THE FUNCTIONING OF THE INTERBANK MARKET AND ITS SIGNIFICANCE IN THE TRANSMISSION OF MONETARY POLICY

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ABSTRACT

Monetary policy in South African is the primary means by which the authorities can influence activity in the overall economy. The South African Reserve Bank accommodates banks through repo transactions for which they charge the repo rate. The most important market in the transmission of the repo rate to the rest of the economy is the interbank market. As such, a detailed discussion of this market is given. In September 2001 the monetary authorities made certain adjustments to the repo system of accommodation, which included changing the repo rate from a floating rate to a fixed rate that would be administratively determined by the MPC. This was done to address certain weaknesses in the floating rate system. This thesis examines and compares the period before and after the adjustments to the repo system, with the aim of determining whether or not the monetary authorities achieved the goals intended from making this change. The repo rate, prime interbank rate, 3-month NCD rate and the prime lending rate are analysed using the Engle-Granger two variable approach and an ECM model to test for causality. It was found that the monetary authorities did not achieve their intended goals as the relationship between the repo rate and the interbank rate was more significant in the first period. Furthermore, the direction of causality the authorities hoped to achieve by implementing the changes were in fact already in place. As such the adjustments to the system changed the transmission mechanism from the one desired by the authorities to one that was not intended. The conclusions reached by this study show that, in terms of the objectives of the monetary authorities, the previous repo system functioned better.

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CHAPTER ONE

INTRODUCTION

1.1 CONTEXT OF THE RESEARCH

The main function of the South African Reserve Bank (SARB)[1] is the "formulation and implementation of monetary policy (aimed at achieving financial stability)" (SARB, 2002a:1). The monetary policy framework currently implemented by the SARB is an inflation-targeting framework, which was formally adopted on 6 April 2000 (Mboweni, 2000a:1). It provides for an explicit inflation target to be set and the responsibility of achieving this target is given to the Reserve Bank (Plenderleith, 2003:3). The main instrument that is used by the SARB to target inflation is the repo rate. The repo rate is the rate that the SARB charges for borrowed cash reserves, that is, for accommodation, and it is the most important rate in the financial markets.

Monetary policy will have no impact on the rate of inflation, no matter what policy is in place, if it is not made effective. What this means is that the main policy instrument (in this case the repo rate) needs to somehow be connected to the banking sector in order for changes in this instrument to be transmitted through the money market to eventually impact on the demand for credit. Thus, the SARB makes sure that the private sector banks are indebted to it at all times (Faure, 2004:67). It does this by creating a "money market shortage", which it then refinances at the repo rate. Banks in need of liquidity sell assets under repo to the Reserve Bank in exchange for borrowed cash reserves and pay the repo rate for this accommodation. A repo is a contract "involving the simultaneous sale and future repurchase of an asset" (Du Plooy, 1998:2).

It is the interbank market where the above process takes place. This market is essentially the foundation of monetary policy and for its transmission through the financial system, yet its operation and its significance in the implementation of monetary policy are not always well understood.

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[1] Henceforth SARB and Reserve Bank will be used synonymously.

In March 1998 the SARB implemented the repurchase system of accommodation. It was intended to address the shortcomings of the previous system, but, as with most new refinancing systems, it was found to have a number of weaknesses. One of the major weaknesses of this system, which consequently resulted in adjustments being made to the repo system in September 2001, was that the system was not equipped to be able to address certain issues hampering the effective functioning of the interbank market (SARB, 2001a:3). The importance of an efficiently functioning interbank market is paramount to the successful implementation of monetary policy. This is the first area in which this research is intended to make a contribution and thus a detailed discussion on how the interbank market functions will be given.

As mentioned, the importance of the interbank market in the transmission of monetary policy is evident in the fact that the SARB made adjustments to the 1998 refinancing system for the main reason that it "did not have the capability to address certain issues hampering the effective functioning of the interbank market" (SARB, 2001a:3). An effective interbank market should respond immediately to changes in the repo rate and will as a result ensure effective pricing in the money market as a whole (SARB, 2001a:4). Thus, certain changes were made to the 1998 refinancing system with the intention of improving the functioning of the interbank market and hence the implementation of monetary policy. According to the Reserve Bank, "effective monetary policy implementation implies ... that the central bank should manage liquidity in such a manner that the interbank overnight rate stays near (generally slightly below) the level of the repo rate" (SARB, 2001a:5). In addition, Gidlow (2001:3) states that the monetary authorities take the view that the money market would function more efficiently if changes to the repo rate had a more direct effect on the interbank rate. In other words, changes in monetary policy should first affect the interbank rates, which then transmit a similar influence to other money market rates and finally impact on the interest rates in the economy. However, before the adjustments to the repo system in September 2001, the opposite mechanism tended to be in operation (Gidlow, 2001:3). This is the second area in which this research is intended to make a contribution. An analysis of the period before the change to the repo system (i.e. March 1998 to September 2001) and the period after the change (i.e. September 2001 to November 2004) will be done in order to determine whether or not the SARB has achieved its goals.

1.2 GOALS OF THE RESEARCH

The first goal of this research is to provide a history of how monetary policy in South Africa has evolved since before the time of the De Kock Commission up to the present repo system of accommodation.

The second goal is to provide a detailed analysis of the operation of the interbank lending market as a conduit for monetary control in South Africa.

The final goal will be accomplished by employing various econometric techniques. Firstly, the effect of the changes to the repo system introduced in September 2001 will be evaluated. Secondly, the transmission mechanism of monetary policy before and after the change to the repo system will be tested. The ultimate goal of employing the latter methods is to see whether the adjustments to monetary policy did in fact achieve the results desired by the monetary authorities.

1.3 METHODOLOGY

This research employs data for the period March 1998 to November 2004. This period will be analysed in two parts; March 1998 to September 2001 (before the changes) and September 2001 to November 2004 (after the changes).

The research will be comprised of a literature study showing how monetary policy works and to highlighting the problems in terms of the interbank market that the monetary authorities hoped to solve by adjusting the repo system of accommodation in September 2001. In addition, quantitative data from the South African Reserve Bank will be used to establish whether or not the Reserve Bank has achieved its objective of improving the efficiency of the interbank market. This will be accomplished by the use of descriptive analysis and econometric methods.

During the course of this research, three econometric methods will be used to establish whether or not the South African Reserve Bank has achieved its objectives in terms of improving the efficiency of the interbank market. These are as follows:

1. Cointegration analysis: Cointegration analysis will be used to establish whether or not the "claimed" relationship between the repo rate and the interbank rate exists at all. The Engle-Granger approach will be used with the alternative being the mixed dynamic model suggested by Guisan (2001).
2. Tests of structural stability: These tests will be used to determine whether the relationship between the repo rate and the interbank rate, if any, has changed with the introduction of the amended policy in September 2001. The methods used will be the Chow forecast and the Chow breaking point tests.
3. Causality tests: These tests will be used to determine the causal relationship between the repo rate and the interbank rate. The standard Granger causality test will be used if the series are stationary. However if the series are found to contain unit roots, an ECM framework will be employed. This test will help to accomplish the following four aims:
    - To determine the relationship between the repo rate and the interbank rate for the period 1998-2004, i.e. to determine whether the repo rate causes the interbank rate or whether the interbank rate causes the repo rate.
    - To determine the relationship between the repo rate and the interbank rate for the period before and after the change in September 2001.
    - To test the transmission mechanism for the period 1998-2004.
    - To test the transmission mechanism before and after the change in September 2001.

1.4 RESEARCH FRAMEWORK

The goals of the research mentioned in 1.2 will be realised by the following research outline.

Chapter two will examine the way in which monetary policy has developed from the period before the De Kock Commission up until the present monetary policy system. It will discuss the way in which monetary policy has functioned during the different phases, the shortcomings of these systems, as well as the various instruments and methods used to achieve the objectives of these systems. It will also examine why the floating rate repo system was replaced in September 2001 with a fixed rate repo system. Finally, chapter two will discuss the new monetary policy operating procedure, its instruments and methods.

Chapter three will discuss the theories of monetary policy and the way in which monetary policy works in South Africa. It will also examine the way in which the interbank market functions and contributes to the transmission of monetary policy in South Africa.

Chapter four will discuss the money market shortage and the way in which the SARB creates this shortage in order to make the repo rate effective. The majority of this discussion will be examined with the use of examples and T-diagrams.

Chapter five will describe the econometric methods that will be employed in order to achieve the final objective. That is, it will discuss the methods that will be used to determine whether or not the changes made by the SARB to the repo system have in fact improved the functioning of the interbank market.

Following on from and using the methods described in Chapter five, Chapter six will present the results, analyse and discuss them.

Chapter seven will conclude the study. Two recommendations arising out of the research will also be briefly discussed.

CHAPTER TWO

HISTORY OF SOUTH AFRICAN MONETARY POLICY

2.1 INTRODUCTION

Over the years there have been a number of views on what the ultimate objectives of monetary policy are supposed to be. However, most monetary experts tend to see the specific contribution of monetary policy as the creation of a stable financial environment, especially price stability, conducive to the attainment of the general economic objectives of growth, employment and external balance (RSA, 1985:141).

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Although the history of monetary policy can be divided into a number of different phases, there are essentially three major phases of monetary policy in South Africa. They are the periods before the De Kock Commission, the De Kock era up until 1998 and the period after 1998. Each of these periods, the main policy instruments used and their shortcomings will be discussed below.

2.2 THE PERIOD BEFORE THE DE KOCK COMMISSION

In the period after the Second World War and before the first report of the De Kock Commission, monetary policy in South Africa passed through four distinct phases (De Kock, 1981:321).

2.2.1 First phase: 1945-1955

The first phase of monetary policy approximately covered the first ten years after the war. During this time the worldview was that fiscal policy was the most effective instrument with regard to stabilisation policy. It was believed that the role of monetary policy was to saturate the economy with liquidity and keep interest rates low so that consumption and investment would expand fast enough to provide full

employment (RSA, 1985:144). However, South Africa's approach to monetary policy at this time conflicted with the worldview and was instead based on the assumption that "money"[2], "was a unique financial asset which played a strategic role in the determination of the total demand for goods and services" (RSA, 1985:144). Also, it was believed that only the Reserve Bank and the commercial banks could "create" money on a multiple basis (RSA, 1985:144). It was therefore taken as fact that bank credit and money had a strong influence on production, incomes, prices and the balance of payment.

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2.2.2 Second phase: 1955-1961

The second phase coincided with the late fifties and early sixties. During this period the money supply was seen as playing an especially important role. Firstly, it was held that an increase in the money supply was needed if expenditure, incomes and prices were to increase. Secondly, it was believed that changes in the money supply could affect investment and consumption as they exert an important influence on interest rates. Thirdly, the link between the "general availability of credit" and the money supply was explicitly recognised by the authorities. Finally, it was accepted that spending could be directly influenced by changes in the money supply (RSA, 1985:144).

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Monetary policy during this phase was still directed at trying to control the commercial banks' "unique ability to create money", i.e. control bank credit extension. The Reserve Bank attempted to use changes in the cash reserves and liquid assets of commercial banks in order to influence bank credit and hence the money supply. However, the SARB ended up having to rely more on moral suasion[3] and discount policy since the markets in government stock, Treasury bills and other money market paper was not well developed (De Kock, 1981:323).

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[2] Money is defined here as bank notes and coin and demand deposits with commercial banks.
[3] This term will be discussed in greater detail in 3.6.5.

2.2.3 Third phase: 1961-1964

According to De Kock (1981:323) the third phase in the "development of South African monetary policy covers the period of reaction to the revolutionary monetary theories propounded during the late fifties by, amongst others, the American economists Gurley and Shaw and the Radcliffe Commission in the United Kingdom". These revolutionary monetary theories saw money not as a unique financial asset but merely as one of a long list of liquid financial assets and argued that commercial banks were not unique kinds of financial institutions (De Kock, 1978:200). The Radcliffe Commission, for example, argued that "money" and "velocity of circulation of money" were not important and that little significance should be attached to the role of commercial banks as "creators of money".

The Technical Committee of South Africa[4] rejected both the conventional approach to money as well as the views of the Radcliffe Commission and Gurley and Shaw. Mostly the committee still favoured the conventional approach but was firm in its belief that two major "modernisations" were needed. The first modernisation was that in addition to "money" it needed to be recognised that there were also close substitutes for money such as deposits or other financial instruments, which could be easily converted into money, then termed "near money". The second was the recognition that it was not only the Reserve Bank and commercial banks that could create money, but that there were several other kinds of deposit-taking institutions such as merchant banks and discount houses, which could also create money on a multiple basis (RSA, 1985:145). The concept of the "monetary banking sector" grew out of this approach and included the Reserve Bank, the commercial banks and other banking institutions with monetary significance. In other words, those institutions, which as a group, were able to create their own liabilities by expanding their assets (De Kock, 1981:324).

[4] The Technical Committee was appointed in 1961, following complaints about unfair competition between the building societies and different banking institutions, to advise the authorities on desirable amendments to the Banking and Building Societies Act.

2.2.4 Fourth phase: 1965-1980

The fourth phase in the post-war developments of South African monetary policy can be seen as encompassing the period 1965-1980. These fifteen years were characterised by non-market oriented or "direct" methods of monetary control as well as semi-market-oriented policy instruments such as cash reserve and variable liquid asset requirements (RSA, 1985:147). Among the direct controls used by the monetary authorities were deposit rate controls, ceilings on bank credit to the private sector, import deposits, direct consumer credit controls and exchange controls. Comparatively little emphasis was placed on market-oriented methods of monetary control such as open market operations and other forms of Reserve Bank intervention in the financial markets (De Kock, 1981:326). Quantitative controls on interest rates and credit were used and little emphasis was placed on the interest rate as a corrective tool. At times, interest rates were kept below their natural levels by measures such as lending rate and direct deposit controls and the "Reserve Bank's fixed pattern of rates for the different maturities of government stock" (RSA, 1985:147). Direct controls are legislative requirements that stipulate a certain course of action in the management of the portfolios of specified financial institutions, whereas market-oriented methods of control simply involve setting the short-term interest rate level and allowing the market to determine both the amount and distribution of credit (Howells and Bain, 2002:292).

Essentially this regime was a liquid asset ratio-based system where the use of liquid asset requirements constituted the main form of monetary control (Aron and Muellbauer, 2000:5). Commercial banks were expected to hold a specified minimum proportion of short-term, medium-term and long-term deposits in liquid assets. These requirements were applied differentially to different categories of bank institutions and could be varied widely. The use of liquid asset requirements was expected to curtail bank lending and money supply growth because of the limited supply and low yields of these liquid assets (Aron and Muellbauer, 2000:5). Under this system of direct control the SARB attempted to control the money supply and bank credit as intermediate goals so as to achieve their ultimate target of aggregate demand management. They did this by setting liquid asset requirements in terms of a

specified proportion of bank liabilities, which resulted in credit expansion being limited. This limitation of credit expansion by banks came about because banks could not exceed that multiple of their reserve assets established by the liquid asset requirements (Skinner and Osborn, 1992:67). Thus, an increase in the liquid asset requirements would result in lower money and credit multipliers and hence a reduction in credit extension and vice versa.

In 1978 the SARB linked its accommodation rate (discount rate) at a margin above the market rates of the previous week (Aron and Muellbauer, 2000:5). This policy led to a "ratcheting up" of interest rates when liquidity dried up and banks were in need of accommodation. The De Kock Commission (1985:214) describes this ratcheting up of interest rates as follows: "The possibility of unduly high market and refinancing interest rates arises because the market rates on rediscountable instruments will normally - if the money market is 'in the Bank' – tend to strive towards approximate equality with the (higher) rediscount rates quoted by the central bank. The upward move in market rates, however, then necessitates a further upward revision of the rediscount rates. Successive adjustments of the market rates to the rediscount rates, then create a tendency for both sets of rates to spiral upwards 'indefinitely'".

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The reasons given by the De Kock Commission for the lack of market-oriented monetary controls during this period were threefold. Firstly, the South African financial markets were still relatively under-developed and were therefore not equipped to allow for the effective application of market-oriented methods of monetary policy. Secondly, market-oriented methods of control were not compatible with the authorities' stance on politically sensitive interest rates such as mortgage society building loans. This was because the authorities strived to avoid large increases in these rates and thus needed to apply direct methods of monetary control. Finally, the government financed its "deficit before borrowing" by recourse to bank credit, which was on a large scale and resulted not only in a direct increase in the money supply but also in banks ability to create money[5]. Due to this, the authorities found it necessary to curb bank credit extension to the private sector with the use of

[5] This increased banks' liquid assets and thus their ability to create credit.

direct controls such as large increases in minimum liquid asset requirements and credit ceilings (RSA, 1985:147).

The direct and semi-market oriented forms of monetary control employed by the SARB during this period did not always produce the desired results. In fact, as a result of these direct controls placed on the banking system, there was a large degree of disintermediation, which left the monetary authorities with even less control over the money supply and inflation. According to De Kock (1981:327), the need for fundamental reform in South Africa's system of monetary control was recognised by the authorities long before the end of this particular phase. As a result, a Commission of Inquiry into the Monetary System and Monetary Policy in South Africa was appointed in 1977 (De Kock, 1978:197). As the shortcomings of this liquid asset ratio system became increasingly obvious, a range of reforms were enacted and the movement towards a cash reserve-based system was initiated following the recommendations of the De Kock Commission Reports. The De Kock Commission published a preliminary report in 1978, and a final report in 1985.

2.3 THE DE KOCK ERA: 1980-1985

1980-1985 was a period of transformation from a liquid asset-based system to a cash reserve-based system. This meant a move from a "direct" to a more market-oriented monetary policy. Certain direct controls were abolished during this period. For instance, deposit rate controls were removed in March 1980 and later that year, bank credit ceilings. This removal of direct controls on the banking sector resulted in a decline in the velocity of money and the reintermediation of this sector. (Aron and Muellbauer, 2000:5) Also, from about October 1980 interest rates were permitted to rise to a greater extent in response to market forces than had previously been allowed (RSA, 1985:148).

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According to the De Kock Commission report (RSA, 1985:148-149), there were many changes that marked the transition from a non-market-oriented system of monetary control to a more market-oriented system. Three of these main changes will be

discussed. Firstly, as previously mentioned, in March 1980 the authorities abolished all statutory controls on deposit rates paid by the banking institutions and building societies. Secondly, in September of that same year the authorities removed credit ceilings on certain types of bank credit, which had previously been in place. Thirdly, in September 1980, once the direct controls on credit extension and deposit rates were abolished, the authorities consciously allowed interest rates to move in response to changes in market conditions. This more flexible interest rate policy stance could be seen by the increase in the prime overdraft rates of commercial banks from 9.5% in September 1980 to 20% in March 1982 (RSA, 1985:148).

The authorities took two important steps in implementing this new interest rate policy. The first step taken was to allow the Treasury bill rate to rise to above Bank rate in response to market forces from December 1981 onwards. The second step was the abolition, in February 1982, of the direct link between the clearing banks' prime overdraft rates and the Bank rate and to allow the former to be market-determined. In line with this new, flexible interest rates policy, the authorities began to phase out liquid asset instruments between 1982 and 1984 and in December 1983 the Reserve Bank's Bank rate and other refinancing rates began to be independently set by and varied at the discretion of the SARB and was no longer determined by setting it at a fixed margin above market rates (RSA, 1985:148; van der Merwe, 1997a:234).

2.4THE POST DE KOCK ERA

2.4.1 1986-1993: Cost of cash reserve based system with preannounced monetary targets (M3)

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The movement towards the cash reserve-based system following the recommendations of the De Kock Commission was fully operational by mid 1985. Of the two cash reserve regimes, that is, the "American" and "classical" cash reserve systems[6] the Commission proposed the use of the "classical" system for South Africa. South Africa adopted this system and what it meant was that the SARB had to compel

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[6] These two cash reserve systems will be discussed 3.3.

banks to borrow cash reserves from it. It did this by creating what is called a "money market shortage"[7] by applying such policy instruments as open market operations, foreign exchange market transactions and public debt management (RSA, 1985:184). These liquidity shortages in the market were then fully and automatically met by the Reserve Bank at a rate deemed necessary to achieve its monetary targets (van der Merwe, 1997a:236).

Under this cash reserve system preannounced monetary targets were to be achieved indirectly through adjusting interest rates beginning for the first time in 1986 (Aron and Muellbauer, 2000:5). This meant that the general level of interest rates in the economy, and through the transmission mechanism, other economic aggregates such as bank credit extension, the money supply and rate of inflation were influenced by changes in the Bank rate and associated refinancing rates (van der Merwe, 1997a:234). Thus, if the SARB wanted to reduce the demand for bank credit, it would increase the rate at which it provided accommodation to the banking institutions (against the collateral of certain government securities) at the discount window and vice versa.

