

***MONETARY CONDITIONS
AND STOCK RETURNS:
A SOUTH AFRICAN
CASE STUDY***

by

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ABSTRACT

Extensive research on the linkages between monetary conditions and stock returns has been conducted in developed countries. This is in sharp contrast to the situation in developing countries. This paper therefore aims to study the long believed asymmetrical relationship between changes in monetary conditions and subsequent changes in stock returns in South Africa. Research in the United States of America (US) indicates that US stock returns are significantly related to the US monetary environment. The findings and results show that expansive (restrictive) monetary conditions serves as good (bad) news for stock returns, i.e. cuts in interest rates are followed by periods of excess stock returns, while increases in interest rates have a restrictive effect.

The results of this study (for South Africa over the period 1991-2001) are in line with international findings, but are, in terms of South Africa, in contradiction with the findings of a previous study. This previous study on the relationship between South African monetary conditions and stock returns suggests that South African stock returns were not related to South African monetary conditions. The results of this (current) study, however, disputes the conclusions of the previous study indicating that, for South Africa, expansive monetary conditions are indeed followed by excess stock returns, while restrictive monetary conditions are followed by low or negative stock returns. The South African stock market thus perform better (worse) in expansive (restrictive) monetary conditions. This inverse relationship also seems to be more apparent in expansive than in restrictive monetary conditions.

Empirical results show that the role and potency of monetary conditions, as proxied by a short-term interest rate and a monetary conditions index, in the behaviour of stock market performance for South Africa has increased over the study period, indicating the growing importance of the credit and exchange rate channels in affecting domestic monetary conditions and stock returns.

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CHAPTER 1

INTRODUCTION

1.1 Overview

The existence of an inverse relationship between changes in monetary conditions and changes in stock returns seems quite obvious. It is also to be expected in modern finance. The conventional view suggests that a restrictive monetary environment serve as bad news as it is generally associated with high interest rates and a decrease in the level of economic activity. In contrast, an expansive monetary environment is commonly viewed as goods news as these periods are usually associated with low interest rates and an increase in economic activity.

The linkages between stock market behaviour and monetary conditions and monetary policy has been extensively researched for developed markets, but it remains a relatively unexplored area for emerging markets. The focus of this research is to determine the linkage/relationship between stock market performances, i.e. stock returns and monetary conditions (as proxy by the Interbank Call Rate and a Monetary Conditions Index) in South Africa. The results of this study are based on theoretical arguments and on empirical and econometric analysis.

1.2 Aim of the research

The aim of my research is to determine whether an ex-ante measure of monetary conditions can serve as an indicator of shifts in the rate of local stock returns, i.e. what is the linkage/relationship between local monetary conditions and local stock returns?

1.3 Background

A long-standing issue among macroeconomists is whether monetary shocks have real effects. It was Keynes that offered simultaneously an explanation for the presumed impotence of monetary policy to stem the depression and an alternative to monetary policy. It was believed by many of Keynes' followers that low interest rates, if it could be affected by monetary policy, would do little or nothing to the real economy. Expanding the real money supply beyond some level will leave interest rates unaffected without a corresponding increase in investment levels, i.e. the liquidity trap (Angresano, 1992: 162). According to Keynes and his followers a study into the real effects of monetary policy will thus not be necessary, because monetary policy has no real effects, i.e. money does not matter (Friedman, 1968: 2). It is fiscal policy that has real effects and was it fiscal policy that was extensively used during and after the Great Depression to promote macroeconomic stability by guiding the economy toward achieving a full-employment level of aggregate demand. The belief by many policy makers in the effectiveness of fiscal policy was unchallenged until the outbreak of stagflation. Fiscal policy then proved to be ineffective in simultaneous addressing rising unemployment and inflation.

Inflation stimulated by cheap money policies in the early 60's turned out to be the order of the day. The result was the beginning of a revival of belief in the potency of monetary policy. The revival of belief in the potency of monetary policy was fostered also by a re-evaluation of the role money played from 1929 to 1933. The Great Contraction is, according to Mr. Friedman (Friedman 1968: 4), tragic testimony to the power of monetary policy and not as Keynes and so many of his contemporaries believed evidence of its impotence.

There was considerable debate in the late 70's and 80's on the relative merits of various monetary aggregates as a guide to monetary policy. Monetary policy and its effectiveness were back on the agendas of governments and academics. There was no longer any doubt of the importance of monetary policy and its potential effects on real variables. There was, however, still a lot of speculation about the magnitude of

the effects and the lag structures of monetary policy. In contrast, the early 90's researchers focused mostly on interest rate variables and spreads as indicators of monetary policy. Bernanke & Blinder (1992) argue that the federal funds rate is a relative good indicator of monetary policy shocks because it is sensitive to shocks in the supply of bank reserves.

The widespread liberalization of financial markets in the 1980s has increased the interest of Central Banks in asset price developments in two ways. First, as the use of the traditional intermediate targets, for example money supply has become unreliable in many countries, Central Banks have sought other indicators to guide policy actions. A natural place to look has been the various asset markets. Second, the greater role of asset prices in the monetary transmission mechanism, combined with their sustained volatility, has led to an increased concern that large changes in asset prices might disrupt economic activity and price stability as well as lead to financial fragility (Gertler, et al, 1998: 1). As a reflection of the underlying economy the inclusion of asset prices in such models would be useful in settling the issue of the effectiveness of monetary policy. After all, assets such as equities (Patelis, 1997:1952) are claims on future economic output, so if monetary policy has real economic effects then shifts in monetary policy should affect stock prices.

It is thus reasonable to hypothesize that variables such as interest rate spreads, exchange rate movements predict/affects stock returns because they proxy for the stance monetary conditions. Obviously one cannot expect monetary conditions to fully account for the observed asset returns and/or predictability.

Market analysts (including so-called "Fed watchers") dedicate considerable effort to studying and predicting the path of interest rates and the future moves of the Federal Reserve. This is no more real and observable than in the United States of America at present. Market analyst, commentators, economist fund managers and the world are watching Mr. Greenspan (chairman of the US Federal Reserve (Fed)) with hawk eyes. His every move and sentence is analyzed to get some clue about the direction

and future stance of US monetary policy. Monetary policy and monetary conditions are indeed growing in importance.

As an illustration, note the following excerpt from the New York Times of February 5, 1994 when the Fed tightened monetary policy after unusually long period of relatively low interest rates (Patelis, 1997: 1953).

“The Federal Reserve sent an Arctic blast through Wall Street yesterday, chilling the stock and bond markets and rousing questions about the future of this years remarkable rally in equities Yesterday’s 96 points decline was the largest for the Dow Jones industrial average since November 15, 1991 when it fell 120.31 points. It was the eight biggest daily drop ever”.

The process whereby a change in monetary conditions will initiate a movement out of certain assets into others next along the spectrum with similar consequences (for example stocks) has been described by Goodhart (1970:161) as follows:

“The effect of a change in the money supply is seen to be like a ripple passing along the range of financial assets, diminishing in amplitude and unpredictability as it proceeds further away from the initial disturbance”.

1.4 Structure of the paper

Chapter 2 will focus on conceptualizing monetary conditions and presents a proxy for local monetary conditions. Chapter 3 will focus on the formulation of a theoretical argument supporting the view of a relationship between changes in monetary conditions and stock returns. Chapter 4 will give an overview of the methodologies, results and findings of previous studies on this topic. Chapter 5 will give a detailed layout of the methodology of this study as well as some analysis of the data being used. Chapter 6 will focus on the empirical and econometric analysis of the

relationship between the variables. This study will conclude with a summary of the main findings of this study in Chapter 7.

CHAPTER 2

CONCEPTUALIZING MONETARY CONDITIONS AND STOCK RETURNS

2.1 Introduction

Short-term interest rates has been, for many years (at least the last 30 years), the primary indicator of domestic and foreign monetary conditions, i.e. short-term interest rates are, in most countries, used as an instrument of interpreting the stance of monetary policy and its effect on the economy. Short-term interest rates can be used as an indicator and/or as an operational target. Monetary conditions, as an indicator, reflect the stance of monetary policy for example restrictive monetary policy reflects tight monetary conditions.

Over the past decade, the framework and strategy of central banks in implementing monetary policy has continually evolved along with a rapidly changing economic and financial environment. An increase in the volume and volatility of international capital flows coupled with an intensified financial innovation has made financial markets and economic systems more and more interdependent. As a domestic financial market becomes more closely linked to the global financial system, so does the exchange rate become an increasingly important factor as a channel through which monetary policy may have potential impacts on the real sector (Hataiseree, 1998: 1).

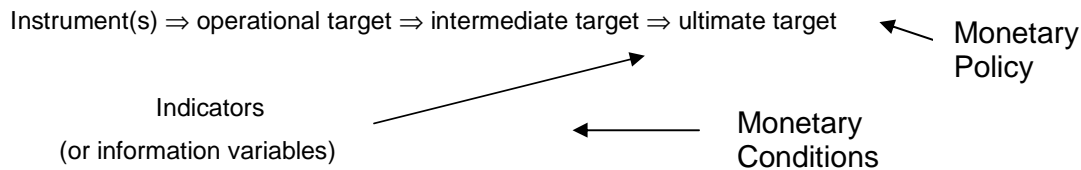
The construction and use of a Monetary Conditions Index (MCI) (as an indicator and/or operational target) has become popular in several countries over the past few years as a way of interpreting the stance of monetary policy and its effect on the economy. The rationale for the use of an MCI is the same as for interest rates, i.e. to provide numeric information about the stance of monetary policy. The change in the MCI, as with short-term interest rates, is interpreted as “the degree of tightening or easing in the monetary conditions”. It captures, in a single number, the degree of

pressure that monetary policy is placing on the economy, and therefore inflation (Kesriyeli & Kocaker, 1999: 2)

Corporate stock represents an ownership interest in a corporation conferring on the holder a number of important rights as well as risks. It represents a residual claim against the assets of the issuing firm entitling the owner to share in the net earnings of the firm when it's profitable and to share in the net market value of the company's assets if it is liquidated. Corporate stock is held in the hope and anticipation of receiving a constant income stream in the form of company dividends and to make a capital gain when selling the stock. Stock returns are therefore the dividends received plus the capital gain when disposing of the asset compared to the cost of acquiring the asset.

2.2 Defining Monetary Conditions

Monetary policy can be described as consisting of decisions that are formulated and implemented by the monetary authorities (i.e. by the Central Bank, or by the Treasury and the Central Bank) in their various fields of operation which are aimed at achieving certain ultimate objectives with regard to the country's economy (Gidlow, www.finforum.co.za/ecpolicy/impconts.htm). Monetary conditions are the term to describe the overall liquidity in the financial system of a country. Monetary conditions incorporate those variables such as the exchange rate, which are generally deemed to be part of the monetary sphere but are not directly controlled by the central bank. Assessment of the monetary policy stance serves to determine in which direction the central bank attempts to steer the economy. Analysis of the monetary conditions, on the other hand, goes beyond the direct effects of central bank actions and aims to summarize the effects of developments in the monetary sphere in general on aggregate demand conditions (Gottschalk, 2001: 1). The difference between monetary policy and monetary conditions can be characterised as follows:



Monetary policy focuses on decisions, i.e. actions. Monetary conditions on the other hand focus on the effects of these monetary policy decisions, i.e. the reaction. Monetary conditions can therefore be used as an indicator of monetary policy, for example the decision by a Central Bank to increase short-term interest rates tightens domestic monetary conditions, i.e. liquidity in the economy has decreased.

Short-term interest rates are in most countries used as the primary instrument of monetary policy. The explicit use of an exchange rate (in a floating exchange rate regime) as the primary instrument of monetary policy seldom occurs. Monetary conditions, on the other hand, includes all variables that effectively reflects the overall liquidity in the financial system, even if the variable is not an instrument or target of monetary policy. Monetary conditions in Canada, for example, are the term to describe the combined effect of the level of short-term interest rates and the exchange rate of the Canadian dollar.

2.3 Measuring Monetary Conditions in South Africa¹

Short-term interest rates are used in South Africa as an indicator and as an operational variable in conducting monetary policy. South Africa does not incorporate an MCI in conducting monetary policy, nor as an indicator or as an operational target. The exchange rate is not being targeted, nor is it explicitly (at least for the time being) used to influence monetary policy. SARB Governor Tito Mboweni and his staff have, in this regard, repeatedly said that a weak rand is not a problem for the bank. Changes in short-term interest rates (operational target) are

¹ It is important to note that this discussion will only focus on the use of instruments as indicators of monetary conditions and not as operational target variables.

mainly due to inflation movements and expectations. Financial stability is the object. To quote Governor Mboweni: "We are fighting inflation" (quoted in Mitter, 2001: 1).²

The exchange rate is thus clearly not an operational target. Monetary conditions, however, incorporates all variables that reflects and/or describes the overall liquidity in the domestic financial system (as defined in paragraph 2.2). Most countries have open economies and flexible exchange rates (the degree of flexibility of the exchange rate might differ for example exchange rate pegs). Changes in a currency's external value will thus have a big influence on the demand for goods and services (Bank of Canada, www.bank-banque-canada.ca/en/backgrounders/bg-p3.htm). For example, a considerable lower currency can result in more goods being exported, increased tourism, and higher import prices, leading to fewer goods being imported. The exchange rate of a country can be used as an indicator for domestic monetary conditions. This research focus on monetary conditions, thus including the exchange rate as in indicator and/or factor influencing domestic monetary conditions seems obvious.

A short-term interest rate that can be useful in assessing monetary conditions in South Africa is the Interbank Call Rate (a price variable). When market participants speak of the interbank market, they are usually referring to the cash reserve funds market. All banks are statutory required (SARB, www.resbank.co.za) to maintain an amount of funds with the Reserve Bank based on the size of their deposits. In addition to these reserve accounts, clearing banks (mainly commercial banks) maintain current or free balance accounts with the Reserve Bank.

At the end of the interbank clearing the clearing banks end up with a net cash position (either a surplus or deficit position) on their current accounts with the Reserve Bank. Negative or deficit balances on these accounts are a contravention of the cash reserve requirement. Positive balances are allowed but do not make good business sense because it does not earn interest.

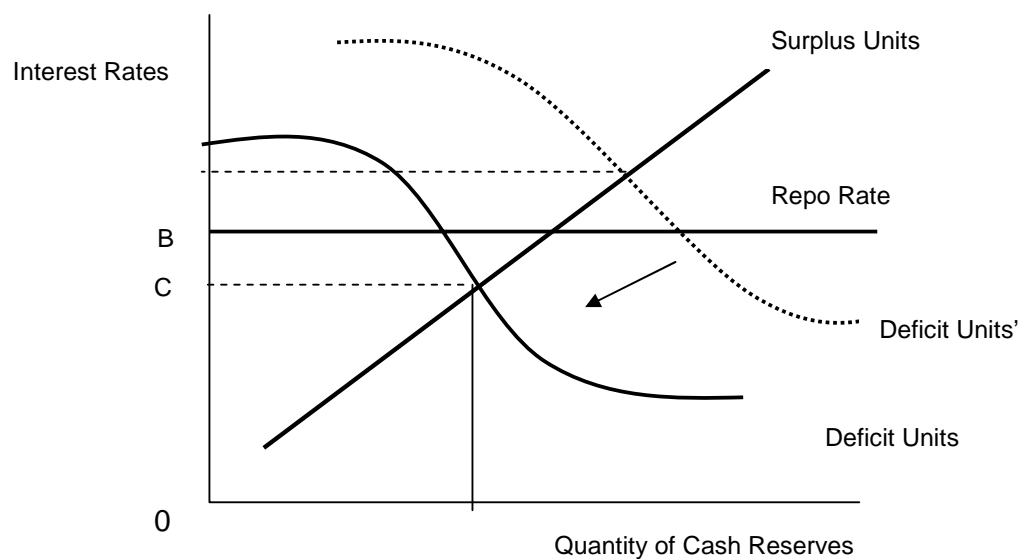
² Statement made at a news conference after a monetary policy committee meeting held from 26 to 27 July 2001.

The banks with negative balances will endeavor to borrow reserves from banks, that have positive balances on their accounts. They will attempt to ignore the only alternative, i.e. the Reserve Bank, at repo rate. Banks with positive balances, on the other hand, will endeavor to lend these reserves to the deficit banks in an attempt to earn interest on their balances. Dealing will take place between these deficit and surplus units in an effort to secure the best rates, i.e. the lowest in the case of a borrower, and the highest in the case of a lender.

It seems logical, see figure 1, that the interbank call rate will not be above the repo rate. The reason being that the deficit unit can borrow reserves at a lower rate (for example 10% at point B compared to 12% at point A) from the Reserve Bank than from surplus units, thus saving on interest. The surplus unit, on the other hand, will not ask a higher interest rate than the repo rate because they will not earn interest on its "free cash", i.e. deficit units will not borrow at the higher interest rate.

It also seems logical to think that the interbank call rate will not be much lower than the repo rate. Surplus units will ask an interest rate just lower (for example 50 to 100 basis points) than the repo rate. Asking a too low interest rate will mean that they lose interests, which does not make good business sense.

Figure1: *Determining the interbank call rate*



Supply and demand forces will ensure that the interbank call rate is determined just below the repo rate. The interbank call rate will also be in line (not exactly the same, but fairly close to) with the previous interbank call rate, because of the tendency of the repo rate to stay fairly constant in the short run. It will thus be evident that the final rate established by the interaction of the surplus and deficit units (banks) will be related to the morning's interbank rate, the call rate established during the previous day's business and ultimately the Reserve Banks lending rate, i.e. repo rate.

The interbank market plays a pivotal role in the implementation of monetary policy, because the interbank and other money-market rates should respond immediately to any changes in the Reserve Bank's refinancing rate. An effective interbank market ensures effective pricing in the money market as a whole.

The interbank rate, according to Hugo (2001: 5) should be very sensitive to changes in the repurchase (repo) rate and should reflect underlying liquidity conditions (money market shortage) in the market. Effective monetary policy implementation implies in the final instance 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.

The approach of central banks to their operational targets is aptly elucidated by Borio and Von't Dack from the Bank for International Settlements (BIS). According to them (in Hugo, 2001: 6) virtually all Central Banks implement monetary policy through the market-oriented instruments that they gear to influence very short-term interest rates. The behavior of the interbank overnight rate in the money market is, therefore, the focus point (operational target) for most central banks. The reason being that it is the rate that the Central Bank can influence most easily.

This system is, however, not functioning that perfectly in the South African market mainly because the interbank overnight rate has never been the central focus of monetary policy. It can be argued that, notwithstanding the current shortcomings, that the interbank call rate does reflect monetary conditions. It might not be as

perfect as is hoped for, but it does supply information about the underlying liquidity needs of the market. There are fortunately processes and procedures in place to address the current shortcomings, which will ensure that the margin between the repo rate and interbank call rate are reduced (Hugo, 2001: 13).³ It is also recommended that a benchmark interbank rate index be developed to solve the current problem of rate rigidity.

