR A (LCC MILLIONS)			
Assets		Equity and liabilities	
Goods Deposits (Bank A)	+100 -100		
Total	0	Total	0

BALANCE SHEET 10: MR B (LCC MILLIONS)			
Assets		Equity and liabilities	
Goods Deposits (Bank B)	-100 +100		
Total	0	Total	0

In the example above the central bank's balance sheet did not change on a net basis. This is because the central bank did not do any other deals / transactions that day (assumed).

3.4.5 Interbank rate

The final rate established by the interaction of the surplus and deficit banks is the interbank rate. This rate is related to the previous day's interbank rate, the call rate established during the day's business and, ultimately, the central bank's lending rate, i.e. the KIR. This is the newly established interbank rate.

Of these factors, the major factor in determination of the interbank rate is the KIR, and this is because reserves are available to the banks at this rate. Thus, deficit banks will endeavour to borrow funds at below this rate and surplus banks will demand a rate as high as possible but below the KIR. It should thus be evident that the interbank rate cannot be higher than the KIR (because the supply of reserves by central bank takes place at this rate).

Thus, the KIR represents a ceiling rate in the interbank market, as substantiated by Figure 2. It shows the call money, interbank and KIR time series rates for a particular country for a period of seven years, and it is evident that KIR represents a ceiling rate for the very short term money rates.

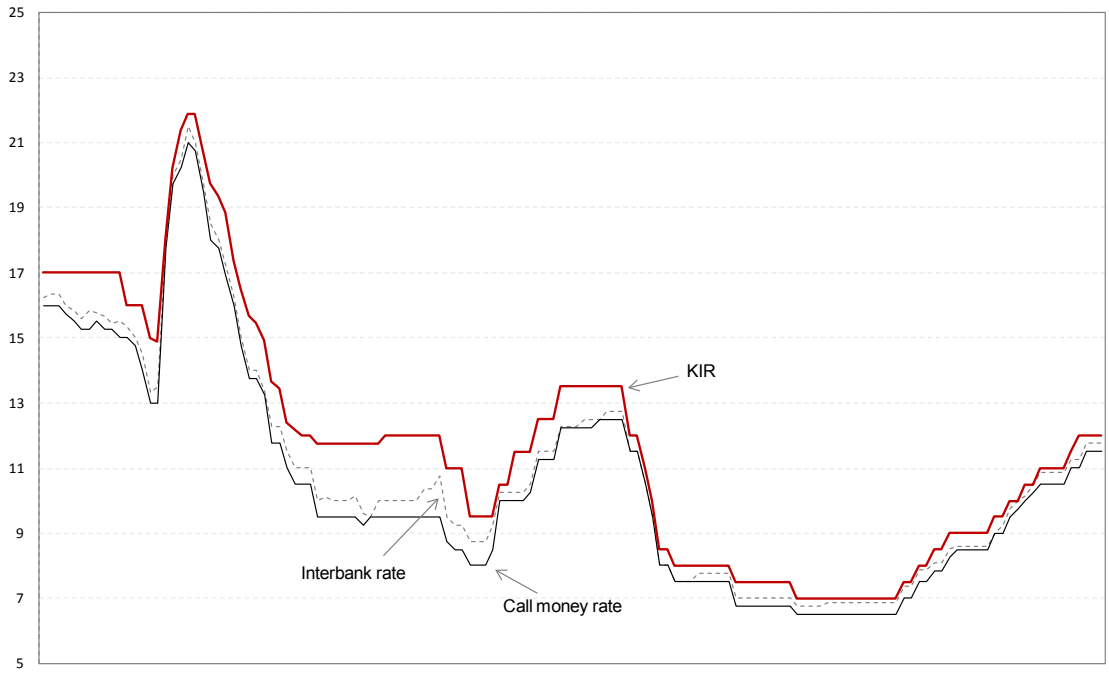


Figure 2: call money rate, interbank rate & KIR

3.5 Central bank to bank interbank market (liquidity shortage) (cb2b IBM)

3.5.1 Introduction

At the end of the reserve fund placing process (the b2b IBM), the net result is that the banks, in aggregate, would be in surplus or in deficit in terms of their collective reserve requirement. This sets in motion the cb2b IBM, which means that the central bank:

- (in the case of a deficit) lends to the banks (borrowed reserves – BR) in order that they comply with the reserve requirement, or
- (in the case of a surplus) repays the banks because they have funds in excess of the reserve requirement [i.e. their indebtedness (BR) to the central bank reduces].

One of the tenets of monetary policy in most monetary systems of the world is that the banks are permanently indebted to the central bank. As we have seen, the outstanding amount of indebtedness is called the money market shortage (MMS) or the liquidity shortage (LS). The purpose of having an LS is to *make KIR effective*, which is very heart of monetary policy.

Central bank accommodation to the banks in most countries is granted in the form of repurchase agreements (repos)[34] conducted with the central bank for a period at the repo rate (which we call the KIR). This simply means that the banks sell certain eligible securities (usually treasury bills and government bonds) to the central bank for a day or a few days under an agreement to repurchase them when they are able to. (It is more complicated that this but we ignore the details here for the sake of didactic elucidation.)

This "complicated" borrowing / lending system of some central banks disguises a simple loan to the bank/s for a short period of a day or a few days at the KIR. Although it amounts to the sale of an asset by the bank to the central bank for a short period (a reduction in an asset) we present it as an increase in a liability (loan) with the repo securities representing the collateral.

Since the banking system is always indebted to the central bank (i.e. always in a BR situation = LS), a surplus reserves situation at the end of the interbank clearing process will lead to a reduction in the amount of BR (i.e. a fall in the LS). On the other hand, a deficit position will lead to an increase in the overall amount of BR (i.e. an increase in the LS). This marks the end of the interbank market process for the day.

It is to be noted that if the LS falls or increases, the "cause" can be found in the balance sheet of the central bank. The means that the LS changes only when the central bank undertakes a transaction, or if a transaction by the private bank or non-bank sector takes place that affects the balance sheet of the central bank (this is an interesting subject that will be touched upon later).

As noted, in most countries the banks are permanently indebted to the central bank, i.e. there is a permanent outstanding amount of indebtedness to the central bank (BR or LS). It will be evident that the LS can also be presented on a net basis with an opposite sign (taking into account any ER the banks may have on their accounts) as net *excess* reserves (NER). In terms of the balance sheet of the central bank presented above this would be equal to the ER of the banks (which is usually = zero) less the amount of BR (the LS); therefore NER = ER – BR. This is a useful measure of money market liquidity. An increase in NER will be seen as an improving liquidity situation (because it results from a decline in the LS), and a decline in NER will be seen as a deteriorating liquidity situation (increase in the LS).[35] We will return to this analysis a little later.

3.5.2 Example of central bank to bank interbank transaction

An example is required in order to integrate this knowledge. However, before we get to it, it may be important to repeat part of the above in different words:

Many millions of bank transactions are done in a single day, including by the central bank. At the conclusion of the b2b IBM interaction, there is a *net outcome* in terms of reserves (on the accounts of the banks). The banks will be short *or* be in surplus *on the day*. This is where the cb2b IBM comes into play and it works as follows:

As mentioned before, the banking system in most countries (in normal times) is *always* in a BR (LS) situation, i.e. the banks are indebted to the central bank at *all* times. This is a central element of monetary policy. Another way of putting this is that a proportion of the banks' *required reserves* are *always* borrowed. Thus, in the case where the banks are in surplus on their accounts at the end of the day's b2b IBM interaction (i.e. have ER), they will utilise these ER to reduce their indebtedness to the central bank (BR). In this case the LS (i.e. the *balance* or *outstanding amount* from the previous day) will fall by the amount of the net surplus.

On the other hand, when the banks (some of them) are in deficit after the b2b IBM, they have no option by to increase their indebtedness to the central bank. This is because *there is no other source of reserves.* The central bank *always* supplies the reserves; *it has no option but to do so*. The LS will increase from the previous day by the amount of the collective deficits of the deficit banks.

It is central to this discussion to understand that *no bank is able to create its own reserves.* This is perhaps best explained by assuming that Bank A is in deficit after the interbank clearing. It draws a cheque upon itself (called a *cashier's cheque*) and presents it to the central bank to credit its account. The central bank does so, but now it has a *claim on the bank* in question. Thus, the central bank will debit Bank A's account. *Nothing has been achieved*. Conclusion: no bank can create *central bank money*.

It is appropriate at this stage to take the example shown above a little further along the road of reality. Assume that the LS on day 1 is LCC 10 223 million (split as follows: Bank A: LCC 2 112 million; Bank B: LCC 3 556 million; other banks: LCC 4 555 million). Mr A draws a cheque for LCC 100 million on Bank A on day 2 and presents it to Mr B in exchange for the goods. Mr B deposits the cheque with Bank B. The latter bank would put the cheque through the IBCH system. Assume that this is the only transaction that takes place on the day. At the close of banking business, the treasury officials of the banks are presented with electronic statements from the IBCH in respect of day 2; they find the following:

- Bank A: deficit on its central bank account of LCC 100 million
- Bank B: credit on its central bank account of LCC 100 million
- Other banks: no change on their central bank accounts.

The bank / bank interbank market fires up, *but only Bank A will be frantically trying to find surplus funds*. And *Bank A will not find the funds*. This is because Bank B already is borrowing from the central bank at KIR. Because the KIR is the *highest rate* in the market, Bank B will repay the central bank LCC 100 million. Bank A will have no option but to borrow LCC 100 million from the central bank. The LS, i.e. the outstanding amount of accommodation to the banking sector on day 2 has not changed (see Balance Sheets 11–13).

BALANCE SHEET 11: BANK A (LCC MILLIONS)			
Assets		**Equity and liabilities**	
		Deposits (Mr A) Loans from CB	-100 +100
Total	**0**	**Total**	**0**

BALANCE SHEET 12: BANK B (LCC MILLIONS)			
Assets		**Equity and liabilities**	
		Deposits (Mr B) Loans from CB	+100 -100
Total	**0**	**Total**	**0**

BALANCE SHEET 13: CENTRAL BANK (LCC MILLIONS)			
Assets		**Equity and liabilities**	
Loans to Bank A Loans to Bank B	+100 -100		
Total	**0**	**Total**	**0**

Overall, the LS has not changed; there has been a shift in central bank accommodation between Bank A and Bank B.

From this it can be gauged that something else must occur in order for the LS to change from day to day. As noted earlier, central to the understanding of the LS is the fact that the *reserve position of the banks only changes when some other transaction has taken place that is reflected in the central bank's balance sheet.* An example is required.

Assume that the LS is as above on day 1 (LCC 10 223 million). The only transaction that takes place on day 2 is the central bank sells LCC 100 million treasury bills from its portfolio to Bank A. Bank A settles the transaction by doing an EFT for LCC 100 million in favour of the central bank. At the end of the business day the bank treasurers will find the following on their electronic IBCH statements:

- Bank A: debit on its central bank account of LCC 100 million
- Other banks: no change on their central bank accounts.

The b2b IBM is set in motion and Bank A is not able to find any bank with surplus reserves. Bank A has no option but to increase its indebtedness to the central bank. The LS increases to LCC 10 323 million, i.e. it increased by LCC 100 million. There are two steps to this process:

Step 1:

BALANCE SHEET 14: BANK A (LCC MILLIONS)			
Assets		**Equity and liabilities**	
Reserves at CB (TR) RR (-100) ER (0) Treasury bills	-100 +100		
Total	**0**	**Total**	**0**

BALANCE SHEET 15: CENTRAL BANK (LCC MILLIONS)			
Assets		**Equity and liabilities**	
Treasury bills	-100	Bank reserves (TR) RR (-100) ER (0)	-100
Total	**-100**	**Total**	**-100**

Bank A had no ER to start off with and is now in contravention of the reserve requirement. It has no option but to borrow LCC 100 million from the central bank:

Step 2:

BALANCE SHEET 16: BANK A (LCC MILLIONS)			
Assets		**Equity and liabilities**	
Reserves at CB (TR) RR (+100) ER (+0)	+100	Loans from CB	+100
Total	**+100**	**Total**	**+100**

BALANCE SHEET 17: CENTRAL BANK (LCC MILLIONS)			
Assets		**Equity and liabilities**	
Loans to Bank A	+100	Bank reserves (TR) RR (+100) ER (0)	+100
Total	**+100**	**Total**	**+100**

Net outcome:

BALANCE SHEET 18: BANK A (LCC MILLIONS)			
Assets		**Equity and liabilities**	
Reserves at CB (TR) RR (0) ER (0) Treasury bills	 +100	Loans from CB	+100
Total	**0**	**Total**	**0**

BALANCE SHEET 19: CENTRAL BANK (LCC MILLIONS)			
Assets		**Equity and liabilities**	
Treasury bills Loans to Bank A	-100 +100	Bank reserves (TR) RR (0) ER (0)	
Total	**0**	**Total**	**0**

The central bank has loaned LCC 100 million to Bank A, i.e. there was a flow from the central bank to Bank A, which led to an increase in the LS from LCC 10 223 million to LCC 10 323 million. This is the *central bank to bank interbank market* (cb2b IBM).

In conclusion, the following should be evident:

- If, in the above transaction, the central bank was an ordinary bank it would have simply lent the LCC 100 million to Bank A in the b2b IBM at the market-determined interbank rate.
- The central bank interposes itself in the monetary system and causes a sort of "blockage", which it "unblocks" in a different way: by "recycling" the funds (reserves) at an administratively determined rate, the KIR.
- Bank A had no option but to accept the recycled funds at the KIR.
- This may be seen in another way: the increased LS (a result of the new central bank loan) arises because the central bank is the only bank in the system that does not do *normal* interbank transactions. It does not maintain bank accounts with the other banks into which it deposits the LCC 100 million it received. It *lends* the relevant amount to the bank in the form it decides upon (overnight, repo system or other), and at its administratively determined rate (KIR).
- Any transaction effected by the central bank will impact on the LS. For example, the purchase of a security will reduce the LS; the issue of more bank notes will increase the LS; the sale of the central bank's own securities will increase the LS.
- The central bank has total control over the LS and the KIR and therefore on the b2b interbank rate.

3.5.3 Significance of the KIR

It will be useful to again highlight the significance of the KIR. The KIR is an administratively-determined rate set by the central bank and it largely "determines" the b2b interbank rate. But it only does so when the banks are indebted to the central bank, i.e. are in a BR situation. In most countries this is a permanent condition (however, it is not the case in extraordinary economic situations when the central bank wishes to "force" interest rates down, as happened in the past recession).

When the banks are chronically short of reserves, the KIR impacts directly on the b2b interbank rate, which in turn has a major effect on bank call money rates (the rates for wholesale one-day money) because banks aggressively compete for this money in order *not to borrow from the central bank* at the KIR (the highest rate for very short-term money) (see Figure 2). The call rate has a major influence on other deposit rates. Therefore, the KIR impacts on all the deposit rates of banks. As profit-maximisers, the banks endeavour to maintain a steady "margin" (i.e. the interest rate differential between the cost of money and their lending rates, the most significant of which is the prime rate[36]); therefore, a change in the KIR is reflected in bank lending rates in the same direction and to the same extent. Figure 3[37] provides strong evidence of this relationship (correlation coefficient = 0.99).