Under this system of accommodation, i.e. up to May 1993, there were essentially two ways in which the SARB provided accommodation to the banks[8]. The first way was through the rediscounting of Treasury bills at Bank rate, i.e. 13 per cent; the discounting of Land Bank bills at a small margin above Bank rate, i.e. 13.15 per cent; and at an even higher margin above bank rate, i.e. 14 per cent, the SARB would rediscount liquid bankers acceptances (Meijer, 1997:11; Schoombee, 1996:85). These margins above Bank rate were fixed at the discretion of the Reserve Bank and the bills had to have a maturity of 91 days or less. The second way accommodation was provided to the banks was through the extension of overnight loans against the security of specified paper. Different rates were charged on different types of paper, for these overnight loans. For example, overnight loans were granted at 15.5 per cent when covered by 105 per cent or better in Treasury bills and short-term government stock, at 15.75 per cent when backed by liquid Land Bank bills and at an even higher

[7] This concept will be explained in detail in Chapter Four.

[8] The Bank rate for April 1993, i.e. immediately before the change in the accommodation procedures will be used as a basis for this discussion.

rate of 16.25 per cent when backed by liquid bankers' acceptances. Gilt and semi-gilt stocks with a maturity of not longer than three years could also be used as cover for overnight loans. In such a case the securities would be valued at 90 per cent of their market value. The rates charged on these securities were the prevailing banks' minimum prime overdraft rate plus 1.50 per cent for the first day, with the possibility of those banks that made excessive use of the facility being penalised thereafter (Gidlow, 1998:316; Meijer, 1997:11). Rediscounting was noticeably cheaper than overnight loans and therefore banks always attempted to rediscount bills before considering the option of overnight loans.

There were a number of problems associated with this accommodation system. The main problem was that this system was unnecessarily complicated by the long list of assets that could be used for refinancing purposes and the wide range of accommodation rates. An additional problem was that bankers' acceptances could be easily created and tailored by banks to achieve liquid asset status and thus receive preferential rediscounting rates. According to Gidlow (1998:316), the SARB at times questioned the self-liquidating nature of this paper as it seemed doubtful whether bankers' acceptances were in fact being used to finance the movement of goods. More importantly this rediscounting procedure involved the Reserve Bank purchasing assets on an outright basis and thus exposed the SARB to credit risk. This risk arose because, in the event of a default, the Reserve Bank was exposed to the risk of selling the assets bought from banks at a loss (van der Merwe, 1997a:237).

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2.4.2 May 1993- March 1998

As a result of the shortcomings of the accommodation system used up until April 1993 a new system was put in place. Under this new system the Reserve Bank provided accommodation to banks only by way of overnight loans against two categories of financial assets and at two different accommodation rates (Gidlow, 1998:317). In the first category (tier), accommodation was provided at Bank rate when Treasury bills, government stock, Land Bank bills and Reserve Bank bills, with an outstanding maturity of not more than 91 days, were pledged as collateral. The second tier consisted of the aforementioned securities with a maturity of longer than

91 days but less than three years and was accepted as collateral at Bank rate plus 1 per cent (Schoombee, 1996:84). This second tier accommodation rate was raised to 1.5 per cent above Bank rate in March 1995 and then reduced to 0.75 per cent above Bank rate in June 1996 (Gidlow, 1998:317). This accommodation at the discount window was provided immediately, unconditionally and completely so long as banks presented suitable collateral to the SARB. Banks also had access to Reserve Bank accommodation over and above the normal day-to-day refinancing but only in exceptional circumstances. That is, only if banks were in a liquidity crisis. Even then assistance was at the discretion of the SARB, which generally only rendered assistance to banks if the failure of that bank posed a threat of systematic risk (Gidlow, 1998:317).

As mentioned above, the introduction of this new system of accommodation meant that Bank rate was no longer a discount rate but rather a loan rate. It had a number of advantages over the old system. Firstly, the SARB was no longer exposed to credit risk as it had been under the previous refinancing system. This was for the reason that under this system of accommodation, i.e. overnight loans, the Reserve Bank no longer had to purchase outright the assets of banks seeking accommodation. Secondly, banks were required to hold cash reserves and liquid assets in response to increases in their short-term liabilities. Since overnight loans are essentially short-term liabilities, this accommodation system was likely to effect banks' interest rate structures more directly. Thirdly, this new system made the administrative task of previously discounting bills easier for the Reserve Bank. This was because when the Bank rate changed, it was easier to calculate the interest rate on loans rather than the discount rate on individual bills (Gidlow, 1998:319). Overall this system of accommodation contributed to a greater degree of stability in money market interest rates (van der Merwe, 1997a:237). However, once again this system was not without its problems.

According to du Plooy (1998:1) there were a number of shortcomings of this system of accommodation. Firstly, since the Reserve Bank always financed the money market shortage fully and automatically at a fixed Bank rate, money market interest rates were insensitive to changes in liquidity. This occurred because, provided that the banks believed the SARB would leave Bank rate unchanged, even though the money market shortage was increasing, the banks saw no advantage to changing their

deposit rates. A case in hand is the turmoil that was experienced in the South African foreign exchange market in 1996. During this time, the money market shortage rose from R5.8 billion in June 1996 to R9.3 billion in September 1996 with no apparent upward or downward tendency in money market rates (van der Merwe, 1997a:238). It was only after a long-lasting and sustained increase in the money market shortage that there was some response in short-term interest rates. The main problem with this is that "in a liberalised and globalised financial system with large and volatile capital movements between countries, it is of the utmost importance for interest rates to react quickly to underlying liquidity conditions" (van der Merwe, 1997a:239).

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Secondly, in addition to the rigidity of money market rates, the easy access to Reserve Bank funds at a fixed Bank rate also had a depressing effect on the development of interbank trading in surplus funds and discouraged active trading in short-dated government bonds and Treasury bills (van der Merwe, 1997a:239).

Finally, this system of accommodation did not allow the SARB to provide clear signals to the market. For instance, the size of the money market shortage was meant to signal the market as to the stance of the Reserve Bank. However, according to van der Merwe (1997a:240), the signalling capacity of the money market shortage was limited by the fact that:

- the authorities had difficulties in projecting the liquidity needs of the market and as a result were not always in control of the shortage;
- factors such as the strengthening of the government's cash position, which did not warrant an increase in interest rates, could be responsible for increases in the shortage and vice versa;
- the market might believe the SARB was bluffing.

These shortcomings gave rise to a new system of accommodation, called a repurchase (repo) system. This system was put in place on the 8 March 1998 and apart from a number of changes is still in use by the monetary authorities today. This repo system, its changes and its implications for the South African interbank market will be discussed below.

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2.5 THE REPO SYSTEM OF ACCOMMODATION

In this repurchase system of accommodation, the SARB applied more active liquidity management through discretionary market operations, and repurchase transactions (repos) between the Reserve Bank and the banks became the main instrument to control this liquidity. Repos are contracts involving the simultaneous sale and future repurchase of an asset (du Plooy, 1998:2; van der Merwe, 1997a:246). The objective of the Reserve Bank in utilising repos as the main instrument in monetary control was to increase flexibility in the determination of money market interest rates. Repurchase transactions were ideal for this purpose because of the fact that they matured and could be renewed at short intervals and the terms could be easily adapted to changes in conditions. There were three further advantages of these operations. Firstly, banks were given more scope to efficiently manage their own liquidity positions. Secondly, repos could be implemented quickly. Thirdly, the price of the underlying instruments were not significantly affected (van der Merwe, 1997a:246; du Plooy, 1998:1).

Banks were given an opportunity to participate in a daily tender system for a fixed amount of Reserve Bank funds in order to obtain funds from or repay funds to the SARB. Banks in need of accommodation would tender various securities to the Reserve Bank on a daily or intra-day basis. Allotments were then made on the basis of individual bidding rates tendered by the banks (van der Merwe, 1997a:246). Thus, in principle the repo rate could change on a daily or intra-day basis corresponding to the results of the daily or intra-day repo tenders. The repo rate established on any particular day would then have an effect on the interest rates of banking institutions (Gidlow, 2001:1).

This system served the needs of the banking sector well and the repo rate became a very useful instrument of monetary policy. Since the implementation of this new repo sytem in March 1998, the SARB has signalled its objectives on short-term interest rates to the market by indicating to what extent the projected liquidity requirement would be financed at the daily tender. Therefore, if the SARB wanted to remain neutral on the determination of the repo rate, it would finance the shortage in full and if it wanted the repo rate to increase/decrease it would offer less/more than the

projected liquidity requirement (Aron and Muellbauer, 2000:6). In addition, fixed-rate auctions could be held if the Reserve Bank felt it was necessary to exercise a stabilising influence on interest rates or simply to give a clear signal to the market (van der Merwe, 1997a:246). However, after more than a year of this system being in place it became apparent to the Reserve Bank that the signalling procedures that were originally adopted were not clearly signalling to the market what direction and to what extent the SARB wanted the repo rate to move (Stals, 1999a:1). Thus, on the 23 June 1999 it was decided that the following more finely applied signalling procedures would be applied by the SARB:

- If the Reserve Bank was satisfied with the direction and extent of interest rate movements it would signal a neutral position to the market by providing the full estimated daily liquidity requirements of banks (Stals, 1999a:1).
- When interest rates were declining/increasing, then a marginal under-provision/over-provision of the estimated daily liquidity requirement in the market would signal that the SARB wanted interest rates to stabilise at the prevailing level (Stals, 1999a:1).
- A significant under-provision/over-provision in the estimated daily liquidity requirement would signal the Reserve Bank's desire to have interest rates move to a higher/lower level. The larger the amount of under-provision/over-provision the larger would be the desired adjustment in the repo rate (Stals, 1999a:1).
- Only under exceptional circumstances, where the SARB wanted to attain an immediate and significant change in money market rates, would auctions with predetermined repo rates be held (Stals, 1999a:1)[9].

On 24 November 1999, the Monetary Policy Committee (MPC) decided to change the system from a variable repo rate, determined at the daily tenders, to a fixed repo rate of 12%. This was to apply as a temporary measure until the next Monetary Policy Committee meeting. The reason for this was that the SARB was of the opinion that it

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[9] As will be discussed in Chapter Four, the SARB is responsible for the MMS (it is a SARB balance sheet item) and it is equal to the remaining balance sheet items. Therefore a change in the MMS is equal to the collective change in the remaining balance sheet items. Therefore, the central bank cannot but accommodate the entire MMS. It is the only creator/destroyer of cash reserves. The banks cannot do so, only the central bank, making it the monopoly manipulator of cash reserves (Faure, 2003c:25).

was in the interests of overall financial stability, over the millennium change (Y2K), to establish a fixed stable repo rate (Mboweni, 1999:68). Thus the repo rate was fixed at 12% from 24 November 1999, during which time full liquidity was provided to the banks at the daily auctions of the Reserve Bank. However, at a meeting of the MPC, on 13 January 2000, after careful consideration of international and domestic developments and the successful transition to the new millennium, the MPC decided to discontinue the temporary measure of fixing the repo rate. Thus, from 14 January 2000 the SARB again applied a variable rate auction in accordance with the agreed signalling procedures (Mboweni, 2000b:66).

The discount window facility used in the previous system of accommodation was replaced by a marginal lending facility, which provided overnight loans or loans for a few days to banks. These loans were charged at Bank rate, which was normally at a premium above the interest rate on repurchase transactions. This facility was available to banks because the SARB was not able to provide all the liquidity needs of banks via repurchase agreements and was not always able to accurately forecast the daily liquidity shortage in the market. Banks with unforeseen liquidity shortages had unlimited access to this facility, for a short period of time, provided they could provide the relevant collateral, i.e. government securities, Land Bank bills and Reserve Bank bills. It was hoped that this would lead to the development of a more smoothly functioning interbank market (van der Merwe, 1997a:249).

During this time the South African authorities used minimum cash reserve requirements to ensure that banks would be indebted to the SARB at all times, i.e. "in the Bank", and also to avoid excessive volatility in interest rates. To fulfil the latter function, banks were no longer bound to maintain the minimum cash reserves on a daily basis (van der Merwe, 1997a:250). Instead they were able to meet the cash reserve requirements on average over a maintenance period of one month[10]. According to the SARB (2003b:4), at the time the averaging of cash reserves principle was introduced, i.e. 20 March 1998, the South African Reserve Bank Act. 1989 (Act No. 90 of 1989) did not provide for averaging on the Cash Reserve Accounts (CRAs). Thus, it was necessary to create the Cash Reserve Contra Accounts (CRCAs), to

[10] A maintenance period starts on the 15th working day of a month and ends on the 14th working day of the subsequent month (SARB, 2003b:4).

provide for this additional refinancing instrument. However, on 21 February 2003 these CRCAs were done away with because by then the Act had been amended to allow for the averaging on the CRAs. Thus, as long as the average level of reserves during the maintenance period was at least equal to the minimum cash reserve requirements, banks had automatic recourse to their cash balances with the SARB (du Plooy, 1998:2).

The ability of banks to draw funds from their CRCAs became popular as a means for financing unforeseen liquidity needs. This was because the alternative was to get financing at the marginal lending facility at penalty rates. The problem with this was that some banks started to deposit surplus balances on their CRCAs instead of lending these balances to banks with cash shortages in the interbank market. As a result those banks that were short of cash were forced to borrow relatively large amounts of cash at the marginal lending facility. In an attempt to improve the efficiency of the interbank market the SARB put limits on the amounts that banks could deposit on these accounts (du Plooy, 1998:2).

2.6 AN OFFICIAL INFLATION-TARGETING FRAMEWORK

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The SARB formally adopted an inflation-targeting monetary policy framework on 23 February 2000. This meant that the monetary authorities would target the rate of inflation directly instead of the earlier "eclectic" approach in which intermediate objectives played a prominent role (Mboweni, 2000a:1).

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An inflation-targeting monetary policy framework is primarily concerned with one aspect of financial stability, namely price stability. The government decided to implement this new framework because of certain advantages that such a framework was believed to have. According to the Mboweni (2000a:2) these advantages were that:

- it could improve planning in the private and public sectors by making the objectives of monetary policy clear;

- in pursuit of the broader economic objective of sustainable growth and employment creation, an inflation-targeting monetary policy framework would form part of a formalised co-ordinated effort to contain inflation;
- it would enhance the accountability of the SARB to the public and thus help to focus monetary policy; and
- it would provide an anchor for future inflation expectations which should positively influence price and wage settings.

Under an inflation-targeting framework, a numerical target for the inflation rate is announced to the public and this target is to be achieved in a specified period or by a specified time. The application of this framework did not directly affect the monetary policy operating procedures of the SARB. Thus, the Reserve Bank continued to influence the overall lending policies of banks and the demand for credit in the economy indirectly through changes in the repo rate and repurchase transactions remained the main refinancing tool (Mboweni, 2000a:5).

2.7 SHORTCOMINGS OF THE 1998 REPO SYSTEM OF ACCOMMODATION

2.7.1 Introduction

As with the implementation of most new refinancing systems, the repo system of accommodation introduced on the 9 March 1998, was found to have a number of weaknesses. A first problem was that the system had not always been allowed to function as it was originally intended. Secondly, the system was not equipped to be able to address certain issues hampering the effective functioning of the interbank market (SARB, 2001a:3).

After the implementation of the repo system in 1998, the SARB noted shortcomings in the functioning of the domestic interbank market, for example the extreme stickiness in the interbank overnight call rates during times of extreme turbulence such as occurred during the emerging market crisis in 1998 (Gidlow, 2001:2; SARB,

2001a:4). In addition, there were certain features of the domestic money market that were identified by the authorities as undermining the efficiency of the refinancing system.

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2.7.2 The importance of the interbank market in the transmission of monetary policy

The interbank market plays a pivotal role in the implementation of monetary policy, because interbank and other money-market rates should be sensitive to any changes in the Reserve Bank's repo rate. That is, the interbank and money market rates should respond immediately to adjustments in the repo rate. Thus, an effective interbank market will ensure that changes in the refinancing rates of the SARB will be quickly transmitted to other money market rates and thereby ensure effective pricing in the money market as a whole (Gidlow, 2001:2).

The monetary authorities believed that the money market would function most efficiently if changes in the repo rate first had an affect on the interbank rate, which then transmitted these effects to other money market rates followed by other interest rates in the economy. However, the problem was that in South Africa, changes in the repo rate were often directly followed by changes in the prime overdraft rate and other rates of banks, which then affected money market rates (Gidlow, 2001:3).

According to Gidlow (2001:2-3), the effective functioning of the interbank market in the South African context requires that it should be flexible and stable as well as liquid, competitive and quickly able to adjust to changes in banking liquidity. The more sensitive interbank rates are to changes in the repo rate, the easier it is for the SARB to influence money market rates by adjusting the repo rate. In addition, it is generally accepted that an efficiently operating interbank market will be characterised by an interbank overnight rate that stays near and slightly below the repo rate (SARB, 2001a:5).

2.7.3 Undeveloped state of the interbank market

A number of concerns were raised with regards to the functioning of the South African interbank market. The first concern was that the price discovery process in the interbank market was impaired. In other words, it was difficult to establish the precise levels of interbank rates, and interbank dealings did not always take place at the rates that were posted. Secondly, the big four banks dominated the market and had the ability to influence rates. Thirdly, there existed a large differential between the repo rate and the interbank rate, which resulted in limited participation in the daily repo tenders and therefore inhibited the development of interbank market activities. The authorities believed that if the smaller banks could borrow more cheaply by means of repos, they would become more active in the interbank market and this might then contribute to competitiveness in this market (Gidlow, 2001:4). Finally, the interbank market did not always clear effectively.

There were also several deficiencies identified with the repo system of accommodation. Liquidity shortages, i.e. the money market shortage was small in relation to the size of the market and, as a result, the SARB had a reduced influence over interest rates. The big banks were thus seen as "immune", at least to some extent, to the open market transactions conducted by the Reserve Bank (SARB, 2001a:12). In addition this system incorporated both the repo rate and repo tender being fixed, which was unsuitable for the implementation of monetary policy. It was believed that one of the two should be allowed to float in order for banks to send signals to the Reserve Bank about their liquidity needs. Finally, the Reserve Bank's refinancing procedures were criticised for a lack of transparency, especially in terms of its open market transactions which were used to drain liquidity from the market. It was argued that instead of the SARB conducting foreign exchange swaps on a bilateral basis between itself and one other counterparty, it should hold auctions where all banks could in principle bid for the funds offered by the Reserve Bank (Gidlow, 2001:5).

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2.8 MODIFICATION OF THE REFINANCING SYSTEM OF THE SOUTH AFRICAN RESERVE BANK

As a result of the shortcomings of the 1998 accommodation system, the SARB conducted comprehensive research involving consultations with the South African banking sector, the Bank of International Settlements (BIS), the International Monetary Fund (IMF) as well as experts from other central banks, in order to identify modifications to the refinancing system that would address these weaknesses (SARB, 2001b:1). According to the SARB (2001b:2), the following modifications were made to the 1998 accommodation system:

- A one-off adjustment to the spread between the interbank call rate and the repo rate was made by appropriately lowering the Reserve Bank's repo rate. The SARB made it clear that this adjustment was purely administrative and did not imply a change in monetary policy stance.
- In order to enhance the functioning of the interbank market, the SARB would calculate on a daily basis a South African Overnight Index Average (SAONIA), which was intended to serve as a benchmark for money-market interest rates.
- The repo rate was changed from a floating to a fixed rate by the SARB so as to eliminate any ambiguity with regards to the Reserve Bank's monetary policy signals.
- As an incentive for banks to square off in the interbank market, the SARB terminated its previous practice of announcing the forecasted liquidity requirement prior to the repo auctions. Instead, the SARB announced the tender amount provided and the amount allotted in the repo tenders shortly after the tender.
- As an additional incentive for the interbank market to clear the SARB replaced the daily tenders with weekly repo tenders that had a seven-day maturity.
- The SARB conducted, at its discretion, daily final clearing repos, reverse repos or supplementary tenders, which enabled banks to square off their positions.

- The SARB placed a limit on the net daily amount that banks could withdraw from or deposit in their cash-reserve contra accounts[11].
- In order to calculate the minimum reserve balances to be held in banks cash reserve accounts at the Reserve Bank, the SARB limited the amount of vault cash that qualified as a reduction to 75 per cent of the total amount of vault cash held. This limit was reduced by a further 25 percentage points per year. On 21 September 2004 vault cash was no longer counted as part of banks' cash reserve requirements.

2.9 THE PRESENT OPERATIONAL PROCEDURES

2.9.1 Repurchase transactions

As part of the Reserve Bank's monetary operations, fixed-rate main repo auctions with one-week maturities are conducted by the SARB. The Monetary Policy Committee determines the rate at which these auctions are conducted. The SARB normally holds these auctions at 12:00 on Wednesdays but if the need arises these auctions can be postponed until 15:00. In order to acquire accommodation, banks must sell eligible assets to the Reserve Bank with the agreement to repurchase these securities after the stipulated period. The eligible securities are Treasury bills, government bonds (Rand denominated), Land Bank bills, Reserve Bank debentures[12], and coupon and principal STRIPS of government bonds (SARB, 2003b:5). Holders of such securities must have full title of the assets and these securities may not become redeemable during the life of the repo for which they are used. In addition, repo securities may not mature on or before the maturity date of a specific repurchase transaction (SARB, 2003b:3). At 12:00 the SARB provides yields on Reuters, InetBridge, Bloomberg and the Internet[13] for the valuation of securities acceptable in the repurchase transactions.