Countries that utilize a Monetary Conditions Index incorporate an exchange rate variable when constructing a Monetary Conditions Index. Most countries utilize a trade-weighted exchange rate. South Africa's trade weighted exchange rate, i.e. effective exchange rate, reflects the movement of the Rand (domestic currency) against a basket of currencies. The weighted average exchange rate of the rand is based on trade in and consumption of manufactured goods between South Africa and its fourteen most important trading partners. The weighting structure is described in an article in the Reserve Bank September 1999 Quarterly Bulletin (SS Walters and BC de Beer, <http://www.resbank.co.za/Economics/articles/art999/art.html#art03>). The weights of the four major currencies are in brackets: Euro (35.70), US dollar (15.15), British pound, Japanese yen (10.26) (SARB, Supplement to the Quarterly Bulletin June 2001).

Restrictive monetary actions following the decision to tighten monetary policy lead to both a rise in short-term interest rates and an appreciation of the exchange rate.

2.4 Defining a Monetary Conditions Index

Towards the late 1980s Central Banks of many industrialized nations have turned their attention towards an inflation-targeting regime as the focal point of their monetary policy. The framework and strategy in implementing an inflation targeting oriented monetary policy rests upon the basic assumption that interest rates and exchanges rates are important in influencing inflation. Thus the aim of constructing

³ See Hugo (2001: 13) for a detailed discussion on the proposed adjustment to the current Refinancing System of the SARB.

an MCI is to take both of these variables into consideration in interpreting monetary conditions (Kesriyeli & Kocaker, 1999: 2 & Hataiseree, 1998: 1).

The idea of using a weighted average of a short-term interest rate and the exchange rate as a tool in the design of monetary policy was pioneered by the Bank of Canada in the late 1980s (Gerlach & Smets, 2000: 1680). The Bank uses it as an indicator of monetary conditions and as an operational target for monetary policy. The Reserve Bank of New Zealand (starting in late 1996) uses an MCI as an operational target in much the same way as the Bank of Canada. The Central Banks of Norway and Sweden use MCIs in a more limited fashion, i.e. as indicators of monetary conditions when formulating their monetary policies. The IMF and the OECD also use MCIs in evaluating monetary policies across countries and businesses such as Deutsche Bank, Goldman Sachs, JP Morgan and Merrill Lynch calculate MCIs to evaluate different countries' monetary conditions (Ericsson, et al., 2000: 35).

The Bank of Canada tracks monetary conditions with a monetary conditions index. The index incorporates interest rates and the exchange rate – a 3 percent change in exchange rate is equivalent to a 1 percent change in interest rates, thus a relative weighting of three for interest rates and one for the exchange rate. The monetary condition index (MCI) is intended to provide a measure of the degree of ease or tightness in monetary conditions relative to a base period.

The Bank of Canada (www.bankofcanada.ca/es/mciz.htm) calculates the MCI as the change in the 90-day commercial paper rate plus one third of the percentage change in the exchange rate of the Canadian dollar against the currencies of its major trading partners. The MCI can be explained by the following formula:

$$\text{MCI} = (\text{CP90}-7,9) + (100/3) \times (\ln(\text{C6}) - \ln(91.33)) \quad (\text{Eq 1})$$

Where:

- CP90 = Canadian 90-day Commercial Paper Rate
- C6 = Canadian dollar index against C-6 currencies (1992=100)
- 7,9 = The average 90-day commercial paper rate for Jan. 87

- 91.33 = The average C-6 exchange rate for Jan. 87
- In Jan. 1987, the MCI = 0

The information provided by the index helps to guide the monetary policy decisions of the Bank. When the Bank needs to change monetary conditions directly, it adjusts its Overnight Target Rate, which in turn can affect the exchange rate. It is also important to note that the Bank gives 18 to 24 months for the transmission mechanism, i.e. the lag in the transmission of monetary policy. The Bank of Canada uses the MCI both as an indicator and as an operational target.

2.5 The use of a Monetary Conditions Index in South African

The use of an MCI to supply information about domestic monetary conditions or as an operational target has as yet not found favor with local policy makers. The reasons for not using an MCI as an operational target is very clear. As it is often emphasized by the Reserve Bank (SARB, 2001: 10), there is no specific target for the exchange rate, and therefore no intervention is undertaken in order to influence directly the level or direction of the exchange rate. The Bank is however concerned about the level and direction of the exchange rate because of the impact that it could have on inflation. Ericsson et al. (2001: 34) argues that achieving targeted levels of MCI has sometimes been infeasible even for a stable developed economy like Canada, because of tactical difficulties. For countries with much more volatile economies and larger speculative swings in the exchange rate (like South Africa), tactical considerations are more likely to make an MCI operationally infeasible.

The use of an MCI as a pure indicator of monetary conditions, however, could be useful especially with the increasingly important role that the exchange rate (or level of) is starting to play in the domestic economy. The use of an MCI in conjunction with the interbank call rate can only give a more effective measurement of domestic monetary conditions. This has been proven in the countries as mentioned and by its use by various international financial organizations. Hataiseree (1998: 1) states that

using the MCI index as an indicator in determining the policy stance seems to be more effective than using either the exchange rate or interest rate alone.

2.6 Stock Market Returns

People buy shares because they value the dividends their investments will pay. The value might also come from buy-backs or, in closely held firms, from the nice jobs given to shareholders. The value of the dividend stream has two components. The first is the dividend stream itself, which, given the uncertainty of its future entails an educated guess about what the firm will pay at some later date. It is by nature forward-looking, expected value calculation that buyers must make. Buying a stock is riskier than for example putting your money in the bank.

This means that investors will demand a higher average return on stock to compensate for the greater uncertainty and change of loss. The required interest rate, i.e. discount rate, is the second component affecting the value of the dividend stream (Haubrich, 1997: 2).

The return expected on stocks may vary for two reasons. The riskless interest rate measured by insured bank deposits or default free Treasury securities may change along with the health of the economy, productivity or Central Bank policy. Alternatively the risk premium, that is, the extra return that people get for holding risky stocks may change. A lower risk premium reflects either a less risky market or investors who are more willing to bear such risk.

The anticipation of good returns is the primary reason for buying and holding stocks. The possibility of making a return on the purchase of stock is thus the primary force in buying stocks.

2.7 Conclusions

Monetary authorities, in the conduct of monetary policy, need to constantly assess the effect of their decisions on aggregate demand. The inclusion of the exchange rate (together with a short-term interest rate variable) can be very beneficial in determining monetary developments, i.e. the change in overall liquidity in the economy. The exchange rate channel, in a small open economy with a flexible exchange rate regime, plays an important role in effecting the overall liquidity of the financial system. Therefore exogenous shocks to the exchange rate can have a considerable impact on aggregate demand conditions.

Most countries focus on short-term interest rates in conducting monetary policy. The exchange rate is neither an instrument nor operational target. Domestic monetary conditions are, however, not only influenced/determined by short-term interest rate movements, but are also influenced/determined by variables not specifically targeted or used as an instrument by the monetary authorities. This study focuses on monetary conditions, thus variables that influences liquidity, for example the exchange rate, will be utilized.

Monetary conditions are often evaluated on the basis of short-term interest rates and the exchange rate. The monetary conditions index combines the short-term interest rate and the exchange rate into a summary index aimed at capturing the developments in the monetary sphere.

CHAPTER 3

Theoretical arguments in explaining the relationship between monetary conditions and stock returns

3.1 Introduction

This study focuses on the relationship between monetary conditions and stock returns, as discussed in the previous chapter. It is, for this study, important to explain the theoretical basis of the relationship in an attempt to lay some sort of foundation for the empirical and econometric analysis that is to follow. Theory, unfortunately, does not supply us with models or arguments about the relationship between monetary conditions and stock returns, but offers numerous models and arguments about the relationship between monetary policy and stock returns. Monetary policy, fortunately, has a major impact on the underlying monetary conditions. This chapter will, therefore, utilize monetary policy as a proxy for monetary conditions in an attempt to explain (based on existing monetary policy theory) the relationship between monetary conditions and stock returns.

Equities are considered claims on future economic output, so if monetary policy has any real economic impact, then shifts in the monetary policy should affect asset prices. According to the monetarist view (Rose, 2000: 564) monetary policy affects the real economy mainly through changes in the rate of monetary growth. For example, if the money supply grows too rapidly, exceeding the public's expectations, an excess stock of money results. Money demand for goods and services, including financial assets, rises rapidly and this puts upward pressure on prices. In contrast, when the money supply grows too slowly relative to the demand for money, the public attempts to restore its desired money balances by cutting back on spending and purchases of financial assets. The result is a drop in income and demand in the economy and a rise in interest rates so that employment and growth are slowed. Therefore monetary conditions have an impact on the stock market return behaviour,

as capital markets are playing an increasingly important role in effecting the overall liquidity in the financial system and the economy.

3.2 Monetary Conditions as proxied by Monetary Policy and the Real Economy

Monetary policy forms an integral part of economic policy. Monetary policy, because of its vital role in the economy, was traditionally assumed to have an important effect on the economy, stock prices, and interest rates. Does money forecast economic activity? Traditionally, most economists believed that the quantity of money was indeed useful in forecasting changes in national output.⁴

Almost all theories of the macro-economy postulate a relationship between money and future economic activity, with the relationship depending on whether changes in money stock can be attributed to shifts in money supply or money demand. For example, increases in money supply tend to increase economic activity, whereas increases in money demand tend to reduce economic activity. More recent research (Jones, 1998: 412) indicates that money does indeed remain a useful indicator of future economic activity. Jones (1998: 412) concludes that investors should keep an eye on the actions of the Federal Reserve because of its role in monetary policy and its impact on interest rates.

A Central Bank's main policy tool is the rate at which commercial banks lend funds from it (SARB, www.resbank.co.za/default/fact_sheet/fso8.html). A Central Bank thus influences short-term interest rates via its control over the supply of funds. The quantity of funds available in the economy is thus dependent on a Central Bank willingness to increase or decrease the quantity of funds in the economy. A Central Bank is at the end of the day the lender of last resort. The action or policy stance of a Central Bank has become very important, because of its mandate and consequent control over the supply of funds.

⁴ This discussion is based on Sean Beckett and Charles Morris, "Does Money Still Forecast Economic Activity?" *Economic Review* (Fourth Quarter 1992), pp.65-77.

The transmission mechanism through such changes in the supply of funds affect the economy is unfortunately a good deal more complex (Economist, www.economist.com).

Keynes (in Mollentze, 1994:3) argued that the monetary authorities can influence the nominal money supply by using various instruments of monetary policy, thereby influencing variables in the product and labour market. Should the monetary authorities increase the money stock, given a certain price level the money supply (M) increases. At the current income level the surplus money balances constitute a decrease in the rate of interest (i). Investment (I) is stimulated as well as income (Y) and consumption (C).

$$M\uparrow \Rightarrow i\downarrow \Rightarrow I\uparrow \Rightarrow Y\uparrow \Rightarrow C\uparrow \quad (\text{Identity 1})$$

There are according to Pierce & Tysons (1985: 22) five transmission mechanisms that have received prominent treatment. These transmission mechanisms provide us with a theoretical background by which changes in the supply of funds are transmitted to the goal variables of prices, output and employment.⁵ For a closed or open economy operating a fix exchange rate the transmission mechanisms are:

- Portfolio Balance transmission mechanism

$$M\downarrow \Rightarrow P_e\downarrow \Rightarrow q\downarrow \Rightarrow I\downarrow \Rightarrow Y\downarrow \quad (\text{Identity 2})$$

i.e. when the money supply (M) decreases, the public has less money relative to money demand and so decreases their spending, i.e. consumption decreases thus putting pressure on company revenue and profits. Investors decrease their demand for equities (because of the expectation of poor dividends and returns) and the prices of equities (Pe) decline.

Lower equity prices lead to a lower q (market value of the relevant firms), since equity prices affect the market value of the relevant firms, lower investment (I) spending and an eventual decline in aggregate demand and production (Y).

➤ Wealth transmission mechanism

$$M\downarrow \Rightarrow P_e\downarrow \Rightarrow \text{wealth}\downarrow \Rightarrow C\downarrow \Rightarrow Y\downarrow \quad (\text{Identity 3})$$

i.e. when stock prices (P_e) decline, the value of financial wealth decreases, decreasing the lifetime resources of consumers so that consumption (C) and aggregate demand and production decline (Y).

➤ Credit availability transmission mechanism

$$M\downarrow \Rightarrow A_c\downarrow \Rightarrow P_c\uparrow \Rightarrow I\downarrow \Rightarrow Y\downarrow \quad (\text{Identity 4})$$

i.e. the argument that the supply of credit (A_c) as reflected in movements in the quantity and the relative cost of credit (P_c) systematically influences economic activity i.e. a decline in the supply and availability of credit will lead to a rise in the cost of credit, and thus a decrease in investment spending (I) leading to a decline in aggregate demand and production (Y).

➤ Expectations transmission mechanism

i.e. changes in the supply of money may have an effect on many kinds of expectations, for example price (inflation) expectations, wage expectations and business confidence.

In the case of an open economy operating a floating exchange rate it can be argued (Pierce & Tysons, 1998: 22) that the exchange rate itself provides another transmission mechanism.

⁵ For a detailed discussion about the various monetary transmission mechanisms see: Pierce & Tysons (1985), Taylor (1995), Goodhart (1995) and Bureau for Economic Policy and Analysis, UP Working Paper No 13, 1994.

➤ Exchange Rate transmission mechanism

$$M\downarrow \Rightarrow i\uparrow \Rightarrow E\uparrow \Rightarrow NX\downarrow \Rightarrow Y\downarrow \quad (\text{Identity 5})$$

i.e. when the real interest rate (i) increase, domestic currency deposits become more attractive relative to domestic denominated in foreign currencies, leading to an appreciation of the domestic monetary unit (E). This appreciation makes domestic goods more expensive than foreign goods, thereby causing a decline in net export (NX) and aggregate output (Y).

The stated transmission mechanisms clearly indicate that links between the real economy and monetary policy (as a proxy for monetary conditions) exists. Broadly and more practically, monetary conditions affect the real economy:

- Through the cost of borrowing in the market which, if reduced could be expected to spur consumer spending and investment. Market interest rates on short-term loans do indeed tend to move in line with a Central Banks lending rate.
- Through the exchange rate. In theory, looser monetary conditions should push down a currency, so boosting exports.
- Through the price of financial assets, especially equities. If higher liquidity in the financial system lift share prices, this may boost consumer spending, as private shareholders feel wealthier, or spur corporate investment by reducing the cost of capital (The Economist, 2001: 1).

Friedman and Schwartz (in Rose, 2000: 564) after analyzing money and business cycles dating back to the Civil War concluded that appreciable changes in the rate of growth of the money stock are a necessary and sufficient condition for appreciable changes in the rate of money income. Moreover, changes in the rate of money supply growth appear to precede changes in economic activity and inflation, suggesting that money exerts an independent causal influence on economic conditions.

Bruce Kasman at J.P. Morgan, Chase has analyzed the Federal Reserves macro economic model of the American Economy. According to the model a one percentage point reduction in the federal-funds rate should raise the level of GDP by 1,7% after two years, but by only 0,6% after one year. Evidence that monetary policy effects economic behavior only after a period of time.

3.3 The Real Economy and Stock Returns

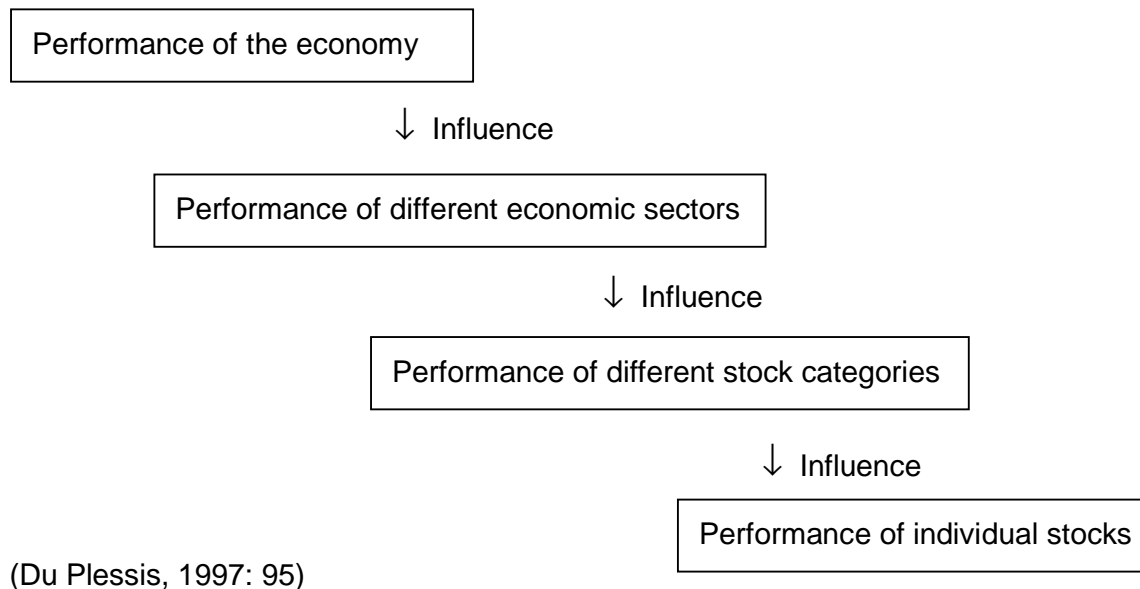
Equities, as mentioned earlier, are considered claims on future economy output. To determine a proper price of a firm's stock price, the security analyst must forecast the dividends and earnings that can be expected from the firm. The prospects of the economy are thus very important in determining a firm's stock price, because the prospects of the firm are tied to those of the broader economy. Bodie, et al (1998: 377) suggest that in analyzing a firm's prospects it often makes sense to start with the broad economic environment. The macroeconomy is, per se, the environment in which all firms operates and do business in.

Asset prices, (Smets, 1997: 1) are strongly influenced by expectations of future returns, which in turn are related to expectations of future economic activity, inflation and monetary policy.

Investments in fixed-income and ownership securities are intimately associated with the economic activity of the nation. Amling (1978: 289) states that an investment in common stock of any company is likely to be more successful and more profitable if the economy is strong and prosperous; so the expectation of the growth of the economy is favorable for the stock market. In contrast, if expectations of a decline in the national economy are strong the overtones and implications for investment in common stock or debt instruments are serious.

The relationship between the conduct of an economy and stock prices can be demonstrated by using the following graphical illustration.

Figure 2: *Schematic representation of the relationship between the performance of an economy and stock prices*



The schematic presentation (see figure 2) indicates that the performance of the overall economy influences the performances of the different sectors of the economy that operates within it. This does not mean that the affects or reaction will be the same for the different economic sectors (for example mining, financial services and agriculture). The sectors are represented by stock markets indices that reflect the collective prices and movements of these different economic sectors. These indices are, in turn, a collective representation of individual stock prices, i.e. the stock prices of individual companies listed in the different economic sectors.