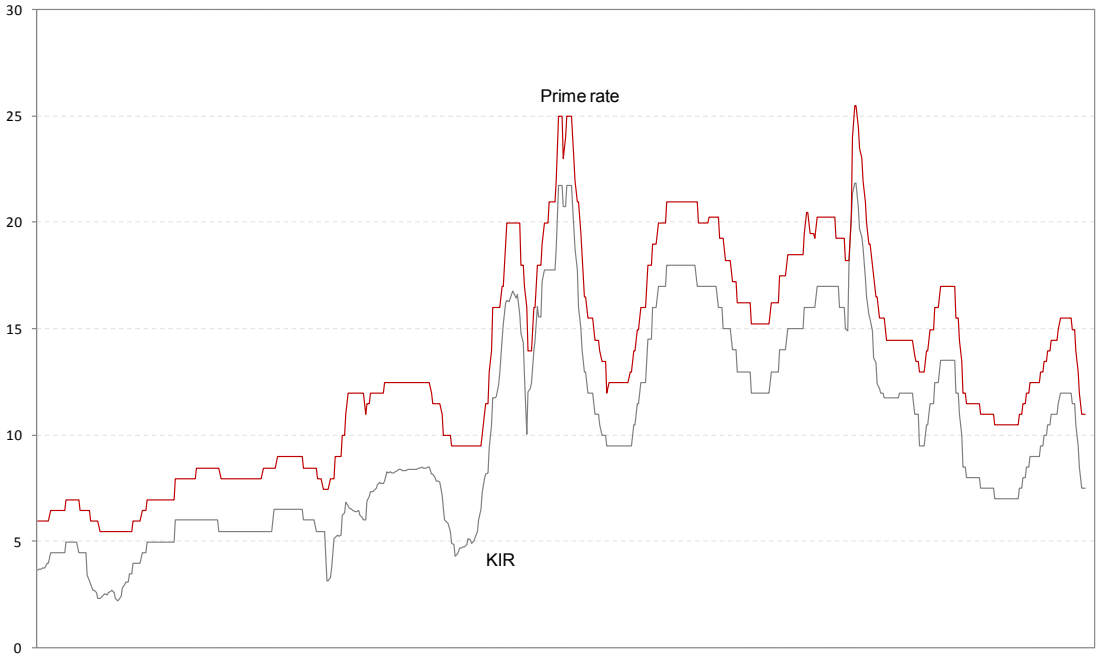


Figure 3: KIR & prime rate (month-ends over 50 years)

The significance of this relationship should be clear:

- The level of the banks' prime lending rate has a major influence on the public's demand for bank loans.
- Satisfied demand for credit is the counterpart of new money creation (see Figure 4 – for a particular country for a period of about 50 years).

It is to be expected therefore Interest rates therefore have a major impact on domestic demand (GDE – see Figure 5 – for a particular country for a period of over 50 years).

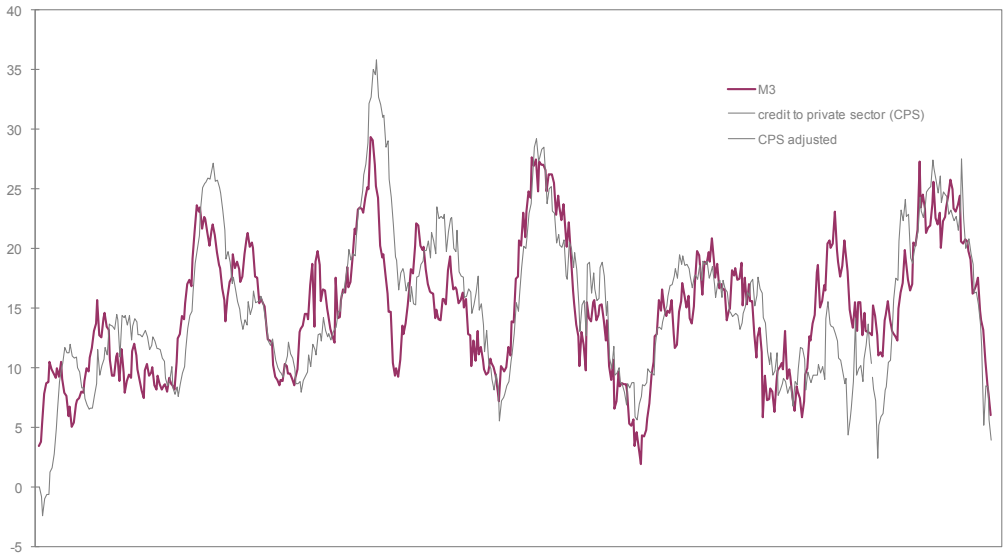


Figure 4: M3 & bank credit (yoy %)

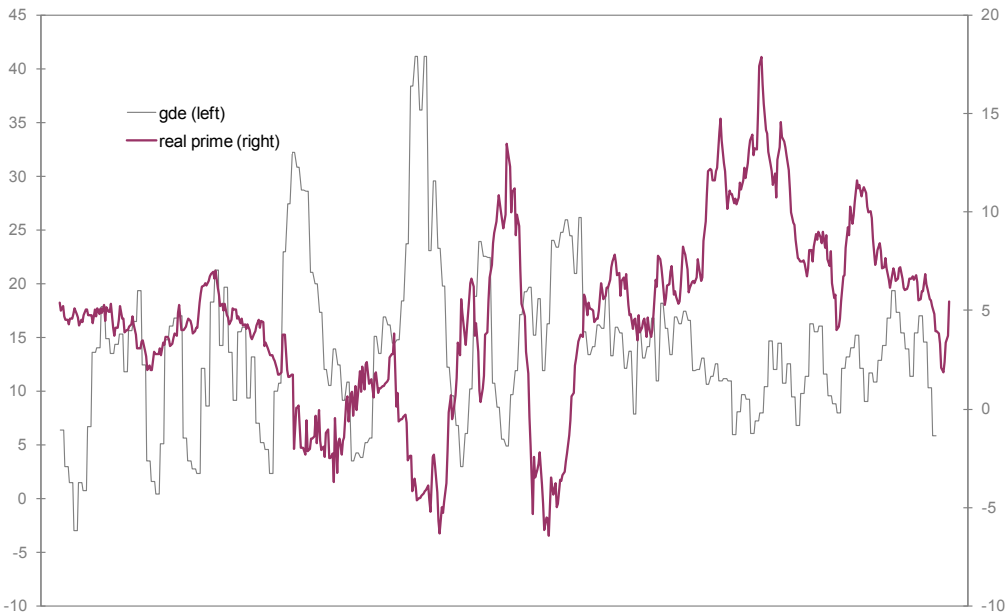


Figure 5: current GDE (yoy %) & real prime (adv 12 months)

It is therefore also expected that there will be a close inverse relationship between interest rates (in real terms) and inflation (see Figure 6 – for a particular country for a period of over 60 years).

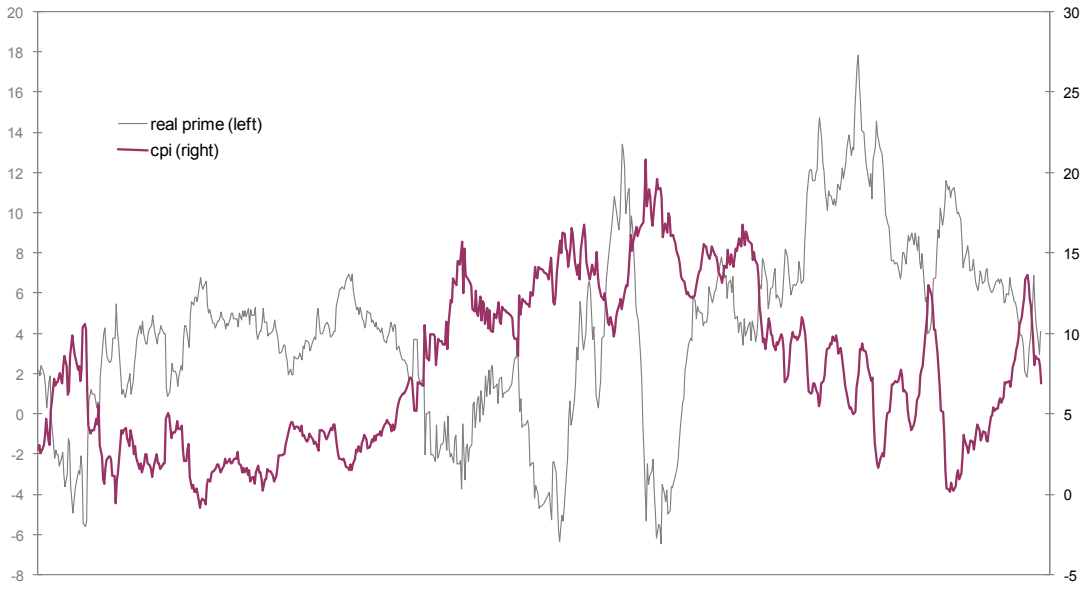


Figure 6: real prime and CPI inflation (yoy %)

The importance of the LS lies therein that the KIR is *made effective*, i.e. strongly influences the interbank rate and other rates. It is the starting point of the monetary policy transmission mechanism (MPTM), our view of which is portrayed in Figure 7.[38]

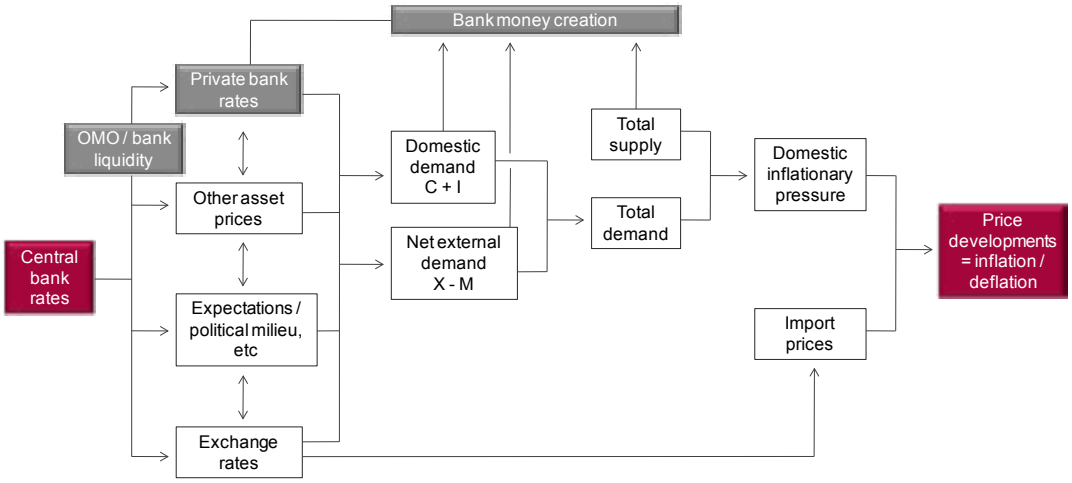


Figure 7: MPTM

3.6 The money market identity / analysis

In the previous section we stated that the importance of the LS lies therein that the KIR is *made effective*. The KIR is made effective only when the banks are indebted to the central bank. How is this brought about? The answer is that the central bank has absolute control over its balance sheet and is therefore able to create a LS of any magnitude it wishes. This is a subject that deserves much space, which we do not have here. Instead we present a summary of an analysis which indicates the various factors that impact on bank liquidity. Most of them are under the control of the central bank, and where they are not, the central bank has the tools to counteract their influence.

A good measure of bank liquidity is the net excess reserves (NER) of the banking sector. This is made up of the ER of the banks (which are usually zero), less the borrowed reserves (BR / LS). To illustrate we present Balance Sheet 20.

BALANCE SHEET 20: CENTRAL BANK (LCC MILLIONS)			
Assets		**Equity and liabilities**	
		A. Notes and coins	1 000
		B. Deposits	
E. Foreign assets	1 500	1. Government	900
		2. Bank reserves (TR)	500
F. Domestic assets (government)	1 000	a. RR (500)	
		b. ER (0)	
G. Loans to banks @ KIR	400	C. Foreign loans	200
		D. Central bank securities	300
Total	**2 900**	**Total**	**2 900**

It will be evident that we can create a balance sheet identity from the accompanying balance sheet. NER is made up of items B2b – G:

$$NER = B2b - G$$

Becuase balance sheets balance, NER is equal to items:

$$E + F - A - B1 - B2a - C - D.$$

If we now pair the items that are related we get:

$$NER\ (B2b - G) = (E - C) + (F - B1) - A - B2a - D.$$

Using the numbers in Balance Sheet 20 we have:

NER (0 – 400) = (1 500 – 200) + (1 000 – 900) – 1 000 – 500 – 300
NER (– 400) = 1 300 + 100 – 1 000 – 500 – 300
NER (– 400) = – 400.

In words:

NER (B2b – G) = Net foreign assets (E – C)
+ Net claims on government (F – B1)
– Notes and coins in circulation (A)
– Required reserves (B2a)
– Central bank securities (D).

It will also be apparent that a change in NER (ΔNER) from a date to another date must be equal to the changes in the other items, as follows:

ΔNER = Δ(B2b – G) = Δ(E – C)
+ Δ(F – B1)
– ΔA
– ΔB2a
– ΔD.

This analysis tells us that if the central bank buys LCC 100 million foreign assets from the banks, NER will increase by LCC 100 million. If the central bank issues LCC 100 million bank notes NER will decline by this amount. If the central bank sells LCC 100 million treasury bills (claims on government) NER will decline by this amount, and so on. Thus, the central bank has absolute control over NER, and in real life the central operate in the open market daily in order to influence NER.

3.7 Bank to bank interbank market revisited

3.7.1 Introduction

We have discussed the b2b IBM at the final interbank clearing in much detail, as well as its link with monetary policy. There are three other facets to this market:

- Bank loans to other banks intra-day.
- Bank group deposits.
- Negotiable certificates of deposit.

3.7.2 Bank loans to other banks intra-day

The smaller banks endeavour to close off their cash reserve positions before the final interbank clearing takes place. They do so with the large banks (who lend to them against collateral) at interbank lending rates which reflect the large banks' acute awareness of the KIR level.

3.7.3 Bank group deposits

Banks within the same group make loans to one another. The existence of this phenomenon results from a certain bank of a banking group having a comparative advantage in the deposit market, and the rationalisation of functions within bank groups. For example, a large commercial bank in a group is able to attract deposits at a lower rate than a smaller fellow subsidiary. Banking groups may also designate one bank in a group to do the sourcing of deposits of the other banks in the group in addition to its own sourcing.

3.7.4 Negotiable certificates of deposit

Negotiable certificates of deposit (NCDs) are fixed deposits of banks that are transferable from on party to another by simple delivery and payment. The holding by a bank of a NCD of another bank represents an interbank loan.

3.8 Summary

The focus of this module was the interbank markets:

- The central bank to bank interbank market (cb2b IBM).
- The bank to central bank interbank market (b2cb IBM).
- The bank to bank interbank market (b2b IBM).

The former interbank markets are "administration-driven" markets. The b2cb IBM represents the cash reserve requirement (cash flows from the banks to the central bank), and this is determined by decree (statute). No interest is paid on these balances.

The cb2b IBM represents the loans of the central bank to the banks, a permanent feature in most money markets. These loans are made at the KIR, which is administratively determined by the Monetary Policy Committee (MPC) of the central bank. The permanent liquidity shortage made good by the central bank at the KIR is central to monetary policy.

The b2b IBM is a free market where the deficit banks negotiate for the excess reserves of surplus banks, and the rate established is the interbank rate. This rate is heavily influenced by the KIR as the banks compete for funds in order to avoid borrowing from the central bank.

The monetary policy transmission mechanism (MPTM) runs from the KIR to the interbank rate and then through various channels to price developments (inflation). The interbank markets represent the start of the MPTM.

3.9 Bibliography

Faure, AP, 2007. **The money market**. Cape Town: Quoin Institute (Pty) Limited.

4 Mathematics

4.1 Learning objectives

After studying this text the learner should / should be able to:

- Define and explain the time value of money concept and its mathematical manifestation: present value / future value (PV / FV).
- Examine the mathematics of the money market, the basis of which is the PV / FV concept.
- Evaluate the two basic money market calculations: discount and coupon, and the other calculations that derive from these.

4.2 Introduction

The mathematics of the money market is straightforward. It is apparent that money has a value over time, and that the value of money changes all the time. It depends on various factors such as the rate of inflation and the demand for money and credit. Central to the value of money is what the central bank thinks it (i.e. the interest rate) should be. The central bank has substantive control over the time value of money via its cash reserves accommodation procedures and the interest rate it charges for this assistance (known as bank rate, discount rate, base rate, repo rate, etc.).

The time value of money is expressed as a rate of interest, and interest may be payable daily, monthly, quarterly, annually, at the end of a short period or at the end of a period of years. Interest may also be paid up-front (some believe). In the case of the money market, interest is usually payable in a period of less than a year.

The following is covered in this text:

- Time value of money concept.
- Simple interest.
- Compound interest.
- Broken periods of less than a year (one interest payment).
- Discount.
- Effective rate.
- Interest-add-on securities (also called coupon securities).
- Discount securities.
- Treasury bill tender mathematics.
- Bonds with less than six months to maturity date.
- Bonds with more than six months to maturity date.

4.3 Time value of money concept

The *time value of money* concept, which clearly means that *money has a value over time*, is founded on the basic fact that money represents a command over goods and services (i.e. consumption). If you delay consumption by lending part of your money supply to someone you will expect compensation; otherwise you would not lend the money. What's the point?