[11] As already mentioned in 2.6 these cash-reserve contra accounts were abolished on 23rd February 2003.

[12] Reserve Bank "bills" were mentioned before the terminology was changed to Reserve Bank debentures.

[13] These are the electronic wire services, which the Financial Markets Department uses to communicate with the market.

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2.9.2 Final square-off auctions

The final square-off auction can either be in the form of a reverse repurchase transaction where the SARB drains surplus liquidity from the market or a repurchase transaction to provide liquidity. These auctions are conducted at the discretion of the Reserve Bank when a liquidity imbalance exists in the market towards the end of the settlement cycle. The eligible securities are Rand denominated government bonds, Treasury bills, Reserve Bank debentures, Land Bank bills, and coupon and principle STRIPS of government bonds (SARB, 2003b:5). The rates applied to the final-square of transactions and reverse repurchase transactions can be either equal to the prevailing repo rate (supplementary auction) or 150 basis points below or above the prevailing repo rate (final clearing auction). The rates used are at the discretion of the Reserve Bank (SARB, 2003b:3).

2.9.3 The marginal lending facility

The marginal lending facility is available as a last resort to banks to bridge overnight liquidity needs. These loans must be covered by at least 105 per cent of the market value of the securities pledged (SARB, 2003b:4). The securities that qualify as collateral for the use of this facility are the same as those mentioned in 2.9.1 and 2.9.2. The rate charged for these loans is currently 5 percentage points above the prevailing repo rate.

2.9.4 Reverse repurchase transactions

Longer-term reverse repurchase transactions are used by the Reserve Bank to drain liquidity from the market. They constitute the selling of securities under repo by the SARB. Market participants are requested to submit bids for the amount of cash, the commensurate cash rates and the underlying bond after the Reserve Bank has announced the cash amounts as well as the underlying bonds on offer in the auction (SARB, 2003b:4). Once the bids have been submitted to the SARB, they are ranked and allotted in ascending order of cash rate (SARB, 2003b:4).

2.9.5 Averaging of cash reserves

As discussed in section 2.5 the averaging of cash reserves over a maintenance period of one month was introduced from 20 March 1998. The accounts that banks used for this purpose were the CRCAs and these were used until 21 February 2003, when they were abolished. From this date the banks have used their CRAs for the purpose of averaging cash reserves (SARB, 2003b:4). When banks access their CRAs they have to differentiate whether it is for refinancing purposes (averaging) or for the updating of balances.

2.9.6 Reserve Bank debentures

Reserve Bank debentures are issued solely for monetary policy purposes. The SARB invites market participants to tender for these securities in order to drain excess liquidity from the market. SARB debentures have a maturity of up to 91 days and are fully dematerialised. In addition they qualify as liquid assets and are issued as an interest-bearing instrument (SARB, 2003b:5).

2.10 PROPOSED CHANGES TO THE PRESENT SYSTEM OF ACCOMMODATION[14]

In December 2004 the SARB put out a consultative paper asking for feedback on certain proposed modifications to the money market operations undertaken by the Reserve Bank.

The proposed changes are as follows:

- The supplementary square-off facility should no longer be a regular feature. Rather, the Reserve Bank will reserve the right to conduct a supplementary

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[14] Please note that these latest proposed changes are not reflected in this thesis's analysis as the analysis had been completed before the release of these proposed changes.

square-off auction in the event of unexpected developments (SARB, 2004:11).

- The marginal lending facility (MLF) should be abolished (SARB, 2004:11).
- The "corridor" in which the interbank overnight rate is allowed to fluctuate should be narrowed from 150 basis point spread with the repo rate to a 50 basis point spread. By narrowing the corridor, the SARB believes that undue large fluctuations in overnight rates will be eliminated (SARB, 2004:13).
- The present system of non-disclosure by the SARB regarding the estimated liquidity requirements has not improved the functioning of the interbank market as expected. Thus, it is proposed that the Reserve Bank announce its liquidity requirement estimate for the coming week before the main repo auction (SARB, 2004:14).
- "Government guaranteed" securities should be included in the range of eligible liquid assets for collateral used in all refinancing auctions (SARB, 2004:15).
- A Money Market Liason Group (MMLG) should be established in order to enhance the SARB's monitoring of market developments as well as its communication with the market (SARB, 2004:16).

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2.11 CONCLUSION

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South African monetary policy has gone through a number of different stages. Perhaps the most significant change was the movement from direct instruments of monetary policy, before the De Kock Commission, to a more market-oriented form of control. More specifically this was a move from a liquid asset-based system to a cash reserve-based system, which is still in existence in South Africa today. This more market-oriented approach and the use of intermediate targets went through a number of changes and worked well for a while. However, with the introduction of South Africa into international markets, a new monetary policy was needed. This resulted in the implementation of the repurchase system of accommodation in March 1998.

The system introduced in March 1998 is called a repo system and repurchase transactions between the Reserve Bank and the banks is the main monetary policy tool used to provide accommodation to banks in need of liquidity. When this system was implemented it was expected that by tendering for funds at the repo auctions on a floating-rate basis, banks would provide signals about liquidity conditions in the market. However, there were various shortcomings; the interbank market did not always clear effectively, there was limited participation in the daily repo auctions, and money-market rates were relatively inflexible. These were some of the concerns that led to the Reserve Bank making amendments to this system on 5 September 2001. It was hoped that these modifications would improve the functioning of the refinancing system and the interbank market. In chapter 5 an econometric analysis will be done in order to determine whether or not the SARB achieved these objectives.

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CHAPTER THREE

MONETARY POLICY THEORY AND MONETARY POLICY IN SOUTH AFRICA

3.1 INTRODUCTION

Government authorities in a market economy have two principal means by which they can influence the pace and direction of overall economic activity. These two means are monetary policy and fiscal policy and they influence not only the level of aggregate output and employment but also the level of inflation, i.e. the rate at which prices rise or fall (Friedman, 2000:1). More emphasis is placed on monetary policy, and less on fiscal policy for these purposes and governments carry out monetary policy via central banks. As noted by Friedman (2000:1) if banks, in most financial systems, want to create deposits and make loans they are required by law to hold claims against the central bank[15]. This control that the central bank has over the supply of claims against itself gives it a form of control over the economy's money and credit in a far broader sense.

3.2 THE CENTRAL BANK AND MONETARY POLICY

The monetary authorities in any country can use a number of techniques in order to influence the rate of growth of bank credit extension and the money supply (Howells and Bain, 2002:291). These can be divided into quantity or "direct" controls and market-oriented or "indirect" controls. According to Howells and Bain (2002:292) most countries have experimented with direct controls at some time or another but in recent years most countries have moved towards the use of market-based controls. Market-oriented controls involve transactions between the market and the monetary

[15] Called borrowed cash reserves.

authorities, which operate via the price mechanism, i.e. the authorities set the level of short-term interest rates (Skinner and Osborn, 1992:66). In order to set the level of short-term interest rates the authorities have to intervene in some form in the money market.

The ultimate goals of monetary authorities when implementing monetary policy involve some sort of combination of inflation and output. However, as noted by Howells and Bain (2002:292) there is neither a direct nor instantaneous connection between the instruments of monetary policy and output and prices. It is for this reason that the authorities in most countries prefer to have an intermediate target[16] that is connected in a predictable way with the inflation rate and responds more directly to changes in the instruments of monetary policy (Howells and Bain, 2002:292). In this way the central bank can judge the effectiveness of its policies more quickly, rather than waiting to see the final outcome on output and prices (Mishkin, 2001:458).

In the majority of countries the operating techniques are similar. The power of the central bank in conducting monetary policy stems from its position as the sole source of cash reserves. It has a monopoly in this respect because bank cash reserves are its liabilities (as well as bank assets). The central bank can behave in a number of different ways when "operating on banks' cash reserves". According to Howells and Bain (2002:293) this behaviour of central banks can be characterised along a spectrum where on the one end the central bank sets "the rate of interest which it wishes to see form the basis of short-term interest rates" and on the other end it sets the quantity target for reserves and provides only the target quantity through engaging in open market operations. If the central bank sets the interest rate, then in order to maintain this level the central bank will have to accommodate the banks demand for borrowed cash reserves fully and automatically. If however the central bank sets a quantity target for reserves then the interest rate is free to find its own level, which will be the level that clears the market (Howells and Bain, 2002:293). In economic theory these two extremes are known as the "classical" cash reserve system and the "American"

[16] "Intermediate targets are the immediate or nearest targets of policy" (Howells and Bain, 2002:292).

cash reserve system[17]. Each of these will be discussed in more detail in the next section.

3.3 "AMERICAN" VERSUS "CLASSICAL" CASH RESERVE SYSTEM

The American cash reserve system or "strict money rule" involves the central bank directly influencing the amount of bank cash reserves in the market. This is done through the open market sale or purchase of securities by the central bank. If for example a central bank wants to increase the cash reserves in the hands of the banking institutions, i.e. expand bank credit and the money supply, it would purchase securities in the open market. In such a case the banking system and the money supply will expand up to the point where the excess reserves created are absorbed into required reserves[18] (Faure, 2004:59). On the other hand, if it is felt that inflation is too high and therefore there is a need to decrease the cash reserves available to banks for credit extension, it will sell securities in the open market. The essence of this system is that the money supply itself is directly targeted and controlled by the authorities and interest rates are free to find their own level. Thus, for any given cash "base", it is the strength of the demand for credit that determines the level of interest rates (RSA, 1985:183).

The "classical" cash reserve system operates directly via interest rates to have an effect on the money supply. Unlike the "strict money rule system", which controls bank cash reserves directly, the classical cash reserve system controls the money supply indirectly by changing interest rates. In other words, instead of the monetary base being the operational variable, under this system the interest rate constitutes the prime element of control (RSA, 1985:183).

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[17] This term was coined by the 1985 De Kock Commission of Inquiry into the Monetary System and Monetary Policy in South Africa.

[18] The deposit multiplier formula is: D= (1/r)*R. where: R=cash reserves; r = cash reserve ratio; and D= deposits (Pierce & Tysome, 1985:85).

Under this system banks respond to the demand for credit as it arises and the central bank controls the demand for credit and hence the money supply by changing the price at which it provides reserves to the banking sector. It should be evident that if the central bank wants to control the demand for credit in this manner it needs to make sure that the banks are indebted to it at all times. It does this by using open market operations, except that instead of trying to have a direct effect on the level of banks cash reserves it creates what is called a "money market shortage". If there is a positive money market shortage this means that the commercial banks are collectively in debt to the central bank (Whittaker, 2003:3). It is this shortage that ensures that the banks borrow from the central bank. The central bank refinances this shortage fully and automatically and charges a rate of interest for these borrowed cash reserves. This "price" paid by the banks is then transmitted through the system to bank lending rates[19]. The rationale for targeting interest rates is based on the argument that the higher the rate of interest, the lower will be the public's demand for credit (Skinner and Osborn, 1992:72).

When central banks choose the "classical" cash reserve system as opposed to the "American" cash reserve system they choose to set the "price" at which they will make reserves available to banks rather than the quantity. As such the chosen policy instrument is the setting of short-term interest rates (Howells and Bain, 2002:293). This "price" of borrowed reserves is administratively set by the central bank. Changes in this "target" price are then transmitted to a broad spectrum of short-term rates by arbitrage or simply by conventionally determined mark-ups (Howells and Bain 2002:294). Changes in short-term rates then affect the rate of interest banks charge on credit extension and, as such, the quantity of credit demanded will change as will the rate of return on a wide range of assets. According to Howells and Bain (2002:294) if the change in the return of these assets is a change relative to the return earned on money then there will also be an impact on the quantity of money demanded.

[19] This process is known as the transmission mechanism of monetary policy.

3.4 TRANSMISSION CHANNELS OF MONETARY POLICY

3.4.1 Introduction

As discussed by Smal and de Jager (2001:5), when the SARB adjusts the repo rate it sets in motion a series of economic events. This series of economic events is referred to as the "transmission mechanism of monetary policy". Thus, changes in the repo rate, which is the SARB's main policy instrument, can affect an economy through a number of different channels. Mishkin (1995:3) discusses these as the interest rate channel, the exchange rate channel, other asset price effects and the credit channel.

3.4.2 Interest rate channel

Mishkin (1995:4) uses a schematic diagram to illustrate the traditional Keynesian view of how the effects of a tightening of monetary policy are transmitted to the real economy.

$$\mathbf{M}\downarrow \rightarrow \mathbf{i}\uparrow \rightarrow \mathbf{I}\downarrow \rightarrow \mathbf{Y}\downarrow$$

What the above diagram shows is that a tightening of monetary policy (M↓) will lead to an increase in real interest rates (i↑). This increase in interest rates will cause a decline in investment spending (I↓) as the cost of capital will now be higher. This in turn will result in a fall in output (Y↓) due to a decline in aggregate demand.

3.4.3 The exchange rate channel

Mishkin (1995:5) describes this channel with the use of the schematic diagram represented below. This channel starts once again with the monetary authorities making a decision to either implement a contractionary or expansionary monetary policy. This of course would depend on a number of economic factors such as the exchange rate, aggregate demand, inflation etc. In South Africa the Reserve Bank has committed itself to containing inflation and as such the main economic factor on which the authorities base such decisions is the rate of inflation.

$$\mathbf{M\downarrow \rightarrow i\uparrow \rightarrow E\uparrow \rightarrow NX\downarrow \rightarrow Y\downarrow}$$

Following the above diagram, the monetary authorities have decided on a contractionary monetary policy (M↓). This will lead to an increase in domestic real interest rates (i↑) since there will now be less money in the system. As discussed by Mishkin (1995:5) this channel involves interest rate effects, because an increase in domestic real interest rates will result in domestic rand deposits becoming more attractive relative to foreign currency deposits. This will lead to capital inflows and thus an appreciation of the rand (E↑). There is uncertainty in determining the exact effect of an official rate change on the exchange rate, as this will depend on expectations about foreign and domestic interest rates and inflation (BOE, 1999:4). The stronger rand will lead to a decline in net exports (NX↓), as rand denominated goods will become more expensive relative to foreign goods. This fall in net exports will of course lead to a decline in aggregate output (Y↓), slowing down the economy and thereby achieving the desired result.

3.4.4 Other asset price effects

The transmission of a contractionary or expansionary monetary policy through the economy can also come about through effects on other asset prices. Mishkin (1995:6) discusses two of these channels; Tobin's q theory of investment and wealth effects on consumption.

3.4.4.1 Tobins q theory

Monetary policy can affect the economy through its effect on the valuation of equities (Smal and de Jager, 2001:8). This is the mechanism on which Tobin's q theory is based. According to Mishkin (1995:6), Tobin (1969) defines q as the market value of firms divided by the replacement cost of capital. The lower the interest rate, the higher equities will be valued. The reason equities are valued higher when lower interest rates are in place is because in a low interest rate environment the public will find that it has more money to spend. One possible place for the public to spend this "extra" money is in the stock market (Smal and de Jager, 2001:8). The increased demand for equities will raise the price of equities. Thus, the increased value of

equities and the lower interest rate will result in a high q. As such, new plant and equipment will be relatively cheap compared to the market value of firms and thus firms can issue equity at a price that is relatively higher than the cost of capital. This will lead to an increase in investment spending, as firms will only have to issue a small amount of equity in order to be able to purchase a lot of investment goods. On the other hand, if q is low, firms will not buy new investment goods as the market value of firms will be low relative to the cost of capital (Mishkin, 1995:6). This transmission mechanism can be illustrated by the following schematic diagram used by Mishkin (1995:6).

$$\mathbf{M\downarrow \rightarrow P\downarrow \rightarrow q\downarrow \rightarrow I\downarrow \rightarrow Y\downarrow}$$

3.4.4.2 Wealth effects on consumption

A further channel through which changes in monetary policy can affect the economy is through wealth effects on consumption (Mishkin, 1995:6). As noted by Smal and de Jager (2001:9) many households hold portfolios consisting of equities and property. If the monetary authorities implement a contractionary monetary policy, equity and property prices will decrease as interest rates increase. This represents a decrease in consumers' wealth and consequently there will be a decline in consumer spending. This transmission mechanism is represented by the following schematic diagram taken from Mishkin (1995:6).

$$\mathbf{M\downarrow \rightarrow P\downarrow \rightarrow wealth\downarrow \rightarrow consumption\downarrow \rightarrow Y\downarrow}$$

3.4.5 The credit channel of monetary transmission

Agency problems in credit markets give rise to two main channels of monetary transmission: the balance-sheet channel and the bank lending channel (Mishkin, 1995:7).

3.4.5.1 The bank lending channel

The bank lending channel is based on the view that banks specialise in overcoming informational problems in credit markets (Bernanke and Gertler, 1995:40). This channel can be represented by the following schematic diagram (Mishkin, 1995:7).

$$\mathbf{M\downarrow \rightarrow bank\ deposits\downarrow \rightarrow bank\ loans\downarrow \rightarrow I\downarrow \rightarrow Y\downarrow}$$

If there is a contractionary monetary policy in operation banks reserves and deposits will decrease. Banks will therefore have less funds to lend and bank-dependant borrowers (mainly small and medium size businesses) will incur costs associated with finding a new lender. This would result in a number of previously profitable investment decisions becoming unprofitable and as a result there will be a drop in investment spending and hence output (Bernanke and Gertler, 1995:40; Mishkin, 1995:7).

3.4.5.2 The balance-sheet channel

The balance-sheet channel operates through the net worth of firms and can be represented by the following schematic (Mishkin, 1995:8).

$$\mathbf{M\downarrow \rightarrow P\downarrow \rightarrow adverse\ selection\uparrow\ and\ moral\ hazard\uparrow \rightarrow lending\downarrow \rightarrow I\downarrow \rightarrow Y\downarrow}$$

If the authorities implement a contractionary monetary policy (M↓), this will cause a decrease in the price of equities (P↓), which will lead to a lower net worth of firms. The lower net worth of firms increases the problems of adverse selection and moral hazard and, as such, there will be a decline in lending to finance investment spending (Mishkin, 1995:8). This of course will lead to a decline in investment spending (I↓) and hence aggregate demand (Y↓).

3.5 THE INTERBANK MARKET

The interbank market is the market for bank loans to one another and is a telephone based market. As mentioned by Struthers and Speight (1986:132), the transactions in this market take the form of deposits placed by one institution with another institution for fixed terms. These terms are usually short-term but can range from overnight to five years. What is meant by a "telephone based market" is that money brokers seek to conclude transactions (and thus earn a commission) by telephoning banks at various times through the day to find out if they are in need of funds, or if they have surplus funds, which they then endeavour to match with other banks' needs.

Neyer and Wiemers (2003:4) argue that, in the conduct of monetary policy, it is important to understand the functioning of the interbank market and the determinants of the interbank rate. Their justification for this is that the interbank market is the starting point of the transmission mechanism of monetary policy impulses and as such plays a crucial role in the conduct of monetary policy. This point is reiterated by Gidlow (2001:2) who argues that any interbank market should play a pivotal role in the implementation of monetary policy. As such, these markets should be sensitive to adjustments in the central bank's refinancing rate because "such an efficient interbank market quickly transmits changes in the refinancing rates of a central bank to other money market rates" (Gidlow, 2001:2). Furthermore, the importance of the interbank market is evident from the fact that central banks in most industrialised countries make the rate on interbank overnight loans their operating target (Neyer and Wiemers, 2003:4). According to Gidlow (2001:3), for central banks in numerous countries the interbank overnight rate is the easiest to influence. These central banks control this rate by not allowing it to deviate much from the key policy rate or by using direct measures, such as setting an explicit target for the overnight rate (Gidlow, 2001:3).

According to the theory, the repo rate will influence the interbank rate because no bank will pay a higher rate to borrow from another bank than the rate at which it can borrow from the central bank[20]. Similarly, since banks collectively borrow from the

[20] This is based on the assumption that the central bank accommodates the banks' liquidity requirements fully and automatically.

central bank at the repo rate, no bank will accept a rate far below the repo rate when making a loan to another bank (Whittaker, 2003:5). It is this phenomenon that ensures the interbank lending rate remains close to the repo rate.

3.6 MONETARY POLICY IN SOUTH AFRICA

3.6.1 Introduction

"The main reason for the South African Reserve Bank's (the Bank's) operations in the money market is to implement the Bank's interest rate policy, as determined by the Monetary Policy Committee (MPC), with the aim of achieving the Bank's inflation target" (SARB, 2002b:1). The SARB also aims at promoting financial stability, through monetary operations, by managing the liquidity needs of the banking system. In addition, it facilitates the growth and efficiency of the South African financial markets, particularly the interbank market. As discussed in the previous chapter the SARB's current monetary policy framework is one of inflation targeting.