It is also important to note that economic performance by itself contains information. Information regarding the future path of the economy and the instruments being used or that is going to be used to steer the economy on its future path. The present performance of the economy might contain information about the future direction of inflation, interest rates, the exchange rate, and so forth. It is on this information that investors base their predictions about the future prospects and performance of the

economy and companies. This information also sends signals to policy makers, investors and companies, which in turn react to these signals. Each reaction will lead, for example, to a change in the products of the company, which will influence future earnings and hence its stock price and market value. Stock, by its very nature, cannot be thought of as independent from economic realities and performance. Stock prices reflect this interdependence with the real economy.

3.4 Monetary Conditions and Stock Returns

It has been contended, as pointed out on the previous paragraphs, that monetary conditions affect not only economic activity, but also stock returns. An early examination of the link between stock returns and monetary policy (as a proxy for monetary conditions) by Rozeff (1974) finds a relationship between stock returns and contemporaneous monetary developments.

One possible explanation for the predictive power of monetary indicators relates to the so-called “*financial propagation*” mechanism (developed in Fazzari, Hubbard & Petersen (1988) and others) as well as the “*credit channel*” of monetary transmission (Bernanke & Gertler, 1995). Both theories describe a non-linear world in which macroeconomic shocks are propagated depending on the financial propagation mechanism amplifies and propagates shocks to firms’ balance sheets through endogenous changes in the agency cost of lending and the spread between external and internal finance. The “*credit channel*” works through both the balance sheet channels mentioned above and through a bank lending channel, i.e. a monetary policy shock leads to a reduced and costlier bank-loan supply.

In such a world firms’ responses to macroeconomic shocks are state-dependent. A monetary policy shock during a tight money period (a period with high interest rates) has larger effects than one during easy money periods, since firms’ financial health has already declined through both worsening balance sheet income and through reduced bank loan supply. Given the usual risk-return trade off underlying most theoretical models of asset pricing, it is clear that those firms’ increased vulnerability

to future macroeconomic shocks will lead to a higher expected risk premium by investors. Therefore, following the initial negative response of stock prices to monetary shocks, future expected returns would have to increase to compensate for the deterioration in the financial health of the firms caused by this monetary policy shock.

Peter Oppenheimer, chief economic strategist at Hambros Bank, has analyzed the behavior of the financial markets and produced a chart, which is shown in Figure 2. The analysis is based on a pattern measured since 1960. The pattern is set up as the result of the interplay of three variables: economic growth (real change in GDP), inflation rates (RPI) and interest rates. The typical cycle, according to Oppenheimer, repeats itself every three years unless there is a shock like the Gulf War (Martin-Fagg, 2000: 101). The pattern seems to support (although not empirical evidence) the argument that monetary conditions, through its effect on economic growth, effects stock market behavior and stock returns.

Figure 3: *Schematic representation of the relationship between the conduct of an economy and stock prices*

(Martin-Fagg, 2000: 101)

Chami et al. (Sourial, 2001: 4) shows that modern day process for transmitting the effect of monetary policy shifts is primarily through capital market asset adjustment rather than through the traditional money and credit channel. The response of the financial markets towards a change in monetary conditions depends on market efficiency, financial institutions degree of development, equity culture of market participants and whether the new measures were anticipated or not.

Stock prices, according to Rose (2000: 692), would also be expected to be closely tied to movements in market interest rates because 1) interest bearing debt securities compete with stock for investors money (so higher interest rates may pull money out of stocks and into bonds, for example); 2) interest rates levels affect the discount rate applied to future stock dividend streams, thereby, should be inversely related to the level of stock prices; and 3) higher market interest rates make it more expensive for investors buying stock on margin to borrow funds and, therefore tend to discourage the demand for those stock not expected to be strong performers.

3.5 Conclusions

Equities are considered claims on future economic output, so if monetary conditions (as proxied by monetary policy) have a real economic impact (this has hopefully been proved in the discussion in this chapter), then shifts in the monetary conditions should affect asset prices. Monetary conditions must therefore have an impact on stock market return behavior as capital markets are playing an increasingly important role in the transmission of monetary conditions.

It is, however, necessary that the financial markets and participants reach a certain level of maturity before the above statement can be true. It can thus be said that only the developed and some developing countries will behave in a way that satisfy the stated theory.

CHAPTER 4

REVIEW OF PREVIOUS STUDIES

4.1 Introduction

A great deal of debate and research surrounds the issue regarding the relationship between stock returns and monetary conditions for developed countries, but, unfortunately, not for developing countries. It is important that we take cognizance of the methodologies and findings of previous studies to ensure that our methodologies are in line with international best practice, i.e. this will allow us to make comparisons.

4.2 Previous Studies

There is considerable evidence that stock returns in the US are related to the US monetary environment; for example, Waud (1970:231); Pearce & Roley (1985:49) and Smirlock & Yawitz (1985:1141) focused on the short-term security market reaction to discount rate changes and found that discount rate increases produced negative announcement period returns while rate decreases produced positive reactions.

Jensen and Johnson (1993:26) found evidence that the direction of the discount rate change is more informative than either the size of the change or the differential between the discount rate and market rates. Jensen and Johnson (1995:79) and Jensen et al (1996:213) extend these earlier studies and demonstrate that a broad, early-identified measure of changes in US Federal Reserve monetary policy effectively differentiates monetary conditions and security returns. In particular they show that changes in the Federal Reserve discount rate indicate shifts in Federal Reserve policy and are useful in explaining US stock returns. In their analysis, Jensen and Johnson show that long-term stock returns following discount rate decreases are higher and less volatile than returns following rate increases.

Canover, Jensen & Johnson (1999:1362) focused their analysis on determining whether stock returns in foreign markets are associated with both local and US monetary environments. They examine monthly data from January 1956 to December 1995. Their study utilizes a broad measure of monetary conditions. They rely on discount rate changes, which according to them are likely to correspond with changes in the monetary environment as well as changes in business conditions. They base their argument about the use of the discount rate on evidence supplied by Thornton (1998) that argues that changes in the Fed discount rate signal information to the financial markets and that stocks returns indeed react to this information.

Table 1: Number and duration of expansive and restrictive local monetary environments (1956-1995)

Country	Number of total months	Number of expansive periods	Mean duration of expansive periods in months	Number of restrictive periods	Mean duration of restrictive periods in months	Correlation of local monetary environment with US monetary environment
Austria	480	7	32.14	7	36.43	-0.0094
Canada	247	10	9.10	11	14.18	0.4775
Finland	480	18	31.63	7	32.43	-0.1002
France	480	18	17.72	17	9.41	0.1553
Germany	480	9	32.00	9	21.22	0.2971
Ireland	283	15	11.20	16	7.19	0.1317
Italy	480	9	36.78	9	16.44	0.1992
Japan	443	9	36.11	8	14.75	0.2346
Netherlands	480	12	17.42	11	24.55	0.3042
New Zealand	305	5	21.00	5	24.55	0.3042
South Africa	307	5	26.80	5	34.60	0.0828
Sweden	480	15	15.53	15	16.47	0.3113
Switzerland	464	5	53.00	5	39.80	0.2473
United Kingdom	480	25	11.48	25	7.72	0.3535
US	480	11	20	12	2167	1.0000

(Conover, Jensen & Johnson, 1999:1363)

Table 1 provides summary statistics for the monetary environments of sixteen countries from 1956 to 1995. There is considerable disparity in how actively the discount rate was used as a monetary policy tool. South Africa had 5 expansive and 5 restrictive monetary periods and the restrictive periods are longer than the expansive periods. South Africa together with Finland and Austria are the least correlated (less than 10%) with the US monetary environment.

Table 2: *Descriptive statistics for monthly stock returns (1956-1995)*

Country	Number of monthly returns	Mean monthly % return	Standard deviation of monthly returns in %	Minimum monthly % return	Maximum monthly % return	Correlation of local stock return & US stock return
Austria	480	0.48	4.56	-17.36	30.38	0.19404
Belgium	480	0.33	4.12	-15.43	16.67	0.4094
Canada	247	0.64	4.39	-18.42	16.13	0.5562
Finland	480	0.91	4.65	-12.70	25.00	0.1114
France	480	0.68	5.75	-25.00	28.21	0.3223
Germany	480	0.58	4.46	-21.88	17.95	0.3560
Ireland	283	0.80	6.11	-29.93	30.00	0.3100
Italy	480	0.61	6.06	-20.34	25.15	0.2241
Japan	443	0.86	4.21	-12.16	14.05	0.2813
Netherlands	480	0.60	4.41	-23.48	23.08	0.4980
New Zealand	305	0.83	4.37	-13.04	39.62	0.1739
South Africa	307	0.77	5.91	-36.47	17.50	0.3452
Sweden	480	0.97	4.98	-21.31	25.70	0.2751
Switzerland	464	0.49	4.71	-24.63	19.51	0.4165
United Kingdom	480	0.85	5.00	-22.81	17.32	0.4485
US	480	0.64	3.60	-13.46	16.36	1.0000

(Conover, Jensen & Johnson, 1999:1365)

The summary statistics for stock returns during the same period are shown in table 2. The standard deviation for stock returns in SA is very high, i.e. returns are very volatile, while the correlation of local stock returns with US stock returns are positive and high, i.e. 34%.

They examined stock returns associated with local monetary environments by estimating the regression equation

$$S_t = \alpha + \beta D_t + \varepsilon_t^6 \quad (0 < \beta < 1) \quad (\text{eq 2})$$

Where S_t is the local monthly stock return measured in local currency terms and D is the dummy variable equal to one if the local monetary authority is pursuing a restrictive monetary policy and 0 if local monetary policy is expansive.

They found that the intercepts from their regression equations are all positive reflecting the generally positive expected returns associated with a stock market investment. Twelve of the 16 coefficient estimates for the local monetary environment dummy variable are negative and statistically significant, indicating that restrictive monetary conditions are associated with significantly lower stock returns than the returns experienced during expansive conditions (table 3). They found that some of the largest return differences are reported for the UK, Ireland, Finland and Italy. On an annualised basis the returns in expansive monetary environments exceeded the returns in restrictive environment for these countries by approximately 21%, 20%, 18,5% and 18% respectively.

Especially strong statistical relationships are observed for seven of the countries. Specifically, the difference in returns is significant at the 1% level for Finland, the UK, the US, the Netherlands, Japan, Switzerland and Italy. Only for Austria, Canada, New Zealand and South Africa do stock returns appear unrelated to local monetary conditions.

⁶ Where S_t is the local monthly stock return in local currency D_t is a dummy variable equal to one if pursuing a restrictive and zero if pursuing an expansive monetary policy.

Table 3: *Regressions of local country monthly stock returns against local monetary policy environment dummy variable*

Regression	Sample size	α	β	F	R ²
Austria	467	0.0018 (0.57)	0.0058 (1.35)	1.83	0.00
Belgium	443	0.0068** (2.41)	-0.0082* (-2.10)	4.43	0.01
Canada	229	0.0110* (2.26)	-0.0066 (-1.08)	1.18	0.01
Finland	466	0.0166** (5.68)	-0.0154** (-3.62)	13.12	0.03
France	445	0.0100** (3.20)	-0.0116* (-2.10)	4.43	0.01
Germany	462	0.0094** (3.52)	-0.0087* (-2.03)	4.14	0.01
Ireland	255	0.0146** (2.98)	-0.0165* (-2.13)	4.55	0.02
Italy	462	0.0105** (3.15)	-0.0150 (-2.45)	6.01	0.01
Japan	427	0.0123** (5.25)	-0.0141** (-3.04)	9.23	0.02
Netherlands	457	0.0136** (4.31)	-0.0142** (-3.40)	11.56	0.02
New Zealand	296	0.0097* (2.24)	-0.0009 (-0.17)	0.03	0.00
South Africa	298	0.0099* (2.03)	-0.0023 (-0.35)	0.13	0.00
Sweden	451	0.0149** (4.43)	-0.0107* (-2.31)	5.31	0.01
Switzerland	454	0.0102** (3.47)	-0.0124** (-2.76)	7.60	0.02
United Kingdom	431	0.0154** (5.06)	-0.0174** (-3.57)	12.74	0.03
US	458	0.0133** (5.38)	-0.0120** (-3.57)	12.77	0.03

* Denotes significantly different from zero by one tailed test at a 5% significance level

** Denotes significantly different from zero by one tailed test at a 1% significance level

(Conover, Jensen & Johnson, 1999:1366)

The authors also looked at the relationship between local stock returns and US monetary policy environments (table 4). They found that there is an especially strong statistical association between local returns and US monetary policy for the Netherlands, Switzerland, the UK, Belgium, Ireland, South Africa, Japan, Finland, Canada and New Zealand (Canover, Jensen & Johnson, 1999:1364).

This study indicates that for South Africa the US monetary variable is significant while the local monetary variable is insignificant suggesting that security returns are more closely related to US monetary conditions than to local monetary conditions. The reasons why this may be are: Firstly, since return patterns are identified in the US security market, a global asset pricing model dictates that changes in investor required returns translate into similar stock return patterns across the various asset classes available to the investor. Major shifts in required returns should be reflected across countries, or, global investors could identify systematically occurring abnormal return opportunities. Secondly, a change in US monetary policy may correspond with changes in the value of foreign stock because the policy change is linked to changes in the expected cash flows and/or the discount rate ascribed to foreign firms. For example, changes in US monetary policy have implications for the value of the US dollar, and, hence for the levels of imports, exports and the interest rates in foreign countries (Canover, Jensen & Johnson, 1999:1369).

The authors, on the other hand, state that the results must be interpreted with caution as an insignificant coefficient on the local monetary environment variable may be attributed to the monetary environment measure being less effective in differentiating local monetary conditions.

Table 4: *Regressions of local country monthly stock returns against US monetary policy environment dummy variable*

Regression	Sample size	α	β	F	R ²
Austria	458	0.0058* (1.79)	-0.0012 (-0.28)	0.08	0.00
Belgium	458	0.0112** (4.02)	-0.0147** (-3.88)	15.07	0.03
Canada	458	0.0114** (3.70)	-0.0107** (-2.56)	6.54	0.01
Finland	458	0.0154** (4.80)	-0.0114** (-2.64)	6.95	0.02
France	458	0.0100** (2.47)	-0.0070 (-1.28)	1.64	0.00
Germany	458	0.0098** (3.22)	-0.0086* (-1.28)	4.30	0.01
Ireland	458	0.0200** (5.46)	-0.0186** (-3.75)	14.10	0.03
Italy	458	0.0108** (2.56)	-0.0085 (-1.48)	2.19	0.00
Japan	423	0.0153** (5.12)	-0.0131** (-3.19)	10.17	0.02
Netherlands	458	0.0148** (4.93)	-0.0160** (-3.93)	15.42	0.03
New Zealand	410	0.0140 (3.69)	-0.0132** (-2.48)	6.17	0.01
South Africa	293	0.0189** (4.06)	-0.0246** (-3.62)	13.10	0.04
Sweden	458	0.0155** (4.47)	-0.0107* (-2.28)	5.20	0.01
Switzerland	458	0.0140** (4.33)	-0.0181** (-4.13)	17.02	0.04
United Kingdom	458	0.0192** (5.63)	-0.0200** (-4.31)	18.61	0.04
US	458	0.0133** (5.38)	-0.0120** (-3.57)	12.77	0.03

* Denotes significantly different from zero by one tailed test at a 5% significance level

** Denotes significantly different from zero by one tailed test at a 1% significance level

(Conover, Jensen & Johnson, 1999:1370)

Booth & Booth (1997:32) examined the impact of the stance of US monetary policy on US security returns over the period 1954 to 1992. The two measures of the stance of monetary policy used, the federal funds rate and an index based on the change in the discount rate, contain significant information that can be used to forecast expected stock and bond portfolio returns. They use the federal funds rate, based on evidence by Bernanke and Blinder (1992) and Laurent (1988) that the federal funds rate is a good indicator of monetary policy actions. They firstly constructed measures of the business conditions proxies to test the robustness of the findings related to the predictability of stock returns. They secondly used two measures of monetary policy actions, i.e. the one measure developed by Jensen, et al (1996) related to the directional change of the discount rate and the other measure that proxies the federal funds rate. They developed these two measures to determine whether there exists a direct monetary sector effect on stock and bond returns. Thirdly, they examined a portfolio of small stocks and a portfolio of large stocks to determine whether the findings related to either the business conditions or monetary stringency has a differential impact given firm size. The motivation for this is based on the notion that smaller companies are more directly affected by changes in monetary policy due to their dependence on bank and private market financing.

Following the Jensen, et al. (1996) approach in constructing the discount rate series, they found that their study period (39 years) included a total of 99 discount rate changes, 49 increases and 50 decreases. They define, as did Jensen, et al. (1996) a rate change series as a period of time in which discount rate changes are in only one direction, either increasing or decreasing. Their results (table 5) found 23 rate change series, 12 decreasing and 11 increasing.

Table 5: *Federal Reserve Discount Rate Change Series (February 1954 through December 1992)*

Series	Increasing (I) or Decreasing (D)	First rate change	Number of rate changes	Monthly observations
1	D	02/05/54	2	13
2	I	04/14/55	5	30
3	D	11/15/57	4	8
4	I	08/15/58	5	21
5	D	06/30/60	2	36
6	I	07/17/63	3	44
7	D	04/07/67	1	6
8	I	11/20/67	3	8
9	D	18/16/68	1	3
10	I	12/19/68	2	22
11	D	11/11/70	5	7
12	I	07/16/71	1	3
13	D	11/11/71	2	13
14	I	01/15/73	8	22
15	D	12/09/74	7	31
16	I	08/30/77	14	32
17	D	05/29/80	3	3
18	I	09/26/80	4	13
19	D	11/02/81	9	28
20	I	04/09/84	1	6
21	D	11/23/84	7	33
22	I	09/04/87	3	38
23	D	12/18/90	7	24

(Booth & Booth, 1997:34)

They add the proxies for the monetary policy stance, the federal funds rate and the discount rate change series in their regression equation. The coefficients for the

federal funds rate (FFRATE) in the monthly regressions are negative and statistically significant for large and small stock regressions. The coefficient for DIR (value of one during restrictive periods) is negative and statistically significant at the 0.05 level for all the monthly regressions. The regressions indicate that both the changes in the federal funds rate and the discount rate series have explanatory power for predicting excess stock returns. The results indicate that the returns on all portfolios are higher during expansive monetary periods than during restrictive periods.