Even if you were inclined to lend the money to a friend compensation-free, this is a foolish idea, because the future is uncertain. There are two factors to consider in relation to the future: you cannot be certain that you will receive the money lent and/or the compensation amount when they are due (= credit risk), and inflation may erode the value of the money lent. The compensation amount is called interest.

Another way of looking at this concept is that LCC received today is worth more than LCC received at some stage in the future. Ask someone if they would like you to give them LCC 100 today or in three months' time? The answer is obvious. This is because the LCC can be invested and its value enhanced by the rate of return, the interest amount, and because of the reduced purchasing power of the money as a result of inflation.

This is the basic tenet of the time value of money concept, i.e. money has a *future value* and a *present value*: Future value is present value plus interest, and present value is future value discounted by an appropriate rate.

Another basic principle of the concept is that interest is compounded, i.e. interest that is earned is reinvested, and an essential assumption here is that interest earned is reinvested at the rate earned on the principal amount.

The present / future value concept is the foundation of virtually all financial market mathematics.

4.4 Simple interest

Every money transaction involves a lender and a borrower. The lender (or surplus economic unit) lends, while the borrower (or deficit economic unit) borrows, at a rate of interest in order to compensate the lender for the risk s/he is taking. Clearly, the word *investment* applies to the lender while the word *borrowing* applies to the borrower. Simple interest is merely the interest payable at the end of the term of investment or borrowing. The formula used in the calculation of simple interest is as follows:

$$IA = PA \times i \times t$$

where

IA = interest amount
PA = principal amount (i.e. the amount invested / borrowed)
i = interest rate per time period expressed as a part of 1 (e.g. 0.12)
t = term or time (period/s for which interest is to be earned / paid).

An example follows:

PA = LCC 1 000 000
i = 12%
t = one year.

In this example the interest payable on the investment / borrowing is LCC 120 000 and it is calculated as follows:

IA = LCC 1 000 000 × 0.12 × 1
= LCC 120 000.

If the term is two years, and the 12% interest rate is payable at the end of the period (i.e. for two years), the interest amount would be the same as above, i.e. LCC 120 000. However, if the interest rate is payable *per annum*, i.e. for two time periods of a year each, the interest amount is LCC 240 000.

It will also be apparent that this formula may be expressed in terms of the present value (PV) and the future value (FV) of money. The principal value (amount invested) is the PV and the FV is the sum of the PV and the interest amount, as follows:

$$FV = PV + IA$$

or

$$FV = PV + (PV \times i \times t)$$

or

$$FV = PV \times [1 + (i \times t)].$$

This formula is usually written as:

$$FV = PV\ [1 + (i \times t)].$$

An example follows:

PV = LCC 1 000 000
i = 15% per annum (pa)
t = two years

FV = LCC 1 000 000 [1 + (0.15 × 2)]
= LCC 1 000 000 (1.3)
= LCC 1 300 000.

The PV may be derived from the FV formula as follows:

$$PV = FV / [1 + (i \times t)].$$

An example follows:

FV = LCC 1 500 000
i = 13% pa
t = one year

FV = LCC 1 500 000 / [1 + (0.13 × 1)]
= LCC 1 500 000 / 1.13
= LCC 1 327 433.63.

4.5 Compound interest

Compound interest takes into account interest earned on interest. It assumes always that the interest earned is reinvested at the original rate of interest from as soon as it is paid. The compound interest formula may be presented as follows:

$$FV = PV\ (1 + i/cp)^{y.cp}$$

where

i = interest rate pa, expressed as a unit of 1
y = number of years
cp = coupon periods (number of times interest is paid pa).

An example follows:

PV = LCC 1 000 000
i = 15% pa
y = 1
cp = 12 (i.e. monthly)

$$FV = LCC\ 1\ 000\ 000\ (1 + 0.15/12)^{1x12}$$
$$= LCC\ 1\ 000\ 000\ (1.0125)^{12}$$
$$= LCC\ 1\ 000\ 000\ (1.16075452)$$
$$= LCC\ 1\ 160\ 754.52.$$

Another example:

PV = LCC 1 000 000
i = 15%
y = 3
cp = 2 (i.e. six-monthly)

$$FV = LCC\ 1\ 000\ 000\ (1 + 0.15/2)^{3\times2}$$
$$= LCC\ 1\ 000\ 000\ (1.075)^{6}$$
$$= LCC\ 1\ 000\ 000\ (1.54330153)$$
$$= LCC\ 1\ 543\ 301.53.$$

Yet another example:

PV = LCC 1 000 000
i = 12% pa
y = 2
cp = 1 (i.e. one payment per year, in arrears)

$FV = LCC\ 1\ 000\ 000\ (1 + 0.12/1)^{2\times1}$
$= LCC\ 1\ 000\ 000\ (1.12)^2$
$= LCC\ 1\ 000\ 000\ (1.25440)$
$= LCC\ 1\ 254\ 400.00.$

The principal of compound interest should be apparent from the last example. Interest of LCC 120 000 (0.12 × LCC 1 000 000) is earned at the end of the first year and at the end of the second year. But the first interest payment of LCC 120 000 is invested (at the same rate it is assumed) for the balance of the period of the investment (i.e. 1 year). This amount earns interest of LCC 14 400.00 (0.12 × LCC 120 000). Thus, the total amount of interest earned is LCC 254 400.00 (LCC 120 000 + LCC 120 000 + LCC 14 400.00). The sum of the total amount of interest earned and the original investment (PV) is the FV.

4.6 Broken periods of less than a year (one interest payment)

As seen, rates of interest are usually expressed in per annum terms. If broken periods of a year are introduced and one interest payment is made at the end of the period, the formulae become (t = number of days to maturity / 365):

$$FV = PV\,[1 + (i \times t)]$$

$$PV = FV / [1 + (i \times t)].$$

An example:

PV = LCC 1 000 000
i = 14% pa
t = 90 / 365

$$FV = = PV\,[1 + (i \times t)]$$
$$= LCC\ 1\ 000\ 000\ [1 + (0.14 \times 90/365)]$$
$$= LCC\ 1\ 000\ 000\ (1.03452)$$
$$= LCC\ 1\ 034\ 520.55.$$

Another example:

FV = LCC 1 350 000
i = 12% pa
t = 120 / 365

$$PV = FV / [1 + (i \times t)]$$
$$= LCC\ 1\ 350\ 000 / [1 + (0.12 \times 120/365)]$$
$$= LCC\ 1\ 350\ 000 / (1.03945)$$
$$= LCC\ 1\ 298\ 761.20.$$

A name for the above is "interest add-on", and if the above was a deposit, then its maturity value (= future value) was calculated. This type of security (e.g. NNCD or NCD) is called an "interest add-on security".

4.7 Discount

In the above examples it was assumed that interest is payable at the end of the period. In many cases in the money market interest is payable "up-front" (it is not really so as we shall see), meaning that the securities are issued and traded on a *discount basis*.

Thus, as opposed to interest-add-on securities where the amount invested is given (PV) and the interest factor is added to determine the future value FV), in the case of discounted securities the *given amount* is the *future value* (also called the face value or nominal value) and this amount is discounted to determine the present value (the amount to be paid, or its value *now* in the case of an existing security).

With discounted securities the interest amount paid "up-front" is called the discount and the amount paid by the investor or purchaser is called the discounted value. As noted above, the face value is the future value (FV) and the amount paid (the discounted value) the PV. The difference is the discount. The formulae are as follows:

$$D = FV \times d \times t$$

where

D = discount amount
FV = face value (or future value or nominal value)
d = discount rate pa (expressed as a part of 1)
t = term to maturity in days / 365.

The discounted value (or present value) is:

$$PV = FV - D$$

or

$$PV = FV - (FV \times d \times t)$$

or

$$PV = FV [1 - (d \times t)].$$

An example follows:

FV = LCC 1 000 000
d = 11.0% pa
t = 91 / 365

$$
\begin{aligned}
PV \quad &= PV \quad = FV\,[1 - (d \times t)] \\
&= LCC\ 1\ 000\ 000\ [1 - (0.11 \times 91/365)] \\
&= LCC\ 1\ 000\ 000\ (1 - 0.02742466) \\
&= LCC\ 1\ 000\ 000\ (0.97257534) \\
&= LCC\ 972\ 575.34.
\end{aligned}
$$

From the above it will be evident that there is a fundamental difference between discount and interest. An interest amount is based on the PV, and the FV is the sum of the two. The discount amount, on the other hand, is based on the FV, and the PV is the difference between the two. It follows that the rate of interest is always expressed as a percentage of the PV, while the discount rate is expressed as a percentage of the FV. The conversion formulae are as follows:

Interest to discount:

$$d = i / [1 + (i \times t)].$$

Discount to interest:

$$i = d / [1 - (d \times t)].$$

These formulae are important because in most money markets discount securities are traded on a yield basis and then converted to a discount in order to determine the consideration (PV) payable. An example follows:

$$d = 11.0\% \text{ pa}$$
$$t = 91 / 365$$

$$i = d / [1 - (d \times t)]$$
$$= 0.11 / [1 - (0.11 \times 91/365)]$$
$$= 0.11 / 0.972575$$
$$= 11.31\% \text{ pa.}$$

It should be apparent that when one has the yield (as here, i = 11.310182%), the usual formulae apply (use data of last example and enough decimals and compare with it):

$$PV = FV / [1 + (i \times t)]$$
$$= \text{LCC } 1\,000\,000 / 1.028198$$
$$= \text{LCC } 972\,575.34.$$

$$FV = PV [1 + (i \times t)]$$
$$= \text{LCC } 972\,575.34 \times 1.028198$$
$$= \text{LCC } 1\,000\,000.00.$$

4.8 Effective rate

Rates of interest pa in the financial markets are quoted with the interest frequency stated. These rates are referred to as the *nominal* rates. For example, a rate may be quoted as 13.5% pa with interest payable *monthly*, or a rate may be quoted as 12% pa with interest payable *quarterly*.

The terminology used in the market for these two rates are 13.5% *nacm* (nominal annual compounded monthly) and 12% *nacq* (nominal annual compounded quarterly). In the case where interest is payable six-monthly and at the end of a year, the terminology would be *nacs* (nominal annual compounded semi-annually) and *naca* (nominal annual compounded annually).

In order to compare these rates, the term *effective rate* is applied. *Nominal rates* are converted to *effective rates* with the use of the following formula:

$$i_e = [(1 + i_n / t)^t - 1]$$

where

i_e = effective rate
i_n = nominal rate
t = number of interest periods per annum.

An example: a 12% *nacm rate* converts to an *effective rate* as follows:

$$\begin{aligned} i_e &= (1 + i_n / t)^t - 1 \\ &= (1 + 0.12/12)^{12} - 1 \\ &= (1 + 0.01)^{12} - 1 \\ &= 1.12683 - 1 \\ &= 0.12683 \\ &= 12.68\%. \end{aligned}$$

Another example: a 12% *nacq rate* converts to an *effective rate* as follows:

$$\begin{aligned} i_e &= (1 + i_n / t)^t - 1 \\ &= (1 + 0.12/4)^4 - 1 \\ &= (1 + 0.03)^4 - 1 \\ &= 1.12550 - 1 \\ &= 0.12550 \\ &= 12.55\%. \end{aligned}$$

It will be evident that a 12% *naca* rate will be equal to an *effective rate* of 12%. Thus, the more interest period involved, the higher the effective rate will be.

The above formula may also be used for period of longer than a year where interest is payable at the end (it is covered later).

4.9 Interest-add-on securities

4.9.1 Introduction

The negotiable certificate of deposit (NCD) is the best example of an interest-add-on security. It can also be referred to as a coupon instrument, because a coupon is paid once or more frequently. There are a number of ways in which banks can issue negotiable certificates of deposit (NCDs). The main differentiation is short-term and long-term. Short-term refers to NCDs that are issued for periods of one year or shorter, and long-term to NCDs issued for periods longer than a year.

In the case of short-term NCDs interest is always payable at maturity (i.e. one coupon). In the case of long NCDs, interest may be payable at maturity (one coupon) or six-monthly in arrears (more than one coupon).

The following types of NCDs can be identified:

- Short NCDs where the amount invested is given
- Short NCDs where the maturity value is given
- Short NCDs issued at a discount to face value (in order to conceal the actual issue rate)
- Long NCDs with interest payable at maturity
- Long NCDs with interest payable six-monthly in arrears where the amount invested is given
- Long NCDs with interest payable six-monthly in arrears, issued at a discount to par value
- NCDs with a variable rate of interest.

The first-mentioned NCD is the most "common" type. Each method of issue and the mathematics pertaining to it is discussed below.

4.9.2 Short NCDs where the amount invested is given

This is the "common" NCD. A CD, which is simply a fixed deposit that is negotiable, is the most issued and traded money market instrument in the money market. At issue the typical simple interest calculation is involved, as follows:

$$FV = PV [1 + (i \times t)].$$

An example will make this clear:

Amount of deposit (PV)	= LCC 1 000 000
Interest rate negotiated (i)	= 9.8% pa
Term required by depositor	= 180 days; therefore t = 180 / 365)

The *maturity value* is calculated by the deposit-taking bank and placed on the certificate. The maturity value is the FV, and the amount of the deposit the PV.

Maturity value (FV)	= PV [1 + (0.098 x 180/365)]
	= LCC 1 000 000 (1.04832877)
	= LCC 1 048 328.77.

When NCDs are *traded* in the money market, the "givens" are:

- The maturity value (FV)
- The maturity date
- The settlement date
- The rate at which the trade takes place.

These variables are used to calculate the *consideration*, i.e. the amount to be paid by the purchaser (or received by the seller). The consideration is nothing else but the PV. The formula used in secondary market trades is as follows:

$$PV = FV / [1 + (i \times t)].$$

An example: a company would like to invest an amount close to LCC 1 million and approaches its broker in this regard. The broker makes a few phone calls and offers the investor a NCD with the following characteristics:

Maturity value (FV)	= LCC 1 054 246.58 (this was calculated at issue)
Maturity (due) date	= 20 June 2002
Date of transaction	= 21 January 2002
Number of days	= 150 (i.e. 21 January to 20 June); therefore t = 150 / 365
Rate traded at (i)	= 9.2% pa.

The investor accepts the deal and the consideration is calculated:

Consideration (PV) = LCC 1 054 246.58 / [1 + (0.092 × 150/365)]
= LCC 1 054 246.58 / 1.03780822
= LCC 1 015 839.50.

4.9.3 Short NCDs where the maturity value is given

Occasionally, NCDs are issued where the maturity value is a given, i.e. the depositor wants to receive a certain amount at the end of the investment period (for example LCC 1 000 000). In this case the proceeds for the bank, i.e. the deposit amount, need to be calculated. The formula used is the PV formula as follows:

PV = FV / [1 + (i × t)].

An example is required. The depositor insists he would like to receive LCC 1 million at the end of the investment period that will suit him, which is 121 days. The bank negotiates a rate of 11.5% pa, which the depositor accepts. The "givens" are as follows:

Maturity value (FV) = LCC 1 000 000
Issue date = 1 April 2002
Maturity date = 31 July 2002
t = 121 / 365
i = 11.50% pa.

The amount of the deposit (i.e. the consideration, or PV) is calculated as follows:

Consideration (PV) = FV / [1 + (i × t)]
= LCC 1 000 000 / [1 + (0.115 × 121/365)]
= LCC 1 000 000 / 1.03812329
= LCC 963 276.72.

This calculation could also have been executed also by simply converting the issue rate (i) to a *discount rate* (d) as follows:

d = i / [1 + (i × t)]
= 0.115 / [1 + (0.115 × 121/365)]
= 0.115 / 1.03812329
= 0.11077682
= 11.077682% pa

The calculation is then the discount one:

$$\begin{aligned} PV &= FV\,[1 - (d \times t)] \\ &= LCC\ 1\ 000\ 000\ [1- (0.11077682 \times 121/365)] \\ &= LCC\ 1\ 000\ 000 \times 0.96327672 \\ &= LCC\ 963\ 276.72. \end{aligned}$$

4.9.4 Short NCDs issued at a discount to face value (in order to conceal the issue rate)

At times NCDs are issued where the rate on which the maturity value is based and the actual issue rate are different. This is generally done when a bank wishes to conceal the actual issue rate from the ultimate investor. For example, if the bank is approached by a broker and bid for a NCD at a rate with which it is satisfied, it will not want the investor to know the issue rate because it will not know what "turn" is taken by the broker. The formula used to calculate the price is as follows:

$$Price = [1 + (r \times t)] / [1 + (i \times t)]$$

where

r = rate of interest that appears on the face of the certificate (the rate that determines the FV)
i = actual issue rate of interest % pa.