The process through which the Reserve Bank targets inflation is that of controlling the cost of borrowed cash reserves. In other words instead of directly controlling the growth in the money supply and hence the inflation rate, the SARB indirectly controls money supply growth by increasing and decreasing the "price" at which the private sector can borrow funds from the banks. This process is known as a cash reserve system and was implemented as a result of recommendations made by the De Kock Commission of Inquiry in 1985. More specifically, the system in place in South Africa is a "classical" cash reserve system.

3.6.2 The functioning of the South African interbank market

The interbank market in South Africa is made up of two markets, i.e. the bank-to-bank market, which is the market for bank loans to other banks and the Reserve Bank-to-bank market, which is the market for SARB accommodation to private sector banks. The bank-to-bank interbank market consists of bank loans to other banks; bank group

deposits; and bank holdings of negotiable certificates of deposit (NCDs). The cash reserve funds market, i.e. the Reserve Bank-to-bank market consists mainly of the SARB lending cash reserves to private sector banks under repo agreement.

All banks have reserve accounts at the Reserve Bank, in which they are required to hold a percentage of their liabilities to the public (deposits). This is termed the minimum cash reserve requirement and these deposits at the Bank are called cash reserves. These cash reserves are increased or decreased as banks' deposits rise or fall or as the cash reserve ratio is adjusted[21]. In addition to this account the clearing banks hold current accounts with the SARB, which are used for the daily settlement of claims among banks that arise whenever an accountholder at one bank deposits a cheque drawn on another bank (Friedman, 2000:5). These current accounts, also known as free balance accounts, are at the very heart of the South African financial system (Faure, 2003a:7). The process by which the SARB ensures that monetary policy, and the repo rate, are transmitted through the financial system to eventually have an impact on inflation will now be explained.

Many transactions take place every day between members of the public. It is common knowledge that the public utilises a number of different banks and that there must, therefore, be a mechanism for banks to settle claims on one another when transactions do not take place in cash, i.e. currency. In South Africa these are the Automated Clearing Bureau (ACB) and National Payments System (NPS). These are electronic settlement systems that offset the claims between banks. Prior to 2004 the interbank settlement system took place at night, in respect of the previous day's date, however interbank clearing now terminates at 4pm (Faure, 2002b:141). At the close of business, banks will find a net cash reserve position on their current accounts at the SARB, which may be either positive or negative.

It is after the final clearing and settlement process, when some banks find a surplus on their current accounts and others find a deficit that the bank-to-bank interbank market begins. Since a bank's compliance with the cash reserve requirement is determined by the amounts on both the cash reserve account and the current account, the banks with

[21] As mentioned earlier this method of monetary control is used infrequently.

deficit balances will be in contravention of the cash reserve requirement and will try to get the required cash reserves in the interbank market. These banks will try to find funds in the bank-to-bank market because the only alternative is to get the required cash reserves in the Reserve Bank-to-bank market by selling assets under repo to the SARB and paying the higher repo rate[22] (Faure, 2003a:11). On the other hand, those banks with excess reserves on their current accounts will want to lend these funds to the banks requiring liquidity[23] in the bank-to-bank interbank market. The reason for this is that the Reserve Bank does not pay interest on excess balances and it is thus more profitable for surplus banks to lend these extra funds in the interbank market at the interbank rate. This process of surplus banks trying to place their excess reserves with deficit banks and the banks in need of liquidity attempting to remain out-of-the-Bank ensures that the interbank rate closely follows the repo rate (Faure, 2002b:157).

If for any reason a bank that is in contravention of the cash reserve requirement cannot obtain funds in the interbank market it will have no choice but to borrow these funds in the cash reserve funds market. Such a bank would then have to sell eligible securities to the Reserve Bank with the agreement to repurchase these securities after a stipulated period (Faure, 2003a:12). Eligible securities were defined in 2.9.1 and 2.9.2.

If the banks with surplus balances on their current accounts have assets under repo with the Reserve Bank they will first repurchase these securities before lending funds in the interbank market. The reason for this is that the repo rate is the highest rate in the market[24] and thus acts as a ceiling for the interbank rate as no bank will pay more for reserves than the rate charged for Reserve Bank accommodation. It is therefore more profitable for banks to use their excess reserves to repurchase assets under repo with the SARB than to lend these funds in the interbank market, at the lower interbank rate. Once a bank has repurchased all its repo assets it will lend any left over surplus balances in the interbank market.

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[22] This ignores the averaging of cash reserves allowed from 1998, i.e. banks' recourse to funds in their cash reserve contra accounts. However, this statement is true if based on an average at the end of the maintenance period.

[23] "Liquidity" here refers simply to cash reserves.

[24] This ignores the marginal lending facility (MLF), which is technically the highest rate in the market at 500 basis points above the prevailing repo rate (SARB, 2003b:4).

The above explanation dealt with the actions of individual banks in the interbank markets. However, the mechanism by which the SARB ensures that banks remain indebted to it at all times, i.e. the money market shortage, is determined by the amount of borrowed cash reserves of the banking system as a whole. Thus, once deficit banks have complied with the cash reserve requirement, either through selling repo assets to the Reserve Bank or by borrowing funds in the bank-to-bank market, and surplus banks have either repurchased repo assets or lent funds in the interbank market (or both), the change in the money market shortage can be determined. If the amount of borrowed cash reserves of the banking system is greater than the previous day (or maintenance period), then the money market shortage has increased and vice versa. It should be clear that banks will always have assets under repo with the SARB because if they didn't the liquidity requirement would be zero and the Reserve Bank would have no control over the lending rates of banks. However, this is not entirely true for South Africa as the monetary authorities rely a great deal on "moral suasion". This will be discussed in 3.6.5.

The above process is the first step in the transmission of monetary policy. It is the repo rate that then influences the call rates that banks are prepared to pay for deposits because attracting deposits from other banks will allow them to remain out of the Reserve Bank (Faure, 2002b:157). The call rate then determines the prime rate as banks attempt to keep the margins between the cost of their liabilities and the interest earned on their assets stable. It is therefore evident that the repo rate, which is the rate charged in the Reserve Bank-to-bank interbank market, "has an almost direct influence on bank lending rates" via the private bank-to-bank interbank market (Faure, 2002b:157). Bank lending rates then influence the demand for credit because the higher the rate of interest the lower will be the public's demand for credit and vice versa. Since credit to the private sector is the largest component of the money supply, and since the money supply is the main determinant of inflation, an increase (decrease) in the demand for credit will ultimately increase (decrease) the rate of inflation.

It should be clear, from the above explanation of the interbank market, that banks cannot create or destroy reserves. In other words, the private sector banks cannot influence the money market shortage. To elucidate this point, if the banks with excess

balances choose to repurchase securities under repo with the Reserve Bank to the value of, for example, R100 million, the money market shortage will decrease by this amount. However, in this case, there will now be R100 million less available for the deficit banks to borrow in the bank-to-bank interbank market. This is because the Reserve Bank does not hold bank accounts with the private sector banks. As a result, money received by the Bank from other banks relating to a repurchase of securities does not go back into the banking system. Since the banks with deficit current account balances have to comply with the cash reserve requirement, they have no option but to borrow R100 million from the Bank (under repurchase agreement). It should be clear that the money market shortage (assets under repurchase at the Bank) has not changed.

3.6.3 The money market shortage

As discussed in 3.3, the SARB needs to make sure that the private sector banks are in a borrowed cash reserve position at all times in order to make the repo rate effective. It accomplishes this by creating a money market shortage (borrowed cash reserves), which it then refinances at the repo rate. The money market shortage is the amount of cash reserves borrowed from the Reserve Bank by the private sector banks and is represented by the amount of assets under repo with the SARB. This shortage is an asset item (repo assets) on the balance sheet of the Reserve Bank, and it therefore follows that a rise in a liability item will increase the shortage and vice versa[25]. The SARB keeps the money market shortage at a level where it believes it has a firm hold on the banking sector, i.e. where repo rate is effective. Currently this level is approximately R13 billion.

There are a number of factors that can influence the level of the money market shortage and these can be divided into managed and unmanaged factors (Faure, 2003a:35). Unmanaged factors are items on the Reserve Bank's balance sheet that affect the size of the money market shortage and which are outside the control of the Reserve Bank. If these factors move the shortage in a direction that is not supported by the SARB, it can make use of a number of monetary policy tools (items on its

[25] Assets = equity + liabilities.

balance sheet) in order to bring the shortage to a level that it deems desirable. These tools are under the control of the Reserve Bank and are referred to as managed factors[26].

The primary form of control that the SARB has in order to ensure a constant demand for its funds is the implementation of a cash reserve requirement. This ratio is currently 2.5 per cent of banks' liabilities (as adjusted) (SARB, 2002b:2). In addition to this, the SARB can increase (decrease) the cash reserve ratio in order to increase (decrease) the money market shortage. However, this method is not often used as a way of influencing bank liquidity because even a very small change in the ratio can free up or tie up vast amounts of reserves. The SARB can also use open market operations, such as the outright buying and selling of domestic securities in the open market, i.e. the sale or purchase of either Reserve Bank securities (debentures) or securities from the Bank's asset portfolio (mainly government securities), debt and longer term reverse repo transactions, currency swaps, and the transferring of government funds between Tax and Loan accounts at private sector banks and the Exchequer account at the Reserve Bank (Van der Merwe, 1997b: 3; Stals, 1999b: 3). The SARB at this stage makes use of all the mentioned open market operations with the exception of the shifting of funds between the government accounts at the private sector banks and the Reserve Bank (Brevis, 2004; SARB, 2003a:1).

3.6.4 The money supply

The money supply (M3) is the monetary aggregate that the SARB targets indirectly in its effort to control inflation. This is because inflation is the main consequence of growth in the money supply. Changes in M3 are brought about by changes in its "counterparts". These "counterparts" of the money supply are net claims on government (NCG), net foreign assets (NFA), credit to the private sector (CPS), and net other assets (NOA). However, credit to the private sector is the largest determinant of growth in the money supply and it is for this reason that the SARB targets bank credit extension through changes in the repo rate.

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[26] The details of these factors will be discussed in 4.2.

Apart from CPS, the other components of the M3 are influenced by a large number of transactions that take place in the economy and this therefore affects the money supply. An example would be the SARB performing an open market sale of its own paper to the value of R100 million, in order to increase the money market shortage. If this paper is bought by the private sector it would result not only in an increase in the money market shortage but also in a reduction in M3 by R100 million. This is because the private sector needs to pay for these securities and therefore private sector deposits with the monetary banking institutions would decline by R100 million. The reason a decrease in private sector deposits with the monetary banking sector will result in a decrease in M3 stems from the fact that the money supply (M3) is defined as notes and coin in circulation and domestic private sector deposits held with the monetary institutions (ABSA, 1998:26). A spin-off of the SARB performing open market transactions in order to affect the money market shortage is a decrease in the money supply (when it deals with the non-bank sector). It should therefore be clear that the SARB's primary objective is not to control the money supply directly. Rather, it monitors M3 and if in its opinion the growth in M3 is inflationary it will try to temper this by increasing the repo rate.

3.6.5 Moral suasion

"Moral suasion" "consists of central bank requests, cautions or admonitions to banking institution to act or not to act in certain ways" (Meijer, 1984:39). Banks may be asked by the central bank to do, or not to do, a number of things. These include being asked to slow down total lending, to temporarily refrain from, or increase, new lending for certain purposes, to encourage clients to temporarily make use of foreign sources of finance or to observe high standards of prudence in their lending or investments (Meijer, 1984:39). However, in South Africa the main "request" of the Reserve Bank is for private sector banks to follow suit when it makes changes to the repo rate.

According to Handa (2000:265) moral suasion is generally most successful in countries with a very small number of large banks that are intimately within the sphere of central bank influence and have a tradition of respect for the judgement and

extra-legal authority of the central bank. These features are in line with the characteristics of the South African banking sector, where a significant proportion of the banking industry's market share is controlled by the "big four" banks; Absa Bank, Nedbank, Standard Bank, and First National Bank. The SARB keeps the money market shortage at a level where it believes it has a strong hold on the banking sector, i.e. at a level, which will ensure that the repo rate is effective. However, according to Brevis (2004), the South African banking institutions listen more to what the Monetary Policy Committee has to say when adjusting their interest rates than from observation of the level of the money market shortage. This co-operation of the banking sector with regards to "moral suasion" has been observed many times this year[27]. For instance, when on the same day as the SARB changed the repo rate the banks changed their prime lending rates by the same amount.

3.7 CONCLUSION

The way in which the South African Reserve Bank implements monetary policy has been discussed. The importance of the interbank market in this process should be clear from the above discussion. More specifically, the interbank market is the first step in the transmission mechanism of monetary policy and as such it is imperative that this market function efficiently.

[27] 2004.

CHAPTER 4

THE MONEY MARKET SHORTAGE

4.1 INTRODUCTION

Chapter three and four discussed how the present monetary policy system in South Africa operates. An essential element of the functioning of this system is the phenomenon of the money market shortage. As mentioned previously the SARB controls the demand for bank credit and hence the money supply indirectly through the "price" of credit. Therefore, banks respond to the demand for credit as it arises and then borrow the required reserves in the cash reserve funds market by selling certain eligible securities to the Reserve Bank under agreement to repurchase these securities after a stipulated period (Faure, 2003a:12). The banks pay the repo rate for these borrowed cash reserves and this rate then influences the interest rates charged by banks and therefore bank credit extension, the money supply and ultimately rate of inflation (SARB, 2002:1). However, for the repo rate to have an influence on other money market rates, it needs to be made "effective". What this means is that the SARB has to force the banks to borrow cash reserves from it and pay the repo rate for these funds. This the Reserve Bank accomplishes by creating what is called a money market shortage and then refinancing this shortage at the repo rate. The SARB has a number of monetary policy instruments at its disposal, which it can use to create such a shortage.

An extremely important point in this process of the Reserve Bank creating a liquidity requirement and then refinancing it at the repo rate is that banks are not able to create or destroy cash reserves. It is only the Reserve Bank that has the ability to do this and this stems from the fact that the SARB does not bank with other banks. For example, if the Reserve Bank wanted to destroy cash reserves, i.e. increase the money market shortage, it would perform an open market sale of Reserve Bank debentures. The funds "paid" for these securities are not put back into the system because the SARB does not bank with other banks. As a result those cash reserves are removed from the banking system thus increasing the liquidity requirement. Therefore, it should be

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evident that the power of the SARB in conducting monetary policy stems from its position as the sole source of cash reserves.

4.2 FACTORS AFFECTING THE MONEY MARKET SHORTAGE

4.2.1 Introduction

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As noted earlier, monetary policy can only be transmitted to lending rates if the repo rate is effective. This is made possible by the Reserve Bank ensuring that the money market shortage is always positive. Although the public and even sometimes the government can affect the size of the money market shortage (through deposits and the demand for banknotes and coin) the Reserve Bank has the greatest control. The main monetary policy instrument that the SARB makes use of to ensure a constant demand for its funds is the cash reserve requirement. In addition to this, should the Reserve Bank feel the need to either increase or decrease the money market shortage it can make use of open market operations. At this stage the SARB makes use of the following open market operations: the outright sale or purchase of domestic securities (sometimes); the sale and purchase of its own securities (i.e. Reserve Bank debentures), debt and longer term reverse repos (in government securities), and currency swaps (Brevis, 2004; SARB, 2002:2). The SARB can also make use of cash reserve ratios and the transferring of government funds between Tax and Loan accounts at private sector banks and the Exchequer account at the Reserve Bank to influence bank liquidity but does not often utilise these. Each of these tools and its influence on bank liquidity will be discussed, but it is necessary first to look at those factors that affect the money market shortage and are outside the control of the Reserve Bank (i.e. unmanaged factors) and those factors over which the SARB has control (i.e. managed factors).

Managed factors are those items in the Reserve Bank's balance sheet that represent the policy actions of the SARB, i.e. the items over which the Reserve Bank has control and which they utilise for monetary policy purposes (Faure, 2003a:35). On the other hand unmanaged factors are factors which influence the money market shortage and

which the Reserve Bank has no control over. Essentially, the SARB uses managed factors to correct undesirable changes in the liquidity shortage brought about by unmanaged factors. Currently the Reserve Bank keeps the money market shortage at approximately R13 billion. It believes that this is the correct level to ensure that they have a hold on the banks but that will also not hamper the activities of banks. If unmanaged factors move this level of R13 billion either upward or downward, the SARB will utilise the factors over which it has control to move the money market shortage in the desired direction. According to Faure (2003a:37) the balance sheet items which the SARB can and does manage are the following:

- Required reserves: the SARB has the authority to change the cash reserve requirement. If the Reserve Bank increases the cash reserve ratio, there will be an increase in the money market shortage and vice versa.
- Government deposits: the SARB has the option to shift funds between the Exchequer account at the Reserve Bank and the Tax and Loan accounts at the banks. However, the Reserve Bank is powerless if government deposits exceed the maximum amount banks can hold. The concept, and the effect, of shifts between these two accounts will be discussed in section 6.3.
- Net foreign assets: the size of net foreign assets is entirely within the control of the SARB. If the Reserve Bank sells forex in the open market the money market shortage would increase and vice versa.
- Domestic assets: the SARB can use its holdings of domestic assets to affect the size of the money market shortage. If it sells these assets in the open market, either outright or under repurchase the money market shortage would increase and vice versa.
- Reserve Bank debentures: the issue of these securities in the open market will increase the size of the money market shortage.
- Net other assets: there are many items under this category. The Reserve Bank has control over these.

Faure (2003a:36) describes unmanaged factors as follows:

- Notes and coin in circulation: banks and the private sector's demand for bank notes and coin is what determines the amount in circulation. The SARB simply reacts to the demand for banks notes. An increase in the demand for bank notes and coin will increase the size of the money market shortage and vice versa.
- Required cash reserves: the Reserve Bank has no control over this item on its balance sheet. Required reserves are a function of deposits, which in turn are a function of bank credit extension, which in turn is a function of the demand for credit. As bank deposits increase so too does the amount of required reserves. An increase in the amount of required cash reserves deposited with the SARB will increase the money market shortage and vice versa.
- Government deposits: when the amount of government deposits exceeds the maximum that the banks are allowed to hold, the SARB has no control over the effect this item will have on the money market shortage.

4.2.2 Cash reserve requirement

4.2.2.1 Introduction

The cash reserve requirement is a percentage of banks' total liabilities (or deposits) that must be held on their cash reserve accounts at the SARB. Presently, this percentage is 2.5 percent and earns no interest at the Reserve Bank (SARB, 2002:2). This minimum reserve requirement is the basis of monetary policy because it ensures that there is a stable demand for Reserve Bank money. This happens because whenever the volume of money and credit expands, the banks are forced to obtain the needed liquidity from the SARB (Van der Merwe, 1997:16). Since banks cannot create their own cash reserves, when the deposits of the banking sector as a whole expand, banks will have to sell eligible assets under repo to the SARB, which will then credit the banks' reserve accounts by the relevant amount. The banks pay the repo rate for this accommodation and this represents the cost of money at the margin for banks. As a result, banks will adjust their call and lending rates and by doing so, complete the Reserve Bank's task of making the repo rate effective. This increase in

assets under repo with the Reserve Bank means that the money market shortage has increased. If this increase is too large the SARB can make use of open market operations to bring the shortage down to a level that it deems desirable. As mentioned in 3.6.3, the level of the liquidity requirement at which the SARB has a "hold" on the banks is currently R13 billion.

There are two effects of the cash reserve requirement on the money market shortage. The first comes about due to changes in bank deposits (M3) as discussed above and the second comes about by changes in the ratio of the cash reserve requirement (Faure, 2003a: 24).

The effects of each of these scenarios on the money market shortage will be illustrated with the use of T-diagrams.

4.2.2.2 Changes in bank deposits and the cash reserve requirement

As bank liabilities (deposits) increase so do the amount of reserves that are required to be held at the Reserve Bank in the banks' cash reserve accounts. Under the present system of accommodation, banks respond to the demand for credit as it arises and then they find the required reserves (2.5 per cent of liabilities) either in the bank-to-bank interbank market or the cash reserves funds market. This is because if one bank makes a loan to a customer in need of credit, this loan will end up back in the banking system as a deposit once the customer has spent these funds. Thus, banks generate deposits by extending credit. The changes in the balance sheet of the banks and the Reserve Bank and hence on the money market shortage is best described with the use of an example.

Mr A wants to buy goods worth R100 million from Mr B. Mr A approaches the banks, who grant him an overdraft facility of R100 million. Mr A gives Mr B a cheque in exchange for the goods. Mr B deposits the cheque. As a result of this transaction, bank deposits (M3) will increase by R100 million (Faure, 2003a:24). If a cash reserve ratio of 2.5 percent is assumed, the following balance sheet changes occur.