Table 6: *Results of regressions of monetary policy proxies on the expected returns on stocks: August 1954 to December 1992*⁷

Dependant Variable	Constant	FFRATE	DIR
Large stock portfolio	-0.001	-0.163**	-0.009*
Small Stock portfolio	-0.004	-0.180*	-0.011*

* Denotes significantly different from zero a 5% significance level

** Denotes significantly different from zero a 1% significance level

(Booth & Booth, 1997:39)

Sourial (2001:2) conducted a study on *monetary conditions and the stock market in Egypt* during the period June 1992 till April 2000. The results show that the upsurge in market performance during the period 1996-97 yielding significant capital gains was not reflected in monetary aggregates in terms of liquidity and wealth effects. The estimation results obtained provides evidence that monetary aggregates did not have a significant impact on the stock market performance during that period. The estimation period post 1997 provides evidence of a new interrelation between stock returns and monetary policy in Egypt. The study makes use of Bayesian Vector Autoregressive models (Bayesian-VAR) using monthly monetary and stock market data. Two market indices are used to represent the Egyptian Stock Market performance, i.e. the Egyptian Financial Group Index (EFGI) and the Hermes

⁷ For a detailed discussion on the proxies for large and small stock returns see Booth & Booth (1997:35).

Financial Index (HFI). Monetary data are represented by four variables, i.e. credit to the private sector, discount rate, inflation rate and money supply (both M_1 and M_2).

The results of the study can be summarized as follows:

- Both market indices returns respond positively (EFGI by 0.5376% and HFI with 1.0676%) to a positive shock in the inflation rate (0.9%).
- There was a distinct response for each index towards positive shocks in the growth in the money supply. This result is consistent with the wealth effect.
- Both indices respond negatively to shocks in growth of broad money, especially before 1998. This implies that the shock might be a money demand rather than a money supply shock. The change in the trend after 1998 could be interpreted from the increasing dollarization of the economy.
- A surge in stock prices will be realized reflecting growth in private sector credit. This might be if private sector credit is being used as a vehicle to boost investments, which contributes to economic growth.

4.3 Conclusion

A growing body of research has been conducted on the relationship between stock returns and monetary conditions/policy in developed countries, especially the US. It is; however, hard to find research that has been done in developing countries. The leading authority on this topic seems to be Jensen and Johnson.

The studies that focused on developed countries all indicate that a statistically significant negative relationship between stock returns and monetary conditions exists. Booms in stock returns are associated with expansive monetary conditions, while weak returns are associated with restrictive periods. No definite conclusions can be put forward for developing countries, because of a lack of research and evidence. Stock returns in South Africa seem to have reacted independently of local monetary conditions, but did react to changes in US monetary conditions.

CHAPTER 5

DATA AND METHODOLOGY

5.1 Introduction

This study examines weekly data from 5 January 1991 to 19 May 2001 (542 weeks) in analyzing the relationship between the interbank call rate (as a proxy for monetary conditions) and stock returns and monthly data from January 1991 to May 2001 (118 months) in analyzing the relationship between a monetary conditions index (as proxy for monetary conditions) and stock returns. The data for the interbank call rate and the nominal effective exchange rate of the rand were obtained from PSG Investment Bank, South African Reserve Bank Quarterly Bulletins and Sharenet (www.sharenet.co.za). These institutions and sources are also the primary sources for the Johannesburg Stock Exchange All Share 40 Index data. Data from several sources were used to verify the data and to supplement one another when data from one source are unavailable.

This study, firstly, utilizes changes in the interbank call rate and, secondly, a Monetary Conditions Index to describe alternative monetary conditions in the South African economy. The use of the interbank call rate as a proxy for monetary conditions is consistent with the methods used by Jensen and Johnson (1995) and Jensen et al (1996). Canover, Jansen and Johnson (1999:1361) argue that this method of classification serves to describe broad measures of the existing monetary conditions. Booth & Booth (1997:32) also used this method, i.e. the directional change of the discount rate as a measure of monetary policy. A Monetary Conditions Index for South Africa, incorporating the interbank call rate and the nominal effective exchange rate of the rand, will also be developed and will be used in this study in the same manner as the interbank call rate. This method is consistent with the method used by the Bank of Canada and the Reserve Bank of New Zealand. It is important to

note that the interbank call rate and MCI will be used as separate indicators, i.e. they will be used as substitutes for determining domestic monetary conditions,

This study classifies monetary conditions as either expansive or restrictive, based on the most recent interbank call rate (0.25%) or MCI (1 index point) change. The monetary conditions classifications remains the same until the interbank call rate or MCI is changed in the opposite direction. For example the period following a decrease in the interbank call rate is classified as expansive. Further interbank call rate decreases do not affect the classification of the monetary conditions likewise, restrictive monetary conditions begins when the interbank call rate first increase and end when the interbank call rate decreases. A fall (rise) in the MCI is interpreted as a loosening (restricting) of monetary conditions, because a decline in the interbank call rate will increase aggregate demand and lowers the MCI, as does a depreciation of the rand. The role of the interbank call rate and the exchange rate as indicators of domestic monetary conditions is summarized in table 7. The first two rows indicate a situation where the interest rate and the exchange rate moves in opposite directions, This is the case in the periods when the exchange rate is strengthening, but interest rates are falling (and vice versa). The net effect of the opposite movements depends on the relative importance of the two variables in affecting the economy and inflation. The last two rows indicate a situation where the interest rate and the exchange rate move in the same direction.

Table 7: *Interest rate and exchange rate in affecting monetary conditions*

Δr	Δe	Monetary Conditions
$r \downarrow$ (i.e. 15% \Rightarrow 10%)	$e \uparrow$ (i.e. 35 \Rightarrow 40)	Inconclusive (Depending on the relative importance of r and e)
$r \uparrow$ (i.e. 10% \Rightarrow 15%)	$e \downarrow$ (i.e. 40 \Rightarrow 35)	Inconclusive (Depending on the relative importance of r and e)
$r \downarrow$ (i.e. 15% \Rightarrow 10%)	$e \downarrow$ (i.e. 40 \Rightarrow 35)	Easy Monetary Conditions
$r \uparrow$ (i.e. 10% \Rightarrow 15%)	$e \uparrow$ (i.e. 35 \Rightarrow 40)	Tight Monetary Conditions

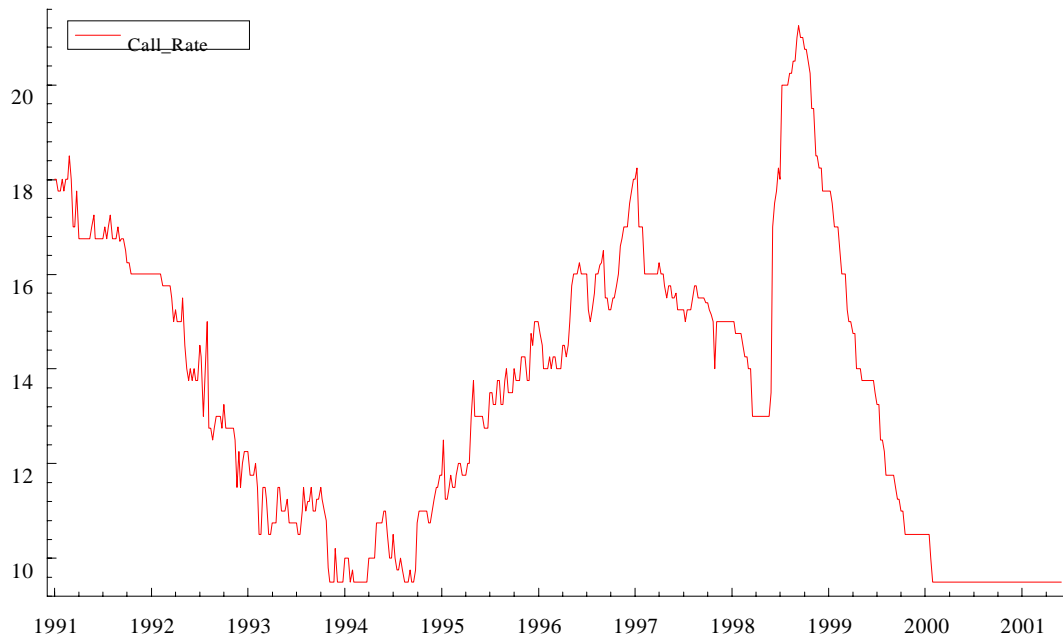
r = interbank call rate

e = the exchange rate, defined as nominal effective exchange rate index

5.2 Interbank Call Rate

The interbank call rate has showed some definite cyclical behaviour from 1991 till present. A progressive downward movement mainly characterized the period 1991 to the end of 1993. The period 1994 to 1997 saw a progressive rise in rates followed by a moderate decline. The Asian Crises in 1998 saw very high interest rates. Fortunately rates have started it downward path from the beginning of 1999 as result of inflation being reduced. Inflation is still continuing on its downward path and is monetary conditions currently looser than the period 1994 to 1999 (see figure 4).

Figure 4: *Interbank Call Rate: actual values 1991 to 2001*



South Africa has (for the study period) 11 restrictive and 11 expansionary periods. In examining the medium duration of the restrictive and expansive periods it seems that South Africa have longer expansive periods (mean duration of 34 weeks) than restrictive periods (mean duration of 15.27 weeks) (see table 8).

Table 8: *Number of and duration of expansive and restrictive local monetary conditions as proxy by the interbank call arte*

Number	Duration	Date from	Date till	Expansive	Restrictive
1	10 weeks	05 Jan 91	09 Mar 91		18% - 18.5%
2	19 weeks	16 Mar 91	20 Jul 91	18.50% -16.75%	
3	2 weeks	27 Jul 91	03 Aug 91		16.75%-17.25%
4	47 weeks	10 Aug 91	27 Jun 92	17.25%- 13.75%	
5	5 weeks	04 Jul 92	01 Aug 92		13.75% - 15%
6	18 weeks	08 Aug 92	05 Dec 92	15.00% - 11.5%	
7	8 weeks	12 Dec 92	30 Jan 93		11.5% - 12%
8	11 weeks	06 Feb 93	17 Apr 93	12% - 10.75%	
9	6 weeks	24 Apr 93	29 May 93		10.75%11.25%
10	7 weeks	05 Jun 93	17 Jul 93	11.25% - 10.5%	
11	13 weeks	24 Jul 93	16 Oct 93		10.5% - 11%
12	23 weeks	23 Oct 93	26 Mar 94	11% - 9.5%	
13	10 weeks	02 Apr 94	04 Jun 94		9.5% - 11%
14	15 weeks	11 Jun 94	17 Sep 94	11% - 9.5%	
15	67 weeks	24 sep 94	30 Dec 95		9.5% - 15%
16	16 weeks	06 Jan 96	20 Apr 96	15% - 14.5%	
17	19 weeks	27 Apr 96	31 Aug 96		14.5% - 16.5%
18	7 weeks	07 Sep 96	19 Oct 96	16.5% - 15.75%	
19	11 weeks	26 Oct 96	04 Jan 97		15.75%-18.25%
20	72 weeks	11 Jan 97	23 May 98	18.25% - 13.5%	
21	17 weeks	30 May 98	19 Sep 98		13.5% - 21%
22	139 weeks	26 Sep 98	19 May 01	21% - 9.5%	

Table 9 provides a breakdown of the interbank call rate changes based on the relative size of the change in basis points. Twenty-five basis point changes occur the most frequent. The mean average rate change for the period is a 43 base point change. Absolute changes in the interbank call rate for the period is thus in the lower range.

Table 9: *The Absolute size of Interbank Rate Changes*

	Discount Rate Change in Basis Points					
	25	50	75	100	200	Mean
Observations	134	48	24	19	2	43

5.3 A Monetary Conditions Index for South Africa

We concluded in chapter 2 that the use of an MCI, in addition to a short-term interest rate, as an indicator of domestic monetary conditions can be useful. An MCI must however first be constructed because an official MCI does not at present exist for South Africa. The choice of weights and variables in an MCI is central in constructing the index itself and MCIs can be empirically sensitive to the choice. The Monetary Conditions Index at time t , MCI_t , is defined as the weighted sum of changes in the exchange rate (e) (in logs) and in the interest rate (r) (in levels) from their levels in a chosen base year ($t=0$).

$$MCI_t = w_e(e_t - e_0) + w_r(r_t - r_0) \quad (\text{eq 3})$$

Where w_r and w_e are the weights for the interest and exchange rates respectively.

Freedman (Kesriyeli & Kocaker, 1999: 3) suggests two methods of constructing an MCI; the effect of interest rate and exchange rate changes on either “aggregate demand” or “prices”. In the first case, the weights used in the MCI are obtained from the estimation of an aggregate demand equation. The estimation results in this case give the effect of changes in exchange and interest rates on the real aggregate demand. The second case focuses on the effects of changes in exchange and interest rates on prices. In this case, the exchange rate has a greater weight because it has a direct effect on prices in addition to its indirect effect through aggregate demand.

Although the actual calculations seem fairly simple in constructing an MCI, it is more difficult to decide on the variables to include and their relative weights of these variables in the MCI. The interbank call rate seems to be the most relevant interest rate to include in a South African MCI (as discussed in chapter 2 paragraph 3). The nominal effective exchange rate of the rand will be included in a South African MCI because most the countries that use MCIs include a trade-weighted exchange rate.

The two variables that this study includes are, 1) the interbank call rate and 2) the nominal effective exchange rate of the rand. The weightings of the two variables in the MCI must be determined by employing various econometric techniques in determining various estimation functions. Ericsson et al. (2000: 43) estimated the weights for Canada, New Zealand, Sweden and the United States and found that the estimated values do not differ a lot from the published values. They employed an estimated equation in the form:

$$\Delta y_t = \alpha \Delta RR_t + \beta \Delta q_t + \text{other variables} + \text{error} \quad (\text{eq 4})$$

The relative MCI weight μ is ρ / σ .⁸ The real interest rate (RR) is constructed as the nominal 90-day commercial paper interest rate (R) minus the one-quarter lag in the annual rate of change in the Canadian GDP deflator (P). The real exchange rate (q) is the product of the nominal bilateral US-Canadian exchange rate and the ratio of the Canadian DGP deflator to the US GDP Deflator (P*). The estimated and published weights for the above countries do not differ too much for one another (see table 10). The weights range between two (New Zealand) and four (Sweden). The average seems to be a weight of three (Norway and Canada). It is thus possible to construct a MCI for South Africa using eq 2 because of its track record and effectiveness. It is however very important to ensure stationarity in the variables and to use proper econometric principles when applying eq 2 in determining the relative weights. This study will assume a relative weight of 3 for South Africa. The rate will not be determined via estimation functions primarily because of a lack of data

⁸ For a detailed discussion on the methodology and techniques employed to construct a MCI see Ericsson et al., (2000), Kesriyeli & Kocaker, (1999) and Hataiseree, (1998).

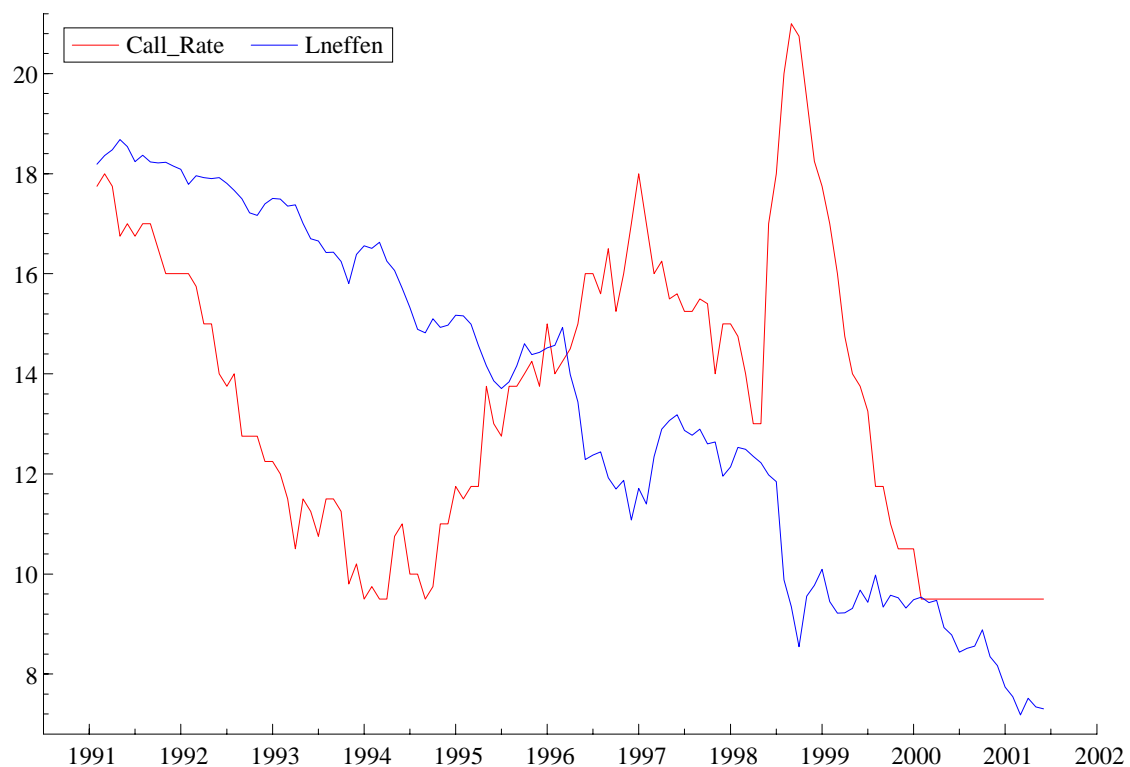
Table 10: *MCI relative weights*

	Country				
	Canada	New Zealand	Norway	Sweden	United States
MCI relative weight					
Published	3	2	3	3-4	-
Estimated	3.56	1.75	2.15	2.02	-3.69

Ericsson et al., (2000, 43),

The movements of both variables (nominal effective exchange rate and interbank call rate) are displayed in figure 5.

Figure 5: Log of the *Nominal Effective Exchange rate of the Rand (Feb1995=100)* and the *Interbank Call rate*



An MCI can be constructed by using the following equation:

$$MCI_t = \varnothing_R(R_t - R_0) + \varnothing_e(e_t - e_0) \quad (\text{eq 5})$$

Where t is a time index, $t = 0$ is the base period (January 1991), \varnothing_R and \varnothing_e are respectively weights on the interbank call rate and the nominal effective exchange rate, and variables in the lower case denotes logarithms. Ericsson et al. (2001: 29) states that the exchange rate is normally expressed in logarithms, whereas the interest rate is in levels. Both variables are in nominal terms.

The MCI (derived from eq 5) is displayed in figure 6. It is mainly characterized by a downward trend, i.e. a decline from 100 to 72 over the study period.