An example:

Issue date = 1 April 2002
Maturity date = 31 July 2002
t = 121 / 365
r = 11.50% pa
i = 12.00% pa

Price = [1 + (0.115 × 121/365)] / [1 + (0.12 × 121/365)]
= (1.03812329) / (1.03978082)
= 0.99840589.

In this example the maturity value of a LCC 1 000 000 NCD (i.e. the stated amount of the deposit on the face of the NCD) will be LCC 1 038 123.29, but the proceeds to the bank, i.e. the actual amount of the deposit, will be LCC 998 405.89. The investor will not be able to determine the size of the "turn" taken by the broker.

The 12.0% pa rate at which the broker purchased the NCD may be verified by annualising in percentage pa terms the interest earned on the amount paid for the NCD:

Rate agreed = [(LCC 1 038 123.29 – LCC 998 405.89) / LCC 998 405.89] × 365/121
= (LCC 39 717.40 / LCC 998 405.89) × 365/121
= 12.0% pa.

4.9.5 Long NCDs with interest payable at maturity

As in the case of NCDs with tenors of one year or shorter, long NCDs can be issued with interest payable at maturity in the three forms as mentioned earlier.

In the case of a NCD issued for longer than one year with *interest payable at the end of the period,* the investor would want to know what his *effective rate* pa is. The formula used is the one employed above in the section on the *effective rate.* This is repeated here:

$$i_e = [(1 + i_n / t)^t - 1]$$

where

i_e = effective rate
i_n = nominal rate
t = number of interest periods per annum.

It should be noted here that t becomes a fraction of 1, i.e. the *number of interest periods per annum* is less that 1, and this is calculated by a year (365 days) over the term of the NCD. An example follows:

Issue date = 1 April 2002
Maturity date = 31 July 2003
Term to maturity = 486
t = 0.75102881 (365 / 486)
i_n = 11.70%

$$i_e = [(1 + i_n / t)^t - 1]$$
$$= [(1 + 0.117 / 0.75102881)^{0.75102881} - 1]$$
$$= (1.15578630)^{0.75102881} - 1$$
$$= 0.1149$$
$$= 11.49\%.$$

4.9.6 Long NCDs with interest payable six-monthly in arrears where the amount invested is given

Interest on NCDs issued for longer than a year is usually payable six-monthly in arrears. An example is:

Amount of investment (PV) = LCC 1 000 000
Issue date = 15 October 2002
Redemption date = 25 October 2004
Tenor = 2 years and 10 days
Coupon rate = 15.00% pa
Interest dates = 25 October and 25 April.

In this example the first interest payment will be on 25 October 2002 and the amount will be LCC 4 109.59. This amount is calculated in terms of the simple interest formula shown earlier, as follows:

Interest payment = PV (i × t)
= LCC 1 000 000 (0.15 × 10/365)
= LCC 1 000 000 (0.00410959)
= LCC 4 109.59.

Subsequent interest payments are, of course, equal to LCC 75 000, which is calculated in terms of the following formula:

Interest payments = PV (i × 1/2)
= LCC 1 000 000 (0.15 × 0.5)
= LCC 1 000 000 (0.075)
= LCC 75 000.

4.9.7 Long NCDs with interest payable six-monthly in arrears, issued at a discount to par **value**

On occasions banks issue NCDs with interest payable six-monthly at a discount to nominal (also termed par or face) value (for example, LCC 1million). The formula used to calculate the price is the same as the one used to calculate the price of a long-term government or other bond, i.e. the price is equal to the present value of the future stream of interest payments plus the present value of the redemption proceeds (LCC 1 000 000) discounted at the actual rate at which the NCD is issued. An example will make this clear.

Nominal amount	= LCC 1 000 000
Issue date	= 30 April 2001
Redemption date	= 30 April 2004
Tenor	= 3 years
Coupon rate	= 13.0% pa
Actual issue rate	= 15.0% pa
Interest dates	= 30 April and 30 October.

In this example the price is calculated to be LCC 95.31%, and the amount received by the bank upon issue of the LCC 1 000 000 nominal value certificate is LCC 953 100.00.

4.9.8 NCDs with a variable rate of interest

At times banks issue NCDs for fixed periods, but the interest payable is variable. In this case the rate is specified with reference to some agreed benchmark rate. The rate may be determined daily or less frequently, depending on the requirement of the investor.

The valuation / pricing (after issue) mathematics in this regard is elaborate and will; not be discussed here.

4.10 Discount securities

Money market securities in most countries are negotiated (and traded) in the primary and secondary markets on an interest rate (yield) basis (in order to make comparisons easier), but the calculation of the consideration is effected on a discount basis where applicable: bankers' acceptances, treasury bills, commercial paper.

These instruments are issued with a nominal value (also termed par value, maturity value, end value and face value), which is actually the FV, equal to a round amount such as (and usually as) LCC 1 000 000 or multiples of this. When issued or sold, they are discounted at the discount rate that is derived from the interest rate negotiated, in order to arrive at the consideration (which is the PV).

The formulae that apply here were elucidated above and are repeated here for the sake of convenience.

$$PV = FV\,[1 - (d \times t)]$$

where

PV = present value (or the consideration)
FV = future value (also called face value / end value / nominal value)
d = discount rate pa (expressed as a part 1, e.g. 0.08)
t = number of days to maturity / 365.

An example: the central bank sells a LCC 100 million treasury bill to a bank for the purposes of monetary policy. The bill has 90 days to run (i.e. to maturity) and the discount rate (derived from the agreed yield) is 11.5% pa:

FV = LCC 100 000 000
d = 11.5% pa
t = 90 / 365

PV = FV [1 – (d × t)]
= LCC 100 000 000 [1 – (0.115 × 90/365)]
= LCC 100 000 000 (1 – 0.02835616)
= LCC 100 000 000 (0.97164384)
= LCC 97 164 384.00.

What was the rate (i) that converted to a discount rate of 11.5%? As noted above, the conversion formula is as follows:

i = d / [1 – (d × t)]
= 0.115 / [1 – (0.115 × 90/365)]
= 0.115 / (1 – 0.02835616)
= 0.115 / 0.97164384
= 11.84% pa.

As we saw earlier, converting from an interest rate to a discount rate involves the following formula:

d = i / [1 + (i × t)].

4.11 Treasury bill tender mathematics

Central banks conduct the tender procedure for treasury bills on behalf of government. Most central banks issue 91-day and 182-day bills (and some for 273 days and 364 days) and most require tenders in prices of multiples of 0.005. If an investor wishes to acquire 91-day bills at the current market discount rate of, say 10.80% pa, s/he will calculate the price as follows:

Price = 1 – (0.108 × 91/365)
= 1 – 0.02692603
= 0.97307397.

This may also be written as LCC 97.307397% (i.e. the price per LCC 100 nominal / face value). But the tenderer cannot submit such a price because it must be in multiples of 0.005. S/he will most likely decide upon a price of LCC 97.305%. This price converts to a discount rate as follows:

Discount rate = (100 – 97.305) × 365/91
= 10.8096% pa.

This converts to an interest (yield) rate of:

$$
\begin{aligned}
i &= d / [1 - (d \times t)] \\
&= 0.108096 / [1 - (0.108096 \times 91/365)] \\
&= 0.108096 / 0.973050 \\
&= 0.1111 \\
&= 11.11\% \text{ pa}
\end{aligned}
$$

4.12 Bonds with less than six months to maturity date

Bonds (with interest payable six-monthly) that have less than six months to maturity date are traded according to the formula that applies to the common NCD as illustrated above. However, in this case, the maturity value (FV) of the instrument (bond) is equal to the nominal / face value of the bond plus the final coupon payment. An example is required:

Nominal amount	= LCC 1 000 000
Issue date	= 30 April 2005
Redemption date	= 30 April 2008
Tenor	= 3 years
Coupon rate	= 13.0% pa
Interest dates	= 30 April and 30 October
Settlement date	= 1 March 2008
Days to maturity	= 60; therefore t = 60 / 365
Rate dealt at	= 9.25% pa.

The applicable formula will be recalled:

$$PV = FV / [1 + (i \times t)].$$

As noted, the FV will be the nominal / face value plus the final coupon payment, i.e. the amounts that will be received on the redemption date:

$$\text{LCC } 1\,000\,000 + \text{LCC } 65\,000\ (0.13/2 \times \text{LCC } 1\,000\,000) = \text{LCC } 1\,065\,000.$$

The calculation follows:

$$
\begin{aligned}
\text{PV (consideration)} &= \text{LCC } 1\,065\,000 / [1 + (0.0925 \times 60/365)] \\
&= \text{LCC } 1\,065\,000 / 1.01520548 \\
&= \text{LCC } 1\,049\,048.71.
\end{aligned}
$$

4.13 Bonds with longer than six months to maturity date

Bonds (with interest payable six-monthly) that have longer than six months but less than one year to maturity date are regarded as money market instruments. Such bonds are traded using the bond formula and the bond "rate" (which is called the *yield to maturity* – ytm). This will be covered in a separate module.

4.14 Bibliography

Faure, AP, 2007. **The money market**. Cape Town: Quoin Institute (Pty) Limited.

5 Deposit & debt securities

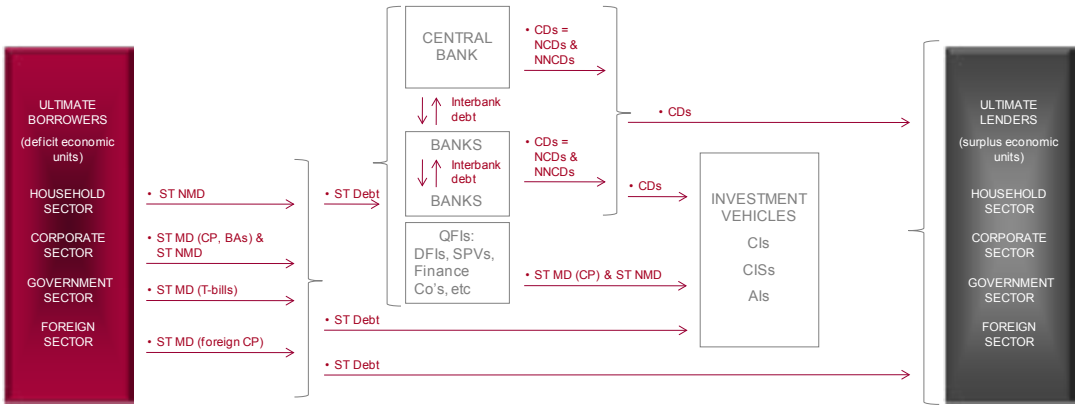
5.1 Learning objectives

After studying this text the learner should / should be able to:

- Describe the characteristics of non-negotiable deposit securities.
- Describe the characteristics of negotiable deposit securities.
- Describe the characteristics of non-marketable debt securities.
- Describe the characteristics of marketable debt securities.

5.2 Introduction

The borrowers in the money market (issuers of short term securities) can be split into the categories ultimate borrowers and financial intermediaries. Both these groups and the securities they issue are visible in the depiction of the money market presented in Figure 1.



ST = short term; MD = marketable debt; NMD = non-marketable debt; CP = commercial paper; BAs= bankers' acceptances; CDs = certificates of deposit (= deposits); NCDs = negotiable certificates of deposit; NNCDs = non-negotiable certificates of deposit;

Figure 1: money market securities

The deposit-taking intermediaries are the central bank and the private sector banks. The latter finance their lending activities with capital, loans and deposits[39]. Deposits make up the vast majority of these three sources of funds. "Loans" are from other private sector banks and the central bank in the interbank market. The deposits taken in (= securities issued) by the banks are twofold:

- Deposits which are non-negotiable after issue, for which the depositors are issued non-negotiable certificates of deposit (NNCDs).
- Deposits which are negotiable after issue for which the depositors are issued negotiable certificates of deposit (NCDs).

Most central banks have liabilities in the form of:

- Bank notes and coins in circulation (i.e. in issue).
- Deposits (banks, government, foreign sector).
- Loans (foreign sector).
- Negotiable securities in issue.

Although these liabilities have different names, we refer to them all as deposit securities for the sake of convenience. The two that are of interest to us here because they are central to the money market are the first and the last. We refer to the last as *central bank securities*.

We discuss these and the private sector banks' deposit securities under the main heading *deposit securities*. The following is the order:

- Non-negotiable certificates of deposit (NNCDs).
- Negotiable certificates of deposit (NNCDs).
- Bank notes and coins in circulation.
- Central bank securities.

The ultimate borrowers borrow by the issue of short-term debt which is either marketable[40] debt (MD) or non-marketable debt (NMD). The household sector issues NMD only (such as an overdraft-facilitated loan from a bank). The corporate sector borrows in both forms, depending on size and/or rating by rating agencies. The different levels of government issue NMD (the smaller entities for example borrow from banks) and MD (the larger entities and the central governments) such as treasury bills.

In addition to the ultimate borrowers, there are a number of quasi-financial intermediaries (QFIs) that issue debt instruments. For example, finance companies and special purpose vehicles (SPVs – the vehicles created in securitisations) issue MD and NMD.

The foreign sector is able to borrow short-term in certain countries (that do not have exchange controls) by issuing foreign commercial paper (in the case of companies), i.e. marketable debt that is denominated in the currency of the foreign country. Debt instruments are covered here in the following order:

- Non-marketable debt.
- Bankers' acceptances.
- Promissory notes.
- Commercial paper.
- Foreign commercial paper.
- Treasury bills.

Before getting to the instruments of the money market, we need to say a little about money market interest rates.

5.3 Money market interest rates

As we have seen, interest rates have their genesis in the repo rate. This one-day or very short-term rate powerfully affects the one-day b2b IBM rate (because banks try and avoid central bank accommodation). The b2b IBM rate powerfully influences the one-day call money rate (the rate paid to depositors that have large one-day deposits). This rate in turn has a major impact on all other deposit rates.

Depositors with large (wholesale) deposits receive high rates relative to small (retail) depositors. The latter receive zero interest on certain bank products such as current accounts, and rates lower than wholesale depositors on other interest-bearing deposit accounts.

As we have seen, banks endeavour to maintain a healthy margin in order to maximise shareholder wealth (which is supposed to be tempered by competition between banks). Therefore bank lending rates are higher than deposit rates by some 2–4 percentage points in countries with efficient financial markets and higher in other more inefficient markets.

There is a major difference between NMD and MD in terms of the rate of interest paid. The benchmark money market rate that is applicable to NMD is the *prime overdraft rate* of the banks. As the name indicates the prime overdraft rate (usually shortened to *prime rate*) applies to prime clients, i.e. those clients that have an excellent record in terms of repaying bank loans. It is notable that quite often prime clients receive rates that are at, say, prime minus 2 percentage points.

The "exceptionally" prime clients are those clients that are able to issue marketable debt securities. These are the large corporations (that issue large-denomination marketable commercial paper, promissory notes and bankers' acceptances) and central government (that issues treasury bills). The rates on these instruments are substantially lower than prime rate and are related more to the repo rate and the b2b IBM rate.