Private sector banks (Rand millions)			
Liabilities		*Assets*	
Deposits (Mr B)	+ 100	Loans (Mr A)	+ 100
		Cash Reserves at Bank	
		Reserve accounts	+ 2.5
		Current accounts	– 2.5

Reserve Bank (Rand millions)			
Liabilities		*Assets*	
Bank cash reserves			
Reserve accounts	+ 2.5		
Current accounts	– 2.5		

(Faure, 2003a:24-25)

Since bank deposits from the private sector (M3) have increased by R100 million (as a result of an increase in bank loans) the cash reserves required to be held at the Reserve Bank in the banks' Cash Reserve Accounts has increased by R2.5 million. The SARB will thus transfer funds from the banks' current accounts to their reserve accounts. However, compliance with the cash reserve requirement is determined by the amount of reserves on both these accounts together and therefore the banks will be in contravention of the cash reserve requirement. As was discussed earlier, banks cannot create these reserves and are therefore forced to sell securities to the value of R2.5 million to the SARB (under repo). Once the Reserve Bank has accommodated this shortfall, the balance sheets of the SARB and the banks change as follows:

Private sector banks (Rand millions)			
Liabilities		*Assets*	
Deposits (Mr B)	+ 100	Loans (Mr A)	+ 100
		Cash reserves at Reserve Bank	
		Reserve accounts	+ 2.5
		Current accounts	-
		Securities (sold under repo)	– 2.5

Reserve Bank (Rand millions)			
Liabilities		*Assets*	
Bank cash reserves		Securities (purchased under repo)	+ 2.5
Reserve accounts	+ 2.5		
Current accounts	-		

(Faure, 2003a:25)

In the above example, the money market shortage has increased by R2.5 million. It should be clear that this increase was brought about by the public due to the increased

demand for bank credit of R100 million and was not as a result of a deliberate intervention by the SARB. In fact, the Reserve Bank has no control over the amount of cash reserves required to be held by banks, as this is a function of bank deposits, i.e. an unmanaged factor.

4.2.2.3 Changes in the cash reserve ratio

The Reserve Bank has the right to change the cash reserve ratio in order to affect bank liquidity. If the unmanaged factors that affect bank liquidity, result in the money market shortage moving in an undesirable direction, the SARB can either increase or decrease the cash reserve ratio. It would increase the reserve ratio if it wanted to increase the money market shortage and would lower the ratio if it wanted to decrease the shortage. A change in the percentage of the cash reserve requirement by the Reserve Bank is seldom used as a monetary policy instrument. Since, in reality, the sum of banks' liabilities is vast, if the cash reserve ratio is changed by even a small amount, it could increase or decrease the money market shortage by significantly large amounts, which may be inconsistent with the objectives of the monetary authorities.

The effect of a change in the ratio of cash reserves required to be held by banks with the Reserve Bank will be demonstrated below. Assume that the deposit base for the banking sector is R1000 million. If the SARB increases the cash reserve requirement from 2.5 percent to 3.5 percent, changes will take place in the balance sheets of the banks and the SARB.

Following on from the earlier example, the banks will already have cash reserves of 2.5 per cent of their liabilities in their reserve accounts at the Bank, i.e. R25 million. They therefore need to find cash reserves of another R10 million in order to comply with the cash reserve requirement.

Private sector banks (Rand millions)			
Liabilities		***Assets***	
		Cash reserves at Reserve Bank	
		Reserve accounts	+ 10
		Current accounts	− 10

Reserve Bank (Rand millions)			
Liabilities		*Assets*	
Bank cash reserves			
Reserve accounts	+ 10		
Current accounts	− 10		

(Faure, 2003a:25-26)

The above diagrams show that the banks are now in contravention of the cash reserve requirement since the amount on both accounts determines compliance with it. Banks cannot create these reserves and they therefore need to request accommodation from the SARB. The result is:

Private sector banks (Rand millions)			
Liabilities		*Assets*	
		Cash reserves at Reserve Bank	
		Reserve accounts	+ 10
		Current accounts	-
		Securities (sold under repo)	− 10

Reserve Bank (Rand millions)			
Liabilities		*Assets*	
Bank cash reserves		Securities (purchased under repo)	+ 10
Reserve accounts	+ 10		
Current accounts	-		

(Faure, 2003a:26)

The overall result of a 1% increase in the cash reserve requirement from 2.5 per cent to 3.5 per cent is an increase in the money market shortage (securities purchased under repo) of R10 million. It should be clear that this item is completely under the control of the Reserve Bank.

The above example illustrates the argument that a change in the ratio of the cash reserve requirement by even a small amount will cause large changes in the money market shortage and is therefore seldom used as a monetary policy instrument.

4.2.3 Open market operations

4.2.3.1 Introduction

The Reserve Bank can influence the money market shortage by manipulating the items on its balance sheet. The intentional manipulation of these items to affect liquidity in the market is termed open market operations. These transactions are termed open market operations because any interested party can deal with the SARB (Faure, 2004:30). A simplified balance sheet of the Bank is needed in order to illustrate how open market operations work.

RESERVE BANK BALANCE SHEET	
Liabilities	***Assets***
A. Notes and coin (in circulation) **B**. Deposits 1. Government 2. Banks (cash reserves) a. Reserve accounts b. Current accounts **C**. Foreign Loans **D**. Reserve Bank securities **E**. Other liabilities (including equity)	**F**. Foreign assets **G**. Domestic assets (claims on government) **H. Repo assets** (money market shortage) **I**. Other assets

The two most important items on the Reserve Bank's balance sheet, in terms of monetary policy, are items B2 (banks cash reserves) and H (money market shortage). Changes in all the other items on the balance sheet will affect these two items (Faure, 2002b:145). Item B2 consists of reserve accounts and current accounts. All banks have a reserve account at the Reserve Bank, in which they are required to hold a percentage of their total liabilities (or deposits) to the public. This is termed the minimum cash reserve requirement and these deposits at the Bank are called cash reserves. In addition to this account the clearing banks hold current accounts with the Bank, which are used for the daily settlement of claims that banks have on one another (Faure, 2003a:7). The clearing banks in South Africa are the cheque account banks such as Standard Bank, Absa Bank, Nedbank and First National Bank.

Item H (repo assets) on the Bank's balance sheet represents the size of the money market shortage. This is because when the banking sector is short of reserves, banks

are forced to sell assets under repurchase agreement to the Reserve Bank in order to acquire accommodation. Item G (domestic assets) is otherwise known as claims on government because the Reserve Bank holds mainly government securities in portfolio. This item along with item D (Reserve Bank debentures) and item F (foreign assets) represents the Bank's open market operations (Faure, 2002a:91).

It should be clear from the above, simplified balance sheet that the Reserve Bank can influence the money market shortage (item H) by manipulating items in its balance sheet, i.e. by performing open market operations. A key characteristic of a balance sheet is that total assets must equal total liabilities. It follows then that a reduction in an asset item of the SARB will be matched by a reduction in item B2 (banks cash reserves) thereby giving rise to a need for refinancing via repurchase transactions. This will only happen if, and to the extent that, there is no simultaneous decrease in any other liability item or increase in any other asset item of the SARB (Meijer, 1997:18). On the other hand an increase in an asset item of the SARB will increase the banks' cash reserves thereby freeing up reserves and allowing banks to repurchase assets under repo with the Reserve Bank. Similarly, an increase in a liability item will result in a reduction of bank deposits unless it is neutralised by a simultaneous and equivalent increase in an asset item of the SARB and vice versa (Meijer, 1997:19). As already mentioned, increases in the assets of the Reserve Bank tend to create cash reserves and decreases tend to destroy them. The opposite is true for the liability items of the SARB, where decreases in liabilities tend to create cash balances held by banks and increases tend to destroy them. Anything that reduces the cash balances of banks will result in the need for Reserve Bank accommodation and therefore increase the money market shortage and anything that increases the cash balances of banks will free up banks' cash reserves and allow them to repurchase assets under repo with the SARB thereby decreasing the money market shortage. Having said this, the money market shortage is represented by the following identity:

$$\mathbf{H = (A + B1 + B2a + C + D + E) - (F + G + I)}$$

From this identity it can be seen that a rise in a liability item of the Reserve Bank or a decrease in an asset item will increase the money market shortage, whereas a fall in a liability item or increase in an asset item will reduce the money market shortage

(Faure, 2002a:91). Each of the open market instruments available to the bank to influence the money market shortage will now be explained, i.e. the items the SARB has control over.

4.2.3.2 Sale or purchase of domestic securities

The outright sale or purchase of securities in the open market is another monetary policy tool used by the Reserve Bank to influence liquidity in the banking system. Open market sales of securities held by the SARB (decrease in an asset item) will drain excess liquidity, i.e. cash reserves, from the market, thereby increasing the money market shortage. On the other hand, open market purchases of securities (an increase in an asset item) will inject liquidity into the market causing a decrease in the money market shortage.

The Reserve Bank uses a number of securities in its portfolio for these types of open market operations. They are Treasury Bills, Land Bank bills, and government securities (Gidlow, 1998:23). On the liability side of the balance sheet, the SARB makes use of its own securities - called Reserve Bank debentures. These debentures are of short-term duration and are issued solely for the purpose of monetary policy.

The difference between managed and unmanaged factors was discussed in 4.2.1. If the unmanaged factors move the money market shortage in a direction that is not desirable in the opinion of the SARB then it can utilise open market operations in order to bring it back to a satisfactory level. If for example the Reserve Bank wants to decrease the money market shortage, it would purchase domestic assets from the banks in the open market. The effect of a R100 million purchase of domestic assets (eg. Treasury bills) by the SARB, assuming a 2.5 per cent cash reserve requirement, will have the following effect on the money market shortage.

Reserve Bank (Rand millions)			
Liabilities		***Assets***	
Bank cash reserves		Treasury bills	+ 100
Reserve accounts	-		
Current accounts	+ 100		

Private sector banks (Rand millions)			
Liabilities		***Assets***	
		Treasury bills	– 100
		Cash reserves at Reserve Bank	
		Reserve accounts	-
		Current accounts	+ 100

The Reserve Bank will pay for the Treasury bills by crediting the current accounts of the banks by R100 million. The banks in aggregate now have surplus cash reserves of R100 million. The banks are indebted to the Reserve Bank at all times (meaning, that they have securities under repo with the SARB). Since the "penalty" rate (repo rate) paid for having these securities under repo with the Reserve Bank is the highest in the market[28], the banks will choose to repurchase securities to the value of R100 million with their extra cash reserves on their current accounts.

The following balance sheets of the banks and the Reserve Bank will show the net changes that occur as a result of a R100 million purchase of Treasury bills from the private banking sector.

Reserve Bank (Rand millions)			
Liabilities		***Assets***	
		Treasury bills	+ 100
		Securities (purchased under repo)	
		(money market shortage)	– 100

Private sector banks (Rand millions)			
Liabilities		***Assets***	
		Treasury bills	– 100
		Cash reserves at Reserve Bank	
		Reserve accounts	-
		Current accounts	-
		Securities (sold under repo)	+ 100

From the above example, it is clear that an open market purchase of domestic assets results in an increase in an asset item on the Reserve Banks' balance sheet (item G). This eventually leads to a decrease in the money market shortage (item H) by the same amount. In this case the cash reserve accounts of the banks are not affected

[28] This is not entirely true. The highest rate in the market is that paid for the use of the marginal lending facility (MLF). However, banks do not often make use of this facility.

because the cash reserve requirement is based on banks liabilities, i.e. deposits from the public.

It is important to show the effect on the money market shortage if the Reserve Bank purchases the Treasury bills from the non-bank private sector eg. pension funds. As noted earlier banks are required to hold a percentage of their liabilities (or deposits) in the reserve accounts at the SARB.

Reserve Bank (Rand millions)			
Liabilities		***Assets***	
Bank cash reserves		Treasury bills	+ 100
Reserve accounts	-		
Current accounts	+ 100		

Private sector banks (Rand millions)			
Liabilities		***Assets***	
Deposits (private sector)	+ 100	***Cash reserves at Reserve Bank***	
		Reserve accounts	-
		Current accounts	+ 100

Non-bank private sector (Rand millions)			
Liabilities		***Assets***	
		Deposits at bank	+ 100
		Treasury bills	– 100

Payment for the Treasury bills is made by means of a deposit with the banking sector, which comes about by the SARB crediting the current accounts of the banks by R100 million. Since private sector deposits at the banks have increased by R100 million, they are required to hold an extra R2.5 million in their reserve accounts at the Reserve Bank. The Reserve Bank will therefore debit the current accounts of the banks by R2.5 million and credit their reserve accounts by the same amount. This leaves the banks with excess reserves of R97.5 million, which they will use to repurchase assets under repo. Therefore the overall effect on the balance sheets of the SARB and the banking sector as a whole is as follows:

Reserve Bank (Rand millions)			
Liabilities		***Assets***	
Bank cash reserves		Treasury bills	+ 100
Reserve accounts	+ 2.5	Repo assets (MMS)	–97.5
Current accounts	-		

Private sector banks (Rand millions)			
Liabilities		***Assets***	
Deposits (private sector)	+ 100	***Cash reserves at Reserve Bank***	
		Reserve accounts	+ 2.5
		Current accounts	-
		Securities (sold under repo)	+97.5

In the above example the money market shortage decreased by R97.5 million which was statistically caused by an increase in the domestic assets of the Reserve Bank by R100 million and required cash reserves increasing by R2.5 million.

4.2.3.3 Longer-term reverse repurchase transactions

Longer-term reverse repurchase transactions constitutes the selling of securities by the Reserve Bank under repurchase contract in order to drain liquidity from the market, i.e. to increase the money market shortage (SARB, 2003b:4). This works in the same way as the outright sale or purchase of domestic securities, i.e. an increase or decrease in an asset item. The difference is that if the SARB enters into longer-term reverse repos to increase the money market shortage it will have to repurchase these securities at a later date and this will inject liquidity into the market, thereby reducing the money market shortage.

4.2.3.4 Reserve Bank debentures

On the liability side of the Reserve Bank's balance sheet, the SARB can issue its own paper in the open market. These securities are called Reserve Bank debentures and are issued solely for monetary policy purposes. The SARB will issue these debentures if it feels the need to drain liquidity in the market, i.e. to increase the money market shortage. The effect such a transaction will have on the money market shortage will be illustrated by means of an example.

The SARB issues R100 million of its own debentures and these securities are bought by a bank.

Reserve Bank (Rand millions)			
Liabilities		***Assets***	
Reserve Bank debentures	+ 100		
Bank cash reserves			
Reserve accounts			
Current accounts	– 100		

Private sector banks (Rand millions)			
Liabilities		***Assets***	
		Reserve Bank debentures	+ 100
		Cash reserves at Reserve Bank	
		Reserve accounts	
		Current accounts	– 100

In the above example, the SARB issues R100 million if its own debentures, which are bought by the banks. This amounts to an increase in a liability item of the Reserve Bank and hence a reduction in banks cash reserves by R100 million. This is because the SARB debits the current account of the banks by R100 million as payment for the debentures. The reduction in banks cash reserves puts banks in a position in which they are in contravention of the cash reserve requirement to the amount of R100 million. They therefore have to get accommodation from the Reserve Bank by selling securities under repo to the SARB. The following changes take place in the balance sheets of these two institutions:

Reserve Bank (Rand millions)			
Liabilities		***Assets***	
Reserve Bank debentures	+ 100	Repo assets (MMS)	+ 100
Bank cash reserves			
Reserve accounts			
Current accounts	-		

Private sector banks (Rand millions)			
Liabilities		***Assets***	
		Reserve Bank debentures	+ 100
		Cash reserves at Reserve Bank	
		Reserve accounts	
		Current accounts	-
		Securities (sold under repo)	– 100

The banks sold R100 million repo assets to the Reserve Bank, which then credited the banks' current accounts by R100 million. Thus, as a result of the SARB issuing R100 million of its own debentures to banks, i.e. an increase in a liability item, the money market shortage has increased by R100 million.

4.2.3.5 Currency swaps

Foreign-exchange swaps are used by the Reserve Bank to drain excess liquidity from the market, that is, to increase the money market shortage. According to Gidlow (1999:337), when the SARB enters into such a transaction it sells foreign exchange spot to banks for rand coupled with an agreement to purchase it forward. The effect such a transaction would have on the money market shortage will be illustrated with the use of an example:

The SARB feels that it is necessary to increase the money market shortage. It therefore swaps R100 million US dollars from its portfolio for rand. The counterparty to this transaction is a domestic foreign exchange dealer, i.e. a bank.

Reserve Bank (Rand millions)			
Liabilities		***Assets***	
Bank cash reserves		Forex	– 100
Reserve accounts			
Current accounts	– 100		

Private sector banks (Rand millions)			
Liabilities		***Assets***	
		Forex	+ 100
		Cash reserves at Reserve Bank	
		Reserve accounts	
		Current accounts	– 100

In the above example, the SARB swaps R100 million in forex with a bank, which pays rand for these dollars. The Reserve Bank debits the bank's current account by R100 million as payment for this forex. Since the bank is now in contravention of the cash reserve requirement it will have to sell assets under repo to the SARB in exchange for borrowed cash reserves. The following changes take place in the balance sheets of these institutions:

Reserve Bank (Rand millions)			
Liabilities		***Assets***	
Bank cash reserves		Forex	– 100
Reserve accounts		Repo assets (MMS)	+ 100
Current accounts	-		

Private sector banks (Rand millions)			
Liabilities		***Assets***	
		Forex	+ 100
		Cash reserves at Reserve Bank	
		Reserve accounts	
		Current accounts	-
		Securities (sold under repo)	– 100

The bank sold R100 million securities to the SARB under repo and in return the Reserve Bank credited the bank's current account by R100 million. The net effect on the money market shortage resulting from a R100 million currency swap, i.e. a decrease in an asset item will be an increase in the shortage by R100 million. It should be noted however that this transaction would be reversed at a later stage, in terms of the swap agreement. This means that the money market shortage would then decrease again.

4.3 TAX AND LOAN ACCOUNT SYSTEM

Before the introduction of the Tax and Loan Accounts at the private sector banks in 1994 the SARB was the sole banker to government. This meant that all the government's receipts either from tax revenues or the issuing of securities were deposited on the Exchequer account at the Reserve Bank. The disbursement of government funds either due to government expenditure or the maturing of securities was made from the Paymaster General account at the SARB (Faure, 1993:2). The result of this was that the flow of funds to and from the government sector had a disruptive effect on the money market. The effect on the money market shortage of the SARB being the sole banker to government will be illustrated with the use of an example.

It is the end of the month and the private sector has to pay taxes to the value of R100 million to the government. (Assume a cash reserve requirement of 2.5 per cent). This will have the following effect on the money market shortage.

Reserve Bank (Rand millions)			
Liabilities		***Assets***	
Government deposits (Exchequer)	+ 100		
Bank cash reserves			
Reserve accounts			
Current accounts	– 100		

Private sector banks (Rand millions)			
Liabilities		***Assets***	
Private sector deposits	– 100	***Cash reserves at Reserve Bank***	
		Reserve accounts	
		Current accounts	– 100

In the above example the private sector pays R100 million taxes to the government. These taxes can only be "deposited" with the Reserve Bank in the Exchequer account. The way in which the banks pay the private sector's taxes to the Reserve Bank is through their current accounts. Thus, the SARB debits the banks current accounts by R100 million and credits the Exchequer account by the same amount. The banks are now in contravention of the cash reserve requirement by R97.5 million and must therefore sell repo assets to the Reserve bank in order to get accommodation. The reason this amount is R97.5 million and not R100 million is because private sector deposits at the banks have decreased by R100 million and this will result in R2.5 million cash reserves being "freed up". Thus, the net result on the money market shortage will be as follows:

Reserve Bank (Rand millions)			
Liabilities		***Assets***	
Government deposits (Exchequer)	+ 100	Repo assets (MMS)	+ 97.5
Bank cash reserves			
Reserve accounts	– 2.5		
Current accounts	-		

Private sector banks (Rand millions)			
Liabilities		*Assets*	
Private sector deposits	– 100	***Cash reserves at Reserve Bank***	
		Reserve accounts	– 2.5
		Current accounts	-
		Securities (sold under repo)	–97.5

The effect therefore of the private sector paying taxes of R100 million to the government will be an increase in the money market shortage of R97.5 million. The important point here is that in reality the collective taxes paid by the private sector are a vast amount and will therefore have an extremely disruptive influence on the money market shortage. A similar but opposite effect will happen when the government buys goods from the private sector or settles maturing securities. It is for this reason that the Tax and Loan accounts were introduced in 1994.

The Tax and Loan accounts are government accounts with the private sector banks. The introduction of this account helped to neutralise the impact of inflows and outflows of funds, related to the government sector, on bank liquidity (Gidlow, 1999:340). In addition, these accounts provided the Reserve Bank with another instrument that it could use when performing open market operations. Thus, by shifting funds between the Exchequer account and the Reserve Bank and the Tax and Loan accounts at the private sector banks, the SARB is able to influence the money market shortage. Although this form of open market operations is not utilised on a regular basis by the South African monetary authorities, the way in which this instrument works will be illustrated with the use of an example.