Figure 6: *Monetary Conditions Index for South Africa*

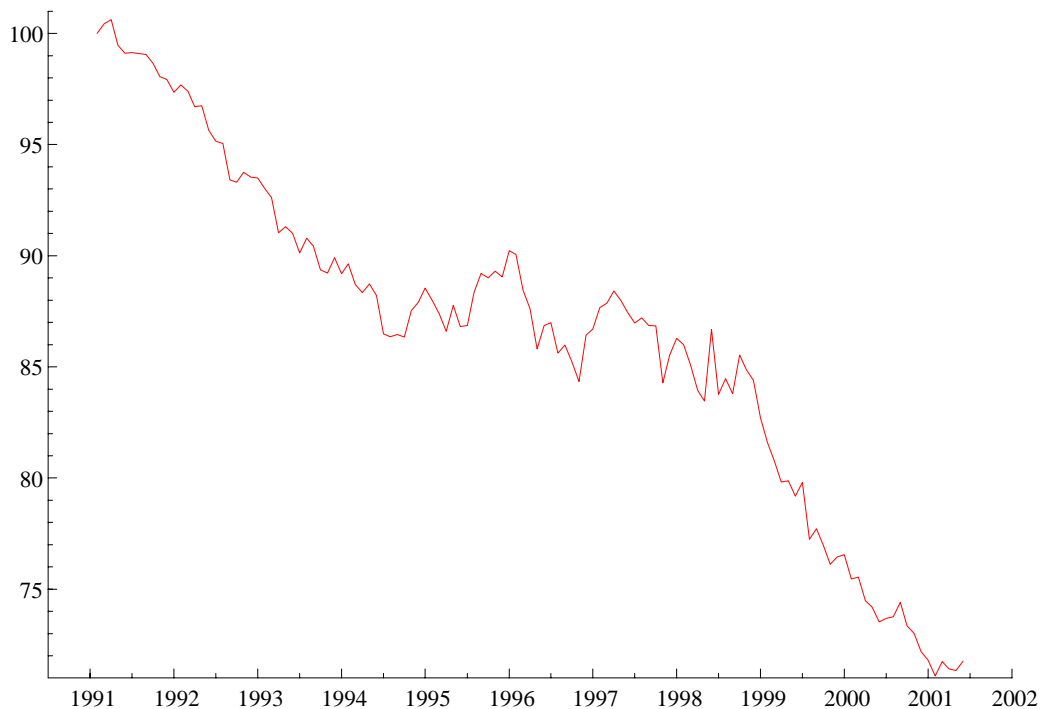
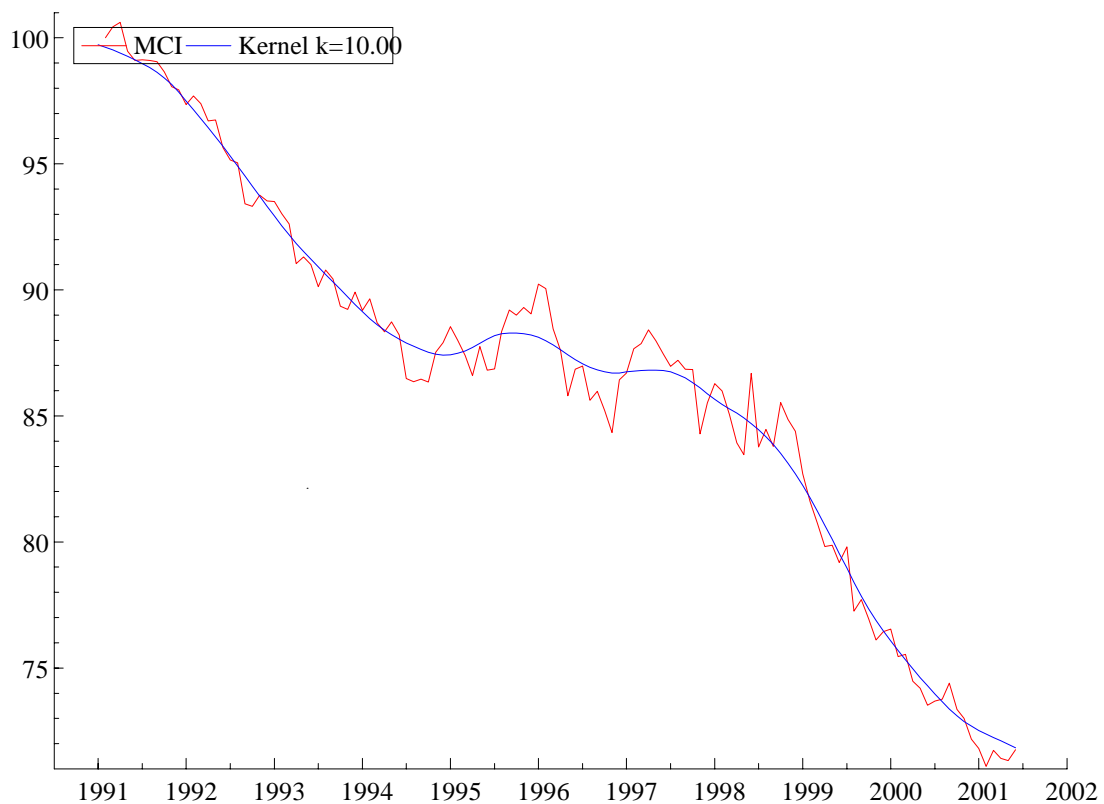


Figure 7: *The MCI smoothed*

Smoothing the MCI (figure 7) indicates five distinctive trends, i.e. declining and increasing movements, in the index. South Africa has (for the study period) 3 expansive and two restrictive periods. South Africa has longer expansive periods (mean duration of 34 months) than restrictive periods (mean duration of 11 months) (see table 11).

These results are in line of the results obtained when analyzing the number and mean duration of expansive and restrictive monetary conditions as measured by the interbank call rate (see table 8).

Table 11: *Number of and duration of expansive and restrictive local monetary conditions as proxy by an MCI*

Number	Duration	Date from	Date till	Expansive	Restrictive
1	44 months	Jan 91	Nov 94	100 - 86	
2	16 moths	Nov 94	Jan 96		86 – 90
3	9 months	Jan 96	Oct 96	90 - 84	
4	6 months	Oct 96	Apr 97		84 - 88
5	49 moths	Apr 97	May 01	88 - 72	

5.4 The Johannesburg Stock Exchange All Share 40 Index (Alsi40)

The JSE/Actuaries Indices are a reflection of the performance of the South African stock market, being the JSE Securities Exchange. The All Share Index measures the performance of the overall market. The purpose of the index is to have a tool that will be able to describe the market at a given point in time in terms of price levels, dividend yield and earnings yields. Investors also use the Alsi40 Index as a benchmark against which their portfolio performance can be measured. The Alsi40 Index consists of the top 40 listed (as measured by market share) companies (JSE Indices, www.jse.co.za).

A definite long-term trend with a positive slope is visible. It is also clear that a cyclical component exists (figure 8). The Russian crises (debt default) were the main cause of the big decline in 1998. Monetary conditions were extremely tight through the crises.

Figure 8: *Actual Values Alsi40 Index (closing prices)*



It is, for the purpose of this paper, necessary that the return on stocks is measured, i.e. the capital gains, because this is what is being investigated. The Alsi40 Index data only represents the closing prices of the stocks.

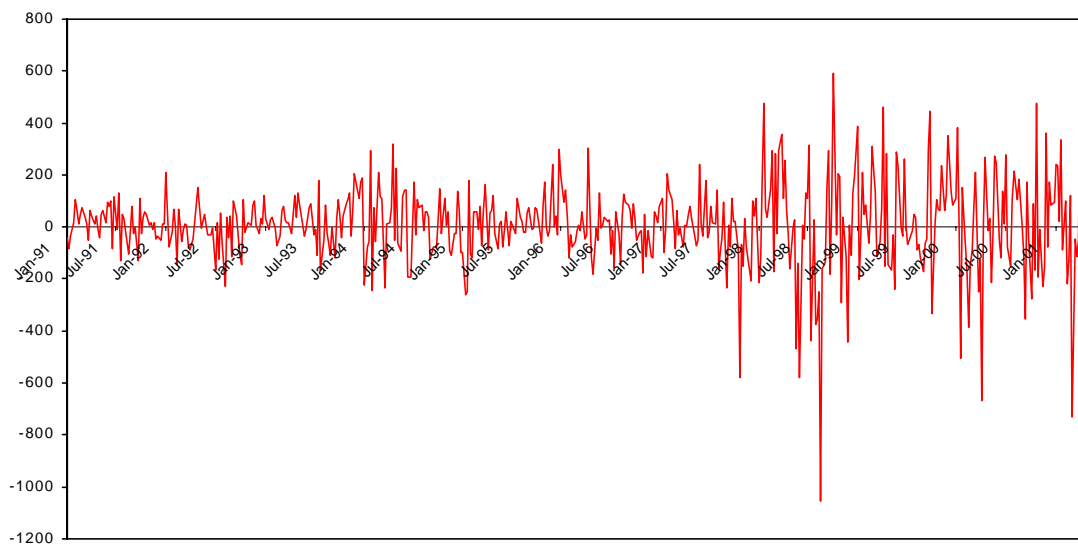
Stock returns (nominal returns) are computed using the following equation.⁹

$$\% \text{ Return} = (\text{Alsi } 40_t - \text{Alsi}40_{t-1}) / \text{Alsi}40_{t-1} * 100 \quad (\text{eq } 6)$$

where Alsi40_{t-1} one period lagged variable

The JSE Alsi40 Index and especially the change in the Index (eq 2) will be used as a proxy for stock returns. Local stock returns are represented in figure 5.

⁹ Results obtain with the use of E-views and WinGive.

Figure 9: *Local Stock Returns*Table 12: *Stock returns in the expansive and restrictive monetary conditions as proxy by the interbank call rate*

Expansive (E) or Restrictive (R) conditions	Number of weeks	% Return over the period	Standard deviation of weekly returns in %	Average weekly % return
R	10	6.09	1.06	0.68
E	19	21.48	2.02	1.12
R	2	1.35	0.33	0.10
E	47	4.67	1.20	0.16
R	5	-6.03	1.03	-1.22
E	18	-4.09	1.01	-0.29
R	8	5.99	0.92	0.77
E	11	2.59	0.66	0.35
R	6	10.58	1.53	1.92
E	7	3.74	0.82	0.41
R	13	-4.18	1.22	-0.34
E	23	33.55	4.38	1.26
R	10	11.36	2.44	0.66
E	15	3.31	1.72	0.41
R	67	8.23	2.68	0.11
E	16	6.86	1.27	0.73
R	19	-5.07	1.29	-0.21
E	7	3.21	0.93	0.66
R	11	-5.55	1.70	-0.54
E	72	21.34	5.57	0.31
R	17	-40.18	10.03	-2.84
E	139	83.10	11.07	0.52

The absolute return in restrictive periods and expansive conditions (table 11) are 21 percent (average weekly return of -0.08%) and 48 percent (average weekly return of 0.51%) respectively, indicating that restrictive conditions are bad news for stocks and expansive conditions are good news for stocks. The average standard deviation of stock returns in restrictive conditions and expansive conditions is 2.2% and 2.8% respectively. Stock returns thus seems to be more volatile in expansive than in restrictive monetary conditions. It is also interesting to note that the volatility in stock returns has increased over the study period (see table 12).

Table 13: *Stock returns in the expansive and restrictive monetary conditions as proxy by the MCI*

Expansive (E) or Restrictive (R) conditions	Number of weeks	% Return over the period	Standard deviation of weekly returns in %	Average weekly % return
E	44 months	125.86	2.72	1.98
R	16 moths	20.97	4.59	1.30
E	9 months	0.35	4.84	0.09
R	6 months	1.24	3.28	0.26
E	49 moths	32.62	7.51	0.86

The absolute return in restrictive periods and expansive conditions (table 12) are 11.11 percent (average weekly return of 0.78%) and 52.94 percent (average weekly return of 0.98%) respectively, indicating that stock returns are less in restrictive conditions than in expansive conditions. The average standard deviation of stock returns in restrictive conditions and expansive conditions is 3.94% and 5.02% respectively. Stock returns thus seems to be more volatile in expansive than in restrictive monetary conditions. It is also interesting to note that the volatility in stock returns has increased over the study period (see table 13). . These results confirm the results obtained earlier (see table 12)

5.5 Testing for stationarity

A concrete set of data (data file or data series) can be regarded as a realization of the underlying stochastic process. A stochastic process is said to be stationary if its mean and variance are constant over time and the value of covariance between two time periods depends only on the distance or lag between the two time periods and not on the actual time at which the covariance is computed. Thus a series is said to be stationary if the mean and autocovariances of the series do not depend on time. Any series that is not stationary is said to be non-stationary. Non-stationarity could be due to a shift in the mean.

If a non-stationary time series is being used in a regression analysis the results tend to be unreliable, that is a high R^2 and t-statistics that appear to be significant, but results that are without any economic meaning. The regression output looks good because the least squares estimates are not consistent and the customary tests of statistical inference do not hold.

Because, as pointed out, standard inference procedures do not apply to regressions, which contain an integrated dependant variable, i.e. non-stationary time series, it is important to determine whether a series is stationary or not before using it in regression.

Two formal methods for testing the stationarity of a series are the unit root test and a test based on correlograms. Eviews performs these two tests to test for the presence of unit roots, i.e. if a series is stationary or not. If a series contains a unit root it is non-stationary. The Augmented Dickey-Fuller unit root test is to be used here.

Now if a time series is differenced once and the differenced series is stationary we say that the original series is integrated of the order 1, denoted by $I(1)$. In general, if a time series has to be integrated to be differenced d times, it is integrated of the order d or $I(d)$. Thus any time we have an integrated time series of order I or greater

we have a non-stationary time series. If $d = 0$ the resulting $I(0)$ process represents a stationary time series.

The results of the unit root tests are indicated in table 14, 15 and 16. We must therefore use the first difference of the variables when using OLS in our regression analysis.

Table 14: *Unit Root Testing of Ashi40*

Augmented Dickey-Fuller Test Equation			
Dependent Variable: D(ALSI40,2)			
ADF Test Statistic	-8.773419	1% Critical Value*	-3.4449
		5% Critical Value	-2.8672

Table 15: *Unit Root Testing of MCI*

Augmented Dickey-Fuller Test Equation			
Dependent Variable: D(MCI,2)			
ADF Test Statistic	-5.02325	1% Critical Value*	-3.48607724629
		5% Critical Value	-2.88569864236
		10% Critical Value	-2.57950044321

Table 16: *Unit Root Testing of Inter Bank Call Rate*

Augmented Dickey-Fuller Test Equation			
Dependent Variable: D(RATES,2)			
ADF Test Statistic	-8.128952	1% Critical Value*	-3.4449
		5% Critical Value	-2.8672
		10% Critical Value	-2.5698

The results obtained for the stationarity analysis (see tables 14, 15 and 16) indicate that all three variables are indeed non-stationary. These results is in fact in line with our methodology because the first difference of MCI, interest rates and Alsi40 are in

fact the change in monetary conditions and stock returns. Employing the first differences of the times series will thus contribute to the effectiveness of this study and will give results that are not spurious.

5.6 Conclusions

The methodology being used in this study is consistent with that being used in previous studies. The methods of analysis were first used in analyzing the US environment. The variables, i.e. interbank call rate and the nominal effective exchange rate, being used are also consistent of that being used in the previous studies. This study utilizes the interbank call rate and a Monetary Conditions Index to describe alternative monetary conditions in South Africa. The MCI incorporates the interbank call rate and the nominal effective exchange rate of the rand. The interbank call rate and the MCI will be used as substitutes in determining domestic monetary conditions.

The results, obtained in this chapter, suggest that South African monetary conditions were more expansive than restrictive for the study period. Changes in the interbank call rate rate were mostly moderate. The absolute and average returns on stock are much greater in expansive conditions than in restrictive conditions, i.e. stock perform better in expansive monetary conditions. Stock returns also seems to be more volatile in expansive than in restrictive monetary conditions.

Testing for stationarity yielded results indicating that all three variables are indeed non-stationary. The variables thus have to be transformed to allow statistical inference.

CHAPTER 6

ECONOMETRIC ANALYSIS AND MODELING

6.1 Introduction

Economic theory is typically crisp and unambiguous. Dependent and independent variables are identified, a functional form is specified and, in most cases, at least a qualitative statement is made about the effects that occur when independent variables in the model change. It is important to remember that a model is only a simplification of reality, implying that it is very optimistic to expect an exact correspondence between a model and its real world counterpart.

Notwithstanding the oversimplicity of the construction and interpretation of models it is still useful to use econometrics to determine the relationship between economic variables. The aim of this study, as mentioned in the introduction, is to determine the whether or not a relationship between monetary conditions and stock returns in South Africa exists and if so, the nature of the relationship. Economic theory suggests that a relationship can and do exist, but it does not really tell us any thing about the nature and magnitude of the relationship. Econometric analysis of this relationship will be used to supply evidence in support of the theory or to reject the theory.

This study utilizes econometric techniques in analyzing the relationship between domestic monetary conditions and stock returns. The relationship will not only be analyzed for 1991 to 2001, but also for the period March 1998 to 2001. The reason being that the conduct of monetary policy in South Africa changed in March 1998. The current refinancing procedures was introduced to address certain weaknesses experienced with the previous system. In particular the efficiency of the operational procedures was improved to increase the efficiency of the money market, thus ensuring the rapid transmission of monetary policy.

6.2 Graphical analysis of the variables

In graphically examining the relationship between the interbank call rate and stock returns (see figure 10) and the MCI and stock returns (see figure 11) it seems that an inverse relationship exists.