5.4 Deposit securities

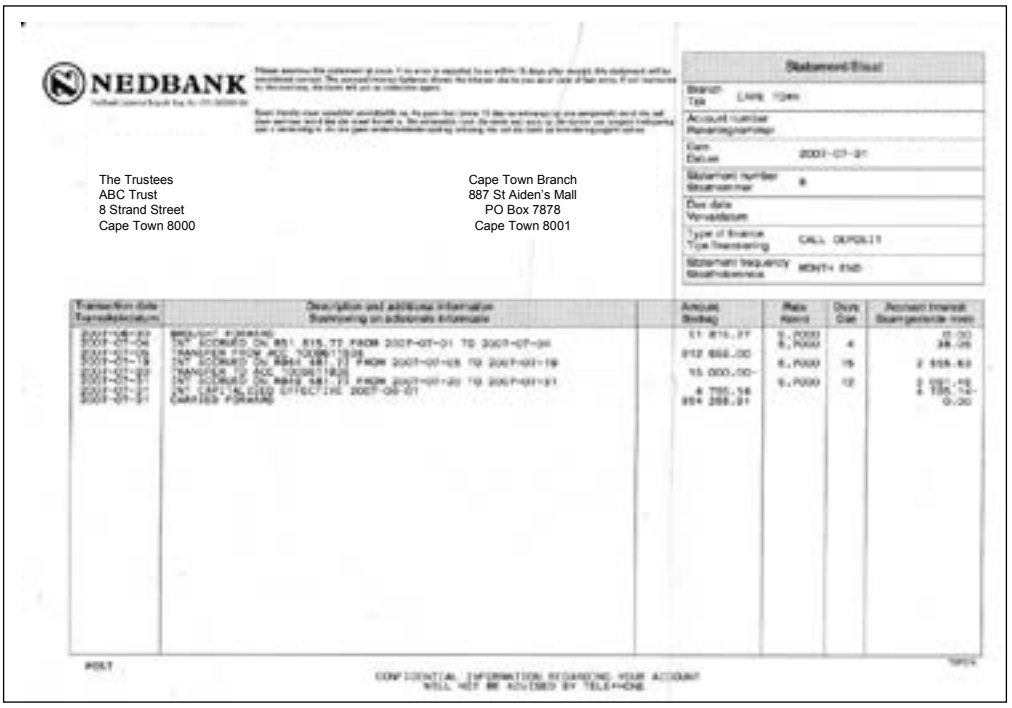
5.4.1 Non-negotiable certificates of deposit

As we have seen, banks take in deposits (borrow) and issue two categories of deposit certificates as evidence of these deposits: non-negotiable certificates of deposit (NNCDs) and negotiable certificates of deposit (NCDs). The former are in the majority by a large margin because most deposits are forthcoming from individuals or companies with small deposit balances.

A NNCD is thus a deposit receipt issued by a bank. The issuing bank undertakes to pay the amount of the deposit plus the interest on maturity date or at specified intervals (for example monthly).

A NNCD is (usually but does not have to be) a small-denomination deposit with a bank that is not negotiable, and there are many types of NNCDs, including:

- Current account deposits. These are deposits on accounts that are used for payments, i.e. the balances are withdrawable on demand by cheque or EFT[41]. In many countries banks do not pay interest on these accounts. In other countries these accounts earn interest if a certain minimum balance is maintained.
- Call deposits. These are one-day deposits that are rolled over at the behest of the depositor. These deposits are usually in large amounts and carry a relatively high rate of interest – that is related to the b2b IBM rate (see Box 1 for a South African example).
- Fixed-term deposits. These are usually smaller deposits that are fixed for certain periods chosen by the depositor. The rates on these deposits are usually fixed for the period.
- Notice deposits. These are also usually smaller deposits that are fixed for a term but are subject to a notice period of withdrawal. The rates on these deposits are usually fixed for the period.
- Savings deposits. These are usually small deposits that are withdrawable on demand. Because of this characteristic they usually earn a low interest rate.


NEDBANK

The Trustees
ABC Trust
8 Strand Street
Cape Town 8000

Cape Town Branch
887 St Aiden's Mall
PO Box 7878
Cape Town 8001

Box 1: example of a NNCDThe

An NNCD is usually evidenced by a physical certificate or monthly statement (which can be seen as a deposit certificate), such as the one in Box 1.

5.4.2 Negotiable certificates of deposit

A negotiable certificate of deposit (NCD) is a fixed deposit receipt issued by a bank that is negotiable in the secondary market that exists for such securities. The issuing bank undertakes to pay the amount of the deposit plus the interest on maturity date (in the case of short-term NCDs), or interest at specified intervals (usually six-monthly) in arrears and the deposit amount on maturity (in the case of long-term NCDs). An NCD certificate contains the following information:

- Name of issuing bank.
- Issue date.
- Maturity date.
- Amount of the deposit.
- Rate of interest per cent per annum.
- Maturity value (amount of the deposit plus interest) in the case of short-term NCDs.
- Interest dates (in the case of long-term NCDs).

VALUE AT MATURITY R 101,800-00 Due 21st January 1965

BARCLAYS BANK D.C.O. No. 301

THE NATIONAL BANK OF SOUTH AFRICA LIMITED

Head Office in South Africa
JOHANNESBURG. 25th July 1964

NEGOTIABLE CERTIFICATE OF DEPOSIT

*This certifies that there has been deposited with Barclays Bank D.C.O. the sum of R100,000-00 (One hundred thousand Rand) payable to *the Bearer of this Certificate *the Order of*

180 days after date hereof together with interest at the rate of 3·65 per cent per annum.

The amount of the deposit and the interest thereon will be repaid upon presentation of this Certificate at the Johannesburg Branch of Barclays Bank D.C.O. on or after 21st January 1965 on which date interest will cease.

General Manager

Chief Accountant

N.B.—THE ISSUE AND NEGOTIATION OF THIS CERTIFICATE ARE SUBJECT TO THE CONDITIONS PRINTED ON THE BACK HEREOF

* DELETE WHICHEVER IS INAPPLICABLE

Box 2: example of a NCD

NCDs are issued with the purpose of attracting large-denomination deposits. The attraction of the NCD lies therein that it is negotiable, a characteristic demanded by large depositors. Being negotiable, NCDs are issued at lower rates that equivalent term fixed deposits.

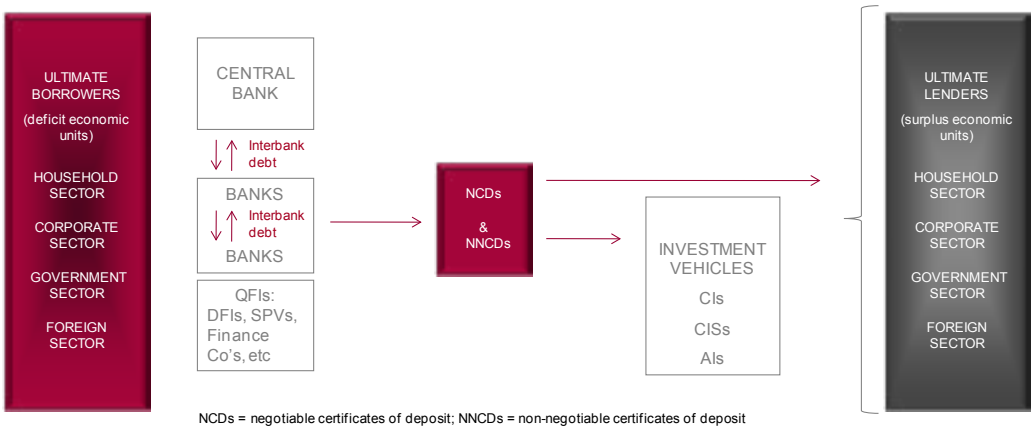


Figure 2: NNCDsand NCDsin the financial system

NCDs are usually issued for periods less than a year, but longer term NCDs are issued (up to 5 years in many countries). NCDs are usually issued in bearer form (i.e. not payable to any particular person), and only occasionally in the name of the depositor. In this case the endorsement of the investor is required for transfer.

The place of NNCDs and NCDs in the financial system is depicted in Figure 2. These instruments are mainly held by the investment vehicles and the ultimate lenders.

5.4.3 Bank notes and coins in circulation

Box 3: example of an bank note

The currency of each country is the *monetary unit* of that country. In most countries the monetary unit is established under the statute that governs the operations of the central bank. The central bank statute also usually determines the *legal tender* of the country. This is its bank notes and coins, which are usually issued by the central bank itself.

Bank notes and coins are also securities in that they represent claims on the issuer, the central bank (in most countries). Bank notes and coins (being marketable) can be exchanged for goods and services or for other securities such as NNCDs. Securities in the form of bank notes and coins do not pay interest. They are much like an interest free deposit – at the central bank.

The place of bank notes and coins in the financial system is depicted in Figure 3. These securities are mainly held by the banks (in ATMs and teller tills), and the household sector (for expenditure on consumables). They are also held by the foreign sector if the currency is in great demand (such as USD / EUR / GBP in inflation-plagued and unstable countries) or if the tourism sector is large.

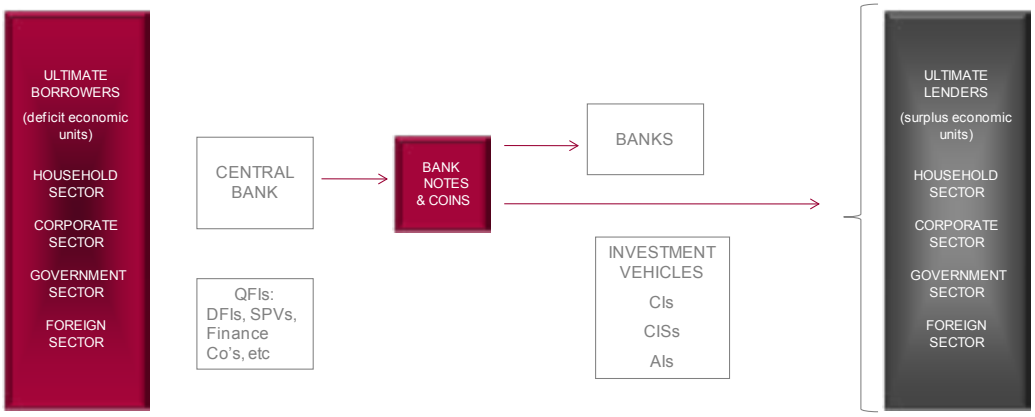


Figure 3: bank notes and coins in the financial system

The amount of legal tender in circulation differs vastly between countries. In countries with stable banks legal tender makes up 2–3% of the total money stock.

5.4.4 Central bank securities

Central bank securities are "deposit" securities issued by central banks solely for the purpose of the implementation of monetary policy. When a central bank issues LCC100 million, money market liquidity deteriorates by LCC100 million.

These securities are issued by most central banks, such as:

- Bank of Botswana: Bank of Botswana certificates (BOB certificates)
- South Africa: South African Reserve Bank debentures (SARB debentures)
- Malawi: Reserve Bank of Malawi bills (RBM bills)
- Ghana: Bank of Ghana bills (BOG bills).

They are usually issued on a discount basis, but some are of the interest add-on variety (as the example in Box 4). The term to maturity of these securities varies according to monetary policy requirements but they are usually of short duration (and always less than a year).

Box 4: example of a central bank security

The place of central bank securities in the financial system is depicted in Figure 4. These securities are usually held by the banks, retirement funds and specialist securities unit trusts (money market unit trusts).

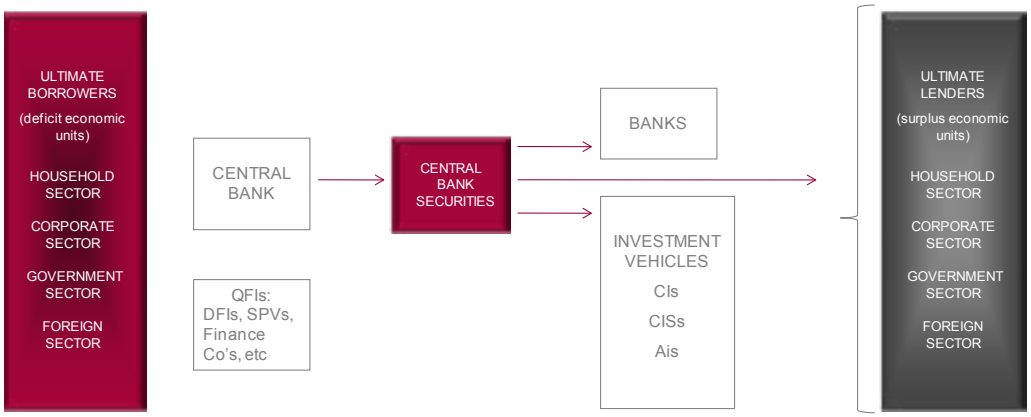


Figure 4: central bank securities in the financial system

5.4.5 Variations on the theme

There are a number of variations on the theme, such as the numerous quasi-financial institutions (QFIs) in existence in many countries that issue deposit-type securities. For example, in Ghana rural finance companies issued rural finance bills in the past. In South Africa the Development Bank of Southern Africa issues short-term bridging bonds from time to time. Similarly, the Land Bank in South Africa issues Land Bank bills, promissory notes and call bonds on a permanent basis.

5.5 Debt securities

5.5.1 Non-marketable debt

The ultimate borrowers that issue debt and the type of debt [non-marketable debt (NMD) and/or marketable debt (MD)] they issue are as follows:

- Household sector: NMD only.
- Corporate sector: MD and NMD, but mainly the latter.
- Government sector: central government: MD; other levels of government: MD and NMD, but mainly the latter.
- Foreign sector: MD only.

As indicated by the heading, here we cover only the NMD. There are a number of forms of non-marketable debt issued by the ultimate borrowers. The main ones are:

- utilised overdraft facilities (which we regard as short-term[42])
- utilised leasing finance facilities (if short-term)
- utilised instalment credit facilities (if short-term)
- utilised credit card facilities.

Note that these forms of debt are mainly available at banks, and while the banks may "issue" (or create them) on behalf of their customers, they are in reality debts issued by the ultimate borrowers and readily accepted by the banks. They are assets of banks and liabilities of the borrowers.

Another potentially confusing issue in this regard is the lack of a debt certificate, such as in the case of an utilised overdraft facility. The borrower does not issue a physical security stating that s/he owes the bank the amount of the overdraft utilised; rather the evidence of debt (= the asset of the bank) exits in the form of a debit balance on a bank current account statement.

It is not only banks that create debt in the above NMD forms. There are QFIs in many different countries such as non-bank leasing companies, asset finance companies and securitsation vehicles that also provide finance to borrowers.

Of these forms of NMD, the utilised bank overdraft is the largest by a large margin. Mortgage advances (which fall into the long-term debt market) come in a close second, with the rest trailing behind. In some countries the utilised overdraft facilities and utilised mortgage finance facilities together occupy close on 50% of bank assets.[43]

5.5.2 Bankers' acceptances

A bank acceptance (BA) is a *bill of exchange* drawn on and accepted by a bank. A bill of exchange is usually defined in a statute, a summary of which follows (which breaks up the definition into comprehensible parts).

- A bill of exchange is
- an unconditional order in writing
- addressed by a company (requiring temporary finance) (the *drawer*) to a bank (the *drawee*)
- signed by the company (the *drawer*) requiring the bank to whom it is addressed (which then signs it and becomes the acceptor)
- to pay
- at a fixed or determinable future time
- a sum certain in money
- to, or to the order of, the company.

Box 5: example of a bank acceptance

The BA is a complicated instrument but in essence it is a debt obligation of a company that is linked to its trading business. Underlying the BA is a specific business transaction, such as "purchases of wheat and maize" in the example provided in Box 5.

The bank provides the finance facility and draws up a BA, which is signed by the company. The bank also signs it, signifying "acceptance" of it and thereby guaranteeing that it will be paid should the company fail. This enables the BA to be sold to a third party. On the due date of the BA the company (which should have sold the goods financed by the BA by then) places the bank in funds, enabling the bank to pay the third party holder.

BAs are usually issued for short-term periods ranging from 90 days to 180 days, and occasionally for longer periods. In the example provided in Box 5, the BA is issued for 90 days.[44]

The bill of exchange is one of the oldest instruments of credit in the world, and its origins have been traced back to at least the fourth century BC. It was commonly in use in England at the time of the Norman Conquest, and is mentioned first in a Statute of 1379.[45]

Bills of exchange were originally created to enable sellers or exporters of goods to obtain funds as soon as possible after the dispatch of their goods, and to enable the buyers or importers of goods to delay payment until the goods reached them or until they had sold them.

The BA is falling into disuse. The main reason is that companies find it more convenient to borrow from the banks on the more flexible overdraft facility. Another reason is that larger companies, which are able to rely on their own name in terms of creditworthiness, prefer to issue commercial paper in order to avoid the bank commission payable on BA finance.

5.5.3 Promissory notes

The promissory note (PN) is usually also defined in a statute as "…an unconditional order in writing made by one person to another, signed by the maker, and engaging to pay on demand or at a fixed or determinable future time, a sum certain in money, to a specified person or his order, or to bearer."[46]

A promissory note therefore constitutes an evidence of debt of a borrower (usually a company) made and signed by the borrower in favour of the lender. Unlike BAs where the underlying transaction financed is trade, which is therefore self-liquidating, PNs are made by companies requiring temporary bridging finance.