The factors over which the SARB has no control has increased the money market shortage to a higher level and the Reserve Bank feels that this could be detrimental to banks' activities. It therefore decides to shift R100 million from the government's Exchequer account at the Reserve Bank to the Tax and Loan accounts at the private sector banks. This will have the following effect on the money market shortage:

Reserve Bank (Rand millions)			
Liabilities		***Assets***	
Government deposits (Exchequer)	– 100		
Bank cash reserves			
Reserve accounts			
Current accounts	+ 100		

Private sector banks (Rand millions)			
Liabilities		***Assets***	
Tax and Loan account	+ 100	***Cash reserves at Reserve Bank***	
		Reserve accounts	
		Current accounts	+ 100

In the above example, the SARB moves R100 million of government deposits from the Exchequer account to the Tax and Loan account at the private sector banks. It does this by crediting the current accounts of the private sector banks by R100 million and debiting the Exchequer account by the same amount. The banking sector now has R100 million in cash reserves over and above the cash reserve requirement. Since banks are always indebted to the Reserve Bank, i.e. have assets under repo with the SARB, and since the repo rate is the highest in the market, the banks will choose to repurchase repo assets with these extra reserves. The net effect on the money market shortage will therefore be as follows:

Reserve Bank (Rand millions)			
Liabilities		***Assets***	
Government deposits (Exchequer)	– 100	Repo assets (MMS)	– 100
Bank cash reserves			
Reserve accounts			
Current accounts	-		

Private sector banks (Rand millions)			
Liabilities		***Assets***	
Tax and Loan accounts	+ 100	***Cash reserves at Reserve Bank***	
		Reserve accounts	
		Current accounts	-
		Securities (sold under repo)	+ 100

The result therefore of the SARB transferring R100 million of government deposits from the Exchequer account to the Tax and Loan accounts is a R100 million decrease in the money market shortage.

4.4 CONCLUSION

The Reserve Bank uses the money market shortage to make repo rate effective. What this means is that the SARB forces banks to borrow cash reserves from it by selling eligible securities to the Reserve Bank with the agreement to repurchase these securities after the stipulated time period. The Reserve Bank then credits these banks' accounts by the relevant amount and charges the repo rate for this accommodation. Since this repo rate is the highest rate in the market, banks will try and get the required reserves in the bank-to-bank interbank market. The competition for funds ensures that the interbank rate closely follows the repo rate as banks bid up their call rates in an attempt to attract deposits. Banks endeavour to keep their profit margins constant and as a result push up their lending rates. The higher the cost of credit, the higher is the opportunity cost of borrowing money and therefore the demand for credit will fall. It is the demand for credit that is the main cause of changes in the money supply and since the money supply is the main cause of inflation the result is that the SARB has control over the inflation rate. None of this would be possible if the Reserve Bank fails at making the repo rate effective. Thus, the importance of the money market shortage in the implementation of monetary policy should be evident. The SARB has a number of tools, which it can use to create a money market shortage and to keep at a desirable level.

CHAPTER FIVE

ANALYTICAL FRAMEWORK

5.1 INTRODUCTION

Monetary policy in South Africa and its main component, the SARB's accommodation system, has gone through a number of changes over the years. The most recent shift in the accommodation system took place on 8 March 1998 with the introduction of the repo system of accommodation. However, on 15 September 2001 the SARB made a number of adjustments to this method of accommodation because it "did not have the capability to address certain issues hampering the effective functioning of the interbank market" (SARB, 2001a:3). According to the SARB (2001a:4) an effective interbank market should respond immediately to changes in the repo rate and will as a result ensure effective pricing in the money market as a whole. Thus, the result desired by the SARB when making these adjustments was to improve the functioning of the refinancing system and the interbank market in order to strengthen the implementation of monetary policy (SARB, 2001a:2).

"Effective monetary policy implementation implies ... that the central bank should manage liquidity in such a manner that the interbank overnight rate stays near (generally slightly below) the level of the repo rate" (SARB, 2001a:5). In addition, Gidlow (2001:3) states that the monetary authorities take the view that the money market would function more efficiently if changes to the repo rate had a more direct effect on the interbank rate. In other words, changes in monetary policy should first affect the interbank rates, which then transmit a similar influence to other money market rates and finally impact on the interest rates in the economy. However, before the adjustments to the repo system in September 2001 the opposite mechanism tended to be in operation (Gidlow, 2001:3).

The objective of this analysis is to determine whether the goals of the SARB have in fact been achieved. The two main benchmarks that will be used in order to examine this will be, firstly, whether or not the relationship between the interbank rate and the repo rate has become more significant since the adjustments to the repo system and, secondly, whether the intended change in the transmission mechanism of monetary policy has been achieved.

5.2 MODEL SPECIFICATION

The aim of the analysis is to capture the various relationships between the repo rate, the interbank rate, the prime lending rate and the money market rate. The models are specified as follows:

$$PIBR = \alpha_0 + \alpha_1 RR + \varepsilon \quad (1)$$

$$MNR = \alpha_2 + \alpha_3 RR + \varepsilon \quad (2)$$

$$PLR = \lambda_0 + \lambda_1 RR + \varepsilon \quad (3)$$

$$PIBR = \gamma_0 + \gamma_1 PLR + \varepsilon \quad (4)$$

$$PLR = \gamma_2 + \gamma_3 PIBR + \varepsilon \quad (5)$$

$$PLR = \phi_0 + \phi_1 MNR + \varepsilon \quad (6)$$

$$MNR = \phi_2 + \phi_3 PLR + \varepsilon \quad (7)$$

$$PIBR = \delta_0 + \delta_1 MNR + \varepsilon \quad (8)$$

$$MNR = \delta_2 + \delta_3 PIBR + \varepsilon \quad (9)$$

$$RR = \beta_0 + \beta_1 PIBR + \varepsilon \quad (10)$$

$$RR = \beta_2 + \beta_3 PLR + \varepsilon \quad (11)$$

$$RR = \lambda_2 + \lambda_3 MNR + \varepsilon \quad (12)$$

where: RR = repo rate; PIBR = prime interbank rate; MNR = money market rate; and PLR = prime lending rate. Although technically the repo rate as a dependent variable should not be included, as it is administratively determined by the Monetary Policy Committee (MPC), it has been included here for the purpose of determining causality.

5.2.1 Interbank and repo rate function

Equation (1) specifies the interbank rate as a function of the repo rate. As noted by Whittaker (2003:5), central banks provide banks with borrowed cash reserves and charge a rate for these reserves. In South Africa this rate is called the repo rate and it is administratively determined[29]. The relationship between the repo rate and the interbank rate stems from the fact that the SARB accommodates banks' liquidity requirements fully and automatically at the repo rate. As such, according to theory, no bank will pay a higher rate to borrow from another bank than the rate at which it can borrow from the central bank. Similarly, since banks collectively borrow from the central bank at the repo rate, no bank will accept a rate far from the repo rate when making a loan to another bank (Whittaker, 2003:5). It is this phenomenon that ensures the interbank lending rate remains close to the repo rate.

It is necessary to test the relationship between these two variables in order to establish the success of the amendments to the repo system in respect of the SARB's goals. If the SARB has achieved its objectives, it is expected that the relationship between these two variables will be stronger in the period after the change in the repo system in September 2001, i.e. the cointegration of the repo rate and the interbank rate should be stronger in the period September 2001 to November 2004 than in the period March 1998 to September 2001. In addition, it is expected that the transmission through the

[29] The level at which the repo rate is set is determined by the Monetary Policy Committee (MPC).

system of changes to the repo rate will have a more direct impact on the interbank rate in the period after the amendments than in the period preceding the changes. This is based on the definition of an efficiently functioning interbank market as stated by the SARB and its belief that the amendments to the refinancing system would improve the functioning of the money market as a result of the repo rate having a more direct effect on the interbank rate than was previously the case (SARB, 2001a:5; Gidlow, 2001:3).

5.2.2 The money market and repo rate function

Equation (2) specifies the money market rate as a function of the repo rate. For the purpose of this analysis the 3-month negotiable certificate of deposit (NCD) rate will be used as a representation of the money market rates. Since deposits and interbank borrowing are alternative sources of funds, the rate on wholesale deposits is determined with reference to the repo rate (Whittaker, 2003:5). Banks will usually set their rates offered on deposits at a margin below the repo rate in order to cover transaction and administration costs. It is this process of banks attempting to remain "out of the Bank", i.e. not borrow from the central bank, that ensures the repo rate and the money market rates are linked.

It is important to determine the significance of the relationship between these two variables in order to establish the effectiveness of money market rates as a conduit for monetary policy, that is, as a conduit for the repo rate. In addition, it is necessary to establish the direction of causality in order to determine the direction of monetary policy transmission. It is expected that if the SARB achieved its objective of transmitting monetary policy, the repo rate will granger-cause the money market rate via the interbank rate.

5.2.3 The prime lending rate and the repo rate function

Equation (3) specifies the prime-lending rate as a function of the repo rate. The significance of this relationship will determine whether, and to what extent, these two variables move together, i.e. whether, and to what extent, they are cointegrated.

Furthermore, if the objectives of the SARB have been achieved it is expected that the direction of causality between these two variables, after September 2001, will move from the repo rate to the prime lending rate via the interbank and the money market rates. According to Gidlow (2001:3), before the modifications to the repo system the direction of causality, i.e. the transmission mechanism, moved from the repo rate directly to the prime overdraft rate and other rates of banks, which then affected money market rates.

5.2.4 The interbank rate and the prime lending rate

Equations (4) and (8) specify the interbank rate as a function of the prime-lending rate and the prime-lending rate as a function of the interbank rate respectively. It is expected from economic theory that these two variables will be cointegrated. This is because an upward adjustment in the repo rate will encourage banks to increase rates paid on deposits (in order to stay "out of the Bank") and since banks attempt to earn a constant profit margin they will increase the rates at which they lend funds to the public (Faure, 2002b:157). In addition, if the SARB has achieved its objectives, causality is expected to run from the interbank rate to the prime-lending rate via money market rates for the period after the adjustments to the system, i.e. September 2001 to November 2004.

5.2.5 The money market and prime lending rate

Equations (5) and (6) specify the money market rate as a function of the prime lending rate and the prime lending rate as a function of the money market rate respectively. It is expected *a priori* that these two variables will be cointegrated for the reason that, according to economic theory, money market rates are a link in the transmission mechanism of monetary policy. That is, changes in the money market rate (in this case the NCD rate) will influence the prime-lending rate because banks endeavour to keep their profit margins constant. Banks profit margins are the difference between the rate paid on their liabilities (deposits) and the rate earned on their assets (loans). Therefore, if the NCD rate increased as a result of an increase in the repo rate (as

discussed in 4.2.2) banks would increase their lending rates so as to keep their profit margins constant (Faure, 2002b:157).

It is further expected that if the SARB has achieved its goals, in terms of modifying the repo system, the causality will run from money market rates to the prime lending rate in the period September 2001 to November 2004. Gidlow (2001:5) states that before the change in the repo system the causality tended to run in the opposite direction.

5.2.6 The interbank rate and the money market rate

Equations (7) and (9) specify the interbank rate as a function of money market rates and the money market rates as a function of the interbank rate respectively. The relationship between these two variables is important for two reasons. Firstly, the degree of cointegration will establish the effectiveness of these channels in the transmission of monetary policy. Secondly, the direction of causality will provide evidence of the channel of monetary policy and hence whether or not the SARB has achieved its objective of changes in the repo rate having a more direct impact on the interbank rate. As such, it is expected that if the SARB has achieved this objective the direction of causality should run from the repo rate to the interbank rate and then from the interbank rate to money market rates in the period September 2001 to November 2004 (Gidlow, 2001:5).

5.3 DATA

The data under examination consist of the repo rate (RR), prime interbank rate (PIBR), prime-lending rate (PLR), and a money market rate (MNR). This data has been compiled by QUOIN Institute (Pty) Limited from SARB sources and other money market participants. The 3-month NCD rate will be used as a representation for money market rates as opposed to the 3-month bank acceptance (BA) rate or 3-month Treasury bill (TB) rate. The reason for this is that the 3-month NCD rate is a yield rate as opposed to a discount rate and since the other variables are yield rates

this will make the analysis easier. In order to examine the relationships between each of the above-mentioned variables monthly time series data for each of these variables will be used for the period March 1998 – November 2004.

5.4 ECONOMETRIC PROCEDURE

5.4.1 Introduction

The relationships specified in 5.2 will be examined with the use of cointegration analysis, structural stability tests and causality tests. Each of these will be discussed in turn.

5.4.2 Cointegration analysis

The cointegration testing procedures involves 3 steps.

Step 1: It is necessary to conduct a unit root test in order to establish the stationarity of the time series, i.e. whether the time series are of the same order of integration. A stationary time series will have a time invariant mean, variance and autocovariance (at various lags) and tends to return to its mean value after a shock. On the other hand a nonstationary time series will have a time-varying variance, a time-varying mean or both (Gujarati, 2003:798). The importance of testing for stationarity lies in the problem that a nonstationary time series could produce a spurious regression or "nonsense regression". This means that the results of a regression will show t-statistics that are significant and a high R^2 but will have no economic meaning. According to Granger and Newbold (1974:117) $R^2 > d$ is a guide to suspect that the estimated regression is spurious. As mentioned by Gujarati (2003:807), before formal tests of stationarity are undertaken, it is worthwhile to plot the time series under study because this will give an initial clue about the likely nature of the time series under study. The Augmented Dickey-Fuller (ADF) test will be used. The justification for using this test is that it is the most commonly used method in the literature. This method is described below.

The following regression is run to apply the ADF test:

$$\Delta Y_t = \beta_1 + \partial Y_{t-1} + \alpha_i \sum_{i=1}^{m} \Delta Y_{t-i} + \varepsilon_t \qquad (13)$$

where ε_t is a pure white noise error term and $\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2})$, $\Delta Y_{t-2} = (Y_{t-2} - Y_{t-3})$, etc. The regression used will be a random walk with drift as can be seen from the above equation. The null hypothesis is that $\partial = 0$ (has a unit root) and the alternative is that $\partial < 0$ (stationary). The Schwarz Information Criterion (SIC) will be used to select the optimum number of lags, in order to ensure that the error term in equation 13 is serially uncorrelated. In estimating the above equation, if the t ($= \tau$) value of the lagged coefficient is greater than the critical τ value, at the various levels of significance, then the null hypotheses that the series has a unit root can be rejected and it can be concluded that the series is stationary.

Step 2: Using series of the same order of integration, the relationships specified in section 4.2 will be estimated with the help of OLS method. For each of these relationships the error series are also generated and subjected to unit root tests in order to test for cointegration. Two variables that have a long-term, or equilibrium, relationship between them will be cointegrated (Demirbas, 1999:6). The Cointegrating Regression Durbin-Watson (CRDW) Test and the Engle-Granger (EG) Test are the most commonly used cointegration tests in the literature[30]. Since the analysis deals with two variables at a time, the EG test should be sufficient.[31] Each of these will be discussed.

The Engle-Granger test involves a number of steps. Firstly, equations (1) to (12) would be estimated with the help of OLS method. The following regression would be estimated for each equation:

Time period March 1998 - November 2004: $Y_t = \alpha_1 + \alpha_2 X_t + u_t \qquad (14)$

[30] Apart from the Johannsen-Juselius method.
[31] If there is more than one explanatory variable in the regression the Johannsen's approach is preferred.

Secondly, the residuals of these regressions would be obtained and the ADF test used in order to test if these residuals are I(0). It should be noted however, that the estimated error terms (u_t) are based on the estimated cointegrating parameter (the coefficient of the explanatory variable) and as such the ADF critical significance values are no longer appropriate (Gujurati, 2003:823). Instead Engle and Granger (1987:269) have calculated the appropriate values. If the residuals of the regressions are found to be stationary, i.e. if a linear combination of two or more nonstationary series exists, then the estimated regression is a cointegrating regression and is not spurious. This means that there that there will be a long-run equilibrium relationship between the variables.

The Cointegrating Regression Durbin-Watson Test is an alternative way of finding out whether two variables are cointegrated. This test involves using the Durbin-Watson d statistic obtained from the cointegrating regressions but in this case the null hypothesis is that d = 0 as oppose to the standard d = 2. If the computed d value is smaller than the critical values[32] for the various levels of significance then the null hypothesis of cointegration is rejected. On the other hand, if the computed value is greater than the critical values, the null hypothesis that the two variables are cointegrated is accepted (Gujurati, 2003:824).

However, there are problems with the above cointegration tests. Guisan (2001:1) points this out by stating, "cointegration tests fail very often to recognise causal relations and, on the other hand that approach does not always avoid the peril of accepting as causal relations those that really are spurious". In her 2001 paper Guisan has applied these various tests to the relationship between gross domestic product and private consumption expenditure in 25 OECD countries for the period 1961-97. The outcomes of these tests confirm the above statement that cointegration tests have a number of limitations.

Guisan (2001:1) notes that in many cases the problem of no cointegration between variables is often no more than a simple problem of misspecification in the form of the relation. After a number of tests Guisan (2001:1) found that a mixed dynamic

[32] The 1, 5 and 10 percent critical values are 0.511, 0.386 and 0.322 respectively (Gujarati, 2003:824).

model was superior to both a model in levels and a model in first differences. More specifically, while all three models accepted 100% of correct coefficients, the mixed dynamic model was superior to the other two in that it had the lowest level of acceptance of spurious relations. As such, an alternative approach to the EG cointegration and CRDW tests that can be used is one where the model is specified in the following form.

$$Y = \Delta X_t + Y_{t-1} + \varepsilon \tag{15}$$

The above equation states that Y is a function of the first difference of X as well as its own lag (1 lag).

Step 3: Having established whether or not a long-run relationship exists between the variables under consideration, it will be necessary to establish whether the change in policy in September 2001 had an effect on the significance of cointegration. This is important because one of the objectives of the change in policy was to make the relationship between the repo rate and the interbank rate stronger. Step 2 is repeated for each period, i.e. March 1998 to September 2001 and September 2001 to November 2004, in order to determine whether or not the monetary authorities achieved their objectives. The regressions estimated are as follows:

Time period March 1998 – September 2001: $Y_t = \lambda_1 + \lambda_2 X_t + u_{1t}$ (16)

Time period September 2001 - November 2004: $Y_t = \gamma_1 + \gamma_2 X_t + u_{2t}$ (17)

5.4.3 Structural stability tests

Structural stability tests will be used to examine the robustness of the Engle-Granger test. The main aim is to determine whether there is a structural break in the data signifying a change in monetary policy. The two tests that will be used are the Chow breaking point and the Chow forecast test.

The Chow breaking point test is used to examine whether the relationships specified in section 4.2 are the same before and after the change in policy. The data will be

divided into two sub-samples, i.e. March 1998 to September 2001 and September 2001 to November 2004. If significant differences are found then it will be concluded that there is a structural change in the relationship between the estimated variables. In order to achieve this equation (14), (16) and (17) will be estimated so as to obtain the unrestricted (RSS_{UR}) and restricted (RSS_R) residual sum of squares respectively. The null hypothesis under this test is that there is no structural break and thus if the computed F value exceeds the critical F values, at the various levels of significance, the null will be rejected and it will be concluded that there is a structural break.

The Chow forecast test uses the first sub-sample of T_1 observations to estimate a model, which is then used to predict the values of the dependent variable in the remaining T_2 data points (Eviews, 1999). Therefore, in this analysis the model used to predict the dependent variable in the remaining T_2 data points, i.e. September 2001 to November 2004, will be based on the observations in the period March 1998 to September 2001. If there is a large difference between the predicted values and the actual values in the second period, then there is evidence that the estimated relation over the two sub-samples is not stable, which is an indication that there was a shift in policy.

5.4.4 Error correction model (ECM)

Engle and Granger (1987:255-356) show that if two variables Y and X are found to be cointegrated, then an associated error-correction model must exist. This is known as the "Granger representation theorem". This ECM model can then be used to distinguish between the short-run and the long-run relationships between the variables (Islam and Ahmed, 1999:100). An ECM of the following form will express the long-run equilibrium and the short-run disequilibrium relationship:

$$\Delta Y_t = \alpha_0 + \alpha_1 U_{t-1} + \sum_{i=1}^{m} \delta_{1i} \Delta Y_{t-i} + \sum_{j=1}^{n} \delta_{2i} \Delta X_{t-j} + \varepsilon_t \qquad (18a)$$

where: U_{t-1} is the error correction terms, i.e. the lagged stationary residuals of the long-run equilibrium model and α_1 is the speed of adjustment parameter.

As noted by Islam and Ahmed (1999:100), since the variables are in their first difference form and thus stationary, the OLS method can be used to estimate the parameters of the ECM equation. The appropriate number of lags to be included in the ECM in order to ensure white noise error terms will be determined using suitable lag length tests. According to Islam and Ahmed (1999:100), Akaike's minimum Final Prediction Error (FPE) criterion can be used to select the optimum lag length. This criterion is essentially equal to the Akaike's Information criterion (AIC).