Figure 10: *Graphical comparison between the interbank call rate and stock returns*

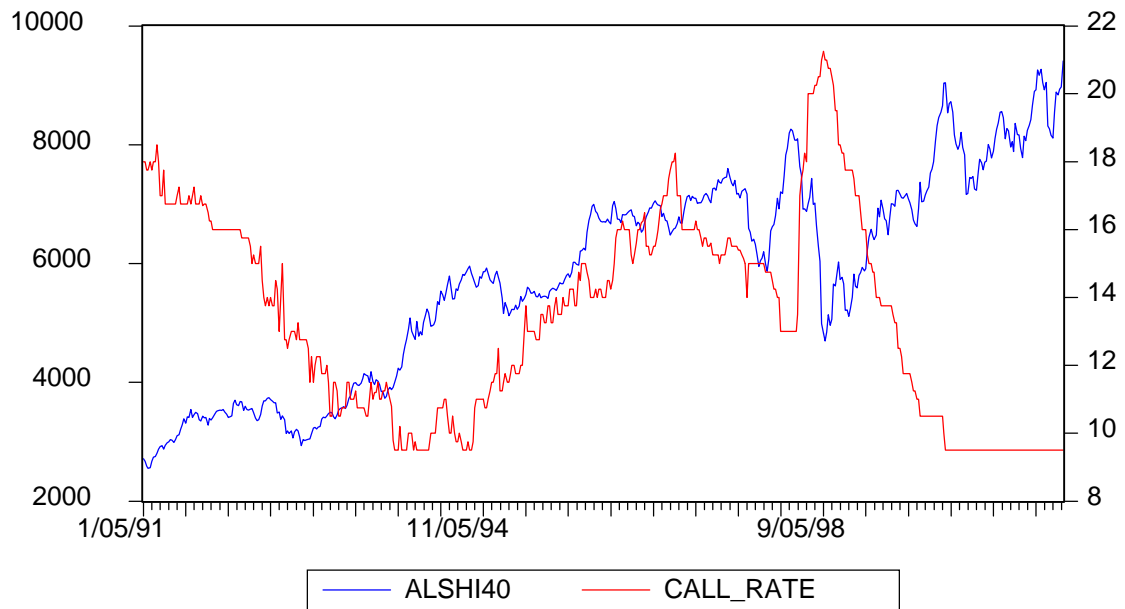
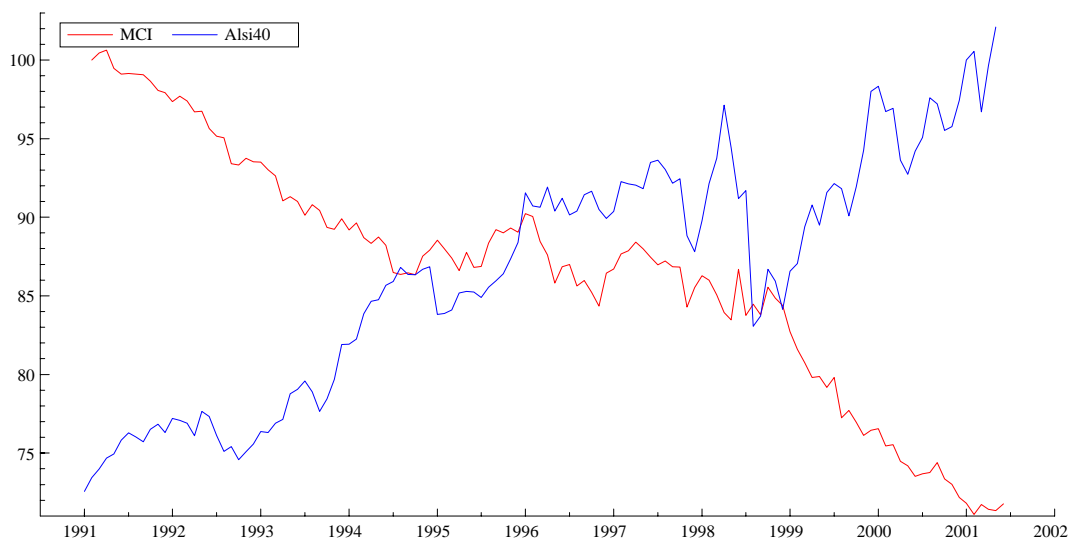


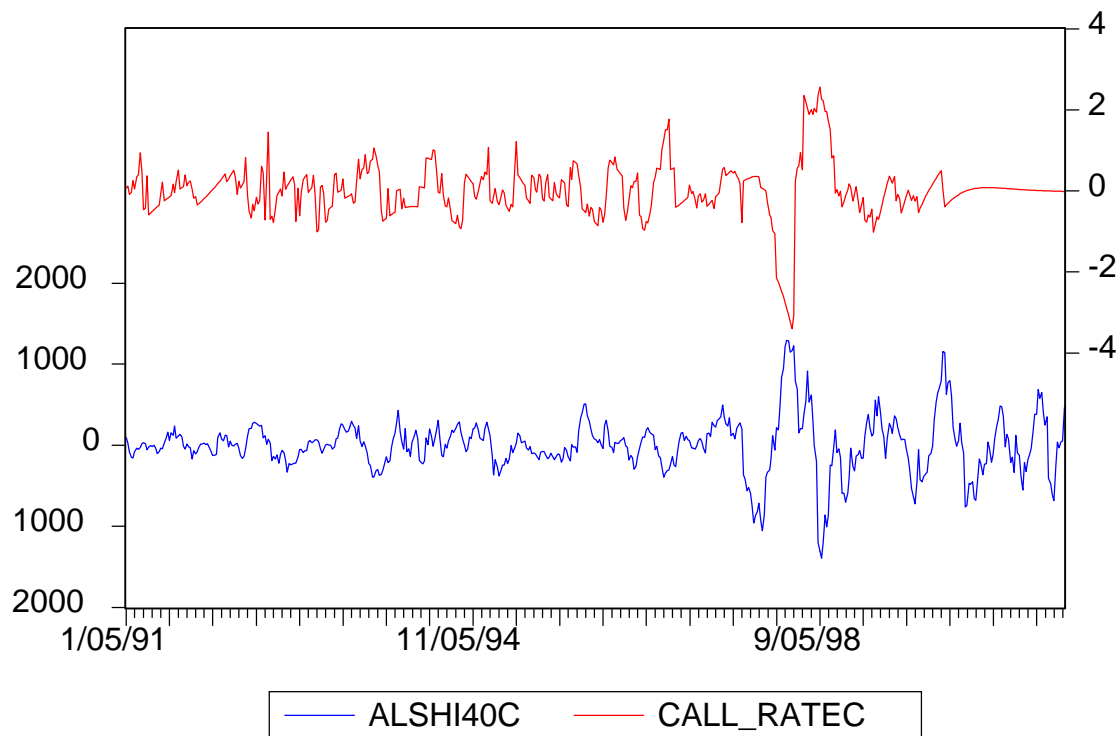
Figure 11: *Graphical comparison between the MCI and stock returns*



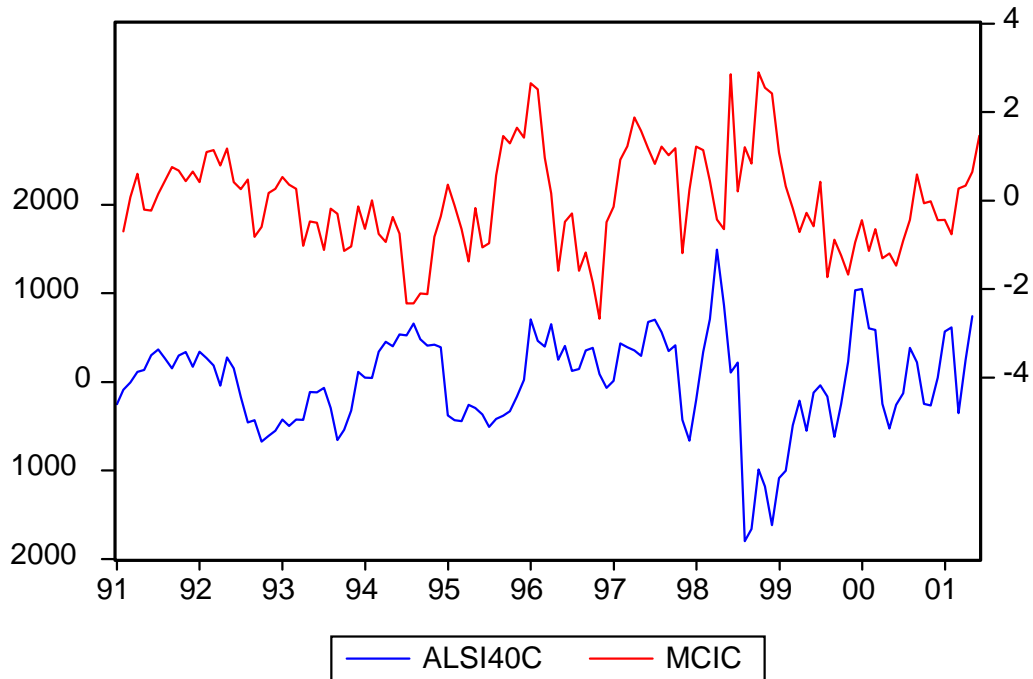
The relationship is in both cases clear from 1991 to the end of 1993 and from 1998 to 2001. The relationship from 1994 to 1998, however, seems somewhat blurred because both variables seem to have a positive trend but with inverse short-term movements. The true relationship for the particular period is thus somewhat uncertain.

The negative relationship is much more apparent when comparing the cyclical behaviour of the variables (see figures 12 and 13).¹⁰ The cyclical component also seems much more stationary than the time series. We have tested for stationarity (page 68) thus confirming the previous findings of non-stationarity. The cyclical component respectively represents the change in monetary conditions and stock returns.

Figure 12: *Cyclical components of the interbank call rate and stock returns*



¹⁰ The Hodrick-Prescott Filter was used to determine the cyclical and trend components of the variables.

Figure 13: *Cyclical components of the MCI and stock returns*

The long-run trend behaviour of the variables suggests that monetary conditions lead changes in stock returns (see figures 14 and 15). Stock returns thus seem to react to changes in monetary conditions.

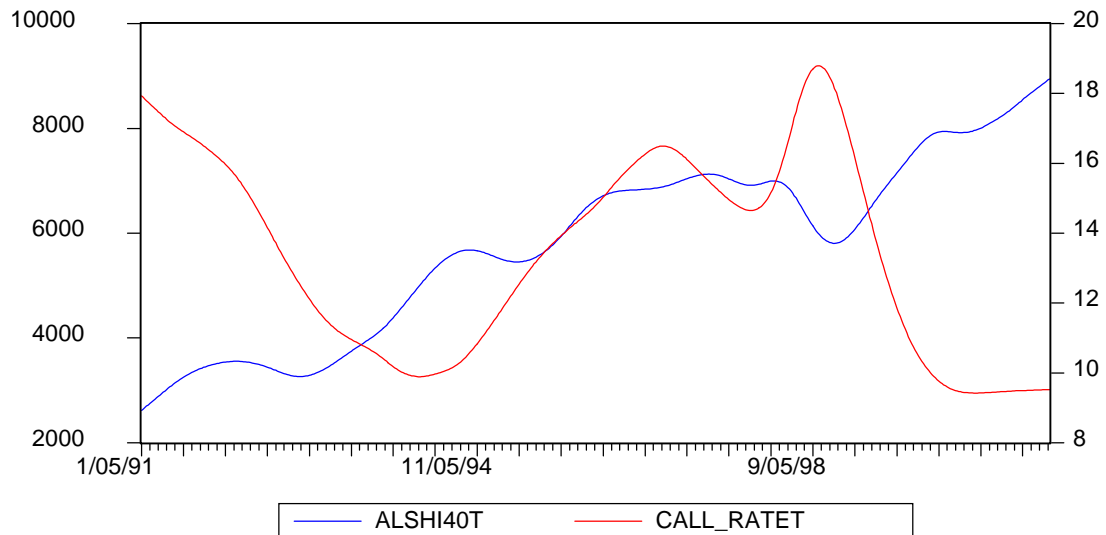
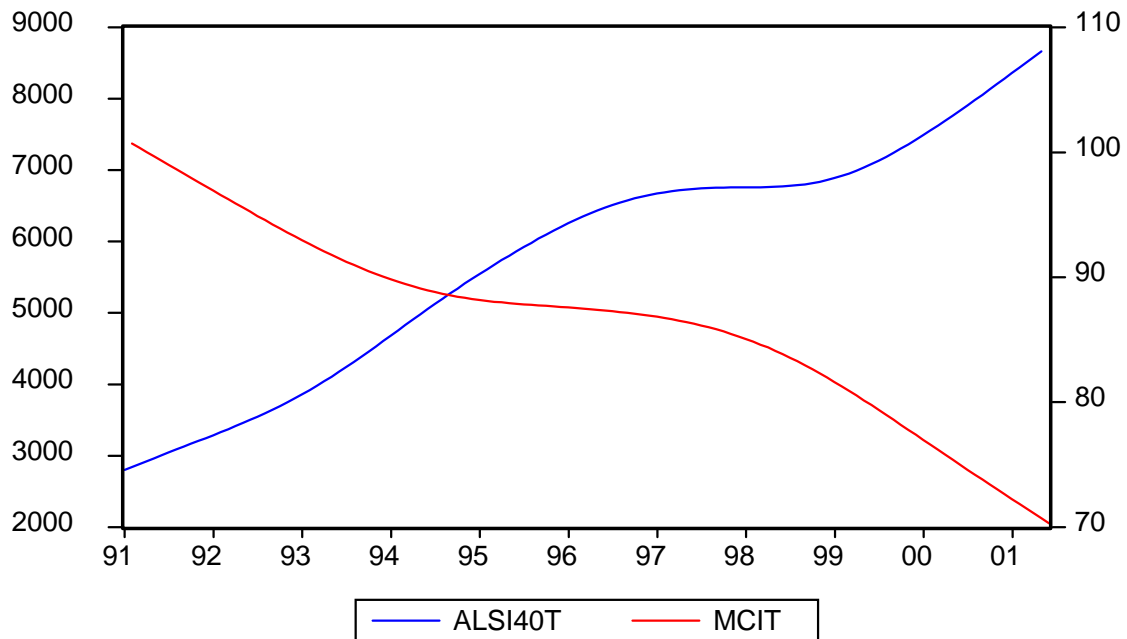
Figure 14: *Long-run behaviour of the interbank call rate and stock returns*

Figure 15: *Long-run behaviour of the MCI and stock returns*

6.3 Estimating the Regression Equation¹¹

Regression is the study of relationships among variables, a principal purpose of which is to predict, or estimate the value of one variable from known or assumed values of other variables related to it.

OLS will be used to estimate the behavioral functions. The time series data for the interbank call rate, the MCI and Alsi40 are non-stationary. It is thus important to work with the first differences of the variables, which is also the change in monetary conditions and stock returns. Stock returns associated with monetary conditions are examined by estimating the regression equation:

$$\Delta S_t = \alpha + \beta \Delta D_t + \epsilon_t \quad (0 < \beta < 1) \quad (\text{eq 7})$$

¹¹ It is important to note that equations 7, 8, 10 and 11 represent the first differences of the variables as determined in PcGive.

Where S_t the local weekly stock return, measured in local currency, and D_t is the weekly interbank call rate. The data is in logs.

Table 17: *Results of the regression equation; 1991-2001*

Modelling DLAlsi40 by RLS: 1991 to 2001					
Variable	Coefficient	Std.Error	t-value	t-prob	PartR ²
Constant	0.0090689	0.0053117	1.707	0.0903	0.0233
DLCall-Rate	-0.29082	0.096274	-3.021	0.0031	0.0696

R² = 0.0695882 F(1,122) = 9.1247 [0.0031] \sigma = 0.0589014 DW = 1.96
 RSS = 0.4232638406 for 2 variables

The inverse relationship between the two variables are indicated in the equation (see table 17), i.e. a one percent increase (decrease) in the interbank call rate will lead to a 0.29 percent decrease (increase) in stock returns. The R² indicates that 6.9 percent of the variation in stock returns can be explained by changes in the interbank call rate. Changes in the interbank call rate, i.e. monetary conditions, thus inversely contribute to the changes in stock returns, albeit smaller than expected.

Table 18: *Results of the regression equation; 1998 - 2001*

Modelling DLAlsi40 by RLS: 1998 to 2001					
Variable	Coefficient	Std.Error	t-value	t-prob	PartR ²
Constant	0.0039263	0.012859	0.305	0.7618	0.0024
DLCall-Rate	-0.46615	0.20748	-2.247	0.0306	0.1173

R² = 0.117256 F(1,38) = 5.0476 [0.0306] \sigma = 0.080035 DW = 2.24
 RSS = 0.2434126325 for 2 variables

Comparing the results of the regression equation in table 18 with table 17 indicates clearly that the relationship between the variables have increased over the study period, i.e. a one percent increase (decrease) in the interbank call rate will lead to a 0.46 percent (against 0.29 percent in table 17) decrease (increase) in stock returns. The R² indicates that 12 percent (against 6.9 percent in table 17) of the variation in stock returns can be explained by changes in the interbank call rate. These results

are in support of the findings of Sourial (2001) that monetary aggregates are becoming more important/significant in stock market performance. This results also confirm the popular believe that the importance and potency of monetary conditions in South Africa and internationally are increasing. The results are not consistent to that by Conover, Jensen and Johnson (1999) that indicates that South African stock returns appear unrelated to local monetary conditions, as discussed in chapter 4.2 page 35. Their results of their study, however, only indicate the relationship between local monetary conditions and local stock returns from 1956 to 1995, which further supports the argument (as indicated in tables 17 and 18) that the importance/significance of monetary conditions in influencing/determining stock market performance in South Africa has increased.

The above regression equations have as its independent variable the actual values of the changes in the interbank call rate. Stock returns associated with monetary conditions can also be estimated by estimating the regression equation:

$$\Delta S_t = \alpha + \beta \Delta D_t + \epsilon_t \quad (0 < \beta > 1) \quad (\text{eq 8})$$

Where S_t the local weekly stock return, measured in local currency, and D_t is a weekly dummy variable equal to one if the monetary authority is pursuing a restrictive monetary policy and zero if monetary policy is expansive. This method is consistent of the method employed by Conover, Jensen and Johnson (1999).

Table 19: *Results of the regression equation; 1991 - 2001*

Modelling DLAlsi40 by RLS: 1991 to 2001	
DLAlsi40 = +0.002273	-0.01487 DDummy
(T-value) (2.064**)	(-2.659**)
R ² = 0.0129481 F(1,539) = 7.0706 [0.0081] \sigma = 0.0256188 DW = 1.76	
RSS = 0.3537585061 for 2 variables	

The results of the regression equation in table 19 must be compared to that of table 17. Comparing the results indicates that the change in the interbank call rate has a greater influence (0.29 percent in table 17) than the dummy variable (0.01 percent in table 19) as a monetary conditions variable affecting stock returns. The use of the changes in the interbank rate to proxy monetary conditions is thus more effective than the use of the dummy variable. In both equations are the intercepts positive reflecting the general positive expected returns associated with a stock market investment, but is it only statistical significant in the equation that uses the dummy variable as proxy for monetary conditions (see table 19).

Table 20: *Results of the regression equation; 1998 - 2001*

<p>Modelling DLAlsi40 by RLS: 1998 to 2001</p> <p>DLAlsi40 = +0.001919 -0.05931 DDummy (T-value) (0.729) (-2.450**)</p> <p>R² = 0.0346895 F(1,167) = 6.0013 [0.0153] \sigma = 0.0342383 DW = 1.70 RSS = 0.1957680195 for 2 variables</p>

The results from the regression equation in table 20 confirms most of the previous conclusions, i.e. the significance of monetary conditions in affecting stock returns has increased and that the use of the interbank call rate as a proxy for monetary conditions are more effective than the use of a dummy variable.

Stock returns associated with monetary conditions are also examined by estimating the regression equation:

$$\Delta \hat{S}_t = \alpha + \beta \Delta M_t + \epsilon_t \quad (\text{eq 9})$$

Where \hat{S}_t the local monthly stock return, measured in local currency, and M_t is the monthly Monetary Conditions Index. The data is not in logs.