A promissory note may be created in one of two ways. A company purchasing goods (for example) could give its supplier a promissory note, undertaking to pay the supplier a sum of money at a date specified in the future. The supplier could then endorse the note in blank, making it payable to bearer, and discount it with a bank. Clearly, the bank will purchase the PN only if it is satisfied with the creditworthiness of the maker. The bank would endorse the PN in blank if it wishes to sell the paper. Clearly, in this case, the bank becomes a liable party to the paper.

The alternative is for the purchasing company (or any other company wishing to obtain finance) to approach a bank directly and issue a PN in its favour. As in the former case, the bank would endorse the PN in blank (on the reverse of the certificate), rendering it marketable, if it wishes to onsell the paper. Clearly, the bank endorsement achieves two advantages: it makes it a bearer document and it becomes a high quality instrument (because the bank is liable if the company fails to pay on the due date).

Box 6: example of a promissory note

An example of the latter method of creation is presented in Box 6. Most PNs available in the money market are created by this method. PNs are created for any periods up to a year, but more usually for 90–180-day maturities.

The PN, like the bank acceptance, is one of the oldest instruments of the money market. The PN made by a borrower and payable by a bank, however, is not that antiquated. As in the case of the BA, the PN is also falling into disuse, and the reasons are similar.

5.5.4 Commercial paper

Commercial paper (CP) is short-term unsecured debt obligations of incorporated companies, usually commercial and industrial concerns. Commercial paper is therefore akin to a promissory note, i.e. a promise to pay a certain amount on a stipulated date in the future. However, while there are at least two parties involved with BA and PN instruments, with CP there is only one: the company.

It will be understood that it is only the large companies that do not require the standing of a bank to enhance the quality of their debt that are able to issue commercial paper. Public enterprises also issue this type of paper in many countries (sometimes with a guarantee issued by central government). An example of a commercial paper certificate of a public enterprise entity is shown in Box 7.

Box 7: example of a promissory note

The large corporations issue commercial paper for the purpose of obtaining short-term bridging finance. Such funding is usually required for one of three reasons:

- To fund short-term undertakings.
- To fund longer-term undertakings in the short-term market until more permanent funding can be arranged.
- To fund longer-term undertakings in the short-term market on a temporary short-term basis, because of an expected fall in interest rates.

In many countries the issue of CP is governed by a dedicated statute. The statute usually stipulates that issuers are obliged to issue a placing document which must include the reason for the issue of commercial paper (not for onlending), a statement that the company is a going concern, auditors' statement, and so on.

There are active commercial paper markets in most industrialised countries. The oldest is generally accepted to be the United States market (which goes back to the colonial days), while the sterling market is relatively young, having emerged officially[47] only in May 1986. In addition to these two, there are commercial paper markets in some ten other industrialised countries. With the exception of the Canadian market, they all emerged in the 1980s.

Next to the treasury bill and NCD markets around the world, the CP markets are the largest markets. The place of the BA, the PN and the CP in the financial system is depicted in Figure 5. Obviously the corporate sector issues the paper which is mostly found in the portfolios of the banks and the investment vehicles (mainly the retirement funds).

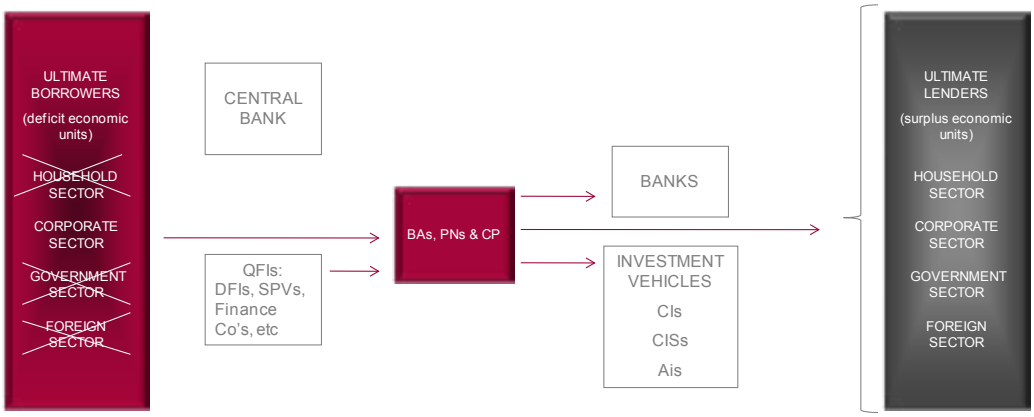


Figure 5: BAs, PNsand CP in the financial system

CP is not only issued by the ultimate borrowers; a number of the QFIs issue CP, for example special purpose vehicles (SPVs) and finance companies.

5.5.5 Foreign commercial paper

In certain counties the issue by foreign entities of securities is permitted (i.e. generally those without the burden of exchange controls). Foreign entities issue equity, bonds and CP. The latter is called foreign CP.

5.5.6 Treasury bills

The trade bill (which gave birth to the bank acceptance) and the PN are the oldest money market instruments. They are followed closely by the treasury bill (TB or T-bill). TBs are short-term debt obligations of central government.

A TB is much like a CP in that it is "one name" paper, but it has the advantage that it represents a charge on the revenues and assets of the country. Thus the TB is called a *risk-free security* and the rate on the TB is called the *risk-free rate*.[48] It also resembles a bank note with the main difference being that it is a note payable not at sight, but on a certain date in the future.

The simplicity of the treasury bill is suggested on the face[49] of the bill; it contains the following information:

- Issue date.
- Maturity date.
- Nominal (face) value, which is the amount payable to the holder on maturity date.

An example of an old TB is presented in Box 8.

Box 8: example of a treasury bill

TBs are issued for two main reasons: to fund part of the government budget deficit and for monetary policy purposes (in that they are the main instrument used by the banks to acquire accommodation from the central bank) in terms of the repo (or discount) system.

Central banks market TBs on behalf of the government, and they generally do so in two ways:

- by weekly tender (for terms of 91 days and/or 182 days and/or 273 days and/or 364 days)
- by "special" tender of bills of other terms to maturity, usually for monetary policy purposes.

The TB is the preferred instrument for the open market operations of central banks, and for providing access to accommodation (i.e. it ranks as an asset that is eligible for central bank assistance). The method of central bank accommodation has changed on many occasions in the history of central banking: TBs (and other assets) have been discounted with the central bank, provided as collateral against overnight loans, and sold under repurchase agreement (repo) to the central bank (which is the case now in most countries).

Many countries also have a liquid asset requirement apart from the cash reserve requirement. TBs always rank as liquid assets for the banks. The place of TBs in the financial system is depicted in Figure 6.

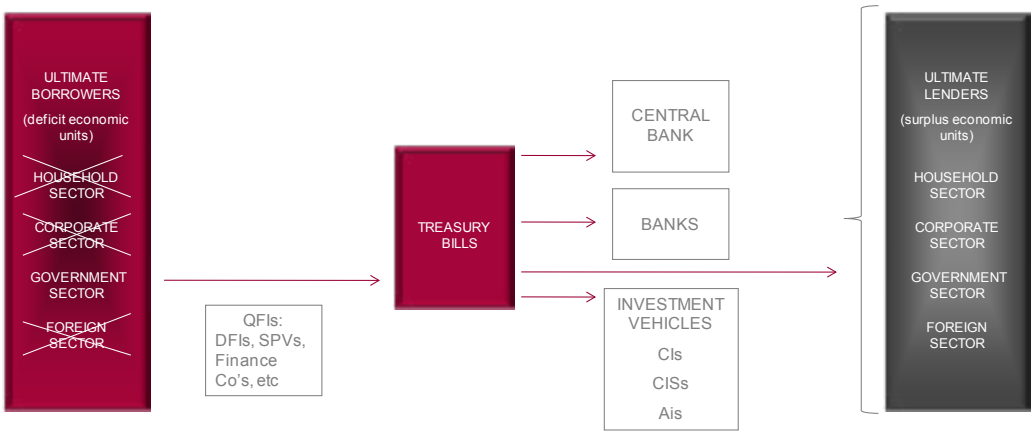


Figure 6: treasury bills in the financial system

TBs are held predominately by the central bank, the banks and the investment vehicles (particularly the retirement funds and securities unit trusts).

5.5.7 Variations on the theme

Treasury bills generally are called treasury bills and have the same characteristics. However, CP exists in many variations. In Malawi, for example, CP is termed negotiable promissory notes (NPNs). In Ghana the mineral bills, cocoa bills, grain bills and cotton bills are variations of CP. Similarly, in Zimbabwe the electricity bill is to be found.

5.6 Summary

Money market securities are issued by ultimate borrowers and certain of the financial intermediaries: the central bank, the banks and certain of the QFIs. The majority of money market securities is in the form of NMD (e.g. utilised overdraft facilities).

There are major differences in the interest rates that pertain to the various money market instruments, but all reflect the repo rate of the central bank and the margin of the banks.

The marketable instruments of the money market are:

- Negotiable certificates of deposit.
- Bank notes and coins in circulation.
- Central bank securities.
- Bankers' acceptances.
- Promissory notes.
- Commercial paper.
- Foreign commercial paper.
- Treasury bills.

5.7 Bibliography

Faure, AP, 2007. **The money market**. Cape Town: Quoin Institute (Pty) Limited.

6 Derivative instruments

6.1 Learning objectives

After studying this text the learner should / should be able to:

- Describe broadly the money market derivative instrument markets.
- Broadly describe each of the money market derivative instruments.

6.2 Introduction

Earlier we defined the money market as encompassing:

- The primary markets that bring together the supply of retail and wholesale short-term funds and the demand for wholesale and retail short-term funds.
- The secondary market in which existing marketable short-term instruments are traded.
- The creation of new money (deposits) and the financial assets that lead to this [loans in the form of non-marketable debt (NMD) securities and marketable debt (MD) securities].
- The cb2b IBM and the b2bc IBM where monetary policy is played out and interest rates have their genesis (i.e. where repo is implemented).
- The b2b IBM where the repo rate has its secondary impact, i.e. on the interbank rate.
- The money market derivative markets (= an addendum).

We are concerned with the latter in this text. Before we get to the instruments, a few words on derivative instruments in general are required.

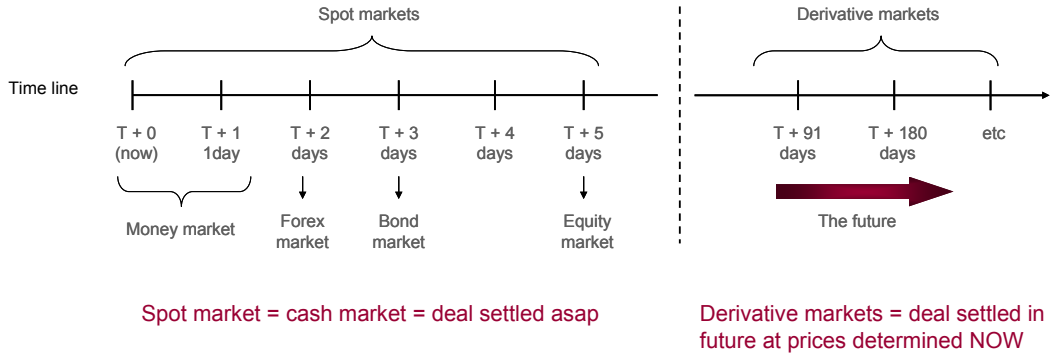


Figure 1: financial markets: spot & derivatives

In the spot (also called cash) markets transactions (deals) are settled as soon as is practically possible. In most countries spot market deals are settled as indicated in Figure 1. In the derivative markets deals are done now (on T+0) but they are settled on dates other that spot settlement dates – usually many weeks or months (or even years) into the future. For example if one sells a future the deal is struck now at a price determined now for settlement in 90 days' time. In the case of an option the deal is done now but settlement *may* take place between now and 120 days into the future, depending on the strike price which is stipulated now.

There are many types of derivatives; they are categorised in Figure 2. These instruments are found in all the instruments / prices / rates in all the markets: money market, bond market, equity market, foreign exchange market and commodities markets.

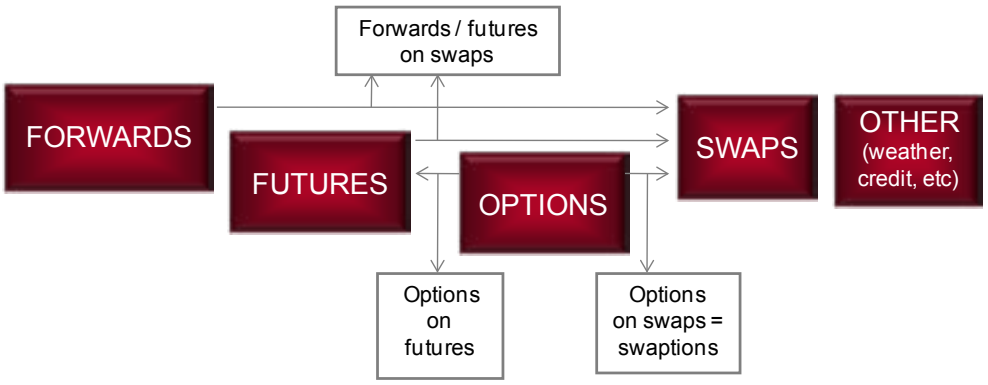


Figure 2: derivative instruments / markets

Derivatives instruments are called *derivatives* because they are "derived" from the spot-settled instruments of the various markets, i.e. they cannot exist without these *underlying* instruments or indices based on them. The values of the derivatives change as their underlying instruments change in value.

The money market derivative instruments that adorn the landscape of many money markets around the world are:

- Forwards:
  - forward interest rate contracts
  - repurchase agreements
  - forward rate agreements.
- Money market interest rate future.
- Interest rate swaps.
- Options:
  - interest rate caps and floors
  - money market options.
- Derivatives on derivatives.

It is to be noted that this text serves as a mere introduction to the money market derivatives.

6.3 Forwards

6.3.1 Forward interest rate contracts

A forward interest rate contract (FIRC) is the sale / purchase of a debt instrument on a pre-specified future date at a pre-specified rate of interest. An example is probably the best way to describe this derivative. A FIRC deal usually contains details as follows (see also Figure 3):

- the debt instrument/s
- amount of the instrument that will be delivered
- due date of the debt instruments
- forward date (i.e. due date of the contract)
- rate of interest on the debt instrument to be delivered.

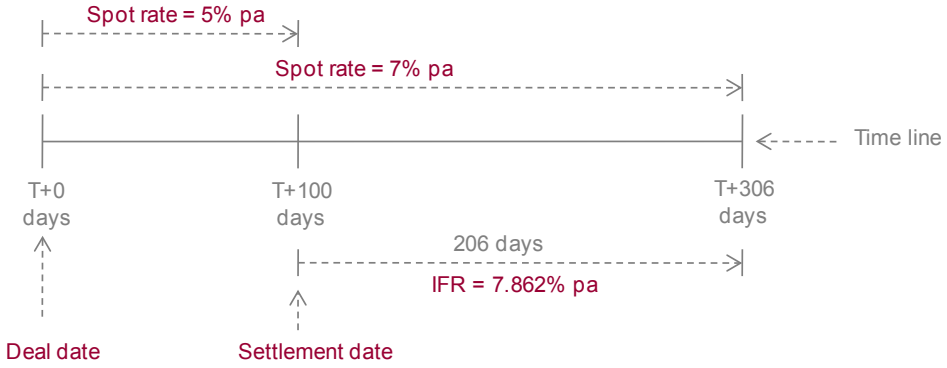


Figure 3: example of forward interest rate contract

An insurance company requires a LCC 100 million (plus) 206-day NCD investment in 100 days' time when it receives a large interest payment. It wants to secure the rate now because it believes that rates on that section of the yield curve are about to start declining, and it cannot find a futures contract that matches its requirement in terms of the exact date of the investment (100 days from now) and its due date (306 days from now – T+0)

It approaches a dealing bank and asks for a forward rate on LCC 100 million (plus) 206-day NCDs for settlement 100 days from now. The spot rate (current market rate) on a 306-day NCD is 7.0% pa and the spot rate on a 100-day NCD is 5% pa. It will be evident that the dealing bank has to calculate the rate to be offered to the insurer from these existing rates. This involves the calculation of the rate *implied* in the existing spot rates, i.e. the *implied forward rate* (IFR):

$$IFR = \{[1 + (ir_L \times t_L)] / [1 + (ir_S \times t_S)] - 1\} \times [365 / (t_L - t_S)]$$

where

ir_L = spot interest rate for the longer period (306 days) = 7% pa
ir_S = spot interest rate for shorter period (100 days) = 5% pa
t_L = longer period, expressed in days / 365 = 306 / 365
t_S = shorter period, expressed in days / 365 = 100 / 365.

$$\begin{aligned} IFR &= \{[1 + (0.07 \times 306 / 365)] / [1 + (0.05 \times 100 / 365)] - 1\} \text{ x } 365 / 206 \\ &= [(1.05868 / 1.01370) - 1] \times 365 / 206 \\ &= (1.04437 - 1) \times 365 / 206 \\ &= 0.07862 \\ &= 7.862\% \text{ pa.} \end{aligned}$$

The bank will quote a rate lower than this rate in order to make a profit. However, we assume here for the sake of explication that the bank takes no profit on the client. It undertakes to sell the 206-day NCDs to the insurer at 7.862% pa after 100 days.