5.4.5 Granger causality test

Granger causality tests can be conducted in order to determine the direction of influence between the variables. This should be done because, as noted by Gujurati (2003:696), "the existence of a relationship between variables does not prove causality or the direction of influence". However, in time series data it can be assumed that an event (X) that follows another event (Y) cannot be the cause of that event (Y).

It is necessary to determine the direction of causality between the variables in order to establish whether the modifications to the repo system in September 2001, accomplished one of the SARB's goals. This goal was to change the direction of the transmission of monetary policy. According to Gidlow (2001:3), before the adjustments to the repo system, monetary policy was transmitted directly from changes in the repo rate to changes in the prime overdraft rate and other rates of banks, which then affected money market rates. However, the monetary authorities believed that the money market would function most efficiently if changes in the repo rate first had an affect on the interbank rate, which then transmitted these effects to other money market rates followed by other interest rates in the economy (Gidlow, 2001:3).

This analysis will be testing causality between two variables at a time as specified in section 4.2, i.e. bilateral causality. This will be done for the entire period since the introduction of the repo system i.e. March 1998 to November 2004. The causality tests will then be repeated for the period from the introduction of the repo system to

the time the SARB made changes to it, i.e. March 1998 to September 2001, as well as the period September 2001 to November 2004. The period before and after the modifications to the repo system will then be compared in order to determine if the direction of causality has changed, i.e. if the transmission mechanism has changed.

It has been pointed out in the literature that if the original time series are cointegrated, then the standard Granger causality test is no longer the best method to use. This is because the application of the standard Granger causality test requires that Y and X be stationary (Gujurati, 2003:698). The problem here is that most economic variables are not stationary at level and thus the appropriate differences of the time series need to be used (Islam and Ahmed, 1999:101). When the differences of the time series are used long-run information about the causal relationship among variables can be excluded and it is thus advisable to use an alternative test for Granger causality based on an error-correction model (Islam and Ahmed, 1999:101). On the other hand if two variables are stationary then it is possible to use the standard Granger test to determine causality.

Thus, if the variables are found to be stationary, the standard Granger causality test can be used and the following pair of regressions will be estimated for each of the possible relationships:

$$Y_t = \sum_{i=1}^{n} \alpha_i X_{t-i} + \sum_{j=1}^{n} \beta_j Y_{t-j} + u_{1t} \tag{19}$$

$$X_t = \sum_{i=1}^{n} \lambda_i X_{t-i} + \sum_{j=1}^{n} \delta_j Y_{t-j} + u_{2t} \tag{20}$$

where it is assumed that u_{1t} and u_{2t} are uncorrelated. In the above regressions, the variable Y granger-causes X if X can be better predicted by using the history of Y in addition to all available relevant information (Atukeren, 2003:1). Since, this analysis is dealing with bilateral causality, if a regression of X on its own lags and the lags of Y produces a lower forecast error variance than regressing X on only its own lags, then Y is a *prima facie* granger-cause of X (Atukeren, 2003:1).

If it is found, in the estimation of equations (19) and (20), that $\sum \alpha_i \neq 0$, i.e. the estimated coefficients on the lagged X in (19) are as a group, statistically different from zero and, $\sum \delta_j = 0$ i.e. the set of estimated coefficients on the lagged Y in (20) is not statistically different from zero, it will be concluded that unidirectional causality runs from X to Y (Gujurati, 2003:697). On the other hand, if $\sum \alpha_i = 0$, i.e. the estimated coefficients on the lagged X in (19) is not significantly different from zero and, $\sum \delta_j \neq 0$, i.e. the set of lagged Y coefficients in (20) are statistically different from zero, then it will be concluded that unidirectional causality runs from Y to X (Gujarati, 2003:697).

If it is found that the sets of X and Y coefficients in both (19) and (20) are statistically different from zero, then it will be concluded that there is bilateral causality between X and Y. If however, it is found that the sets of X and Y coefficients in both (19) and (20) are not statistically different from zero, it will be concluded that X and Y are independent (Gujarati, 2003:697).

5.4.6 Granger causality using the ECM framework

The variables under consideration are required to be stationary if the standard Granger test discussed in section 4.4.4 is to be applied (Islam and Ahmed, 1999:103). This is because with non-stationary variables the standard Granger causality test will have to be applied using regressions based on differenced stationary variables and this process disregards useful long-run information on such causal relationships (Islam and Ahmed, 1999:101). Therefore, if the variables are found to be non-stationary, the ECM framework will be applied to examine the direction of causality. This model involves the first differences of the non-stationary, cointegrated variables as well as the lagged residual of the long-run equilibrium model (Islam and Ahmed, 1999:101) as in equation (18a).

$$\Delta Y_t = \alpha_0 + \alpha_1 U_{t-1} + \sum_{i=1}^{m} \delta_{1i} \Delta Y_{t-i} + \sum_{j=1}^{n} \delta_{2j} \Delta X_{t-j} + \varepsilon_t \qquad (18a)$$

$$\Delta X_t = \alpha_0 + \alpha_1 U_{t-1} + \sum_{i=1}^{m} \delta_{1i} \Delta Yt_{t-i} + \sum_{j=1}^{n} \delta_{2i} \Delta X_{t-j} + \varepsilon_t \qquad (18b)$$

As noted by Nell (1999:13), a variable X is said to cause Y (i.e. the null hypothesis that X does not Granger cause Y is rejected) if the lagged coefficients of the δ_{2i}'s in equation (18a) are jointly significant based on the standard Wald F-test. To examine whether Y Granger causes X, the ECM equation is estimated with the first difference of the X variable as the dependent variable (18b). The null hypothesis in this case is that Y does not Granger cause X and it is rejected if the lagged coefficients of the δ_{1i}'s in equation (18b) are jointly significant (Nell, 1999:13).

The lagged residual of the long-run equilibrium model U_{t-1} in equations (18a) and (18b) differentiates the ECM from the standard Granger causality regression (Islam and Ahmed, 1999:102). The inclusion of this term ensures that causality must exist in at least one direction and such causality can be detected if the error-correction term U_{t-1} is statistically significant.

5.5 CONCLUSION

The aim of the research is to determine whether or not the SARB achieved the objectives that were intended when the monetary authorities made changes to the repo system in September 2001. This will be accomplished by firstly testing the data series (repo rate, money market rate, prime-lending rate and interbank rate) for unit roots using the ADF test. If the series are found to be in integrated of the same order then it is possible to test for cointegration between the variables under study. This will be accomplished by running regressions with the help of OLS, obtaining the residuals from these regressions and then subjecting these residuals to unit root tests. If the residuals obtained from the relationship between two non-stationary variables are found to be stationary, then it can be concluded that the two variables are cointegrated and as such the relationship is not spurious. Furthermore structural stability tests will be performed in order to determine if there is a structural break in the data indicating a

shift in policy. Finally, causality test will be done so as to determine the transmission mechanism before and after the change in policy. If the variables are found to be stationary the standard Granger causality test will be used, on the other hand if the variables are found to be non-stationary causality will be determined using the ECM framework.

CHAPTER SIX

EMPIRICAL RESULTS

6.1 UNIT ROOT RESULTS

As mentioned in the previous chapter, the analysis begins with determining whether each of the variables (repo rate; money market rate; prime lending rate; and the interbank rate) is stationary or not. This is accomplished by testing each of the variables for a unit root. The Augmented Dickey-Fuller (ADF) test is used, as this is the most widely used test for stationarity in the literature. When using this test, if the null hypothesis that there is a unit root is rejected, it will be concluded that the data series is stationary. Alternatively, if the null hypothesis cannot be rejected then the conclusion will be that the series is non-stationary. The results of the unit root tests for the periods March 1998 to November 2004; March 1998 to September 2001; and September 2001 to November 2004 are presented in Table 1.

TABLE 1: ADF UNIT ROOT TESTS

	Level	Lag length	1st difference	Lag length
March 1998 – November 2004				
Repo (RR)	-2.857418[a]	3	-4.550335[a]	2
Interbank (PIBR)	-0.950448	1	-5.676221[a]	0
Prime (PLR)	-0.911091	2	-4.016145[a]	1
NCD (MNR)	-0.918388	1	-5.426442[a]	0
March 1998 – September 2001				
Repo (RR)	-1.032236	0	-3.270421[a]	2
Interbank (PIBR)	-0.873517	0	-2.983697[a]	3
Prime (PLR)	-0.985383	0	-4.618096[a]	3
NCD (MNR)	-0.761187	0	-4.046121[a]	0
September 2001 – November 2004				
Repo (RR)	-0.623842	0	-2.370273[b]	1
Interbank (PIBR)	-0.446406	0	-2.702198[a]	1
Prime (PLR)	-0.620004	0	-2.370273[b]	1
NCD (MNR)	-0.497156	1	-2.827004[a]	0

Note: [a] Indicates significance at the 99 percent confidence level; [b] Indicates significance at the 95 percent confidence level; and [c] Indicates significance at the 90 percent confidence level.

The optimum lag lengths for each of the variables have been chosen using the Eviews 5 automatic lag selection option and are based on the Schwarz information criterion (SIC). The maximum lag length was chosen according to the frequency of the data, i.e. monthly. These optimum lags are reported in the above table. The results show that none of the variables are level stationary, i.e. I(0), however, all the variables are first difference stationary, i.e. they are I(1). The exception here is the RR series for the period March 1998 to November 2004, which is level stationary. This result does not allow for the comparison of the RR series with the other series, as they are not integrated of the same order. Since the main focus of this research is to test the relationship between the repo rate and the other rates in the banking system, this period, i.e. March 1998 to November 2004, will not be further analysed. However, all the variables for the two sub-periods under review are first difference stationary and as such a comparison between these variables in feasible. Having established that the data sets of the four variables are integrated of the same order, it is possible to test for cointegration. That is, it is now possible to see if a long-run relationship exists between these variables.

6.2 COINTEGRATION ANALYSIS AND LONG-RUN RELATIONSHIPS

The unit root tests above have shown that the series under analysis are nonstationary. In such a case the normal Ordinary Least Squares (OLS) procedure is no longer appropriate as the residuals generated from two nonstationary time series may be nonstationary and the OLS estimators are established only for stationary residuals (Alexander, 2001:353). However, if two variables are cointegrated, the regression between these two variables will give stationary residuals and as such an OLS regression is feasible. Cointegration tests analyse a group of nonstationary time series together, i.e. series that individually have a unit root. As noted in the previous chapter, two variables that have a long-term, or equilibrium, relationship between them will be cointegrated (Gujurati, 2003:822). The relationships specified in 5.2 have been estimated with the help of OLS for the periods March 1998 to September 2001; and September 2001 to November 2004. In order to test for cointegration, i.e.

the feasibility of the regressions, the residuals of each of the relationships have been generated and subjected to unit root tests.

According to Gujurati (2003:823), when testing the residuals of the regressions for unit roots the normal ADF critical significance values are no longer appropriate values. Instead Engle and Granger (1987:269) have calculated the appropriate values. Using the MacKinnon tables, the formula for the exact calculation of these critical values.

$$\beta_\infty + \beta_1 / T + \beta_2 T^2 \qquad (21)$$

where: for two variables without trend: β_∞ =-3.9001; -3.3377; -3.0462; β_1 =-10.534; -5.967; -4.069; β_2 =-30.03; -8.98; -5.73 for 1%; 5%; and 10% level of significance respectively; and T = number of observations in data set.

When using the critical values calculated by applying the above formula to test for cointegration, it appears that none of the series in the sub period September 2001 to November 2004 are cointegrated. This suggests that all these relationships are spurious[33] with the exception of the relationship between the prime lending rate and the money market rate as well as the repo rate and the money market rate. For the sub-period March 1998 to September 2001 the prime lending rate and interbank rate as well as the money market and repo rate are cointegrated at the 1% level; the prime lending rate and repo rate are cointegrated at the 5% level; the interbank rate and the repo rate are cointegrated at the 10% level; and the interbank and money market rates as well as the prime lending and money market rate are not cointegrated.

However, based on the theory of the transmission mechanism of monetary policy, it would be expected that all these rates should have a meaningful relationship. Guisan (2001:1) points out the problems of cointegration tests by stating, "cointegration tests fail very often to recognise causal relations and, on the other hand that approach does not always avoid the peril of accepting as causal relations those that really are spurious". Guisan (2001:6) further shows that the Engle-Granger critical values led to

[33] Since the Durbin Watson statistic is smaller than the R^2 statistic.

a 0% success in accepting clear causal relationships (in levels) whereas the ADF statistics accepted 84% of clear cointegrating relationships. However, the mixed dynamic model represented in equation (15) in section 5.4.1 has shown the highest probability of accepting clear cointegrating relations with the lowest peril of accepting non-cointegrating relations.

When testing for cointegration using the mixed dynamic model it was found that all the relationships specified in section 5.2 are cointegrated[34] for both sub-periods[35]. However, as suggested by Guisan (2004)[36] a model in levels using the ADF critical values can be used and as such this method will be used to test for cointegrating relationships between the variables under study. These results are presented in tables 2 and 3.

TABLE 2: COINTEGRATION TESTS AND LONG RUN RELATIONSHIP RESULTS (MARCH 1998 - SEPTEMBER 2001)

Y_t	Coefficient					R^2	F stat	CRD W	ADF
	Constant	PIBR	MNR	PLR	RR				
PIBR	-3.60024 (-14.093)[a]				1.11999 (64.205)[a]	0.9901	4122.3	0.9437	-3.2185[a] (lag 0)
PIBR	-5.71689 (-7.5917)[a]			1.05110 (24.489)[a]		0.9360	599.73	0.9671	-7.9173[a] (lag 3)
PIBR	-1.56447 (-4.6197)[a]		1.07935 (42.598)[a]			0.9779	1814.6	1.4426	-1.9817[b] (lag 5)
PLR	2.78489 (5.4172)[a]				1.01132 (28.809)[a]	0.9529	829.96	0.9012	-3.7265[a] (lag 1)
PLR	4.58778 (9.4540)[a]		0.97737 (26.918)[a]			0.9464	724.62	0.9754	-2.9361[a] (lag 1)
PLR	6.18952 (13.154)[a]	0.89050 (24.489)[a]				0.9360	599.73	0.9621	-4.2171[a] (lag 1)
MNR	-1.67029 (-5.4523)[a]				1.02248 (48.878)[a]	0.9831	2389.0	1.4762	-4.8424[a] (lag 0)
MNR	-3.75333 (-5.9468)[a]			0.96836 (26.918)[a]		0.9464	724.62	0.9988	-3.0176[a] (lag 1)
MNR	1.70183 (6.1839)[a]	0.90601 (42.598)[a]				0.9779	1814.6	1.4611	-3.0024[a] (lag 5)
RR	3.32292 (18.650)[a]	0.88406 (64.205)[a]				0.9901	4122.3	0.9376	-3.1654[a] (lag 0)
RR	-1.95456 (-3.4061)[a]			0.94225 (28.809)[a]		0.9529	829.96	0.9002	-3.6493[a] (lag 1)
RR	1.84596 (7.0210)[a]		0.96151 (48.878)[a]			0.9831	2389.0	1.4517	-4.7536[a] (lag 0)

Note: [a] Indicates significance at the 99 percent confidence level; [b] Indicates significance at the 95 percent confidence level; and [c] Indicates significance at the 90 percent confidence level.

[34] The exception is the interbank rate (as the dependent variable) and the prime lending rate in the first period and the repo rate (as the dependent variable) and the prime lending rate in the second period.
[35] See Appendix A.
[36] See Appendix B.

TABLE 3: COINTEGRATION TESTS AND LONG RUN RELATIONSHIP RESULTS (SEPTEMBER 2001 - NOV 2004)

Y_t	Coefficient					R^2	F stat	CRD W	ADF
	Constant	PIBR	MNR	PLR	RR				
PIBR	0.07711 (0.31268)				0.90757 (39.434)[a]	0.9767	1555.0	0.4676	-2.9067[a] (lag 0)
PIBR	-3.09938 (-9.51347)[a]			0.90757[a] (39.434)		0.9767	1555.0	0.4676	-2.9067[a] (lag 0)
PIBR	0.32499 (0.97128)		0.90325 (28.325)[a]			0.9559	802.351	0.6027	-2.2517[b] (lag 1)
PLR	3.66043 (13.6786)[a]	1.07623 (39.434)[a]				0.9767	1555.0	0.4592	-2.8407[a] (lag 0)
PLR	3.50000 (9.11E+15)[a]				1.00000[a] (2.79E+16)	1.0000	9.47E-30	0.0833	0.0000 (lag 0)
PLR	3.74495 (17.1002)[a]		0.99799 (47.817)[a]			0.9840	2286.4	1.2642	-2.3138[b] (lag 1)
MNR	-0.07831 (-0.3544)				0.98605 (47.817)[a]	0.9840	2286.4	1.2552	-2.3672[b] (lag 1)
MNR	0.10789 (0.29452)	1.05830 (28.325)[a]				0.9559	802.35	0.5854	-2.1967[b] (lag 1)
MNR	-3.52951 (-12.091)[a]			0.98605[a] (47.817)		0.9840	2286.4	1.2552	2.3672[b] (lag 1)
RR	0.16043 (0.59953)	1.07623 (39.434)[a]				0.9767	1555.0	0.4592	-2.8407[a] (lag 0)
RR	-3.50000 (-2.18E+15)[a]			1.0000[a] (8.82E+15)		1.0000	9.47E-29	0.0666	-0.8056 (lag 0)
RR	0.24495 (1.1185)		0.99799 (47.817)[a]			0.9840	2286.4	1.2642	-2.3138[b] (lag 1)

Note: [a] Indicates significance at the 99 percent confidence level; [b] Indicates significance at the 95 percent confidence level; and [c] Indicates significance at the 90 percent confidence level.

The results show that all the relationships specified in equation 5.2. are cointegrated with the exception of the repo rate and prime lending rate in the second sub-period, i.e. after the change to the repo system. However, it is clear that overall, the cointegrating relationships in the period before the change to the repo system are a great deal stronger than after the change. This would suggest that the change in the repo system did not achieve the objectives of the monetary authorities, which was to strengthen the relationship between these variables (specifically between the repo rate and interbank rate). In all cases the changes in the rates under analysis, resulting from a 1% increase in the relevant explanatory variable, are close to unitary. As such not much has changed in terms of the elasticities of these rates as a result of the change in the repo system.

An interesting point to note however is that the roles played by the repo rate and interbank rate seem to have been reversed after the change to the repo system. This can be seen by the fact that in the period before the change to the repo system,

changes in the repo rate, i.e. the repo rate as the explanatory variable, resulted in the other rates adjusting by more than the change in the repo rate. On the other hand, in the period after the changes to the system, adjustments in the repo rate resulted in other rates adjusting by less than the change in the repo rate[37] (i.e. less elastic). The opposite is true for the interbank rate, where in the period before the changes to the system were made, changes in the interbank rate resulted in other rates adjusting by less than the change in the interbank rate. However, in the present system, changes in the interbank rate seem to result in other rates adjusting by more than the change in the interbank rate (i.e. more elastic).

6.3 STRUCTURAL STABILITY TESTS

Table 4 presents the results from the Chow breaking point test and Chow forecast test. These tests were undertaken in order to determine whether there is a structural break in the various relationships, which will signify a shift in policy in September 2001. The Chow breaking point test shows without a doubt that there is a structural break in all the relationships specified in 5.2. However, the Chow forecast test cannot reject the null hypothesis of no structural break for most of the relationships. This shows the possibility that these two tests can have conflicting results (Eviews, 1999). Nevertheless, it seems reasonable to conclude that there was a structural break in the models after the adjustments to the repo system.

6.4 CAUSALITY USING THE ERROR CORRECTION MODEL (ECM)

Since, the series under analysis have been found to be non-stationary, the standard Granger causality test referred to in section 5.4.4 is no longer the best method to use in determining the direction of causality between the variables. This is because the

[37] This ignores the relationship between the repo rate and prime-lending rate, which is exactly equal to one. However, the author is of the opinion that this exact relationship has more to do with moral suasion than the transmission of monetary policy.

standard Granger causality test will have to be applied using regressions based on differenced stationary variables, thereby losing useful long-run information on such causal relationships (Islam and Ahmed, 1999:101). Thus, the Error-correction model developed by Engle and Granger (1987) has been used to determine the causality between the variables under analysis. These results are presented in tables 5 and 6 below.