Table 21: *Results of the regression equation; 1991-2001*

Modelling DAIsi40 by RLS: 1991 to 2001	
DAIsi40 =	49.484 - 19.927DMCI
(T-value)	(1.140) (-0.518)
R ² = 0.00220868 F(1,121) = 0.26784 [0.6057] \sigma = 376.27 DW = 1.88	
RSS = 17131080.98 for 2 variables	

Table 22: *Results of the regression equation; 1998 - 2001*

Modelling DAIsi40 by RLS: 1998 to 2001	
DAIsi40 =	40.610 - 116.52DMCI
(T-value)	(0.441) (-1.366)
R ² = 0.0456439 F(1,39) = 1.8652 [0.1798] \sigma = 558.006 DW = 1.74	
RSS = 12143467.91 for 2 variables	

The results obtained from equation 9 (see tables 21 and 22) suggest that the relationship between the MCI, as a proxy for monetary conditions, and stock returns are not significant. A MCI (for the study period) thus does not seem to be an important variable influencing stock market behavior or as a proxy for domestic monetary conditions. The exchange rate as a variable effecting monetary conditions and stock returns was thus ignored by the stock market. However, comparing the results of the regression equations (table 22 with table 21) indicates clearly that the relationship between the variables have increased over the study period. This can be seen when comparing the coefficients and the R² statistics with each another, suggesting that the usefulness of a MCI as a proxy for monetary conditions in influencing stock market behavior has grown in importance. The results, also, seems to suggest that the importance of the exchange rate as an variable affecting stock market returns has increased.

6.5 Cointegration Analysis

By using differenced variables we will be able to avoid the spurious regression problem, but it will also remove any long-run information. In modeling time series data we need to retain this long-run information, thus while we must avoid non-stationarity, long-run information must not be excluded.

A non-stationary variable will tend to wander extensively, but some pairs of non-stationary variables can be expected to wander in such a way that they do not drift to far apart, thanks to equilibrium forces that will tend to keep them together. Such variables are said to be cointegrated, i.e. although individually they are $I(1)$, a particular linear combination of them is $I(0)$. The cointegration combination is interpreted as an equilibrium relationship since it can be shown that variables in the error correction term in an Error Correction Model (ECM) must be cointegrated, and vice versa, that the cointegrated variables must have an ECM representation (Kennedy, 1998:253). Most tests for cointegration take the form of a unit root test applied to the residuals resulting from estimation of the cointegrating (long-run equilibrium) relationship.

This study will utilize the maximum likelihood method of cointegration analysis developed by Sören Johansen (Doornik and Hendry, 1997:60).

The results from the cointegration test (table 23) suggest that no long-run equilibrium relationship between the interbank call rate and Als40 exist. Further analysis of the relationship seems necessary because it seems strange to think of these two variables not having a long-run relationship. An explanation of the results obtained in table 23 might be found in our previous regression analysis where it became clear that monetary conditions only started playing a significant role in economic policy and thus in influencing stock market performance in early 1998. This, as mentioned earlier, can mainly be explained by the SARB changing its refinancing procedures to more effectively transmit monetary conditions.

Table 23: *Cointegration analysis 1991 to 2001*

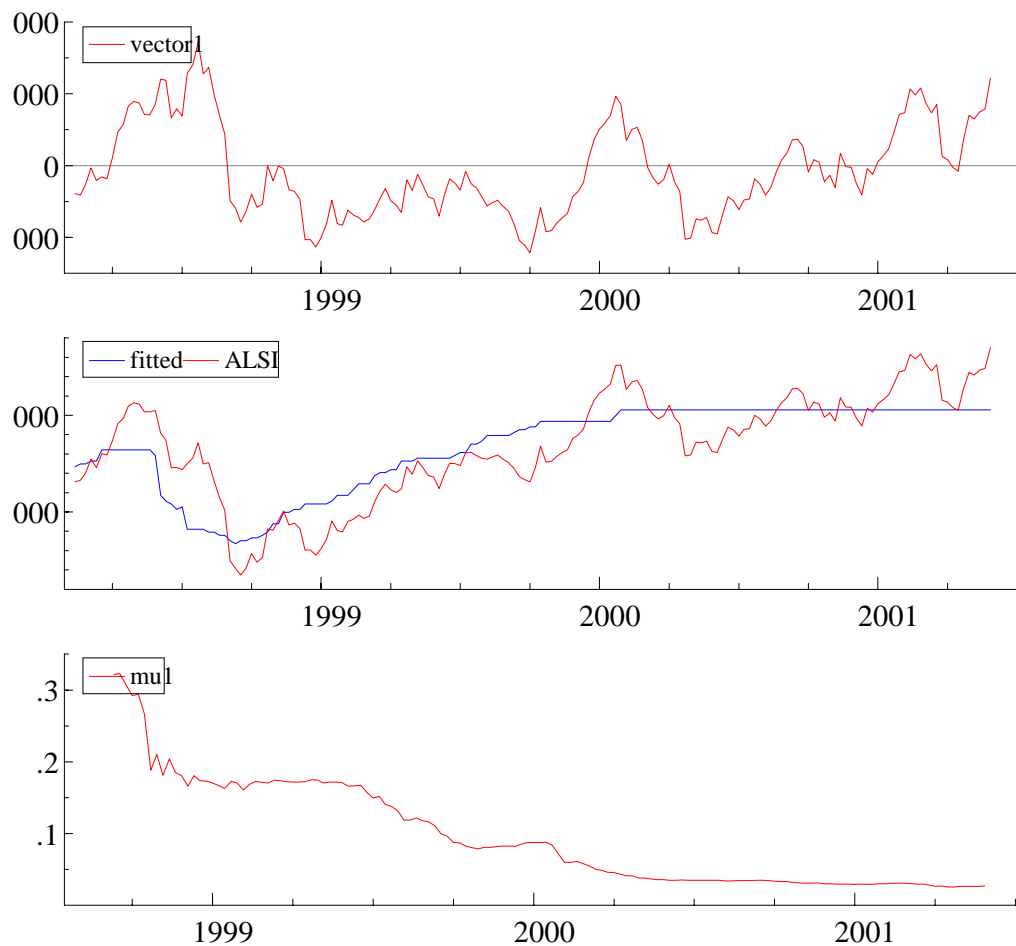
eigenvalue	loglik for rank					
	-2149.72	0				
0.0141505	-2145.91	1				
0.00459905	-2144.68	2				
Ho:rank=p	-Tlog(1-\mu)	using T-nm	95%	-T\Sum log(.)	using T-nm	95%
p == 0	7.625	7.425	14.1	10.09	9.827	15.4
p <= 1	2.466	2.402	3.8	2.466	2.402	3.8

The results from the cointegration test, but only from 1998, (table 24) indicates that a long-run equilibrium relationship indeed exists. This confirms the already proven argument of the recent interaction between monetary conditions and stock returns.

Table 24: *Cointegration analysis 1998 to 2001*

eigenvalue	loglik for rank					
	-745.471	0				
0.115904	-734.877	1				
0.0247768	-732.719	2				
HO:rank=p	-Tlog(1-\mu)	using T-nm	95%	-T\Sum log(.)	using T-nm	95%
p == 0	21.19**	19.71*	15.7	25.5**	23.72*	20.0
p <= 1	4.315	4.014	9.2	4.315	4.014	9.2

The cointegration vector (first graph of figure 16) looks fairly stationary confirming the theory that although the variables might individually be I(1) a stationary relationship between the two non-stationary variables can and does exist. The actual and fitted values are reasonably close and the eigenvalues are relative constant, thus more support of a long-run equilibrium relationship.

Figure 16: *Cointegration graphics*

The long run equilibrium relationship being ($\beta = -1$):

ALSI	IB	Constant
+1.0000	-235.60	10428.

The results from the cointegration test (table 25) suggest that no long-run equilibrium relationship between the MCI and Alsi40 exist. The results obtained in table 21 and 22, however, suggest that the MCI is growing in importance as an indicator affecting stock returns. Further analysis is thus needed. The results from the cointegration test, but only from 1998, (table 26) indicates that a long-run equilibrium relationship indeed exists. This confirms the already proven argument of the recent interaction

between monetary conditions and stock returns. The results also support the argument (as already stated) that the usefulness of a MCI as a proxy for monetary conditions in influencing stock market behavior has grown in importance. The results, also, seems to suggest that the importance of the exchange rate as an variable affecting stock market returns has increasing.

Table 25: *Cointegration analysis 1991 to 2001*

Cointegration analysis 1991 to 2001						
eigenvalue	loglik for rank					
	-930.879	0				
0.111987	-923.812	1				
0.0284967	-922.092	2				
Ho:rank=p	-Tlog(1-\mu)	using T-nm	95%	-T\Sum log(.)	using T-nm	95%
p == 0	14.13	12.71	15.7	17.57	15.8	20.0
p <= 1	3.44	3.093	9.2	3.44	3.093	9.2

Table 26: *Cointegration analysis 1998 to 2001*

Cointegration analysis 1998 to 2001						
eigenvalue	loglik for rank					
	-314.900	0				
0.359123	-306.224	1				
0.145664	-303.154	2				
Ho:rank=p	-Tlog(1-\mu)	using T-nm	95%	-T\Sum log(.)	using T-nm	95%
p == 0	17.35*	12.01	15.7	23.49*	16.26	20.0
p <= 1	6.14	4.251	9.2	6.14	4.251	9.2

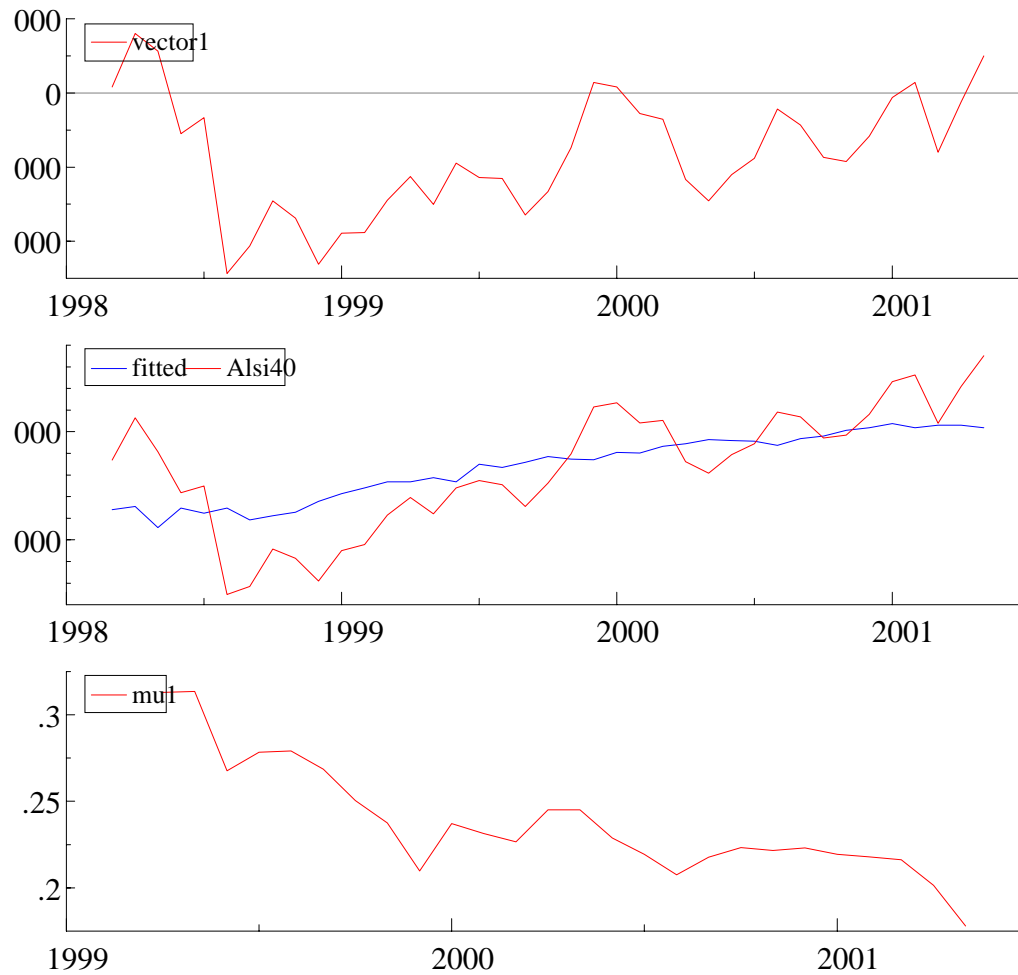
The long run equilibrium relationship being ($\beta_2 = -1$):

Alsi40	MCI	Constant
+1.0000	-15.654	6968.3

The cointegration vector (see figure 17) looks fairly stationary confirming the theory that although the variables might individually be $I(1)$ a stationary relationship between the two non-stationary variables can and does exist. The actual and fitted values are

reasonably close and the eigenvalues are relative constant, thus more support of a long-run equilibrium relationship.

Figure 17: *Cointegration graphics*



6.6 Impulse Response Function

An impulse response function traces the effect of a one standard deviation shock to one of the innovations on current and future values of the endogenous variables, i.e. the effect to stock returns with a disturbance to domestic monetary conditions. A shock to the i -th variable directly affects the i -th variable, and is also transmitted to all of the endogenous variables through the dynamic structure of the VAR. Consider a simple bivariate VAR(1):

$$X = \alpha_{11}X_{t-1} + \alpha_{12}Z_{t-1} + \epsilon_{1,t}$$

$$Z = \alpha_{21}X_{t-1} + \alpha_{22}Z_{t-1} + \epsilon_{2,t}$$

A change in $\epsilon_{1,t}$ will immediately change the value of current X . It will also change all future values of X and Z since lagged X appears in both equations. If the innovations, $\epsilon_{1,t}$ and $\epsilon_{2,t}$ in our example, are uncorrelated, interpretation of the impulse response is straightforward. $\epsilon_{1,t}$ is the innovation for X and $\epsilon_{2,t}$ is the innovation for Z . The impulse response functions for $\epsilon_{2,t}$ measures the effect of a one standard deviation of Z on current and future X and Z .

The innovations are, however, usually correlated, so that they have a common component, which cannot be associated with a specific variable. A somewhat arbitrary but common method of dealing with this issue is to attribute all of the effect of any common component to the variable that comes first in the VAR system. It is, however, only possible to determine the influence of a monetary shock on stock returns and whether or not stock returns will revert back to its mean after a statistical significant VEC model has been estimated.

An unrestricted VAR does not assume the presence of cointegration. This study has, however, determined that a cointegration relationship between the two variables exists, but only from 1998 onwards (page 62). We can thus impose cointegrating restrictions among the variables in the VAR, making possible the use of a vector error correction (VEC) model. It is, however, very important to note that the VEC

specification only applies to cointegrated series, i.e. the same information as for an unrestricted VAR should be provided. The specification of the exogenous intercepts and trends should also be the same as in the cointegration test. We must therefore specify a constant because a constant was included in the cointegration analysis.

The VEC specification restricts the long-run behavior of the endogenous variables to converge to their cointegrating relationships while allowing a wide range of short-run dynamics. The cointegration term is known as the error correction term since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments.

Estimating a VEC model composed of the interbank call rate and Alsi40 yields the following results (see table 27).

Table 27: *Vector error correction model*

Cointegrating Eq: CointEq1	
ALSI(-1)	
1	
IB(-1)	
236.518493777	
R-squared	0.132273762586
Adj. R-squared	0.0852283641723
Sum sq. resids	8602177.94309
S.E. equation	227.640833452
F-statistic	2.8116195642
Log likelihood	-1199.87287053
Akaike AIC	13.748555347
Schwarz SC	13.928696483
Mean dependent	18.21875
S.D. dependent	238.009242415

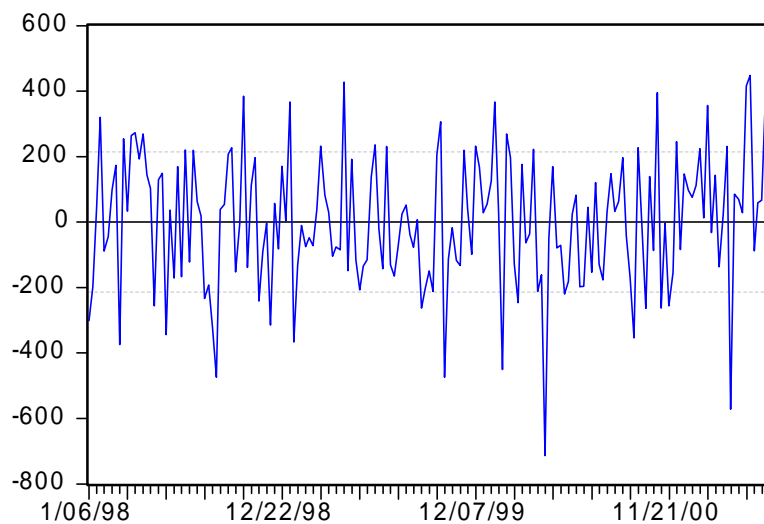
The VEC model being:

$$\begin{aligned}
 D(\text{ALSI}) = & - 0.1250974251 * (\text{ALSI}(-1) + 236.5184938 * \text{IB}(-1) - 10335.2012) + \\
 & 0.1565247686 * D(\text{ALSI}(-1)) + 0.1587952311 * D(\text{ALSI}(-2)) + 0.07919734181 * D(\text{ALSI}(-3)) \\
 & - 0.003808536509 * D(\text{ALSI}(-4)) + 57.17963157 * D(\text{IB}(-1)) - 19.86682528 * D(\text{IB}(-2)) \\
 & - 11.44954795 * D(\text{IB}(-3)) + 84.43434987 * D(\text{IB}(-4)) + 15.2582272 \quad (\text{eq } 10)
 \end{aligned}$$

Figure 18 and 19 graphically illustrates the residuals obtained from the VEC model. The residuals for stock returns (Alsi40) look fairly stationary. Stationarity of the residuals are confirmed with formal statistical tests (see table 28). The results thus confirm our previous finding of a cointegration relationship between the interbank call rate and stock returns. It also confirms the theory that although the variables might be of the order $I(1)$ a linear combination of them can be of the order $I(0)$.