The financial logic is as follows[50]: the dealing bank could buy a 306-day NCD from another bank at 7% pa and sell it under repo (have it "carried") for 100 days; the repo buyer will earn 5.0% pa for 100 days and the ultimate buyer, the insurer (the forward buyer), will earn the IFR of 7.862% pa for 206 days. The calculations follow:

1. The dealing bank buys LCC 100 million 306-day NCDs at the spot rate of 7.0% pa. The interest amount = 7.0 / 100 × LCC 100 000 000 × 306 / 365 = LCC 5 868 493.15.
2. The maturity value (MV) of the investment = cash outlay + interest for the period = LCC 100 000 000 + LCC 5 868 493.15 = LCC 105 868 493.15.
3. The bank has the NCDs "carried" for 100 days at the spot rate for the period of 5.0% pa. This means it sells the LCC 100 million NCDs at market value (LCC 100 million) for a period of 100 days at the market rate of interest for money for 100 days (5% pa).
4. After 100 days, the bank pays the "carrier" of the NCDs interest for 100 days at 5.0% pa on LCC 100 million = LCC 100 000 000 × 5.0 / 100 × 100 / 365 = LCC 1 369 863.01.
5. The bank now sells the NCDs to the insurer at the IFR of 7.862% pa. The calculation is: MV / [1 + (IFR / 100 x days remaining to maturity / 365)] = LCC 105 868 493.15 / [1 + (7.862 / 100 × 206 / 365)] = LCC 101 370 498.00.
6. The insurer earns MV – cash outlay for the NCDs = LCC 105 868 493.15 – LCC 101 370 498.00 = LCC 4 497 995.10 for the period.
7. Converting this to a pa interest rate: [(interest amount to be earned / cash outlay) × (365 / period in days)] = [(LCC 4 497 995.10 / LCC 101 370 498.00) × (365 / 206)] = 7.862% pa, i.e. the agreed rate in the forward contract.

Essentially what the dealing bank has done here is to hedge itself on the forward rate quoted to the insurer. It will be evident, however, that the bank, while hedged, makes no profit on the deal. As noted, in real life the bank would quote a forward rate lower than the break-even rate of 7.862% pa (e.g. 7.7% pa.)

The principle involved here, i.e. "carry cost" (or "net carry cost" in the case of income earning securities), is applied in all forward and futures markets. This will become clearer as we advance through this module.

The above is a typical example of a forward deal in the debt market. It will be apparent that the deal is a private agreement between two parties and that the deal is not negotiable (marketable). The market is not formalised (exchange-driven) and the risk lies between the two parties. It is for this reason that the FIRC market is the *domain of the large players*, and these are the large banks, and the institutions[51].

6.3.2 Repurchase agreements[52]

A repurchase agreement (repo) is a contractual transaction in terms of which an existing security is sold at the market value (or higher) of the security at an agreed rate of interest, coupled with an agreement to repurchase the same security on a specified, or unspecified, date in the future. The parts of this definition require further elaboration.

The transaction note confirming the sale of the security can contain a note stipulating the agreement to repurchase. Alternatively, two transaction notes can be issued, i.e. a sale note together with a purchase note dated for the agreed repurchase date. Underlying all repos is the ISDA[53] Master Repurchase Agreement, i.e. an internationally recognised repo contract.

An example will be useful (see Figure 4):

A small bank has in portfolio a NCD of another bank that it is holding in order to make a capital profit when rates fall. The NCD had 360 days to maturity when it was purchased. It is now day 30 in the life of the NCD (i.e. it has 330 days to run), and the bank needs funding for a particular deal for 70 days. The bank sells the NCD to a party that has funds available for 70 days under agreement to repurchase the same NCD after 70 days. The applicable rate is the price of money for 70 days (the risk-free rate plus a premium reflecting the quality of the maker of the repo and the NCD).

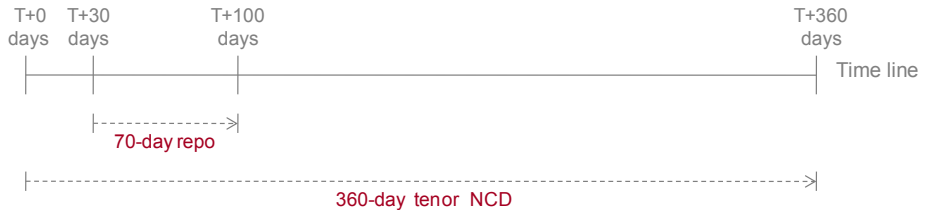


Figure 4: example of 70-day repo in NCDs

There are two main types of repos: the *open repo* and the *fixed term repo*. The former agreement is where there is no agreed termination date. Both parties have the option to terminate the agreement without notice. The rate on these agreements is usually a floating rate, the basis / benchmark of which is agreed in advance.

Fixed term repos are agreements where the rate and the term are agreed at the outset of the agreement. The terms of repos usually range from a day to a few months. The repo markets in most countries far outweigh the spot money markets.

Repos are dealt on a yield basis, i.e. the interest is calculated on an add-on basis (single payment at end of period). The termination value (TV), which is the future value (FV) of the transaction, is calculated as follows:

$$TV\ (FV) = MV \times [1 + (ir \times t)]$$

where

MV = market value (= PV) of the underlying securities
ir = agreed interest rate pa expressed as a unit of 1
t = term of the agreement in days / 365

If in the above example the bank sold LCC 105 million (= maturity value) NCDs for LCC 100 million (= MV = PV) for 70 days at the 70-day repo rate of 8.55% pa, the TV is:

$$\begin{aligned} TV\ (FV) &= MV \times [1 + (ir \times t)] \\ &= LCC\ 100\ 000\ 000 \times [1 + (0.0855 \times 70 / 365)] \\ &= LCC\ 100\ 000\ 000 \times (1.0163972603) \\ &= LCC\ 101\ 639\ 726.03 \end{aligned}$$

The bank receives LCC 100 000 000 at the start date of the repo and pays the buyer of the repo LCC 101 639 726.03 after 70 days. Clearly the interest amount is LCC 1 639 726.03 [LCC 100 000 000 × (0.0855 × 70 / 365)].

6.3.3 Forward rate agreements

A *forward rate agreement* (FRA) is an agreement that enables a user to hedge itself against unfavourable movements in interest rates by fixing a rate on a notional amount that is (usually) of the same size and term as its exposure that starts some time in the future. It is akin to a foreign exchange forward contract in terms of which an exchange rate for a future date is determined upfront.

An example is a 3 × 6 FRA (= 3-month into 6-month): the 3 in the 3 × 6 refers to 3 months' time when settlement takes place, and the 6 to the expiry date of the FRA from deal date, i.e. the rate quoted for the FRA is a 3-month rate at the time of settlement. This is depicted in Figure 5.

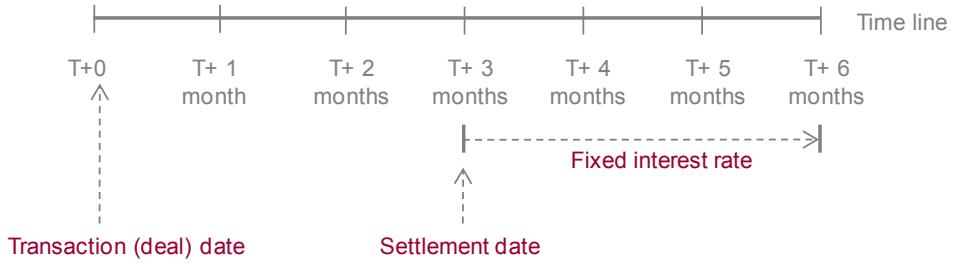


Figure 5: 3 x 6 FRA

This type of instrument is particularly useful for the company treasurer who is of the opinion that the central bank is about to increase the repo rate and that the interest rates on commercial paper (CP – his borrowing habitat) will rise sharply. He needs to borrow LCC 20 million in three months' time for a period of three months. He approaches a dealing bank that he normally deals with on 4 March and obtains quotes on a series of FRAs as shown in Table 1[54].

TABLE 1: FICTIONAL FRA QUOTES

FRA	Bid (% pa)	Offer (% pa)	Explanation
3 x 6	10.00	10.10	3-month rate in 3 months' time
6 x 9	10.20	10.30	3-month rate in 6 months' time
9 x 12	10.40	10.50	3-month rate in 9 months' time

The treasurer verifies these rates against the quoted FRA rates of another two banks (i.e. to ensure that he is getting a good deal), finds that they are fair and decides to deal at the 10.10% pa offer rate for the 3 × 6 FRA for an amount of LCC 20 million, which matches the company's requirement perfectly. The applicable *future* dates are 4 June and 3 September (91 days).

The transaction means that the dealing bank undertakes to fix the 3-month borrowing rate in three months' time at 10.10% for the company. The transaction is based on a *notional amount* of LCC 20 million. The notional amount is not exchanged; it merely acts as the amount upon which the calculation is made.

The rate fixed in the FRA is some *benchmark* (also called *reference*) rate, or a rate referenced on a benchmark rate, i.e. some rate that is readily accepted by market participants to represent the 3-month rate. We assume this is the 3-month IBAR[55] rate, which is a yield rate.

On settlement date, i.e. 4 June, the 3-month IBAR rate is 10.50% pa. On this day the 3-month (91-day) CP rate is also 10.50% pa (which it should be because the IBAR rate is representative of the 3-month rate). The company borrows the LCC 20 million required at 10.50% through the issue of CP for 91 days. According to the FRA the dealing bank now owes the company an amount of money equal to the difference between the spot market rate (i.e. 3-month IBAR = 10.50% pa) and the agreed FRA rate (i.e. 10.10% pa) times the notional amount. This is calculated as follows:

SA = NA x ird x t

where

SA = settlement amount
NA = notional amount
ird = interest rate differential (10.50% pa – 10.10% pa = 0.40% pa)
t = term (forward period), expressed as number of days / 365

SA = LCC 20 000 000 × 0.004 × (91 / 365)
= LCC 19 945.21.

Note that this formula applies in the case where settlement of this amount is made in arrears at month 6 (= 3 September). If the amount is settled at month 3 (= 4 June) it has to be discounted to present value (PV). The discount factor is:

$$df = 1 / [1 + (rr \times t)]$$

where

rr = reference rate (= IBAR rate)
t = term of agreement (number of days / 365)

$$df = 1 / [1 + (rr \times t)]$$
$$= 1 / [1 + (0.105 \times 91 / 365)]$$
$$= 0.97449.$$

Therefore (PVSA = present value of settlement amount):

$$PVSA = SA \times df$$
$$= LCC\ 19\ 945.21 \times 0.97449$$
$$= LCC\ 19\ 436.41$$

This transaction is illustrated in Figure 6. It will be evident that the exchange of interest on LCC 20 million does not take place; the dealing bank only settles the difference.

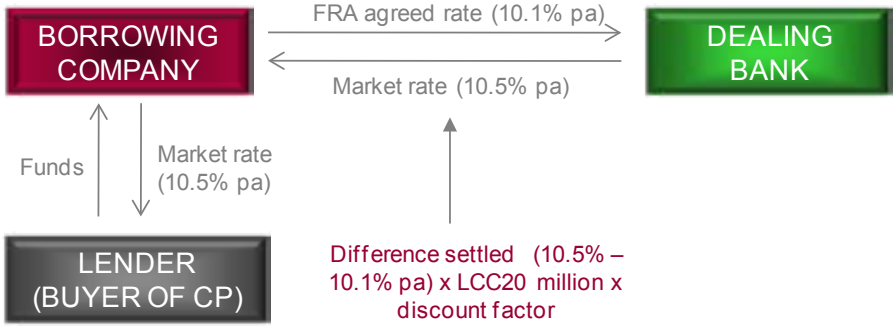


Figure 6: example of FRA: bank settles difference

6.4 Money market interest rate future

A future (correct terminology: futures contract) is an obligation to "buy" or "sell" a standard quantity and quality of an asset [which can be a notional asset (a share index), a financial asset (a specific share) or a commodity (maize)] on a specified date in the future, at a price determined at the time of making / transacting in the contract.

All futures markets are exchange-driven, and the exchange guarantees the futures contracts in the form of interposing itself between the buyers and the sellers in all transactions (see Figure 7).

Figure 7: participants in futures deal

An example of a money market interest rate future is the fictitious *3-month IBAR interest rate future* listed on the exchange of Local Country. The features of this future are shown in Table 2. [The theoretical price or fair value price (FVP) is determined from the calculated *forward-forward rate* (which is also called the *implied forward rate*)].

TABLE 2: SPECIFICATIONS OF THE 3-MONTH IBAR FUTURE	
UNDERLYING INSTRUMENT (CONTRACT BASE)	The 3-month Interbank Agreed Rate (IBAR)
CONTRACT SIZE (NOTIONAL)	LCC 100 000 nominal
QUOTATION STYLE	Effective interest rate
CONTRACT MONTHS	March, June, September and December
EXPIRY DATES & TIMES	11h00 on third Wednesday of the contract month (or previous business day)
MINIMUM TICK SIZE	0.001% (1/10 of a basis point)
BASIS POINT VALUE	LCC 2.50 per basis point (rate change = 0.01% pa)
MARK-TO-MARKET (MTM)	Explicit daily fixing
SETTLEMENT	Cash
SETTLEMENT YIELD (DAILY MTM)	Closing MTM yield
SETTLEMENT YIELD (ON EXPIRY)	3-month IBAR on expiry
INITIAL MARGIN	LCC 100 per contract
Source: example adapted from the South African 3-month JIBAR interest rate contract listed on the JSE.	

Money market futures are used to hedge money market positions / investments and to speculate on future interest rate movements.

6.5 Interest rate swaps

An interest rate swap (IRS) is a transaction (agreement) that involves the swapping (exchanging) of interest rate obligations by two parties. In an interest rate swap one party has a fixed rate obligation and the other a floating rate obligation, and there are two different kinds of debt instruments involved. No principal amount is exchanged. Only the interest rate obligation is exchanged, and these are based on a notional amount. The circumstances that give rise to interest rate swaps usually involve interest rate risk or a comparative rate advantage. The following swaps may be identified:

- IRS that transforms a liability.
- IRS that transforms an asset.
- Comparative rate advantage IRS.

An example of an IRS used to transform a liability is presented in Figure 8. In this example Company A has borrowed LCC 100 million through the issuing of 91-day CP (which is re-priced every 91 days at the then prevailing rate), while Company B has borrowed LCC 100 million by the issuing of corporate bonds at a fixed rate of 12% pa for a 3-year period. These borrowing habitats could reflect the following:

- Company A believes interest rates are going to move down or sideways (does not want to "lock in" a rate for a long period, and wants to take advantage of rates declining if this does come about)

- Company B is of the view that rates are about to rise and wishes to lock in a rate now for the next three years.