TABLE 4: STRUCTURAL STABILITY TESTS

Equation	Chow breaking point test		Chow forecast test	
	F	LLR	F	LLR
PIBR = *f*(RR)	121.1167 (0.000000)	115.1915 (0.000000)	6.217685 (0.000000)	158.3358 (0.000000)
PIBR = *f*(PLR)	5.590441 (0.005407)	10.98237 (0.004123)	0.256871 (0.999978)	18.10372 (0.998283)
PIBR = *f*(MNR)	7.755743 (0.000854)	14.86572 (0.000591)	0.831625 (0.716917)	48.09682 (0.150677)
PLR = *f*(RR)	7.954656 (0.000724)	15.21330 (0.000497)	0.211912 (0.999998)	15.21330 (0.999780)
PLR = *f*(MNR)	8.011192 (0.000691)	15.31182 (0.000473)	0.344976 (0.999406)	23.48539 (0.976532)
PLR = *f*(PIBR)	11.27527 (0.000051)	20.80567 (0.000030)	0.471421 (0.989734)	30.63313 (0.828457)
MNR = *f*(RR)	72.99999 (0.000000)	86.13267 (0.000000)	3.079263 (0.000297)	112.3360 (0.000000)
MNR = *f*(PLR)	4.577574 (0.013230)	9.099894 (0.010568)	0.242769 (0.999989)	17.20817 (0.999035)
MNR = *f*(PIBR)	5.645847 (0.005152)	11.08410 (0.003918)	0.980661 (0.523773)	54.34902 (0.052125)
RR = *f*(PIBR)	134.5614 (0.000000)	121.7421 (0.000000)	8.531640 (0.000000)	180.7908 (0.000000)
RR = *f*(PLR)	14.01062 (0.000006)	25.13894 (0.000003)	0.373243 (0.998699)	25.13894 (0.958095)
RR = *f*(MNR)	94.17392 (0.000000)	100.2161 (0.000000)	3.988277 (0.000015)	128.5389 (0.000000)

Note: The values in parenthesis represent the probability values.

Table 5 shows the causality results between the variables under study for the period before the change from a floating to a fixed repo system. As discussed in 1.1, the monetary authorities believed that the money market would function more efficiently if changes to the repo rate had a more direct effect on the interbank rate. More specifically, they held that changes in monetary policy should first affect the interbank rates, which should then influence other money market rates and finally impact on other interest rates in the economy (Gidlow, 2001:3). During this period however (March 1998 to September 2001) it was thought that the opposite mechanism was in operation (Gidlow, 2001:3).

TABLE 5: ECM CAUSALITY RESULTS FOR 1998 - 2001			
X does not Granger cause Y	**F statistic/Wald test**	**Probability**	**Accept/reject Null**
RR does not Granger cause PIBR	5.525977	0.025503	Reject (at 5%)
PIBR does not Granger cause RR	0.028794	0.866880	Accept
PLR does not Granger cause PIBR	3.506711	0.075111	Reject (at 10%)
PIBR does not Granger cause PLR	3.691744	0.066636	Reject (at 10%)
MNR does not Granger cause PIBR	10.35456	0.003093	Reject (at 1%)
PIBR does not Granger cause MNR	23.51359	0.000024	Reject (at 1%)
RR does not Granger cause MNR	35.74171	0.000001	Reject (at 1%)
MNR does not Granger cause RR	0.662990	0.428244	Accept
MNR does not Granger cause PLR	15.19237	0.000505	Reject (at 1%)
PLR does not Granger cause MNR	0.911152	0.352453	Accept
RR does not Granger cause PLR	0.807787	0.380641	Accept
PLR does not Granger cause RR	0.231645	0.634184	Accept

In terms of the direction of causality between theses variables there are three options that arise. These are as follows:

(1) RR → PIBR → MNR → PLR

(2) RR → MNR → PLR → PIBR

(3) RR → MNR → PIBR → PLR

Out of these three options, it is option (1) that has the strongest causality and as such it is the most likely order in which changes in monetary policy were transmitted through the banking system during this period. What is interesting about option (1) is that the direction of causality is the direction that the monetary authorities hoped to achieve by changing this repo system in September 2001 and not the direction that was thought to be in operation at this time. In other words, the desired direction of causality was already taking place before the changes to the repo system.

TABLE 6: ECM CAUSALITY RESULTS FOR 2001 - 2004			
X does not Granger cause Y	**F statistic/Wald test**	**Probability**	**Accept/reject Null**
RR does not Granger cause PIBR	2.414013	0.130089	Accept
PIBR does not Granger cause RR	14.22757	0.000740	Reject (at 1%)
PLR does not Granger cause PIBR	2.414013	0.130089	Accept
PIBR does not Granger cause PLR	14.22757	0.000740	Reject (at 1%)
MNR does not Granger cause PIBR	0.049695	0.825157	Accept
PIBR does not Granger cause MNR	16.30842	0.000314	Reject (at 1%)
RR does not Granger cause MNR	37.72508	0.000001	Reject (at 1%)
MNR does not Granger cause RR	25.11505	0.000019	Reject (at 1%)
MNR does not Granger cause PLR	25.11505	0.000019	Reject (at 1%)
PLR does not Granger cause MNR	37.72508	0.000001	Reject (at 1%)
RR does not Granger cause PLR	Cannot be estimated (near singular matrix)		
PLR does not Granger cause RR	Cannot be estimated (near singular matrix)		

Table 6 presents the causality results for the period after the changes to the repo system in September 2001. As mentioned above, one of the objectives of the SARB when making the changes to the repo system was to have the direction of causality run from the repo rate to the interbank rate, then to money market rates and finally impact on other rates in the economy. There are four options relating to the direction of causality between the variables under study in this period. These are as follows:

(1) PIBR → RR → MNR → PLR

(2) PIBR → PLR → MNR → RR

(3) PIBR → MNR → PLR

(4) PIBR → MNR → RR

All the above options have rejected the null hypothesis of no-causality at the 1% level of significance and as such all have an equal chance of being the true direction of causality during this period (September 2001 to November 2004). It should be noted however that during this period changes in the repo rate have resulted in an equal and

immediate change in the prime-lending rate[38]. This essentially means that there are in fact only two apparent options for the direction of causality during this period as changes in the repo rate are exactly equal to changes in the prime-lending rate.

An interesting observation from the above results is that the prime interbank rate is not caused by any other rate and as such is the starting point for the transmission mechanism of monetary policy. This result is surprising, as it would be expected that since the repo rate is administratively set by the MPC, it should be the starting point of the transmission mechanism. However, based on the option (1) the transmission mechanism of monetary policy starts in the interbank market, which then influences the repo rate, which then affects the money market rates and finally impacts on the prime lending rate. Option (2) has a similar direction (since changes in the repo rate and prime-lending rate are equal). Options (3) and (4) represent the transmission mechanism as running from the interbank rate to money market rates and then to the repo and prime lending rates. A possible explanation for the transmission mechanism having its starting point in the interbank market is expectations. Banks may anticipate the direction in which the monetary authorities will adjust the repo rate and in so doing adjust the rates at which they lend funds to one another in the interbank market.

From the above analysis it would seem as if the SARB has not achieved its objective of having the repo rate impact more directly on the interbank rate. In fact, the direction of causality before the change was the direction the authorities were hoping to achieve by making the changes to the repo system. However, after the change, the transmission mechanism changed to one that was not desired by the authorities. In other words, in terms of this particular objective, the SARB should not have changed the system in September 2001.

[38] This supports the argument made in 3.6.3 that there is a strong culture of moral suasion in the South African banking sector.

6.5 CONCLUSION

The ADF test was used to determine whether or not the data series for the period March 1998 to November 2004 and the two sub-periods, contained unit roots. It was found that all the variables were I(1) except for the repo rate for the entire period, which was I(0). This meant that the repo rate could not be analysed with the other I(1) series. The repo rate is central to this research and as such only the two sub-periods were analysed.

OLS regressions were run on the I(1) variables and the residuals were acquired and subjected to unit root tests in order to determine whether or not the relationships specified in 5.2 were cointegrated. Using the MacKinnon (1991) values, cointegration was found for only a few relationships. However, following the suggestion of Guisan (2004) the ADF critical values were used to test for cointegration. Using the ADF critical values resulted in all relationships specified in 5.2 being cointegrated with the exception of the repo rate and prime-lending rate in the period September 2001 to November 2004. These results further illustrated that the cointegrating relationships were stronger in the period before the change to the repo system as opposed to after the change. This suggests that the SARB has not achieved its goal in terms of improving the relationship between the repo rate and the interbank rate.

Causality tests were carried using the ECM framework and Wald F-Test in order to determine the transmission mechanism that was in play before and after the change to the repo system. Three possible transmission mechanisms were found for the period before the change with the strongest relationship being the one in which the direction runs from repo rate to interbank rate to money market rate and then to prime-lending rate. The interesting part of this result is that this was the transmission mechanism the authorities were hoping to achieve by changing the repo system. Two main possible transmission mechanisms were found for the period after the change. Neither of these is the direction the monetary authorities had hoped to achieve. What is surprising about these results is that the interbank rate seems to be the starting point in the transmission mechanism. This seems unlikely as the repo rate is administratively

determined by the MPC and as such should not be caused by the interbank rate. A possible explanation for this result is that banks expect the repo rate to be adjusted by a certain number of basis points and adjust their lending rates.

CHAPTER SEVEN

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH

7.1 INTRODUCTION

Monetary policy is the most important means by which government authorities can affect the overall pace and direction of an economy. However, if changes in monetary policy are to be transmitted through the financial system to eventually impact on economic activity, it has to be made effective. In South Africa the main tool of monetary policy is the repo rate and, in order to ensure that changes in this rate are transmitted through the system, the SARB guarantees that banks remain indebted to it at all times.

This repo system of accommodation was implemented on 8 March 1998 to address the shortcomings of the previous Bank rate system. However, this system was not without its problems and in September 2001 the authorities changed the repo system from a floating to a fixed repo system. One of the reasons for this change was that the floating repo system was not capable of dealing with certain problems that were hampering the efficient functioning of the interbank market. This highlights the importance of the interbank market in the transmission of monetary policy. The factors that have been analysed in order to determine whether or not the SARB achieved the objectives intended by changing the repo system are discussed in the next section.

7.2 SUMMARY OF CONCLUSIONS

Monetary policy has been continuously evolving for many years. New policies have been implemented in order to address the shortcomings of their predecessors. However, while many of these policies managed to address the shortcomings for which they were implemented, no policy has been problem free. As a result, a

number of different regimes have been in place with perhaps the most significant being the De Kock era, which began in the early 1980's. It was during this regime that monetary policy was transformed from a "direct" to a more market-oriented monetary policy, which still characterises the South African monetary system today. The next really significant change in monetary policy was the shift from overnight loans to banks with certain categories of financial assets acting as collateral to repurchase transactions on 8 March 1998. In September 2001 a number of adjustments were made to this system of accommodation with a major goal being to improve the functioning of the interbank market.

The interbank market consists of two markets. These are the Reserve Bank-to-bank interbank market and the private bank-to-bank interbank market. These two markets are the first two steps in the transmission of monetary policy and, as such, are possibly the most important markets in terms of the implementation of monetary policy. The SARB creates a "money market shortage" in order to ensure that banks borrow funds from it at the repo rate. Banks try not to borrow from the SARB as the repo rate is the highest rate in the market for short-term funds. This leads to banks competing for funds in the private bank-to-bank market and since no banks will pay more for reserves than the repo rate and similarly no bank will loan funds at a rate far below the repo rate, the interbank rate closely follows the repo rate.

One objective of the monetary authorities when changing the repo system in September 2001 was to strengthen the relationship between the repo rate and the interbank rate. The results suggest that this objective was not achieved. In fact, the relationship between the repo rate and the interbank rate tended to be stronger before the adjustments to the system were made. In addition, the interbank rate and the repo rate were found to "reverse" roles in the period after the adjustments to the system. This was seen both in terms of the direction of causality as well as in the adjustments of other rates in response to a 100 basis point increase in these rates.

Furthermore, the monetary authorities believed that, when implementing the changes to the repo system in September 2001, the money market would function more efficiently if changes in the repo rate had a more direct effect on the interbank rate, which should then influence other money market rates and finally impact on the

interest rates in the economy. Thus, the transmission mechanism of monetary policy has been tested in the period before and after the change to the system.

It has been found that the transmission of monetary policy that the authorities intended by changing the repo system was in fact already in place. More specifically, in the period before the change, causality ran from the repo rate to the interbank rate, which then affected the prime-lending rate via the money market rate. This was the transmission mechanism believed by the monetary authorities to be the best for an efficiently functioning money market. In the period after the change however, the direction of causality changed to run from the interbank rate to the repo rate, which then influenced money market rates and eventually the prime-lending rate. This illustrates the reversal of roles between the repo rate and the interbank rate in the period after the change to the repo system. This result is surprising as the repo rate is administratively determined, and as such, it would be expected that the starting point of monetary policy should be changes to the repo rate. A possible explanation for this is that banks anticipate the direction in which the MPC will move the repo rate and as a result adjust their interbank rates before the official change in repo rate. Thus, the result of the change in policy was to change this process from the desired direction to an undesirable direction in terms of the new policy's objectives. It should be noted however that the prime-lending rate and the repo rate during the second period changed by the exact same amount at the same time and thus are interchangeable in this particular analysis. This illustrates the presence of moral suasion in the South African banking sector because an adjustment in the repo rate[39] resulted in an exact and immediate change in the prime-lending rate.

7.3 RECOMMENDATIONS

The objectives the SARB hoped to achieve by adjusting the repo system of accommodation in September 2001 were not realised. The monetary authorities

[39] Direction of causality here is assumed to run from the repo rate to the prime-lending rate as the repo rate is administratively determined by the MPC.

should therefore not have adjusted the system of accommodation as it functioned in terms of their objectives before the change.

The monetary authorities should simplify the system of accommodation. This recommendation is made on the basis that the main objective of changes in the repo rate is to affect the prime lending rate thereby reducing or increasing the demand for credit and hence the money supply and inflation. Since, it is clear that with a fixed repo system of accommodation the prime lending rate responds immediately and exactly to changes in the repo rate, the author feels that the direction of causality within the banking system is of no consequence.

Researchers that make use of econometric analysis to test a hypothesis should be aware that econometrics is merely a tool to help explain economic theory and as such the results found should not take precedence over what is expected based on economic theory.

7.4 SHORTCOMINGS OF RESEARCH

It has become clear during the process of this research that there is a major lack of uniformity in econometric analysis. An example is the absence of a universally accepted definition for the selection of lag lengths. This was a problem as the results were highly dependent on the lag length selected. Thus, economic theory and expectations played a role in the econometric analysis.

The interbank rate series used in this analysis was compiled by the QUOIN Institute from participants in the money market and was not the SAONIA overnight rate calculated by the SARB. The SAONIA rate was not used for the reason that these rates were not available for the period before the change to the repo system.

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APPENDICES

APPENDIX A

GUISAN (2001) MIXED DYNAMIC MODEL RESULTS

TABLE A1: COINTEGRATION RESULTS USING MIXED DYNAMIC MODEL 1998 - 2001								
Y_t	Coefficient					R^2	CRD W	ADF
	Y(-1)	ΔPIBR	ΔMNR	ΔPLR	ΔRR			
PIBR	1.0001 (213.22)[a]				1.0927 (14.845)[a]	0.9907	2.1349	-7.0051[a] (lag 0)
PIBR	0.9953 (132.41)[a]		0.7381 (7.7497)[a]			0.9758	2.6170	-8.7019[a] (lag 0)
PIBR	0.9927 (93.769)[a]			0.5113 (3.2185)[a]		0.9520	1.7948	-1.9027 (lag 5)
PLR	0.9978 (159.60)[a]				0.6313 (4.7554)[a]	0.9647	1.7142	-5.3405[a] (lag 1)
PLR	0.9957 (143.01)[a]	0.3939 (3.1585)[a]				0.9558	1.4417	-5.9873[a] (lag 3)
PLR	0.9962 (160.99)[a]		0.5074 (4.7823)[a]			0.9648	1.9841	-5.2812[a] (lag 3)
MNR	1.0012 (146.36)[a]				1.0305 (9.3021)[a]	0.9751	2.7502	-9.7880[a] (lag 0)
MNR	0.9993 (129.98)[a]	0.8105 (7.7170)[a]				0.9683	2.6606	-5.1765[a] (lag 4)
MNR	0.9956 (103.70)[a]			0.7162 (4.8176)[a]		0.9501	2.3775	-7.6639[a] (lag 0)
RR	0.9980 (286.95)[a]	0.7733 (14.848)[a]				0.9917	1.8546	-5.8971[a] (lag 0)
RR	0.9958 (200.84)[a]		0.6635 (9.3359)[a]			0.9830	2.4266	-8.2116[a] (lag 0)
RR	0.9947 (141.31)[a]			0.5750 (4.8125)[a]		0.9657	1.7861	-5.6415[a] (lag 0)

Note: [a] Indicates significance at the 99 percent confidence level; [b] Indicates significance at the 95 percent confidence level; and [c] Indicates significance at the 90 percent confidence level.

TABLE A2: COINTEGRATION RESULTS USING MIXED DYNAMIC MODEL 2001 - 2004

Y_t	Coefficient					R^2	CRD W	ADF
	Y(-1)	ΔPIBR	ΔMNR	ΔPLR	ΔRR			
PIBR	1.0016 (13.231)[a]				0.9010 (269.89)[a]	0.9890	1.6280	-4.9711[a] (lag 0)
PIBR	1.0009 (172.90)[a]		0.8324 (7.1310)[a]			0.9733	2.5346	-7.8911[a] (lag 0)
PIBR	1.0016 (269.89)[a]			0.9010 (13.231)[a]		0.9890	1.6280	-4.9711[a] (lag 0)
PLR	1.0000 (3.66E+16)				1.0000 (1.38E+15)	1.0000	0.0307	-0.5324[a] (lag 0)
PLR	0.9981 (385.51)[a]	0.9211 (13.258)[a]				0.9906	1.8368	-5.5306[a] (lag 0)
PLR	0.9992 (265.54)[a]		0.8813 (8.0597)[a]			0.9803	3.1926	-11.932[a] (lag 0)
MNR	0.9987 (216.91)[a]				0.7297 (8.0733)[a]	0.9835	2.3677	-7.2267[a] (lag 0)
MNR	0.9970 (201.7)[a]	0.7052 (7.1642)[a]				0.9809	1.9203	5.7665[a] (lag 0)
MNR	0.9987 (216.91)			0.7297 (8.0733)		0.9835	2.3677	-7.2267[a] (lag 0)
RR	0.9975 (292.22)[a]	0.9210 (13.266)[a]				0.9906	1.8376	-5.5328[a] (lag 0)
RR	0.9990 (201.19)[a]		0.8814 (8.0579)[a]			0.9803	3.1916	-11.922[a] (lag 0)
RR	1.0000 (2.5E+16)[a]			1.0000 (1.25E+15)[a]		1.0000	0.0250	-0.4788 (lag 0)

Note: [a] Indicates significance at the 99 percent confidence level; [b] Indicates significance at the 95 percent confidence level; and [c] Indicates significance at the 90 percent confidence level.

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APPENDIX B

EMAIL CORRESPONDENCE WITH PROFESSOR MARIA-CARMEN GUISAN – 2 DECEMBER 2004

"Dear Catherine De Angelis,

Thank you for your e-mail. I am glad to hear that my article on causality and cointegration has been interesting for you. I think that the subject is indeed important because cointegration analysis is not helpful in many cases due to its limitations.

Regarding your question I am not specialist in Financial Econometrics and I would have to think for a while to analyse the causality order between your series, but I wonder if the order of causality should be with repo depending on interbank and not viceversa. In any case the question that you pose is right: possibly the ratio z=repo/interbank is almost constant and near unity, so both rates should evolve very close. The correct model in that case should be a model in levels without intercept, unless the intercept is significantly different from zero. If that regression has a high goodness of fit (R-square) and there is no autocorrelation, I understand that the model is OK only with this relationship (the "long-term equation" according to ECM terminology), but if there is autocorrelation (Durbin-Watson coefficient clearly different from 2), then it should be better to have this into account, well by means of Generalized Least Squares or by Error Correction Model (really ECM in many cases is only a way to correct autocorrelation). The estimated model with the high adjusted R-square and a low value of the Standard Error, is generally preferable (unless some inconvenience in the signs of coefficients or another problem).

So try to see if the regresion in levels without intercept works better and allows cointegration to be accepted.

In table 3 of my article you can see that own cointegration with EG in levels

failed, in a case of clear causal relationship, in 100% of the cases (O% success),while ADF got 84%of success. Try ADF, as many researchers do, because it has less peril to reject a cointegration relationship when it is true.

If you send to me the data of 2 or more variables I could analyse the particular case. If you do that, please send then to me in a Word file, so I can copy then easily to E-Views.

Regarding bibliography on this subject I suppose you can find many article at http://ideas.repec.org, which web site you probably know.

I wish you a great success with your thesis.

You are right that I am extremely busy but it is not problem. I like to advice students and researchers who try to understand the main questions of Econometrics.

Kind regards,"

Maria-Carmen Guisan
Professor of Econometrics
University of Santiago de Compostela (Spain)
http://www.usc.es/economet/eaa.htm