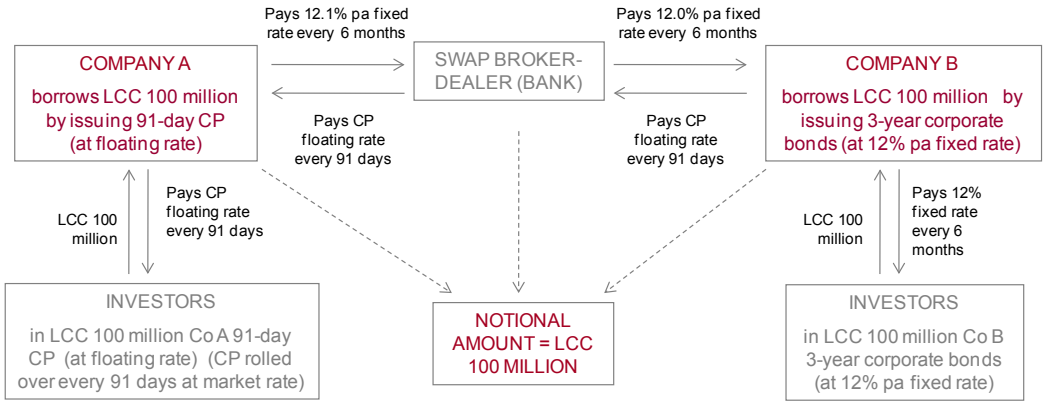


Figure 8: interest rate swap: transforming a liability

Time passes and the two parties change their views. A sharp banker spots the changed views of the two companies and puts the following deals to them:

Company A

- Company A and the bank enter into an interest rate swap agreement
- Company A agrees to pay to the bank a fixed rate of 12.1% for the next three years, interest payable six-monthly
- the bank agrees to pay Company A the floating CP rate every 91-days
- the notional amount of the swap is LCC 100 million.

Company B

- Company B and the bank enter into an interest rate swap agreement
- Company B agrees to pay the bank the CP floating rate every 91 days
- the bank agrees to pay to Company B paying a fixed rate of 12.0%, interest payable six-monthly
- the notional amount of the swap is LCC 100 million.

The deals are agreed. Company A's obligation to pay the 91-day CP rate to the holders (which may be different in each rollover period) is matched by the bank's payment of the 91-day CP rate to it. It is then left with the obligation to pay the fixed rate of 12.1% pa to the bank.

Conversely, Company B's obligation to pay the fixed 12% pa to the investors in its paper is matched by the bank's obligation to pay the fixed 12% pa rate to it. Company B is thus left with the obligation to pay the 91-day CP rate to the bank.

The interest obligations of the bank match, with the exception that the bank earns 0.1% on the fixed interest leg of the transaction (LCC 100 000 per annum excluding compounding and PV calculations).

6.6 Options

6.6.1 Interest rate caps and floors

An interest rate cap (or protected interest rate agreement) is an agreement between a party (usually a bank) and a corporate borrower with a *floating rate debt obligation* to *cap* the borrowing rate. The bank undertakes to *cap* the floating interest rate at a particular level over an agreed period in exchange for a premium (price). In terms of the agreement the bank *undertakes to pay any interest amount in excess of the agreed interest*. An example will elucidate:

Index (reference)	= 91-day BA rate
Term:	= 1 January 2001 to 31 December 2002
Cap level (strike)	= 12% pa
Amount (notional)	= LCC 100 million
Premium:	= LCC 1 million (1% of amount).

This agreement would typically be done by a borrower who has invested in a project that is expected to be profitable at a cost of borrowing not exceeding 13% pa (i.e. the cap level of 12% pa plus the premium which equates to a rate of 1% pa). Thus, the highest interest rate that would be paid by the borrower is 13% pa, but the borrower benefits should the BA rate remain below 12% pa.

The converse of the cap is the interest rate floor, which determines a minimum rate level, and a combination of the purchase of a cap and the sale of a floor is termed a *collar*.

A *cap* purchased makes it possible for a company with a *borrowing requirement* to hedge itself against rising interest rates. The cap contract establishes a ceiling, but the company retains the right to benefit from falling interest rates. On the other hand, a *floor* contract allows a company with an *investment requirement* (surplus funds) to shield itself against declining interest rates by determining a specified floor upfront, while it retains the right to profit from rising interest rates.

On the exercise date of the cap or floor contract, the specified strike rate is evaluated against the standard reference rate (i.e. usually the equivalent-term benchmark rate such as the fictitious IBAR mentioned earlier). The interest differential is then applied to the notional principal amount that is specified in the contract, and the difference is paid by the seller / writer to the buyer / holder. The buyer of a floor or cap pays a premium for the contract to the seller.

It is perhaps best to elucidate a cap with the assistance of an example (see Figure 9): *borrowing company buys a T3-month – T6-month cap:*

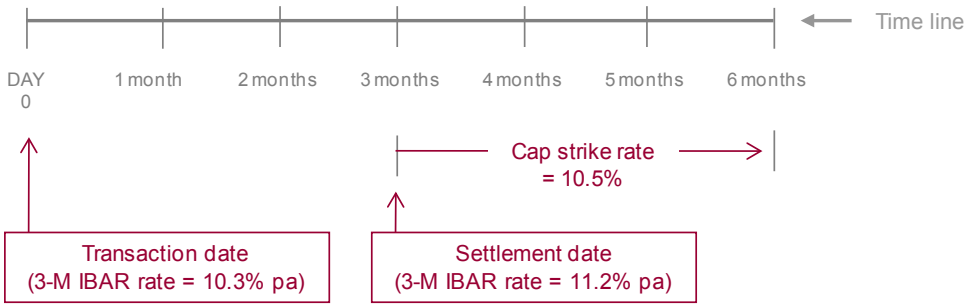


Figure 9: example of T3-month –T6-month cap

A company needs to borrow LCC 20 million in 3 months' time for a period of 3 months, and is concerned that rates are about to rise sharply. The present 3-month market rate (IBAR rate = market rate) is 10.3% pa. The company is quoted a T3-month – T6-month (T3m-T6m) cap by the dealing bank at 10.5% pa, i.e. the 3-month IBAR rate for the company is fixed 3-months ahead. The company accepts the quote and pays the premium of LCC 25 000 to the dealing bank. The number of days of the period for which the rate is fixed is 91.

If the IBAR rate (= market rate on CP, the borrower's borrowing habitat) in 3-months' time (i.e. settlement date), is 9.3%, the company will allow the cap to lapse and instead will borrow in the market at this rate by selling (issuing) CP. The total cost to the company will be the 9.3% interest plus the premium paid for the cap:

$$\text{Cost to company} = (C \times ir \times t) + P$$

where

C = consideration (amount borrowed)
ir = interest rate pa (expressed as a unit of 1)
t = term, expressed as number of days / 365
P = premium

$$\begin{aligned}\text{Cost to company} &= (C \times ir \times t) + P \\ &= \text{LCC } 20\,000\,000 \times 0.093 \times 91 / 365) + \text{LCC } 25\,000 \\ &= \text{LCC } 463\,726.03 + \text{LCC } 25\,000 \\ &= \text{LCC } 488\,726.03.\end{aligned}$$

It will be apparent that the interest rate actually paid by the company is:

$$\begin{aligned}\text{Total interest rate paid} &= \text{LCC } 488\,726.03 / \text{LCC } 20\,000\,000 \times 365 / 91 \\ &= 0.0244363 \times 4.010989 \\ &= 0.09801 \\ &= 9.80\% \text{ pa.}\end{aligned}$$

If the IBAR rate on the settlement date is say 11.2% pa, settlement will take place with the dealing bank according to the following formula:

$$SA = NA \times [(rr - csr) \times t]$$

where

SA = settlement amount
NA = notional amount
rr = reference rate
csr = cap strike rate
t = term, expressed as number of days / 365

$$\begin{aligned}SA &= \text{LCC } 20\,000\,000 \times [(0.112 - 0.105) \times 91 / 365] \\ &= \text{LCC } 20\,000\,000 \times (0.007 \times 91 / 365) \\ &= \text{LCC } 34\,904.11.\end{aligned}$$

The financial benefit to the company is equal to the settlement amount minus the premium:

$$\begin{aligned}\text{Financial benefit} &= SA - P \\ &= \text{LCC } 34\,904.11 - \text{LCC } 25\,000 \\ &= \text{LCC } 9\,901.11.\end{aligned}$$

The company thus borrows at the market rate of 11.2%, but this rate is reduced by the amount paid by the bank to the company less the premium paid to the bank:

$$\begin{aligned}\text{Cost to company} &= (C \times ir \times t) - (SA - P) \\ &= (\text{LCC } 20\,000\,000 \times 0.112 \times 91 / 365) - (\text{LCC } 9\,901.11) \\ &= \text{LCC } 558\,465.75 - \text{LCC } 9\,901.11 \\ &= \text{LCC } 548\,564.64\end{aligned}$$

$$\begin{aligned}\text{Total interest rate paid} &= (\text{LCC } 548\,564.64 / \text{LCC } 20\,000\,000) \times (365 / 91) \\ &= 0.0274282 \times 4.010989 \\ &= 0.110001 \\ &= 11.00\% \text{ pa.}\end{aligned}$$

6.6.2 Money market options

An option is defined as a contract that imparts to the holder (buyer) the right, without the obligation, to buy from (in the case of a call option) or to sell to (in the case of a put option) the writer of the option, an asset / security on which the contract is written, on or before a specified date in the future.

The money market options market has three sub-markets:

- Options on specific securities.
- Options on the interest rate future.
- Swaptions.

Options on specific securities, as the name suggests, are options to buy (call options) or sell (put options), for example, the 91-day treasury bill. In most countries the options market (on money market assets) is limited. This market is generally an OTC market.

6.7 Derivatives on derivatives

There are a number of derivatives on other derivative instruments in many of the money markets of the world. Examples are:

- Forwards on swaps.
- Options on interest rate futures.
- Swaptions (options on swaps).

6.8 Summary

There are five main derivative categories: forwards, futures, swaps, options, and "other" (weather derivatives, credit derivations etc). Money market derivatives are found in the first four categories.

Essentially, derivatives are obligations or options to buy or sell real / notional securities / commodities on dates in the future other than spot settlement dates.

The money market derivatives are:

- Forwards:
  - forward interest rate contracts
  - repurchase agreements
  - forward rate agreements.
- Money market interest rate future.
- Interest rate swaps.
- Options:
  - interest rate caps and floors
  - money market options.
- Derivatives on derivatives (forwards on swaps, options on interest rate futures and swaptions).

6.9 Bibliography

Faure, AP, 2007. **The derivative markets**. Cape Town: Quoin Institute (Pty) Limited.

7 Endnotes

1. Note that although this facility can be in place for decades, we regard it as a short-term loan from a bank that is rolled over frequently in the case of creditworthy, non-delinquent borrowers. It is therefore a loan that can be withdrawn. It also carries a floating rate benchmarked on the prime overdraft rate.
2. We regard them as NCDs. Examples are South African Reserve Bank debentures, Reserve Bank of Malawi bills, Bank of Botswana certificates.
3. This is only one of the functions of money, but it is the main one; the others are s*tore of value*, *unit of account* and *standard of deferred payment*.
4. A yield curve presents the relationship between interest rates and term to maturity at a point in time. It is generally constructed from the rates of comparable securities, specifically one issuer such as government and zero-coupon securities. This gives us the zero-coupon yield curve (ZCYC). This issue is discussed in detail in the bond market course.
5. Risk-free in the sense that government is able to tax and borrow in order to pay interest and repay holders when they mature.
6. In many countries central bank accommodation to the banks is granted on an overnight basis (i.e. 1 day). In the repo system adopted in many other countries 1-week auctions are usually held for the majority of the liquidity required, and overnight repos are executed for "fine-tuning" at the end of the final interbank clearing.

7. Note that this style on monetary policy execution is followed by many countries, including the ECB, the Bank of England, the Bank of Canada, the South African Reserve Bank, and so on. Not all countries follow this style. Some countries follow a policy of not having a liquidity shortage or surplus, while others allow liquidity surpluses. The latter policy is deeply flawed.
8. It is also apparent that the most significant price in the economy (the interest rate) is "controlled" by decree (by the Monetary Policy Committee of the central bank), refuting the notion of a free market economy.
9. Discussed in more detail later.
10. This is so because the public accepts deposit money as a means of payment; discussed in more detail later.
11. Except "self-imposed": creditworthiness-assessment in the case of individuals and scrutiny of viability in the case of the corporate sector.
12. Contractual intermediaries.
13. Collective investment schemes.
14. Certain forms of borrowings, for example the utilised overdraft facility, are not represented by the issue of an actual security. Rather, the bank overdraft is denoted by a debit balance on a bank statement. In law this is a debt obligation; we regard debt obligations as debt securities.
15. In South Africa a bond exchange (Bond Exchange of South Africa – BESA) exists and some money market securities are listed on BESA.
16. Note the absence of an arrow between the ultimate lenders and the contractual intermediaries (CI) and the collective investment schemes (CIS) in Figure 8. This is because lenders do not hold "money" with these institutions but "investments".
17. In South Africa, for example, the Land Bank issues Land Bank bills and PNs; the Development Bank of Southern Africa (DBSA) issues Development Bank bridging bonds (under the relevant statutes that created these institutions).
18. Or primary dealers if the they are officially appointed. The best example is the market makers appointed by the central bank / government to tender for primary issues of government bonds. The market makers / primary dealers are usually the large local and international banks.
19. In most countries.
20. he reason the second "proviso" is even mentioned is because there are some central banks (which were visited by the author) that still believe that they are not responsible for destroying cash reserves if they sell assets or increase liabilities (such as notes issues); bizarrely, they believe that the banks are the cause and should therefore be penalised. Conversely some central bankers believe that a money market surplus (i.e. positive balances on the banks' settlement accounts with the central bank) is caused by the banks and not by their own purchasing of assets or decreasing liabilities (such as the sale by the banks of bank notes back to the central bank).
21. LCC ("local country currency") is a fictitious currency.
22. Where does the new deposit come from is the question that needs to be asked. It is likely to come from a bank loan (the starting point of money creation).
23. In most countries, for good reasons.
24. Because the central bank does not pay interest on balances on these accounts.
25. Except for bank trading in existing NCDs.
26. There are some countries that do not have a cash reserve requirement.

27. Note that in some countries bank notes and coins rank as cash reserves. Here we assume that they do not – for the sake of simplicity.
28. Equity / other assets / other liabilities are ignored for the sake of simplicity.
29. LCC = currency ("corona") of fictitious country, Local Country.
30. In reality banks are permitted in many countries to hold less than the required amount on a daily basis, but must comply on average for the month.
31. Electronic funds transfer.
32. Interbank clearing house.
33. Different central banks have different requirements / policies in this regard, but this one is used here because it demonstrates the principal well.
34. They are actually repos from the point of view of the banks and resale agreements from the point of view of the central bank.
35. The official statistics of most countries allows for this calculation to be made on a monthly basis (including the statistical "causes" of changes in NER).
36. The rate on overdrafts for prime customers; other lending rates are benchmarked on this rate. Most bank assets are related to the prime rate.
37. For a particular country as at month-ends, for a period of over 50 years.
38. Note than every central bank has a different view on the MTPM. Their views can be found on the various websites. This is a personal view, and is adapted from the Bank of England view.
39. And create their own deposits by making loans.
40. Note that the terms *marketable* and *negotiable* are synonymous.

41. Electronic funds transfer (such as by internet banking transfer).
42. Recall our view: although this facility can be in place for decades, we regard it as a short-term loan from a bank that is rolled over frequently in the case of creditworthy, non-delinquent borrowers. It is therefore a loan that can be withdrawn. It also carries a floating rate benchmarked on the prime overdraft rate
43. Keep in mind that banks' balance sheets also include other items such as central bank money, interbank loans, marketable debt securities, other investments, and so on.
44. Note that in most markets securities certificates are rare, because of electronic settlement, which leads to dematerialisation or immobilisation.
45. Mentioned in many historical accounts; the original source is unknown.
46. From the South African Bills of Exchange Act.
47. When the Bank of England put in place conditions for the issue of commercial paper
48. Note that there are many risk-free rates – as many as there are government securities in issue.
49. In many countries the TB is now an electronic accounting entry / record as it is dematerialised. In some countries it is immobilised in a central securities depository. This also applies to other money market securities.
50. Based on the" arbitrage principle", i.e. if this were not the rate, arbitrage could take place.
51. The term "institutions" is used loosely in the financial markets to apply to the large investors, i.e. the retirement funds, insurers and securities unit trusts.
52. Note that not all scholars of the derivatives markets will regard the repo as a derivative. We do because it "derives" from other spot market instruments, and takes its rate from the spot money market. It can also be described as a spot sale coupled with a simultaneous forward purchase.
53. Created by the International Securities Dealers Association, and accepted worldwide.
54. Certain banks act as market makers in FRAs.
55. We assume that an "Interbank Agreed Rate" (an averaged rate) sourced from 10 banks by an independent party (such as a derivatives exchange) exists.