Figures 18 and 19: *Vector error correction residuals*

ALSHI40 Residuals



INTERBANK_CALL_R Residuals

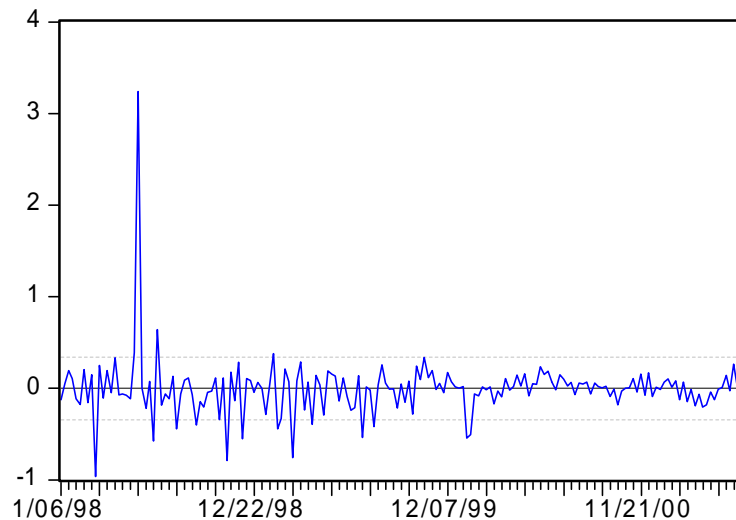
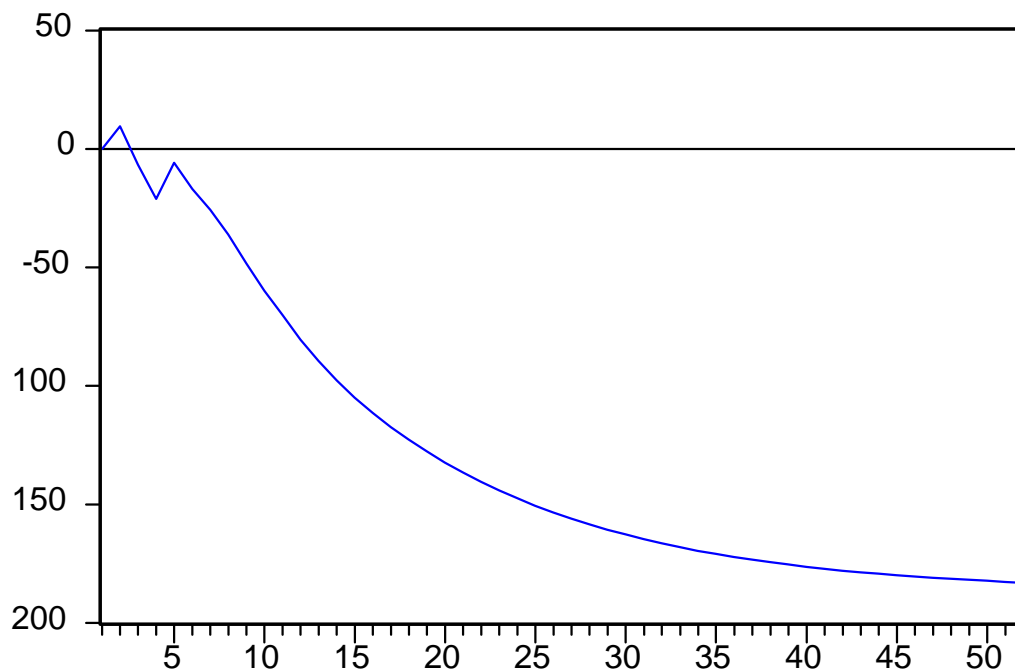


Table 28: *Normality test for VEC Residuals*

Sample size 176: 1998 to 2001	
Mean	-0.868770
Std.Devn.	203.395437 (using T-1: 203.975739)
Skewness	-0.280191
Excess Kurtosis	0.294701
Minimum	-714.245800
Maximum	448.337800
Normality Chi ² (2)=	2.8377 [0.2420]
(asymptotic form of normality test: 2.9398)	

The effect of a one standard deviation interbank call rate innovation on stock returns is demonstrated in figure 20. It is clear that a monetary shock initially has no or a very small effect on stock returns. The effect only influences stock returns after a two-lag period and is this effect negative. Stock returns increases slightly, but decrease very dramatically after a seven period lag. It is also interesting to note that stock returns do not revert back to its long run mean, but levels out at a new mean that is considerable lower than the level prior the shock.

Figure 20: *Response of Alsi40 to one S.D. Interbank call rate innovation*

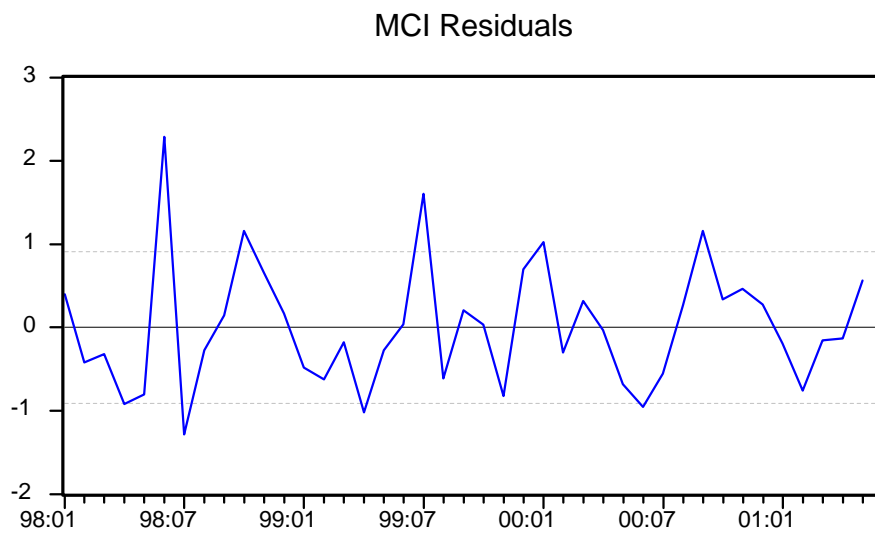
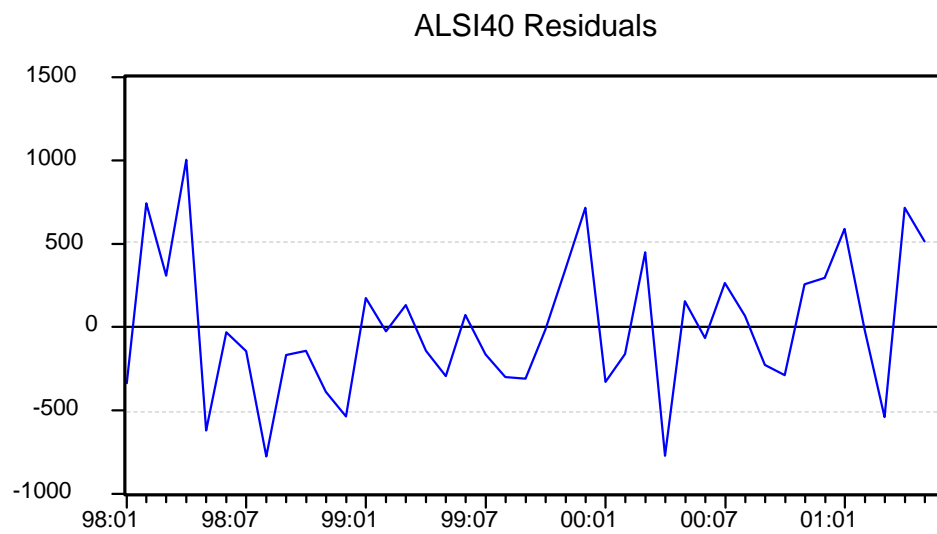
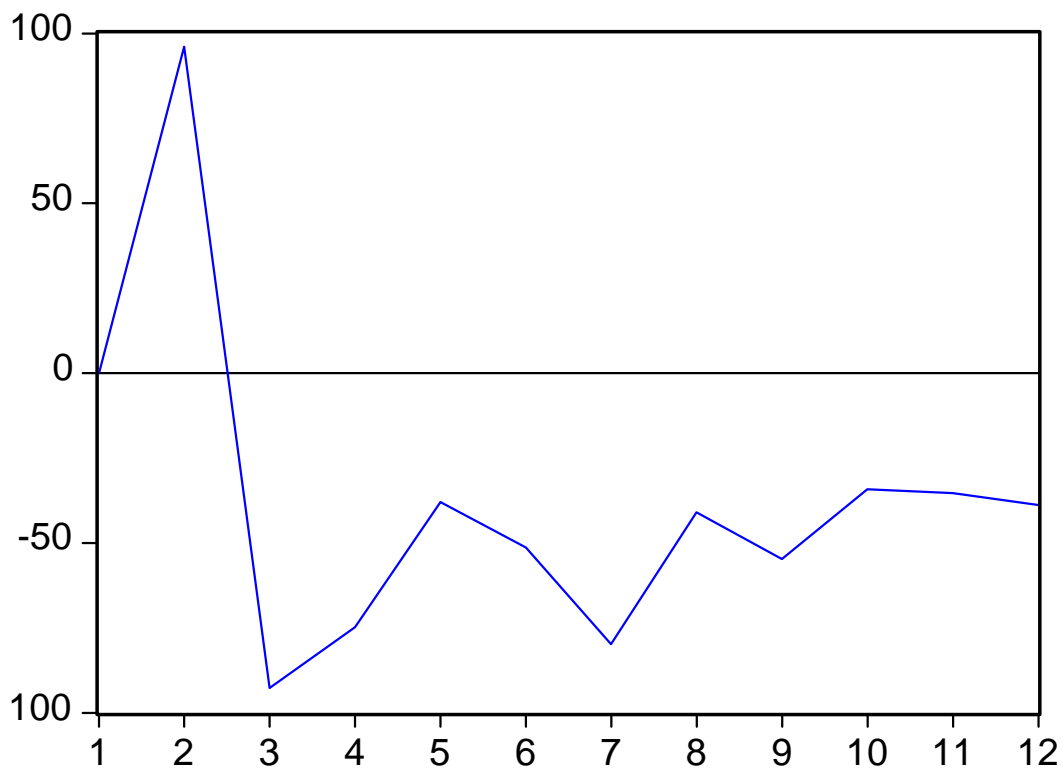
Figures 21 and 22: *Vector error correction residuals*

Table 30: *Normality test for VEC Residuals*

Normality test for Var10	
Sample size 41: 1998 to 2001	
Mean	0.000000
Std.Devn.	413.423708 (using T-1: 418.559603)
Skewness	0.335932
Excess Kurtosis	-0.298782
Minimum	-777.234317
Maximum	1002.899427
Normality Chi ² (2)=	0.98587 [0.6108]
(asymptotic form of normality test: 0.92365)	

The effect of a one standard deviation MCI innovation is demonstrated in figure 23.

Figure 23: *Response of Alsi40 to one S.D. MCI innovation*

It is clear that a monetary shock initially has a significant effect on stock returns. The disturbance influences stock returns immediately and is this effect positive. Stock returns decrease very dramatically after a two period lag. It is also interesting to note that stock returns do not revert back to its long run mean, but levels out at a new mean that is considerable lower than the level prior the shock.

6.7 Conclusions

The relationship between domestic monetary conditions and stock returns is analyzed for from the period 1991 to 2001, but also from 1998 to 2001, because of the profound changes that was made in the refinancing procedures of the South African Reserve Bank. The new procedures were primarily implemented to more effectively transmit monetary signals and policy.

The econometric evidence suggests that an inverse relationship between monetary conditions and stock returns exists and is this relationship more meaningful/significant since 1998. The significance of monetary conditions in affecting/determining stock returns more than doubled since the introduction of the current refinancing procedures.

Cointegration analysis suggests that a stable long-run equilibrium relationship (an inverse relationship) between the two variables exist, but only from 1998. This equilibrium relationship indicates that the two variables will not drift to fare from one another over time, i.e. they will tend to behave consistent with one another over time and not deviate from this long-run equilibrium relationship.

Statistical tests also conclude that monetary conditions are indeed significant in explaining some changes in stock returns and that the error correction term is indeed stationary. The VEC model developed seems to suggest that a monetary shock (either through an interbank call rate or MCI innovation) have a long-term effect on local stock returns, i.e. stock do not revert to its equilibrium path following a monetary conditions shock.

CHAPTER 7

SUMMARY AND CONCLUSIONS

7.1 Introduction

Theory and empirical evidence suggest that an inverse relationship between monetary conditions and stock returns exist. Most of these studies were, however, conducted in developed countries. This study for South Africa seems to confirm the believe that this inverse relationship is also applicable for South Africa and other developing countries, albeit a relative new relationship compared to the situation in developed countries.

7.2 Main findings of this paper

Monetary conditions are a broad concept that reflects the perceived stance of the monetary authorities of a country. It reflects the underlying demand and supply for liquidity in the economy, i.e. the demand and supply for money and credit. Monetary conditions incorporate those variables such as the exchange rate, which are generally deemed to be part of the monetary sphere but are not directly controlled by the central bank. Short-term interest rates are used in South Africa as the primary indicator of the underlying monetary conditions. The Bank of Canada includes not only short-term interest rates but also an exchange rate variable in determining monetary conditions. The construction of a monetary conditions index, similarly to that being used in Canada, for South Africa has not yet found favor with the authorities.

A monetary conditions index for South Africa can, however, be constructed, incorporating a short-term interest rate (the interbank call rate) and an exchange rate variable (nominal effective exchange rate of the rand). The use of an MCI in

conjunction with a short-term interest rate, like the interbank call rate, can only give a more effective measurement of domestic monetary conditions.

This study utilizes the interbank call rate and a MCI as proxy for South African monetary conditions. An effective interbank call rate ensures effective pricing in the money market. It should also be very sensitive to changes in the repo rate and should also reflect underlying liquidity conditions (money market shortage) in the economy. The interbank call rate is a market-orientated rate reflecting the underlying liquidity needs better than the other short-term interest rates, thus it is a good proxy for local monetary conditions. The exchange rate channel, in a small open economy with a flexible exchange rate regime, plays an important role in the overall liquidity of the financial system. An MCI for South Africa combines the short-term interest rate and the exchange rate into a summary index, thus variables that influences liquidity, aimed at capturing the developments in the domestic monetary sphere.

Theory suggests that it is very unlikely for monetary conditions not to have any linkages with stock returns and stock market performances. Monetary conditions have a very important effect and function in any economy. The behaviour and performance of the economy, on the other hand, have a very important effect and relationship with the performance of the stock market and thus stock returns. The monetary transmission mechanisms (in all its forms) provide a theoretical background and rationale by which changes in the money supply (liquidity and thus monetary conditions) are transmitted to real economic variables.

The real economy, as influenced by monetary conditions, has an effect on stock markets and therefore stock returns. The strength and direction of causality might not always be that clear, but the fact remains that a relationship does exist and that stock returns are influenced by economic behavior. It seems logical to think that that stock returns will increase (decrease) in periods of economic prosperity (depression).

It hence can be argued that a relationship/linkage between monetary conditions and stock returns indeed exists. Monetary conditions through its effects on economic performance affects stock returns, for example increasing interest rates will tend to decrease economic growth and activity which in turn will tend to effect stock returns negatively, i.e. depression stock returns.

Previous studies on the linkages/relationship between monetary conditions and stock returns (US and other developed countries) found that an inverse (negative) relationship indeed exists. Expansive monetary conditions leads to higher returns and restrictive monetary conditions produces lower stock returns. The results of a study for South Africa indicates that domestic stock returns (1956-1995) are more closely correlated to US monetary conditions than local monetary conditions, i.e. local monetary conditions are not significant in explaining local stock returns.

This study examines, for the relationship between monetary conditions as proxied by the interbank call rate and stock returns, weekly data from 5 February 1991 to 19 May 2001 and monthly data (January 1991 to May 2001) in examining the relationship between monetary conditions as proxy by an MCI and stock returns. The methodology used is consistent of that used by previous studies.

In analyzing monetary conditions, as proxied by the interbank call rate, and stock returns this study found that South Africa had 11 restrictive and 11 expansive periods. It also seems that South Africa has longer expansive than restrictive periods. A twenty-five-basis point change occurs the most frequent, implying that absolute changes is in the lower range. The average stock returns in expansive periods are more (about double) than the returns in restrictive periods (48% compared to 21%), confirming the notion that lower (higher) interest rates are indeed good (bad) news for stock markets. Stock returns also seems to be more volatile in expansive than in restrictive monetary conditions.

In analyzing monetary conditions, as proxy by an MCI, and stock returns this study found that South Africa had 3 expansive and 2 restrictive periods. The expansive

periods were also longer than the restrictive periods. Monetary conditions expanded on average 9.9% per expansionary period compared to 4.7% per restrictive period. Stock returns were less in restrictive conditions than in expansive conditions. The absolute return in expansive periods was 52.94% compared to 11.11% in restrictive periods.

Testing the data give evidence that the time series are not normally distributed. The variables are indeed I(1), making it not desirable to use the time series in an OLS regression analysis because the results will tend to be unreliable. Using non-stationary variables will result in spurious results and unreliable results. The first differences of the time series must therefore be used in the regression analysis.

The conduct of monetary policy in South Africa has changed in March 1998 to address the weaknesses of the then system. The changes was made and implemented to increase the efficiency of the money market so increasing the effectiveness of monetary policy in South Africa. The Asian and Russian crises also happened during 1997 and 1998, giving new emphasize on exchange rates and its role in affecting domestic economies and monetary conditions. This study thus analyzes the linkages/relationship for the period 1991 to 2001 and 1998 to 2001.

This study made use of econometric techniques and models in analyzing the linkages/relationship between domestic monetary conditions (proxy by the interbank call rate and an MCI) and stock returns. The overall relationship is negative, but is the relationship moderate to weak. The inverse relationship are also more apparent in expansive than in restrictive monetary conditions.

The results of the regression equations indicate that a statistically significant negative relationship between monetary conditions and stock returns exists and that the relationship has strengthened over time. The results of this research thus support the findings of previous studies (chapter 4 page 36). The results of this study are, however, in contradiction but also in support of the results of a previous study for South Africa. It is in contradiction because a statistical significant relationship does

exist and it is in support of the finding that the relationship has strengthened over time. Domestic monetary aggregates are thus becoming more significant in stock market performance and thus stock returns.

The results of a cointegration analysis suggest that a long-run equilibrium relationship between monetary conditions and stock returns exist, but only from 1998, thus further support of the argument that monetary aggregates are indeed becoming more significant since 1998. Monetary conditions (as proxied by the interbank call rate and an MCI) will thus not deviate from its long-run equilibrium relationship. Confirming that a cointegration relationship exists makes it possible to construct an error correction model. The vector error correction term is stationary thus any deviation from the long-run equilibrium will gradually be corrected through a series of partial short-run adjustments.

The VEC model allows the use of impulse-response analysis, i.e. determining the influence and magnitude of a monetary shock on stock returns. It seems that a monetary shock initially has a very small impact. Stock returns, however, decreases drastically after a few weeks and it also seem that stock returns does not revert to its mean. A monetary shock thus has a long-run effect on stock returns.

7.3 Conclusions

This study attempted to explore the linkages between domestic monetary conditions, as proxy by the interbank call rate and an MCI, and stock returns. The empirical investigation was conducted by using econometric techniques and models.

Domestic monetary conditions did not have a significant impact on stock market performance up to 1998. Post March 1998 results provide new evidence of the interrelation between domestic returns and monetary conditions. It is clear that there is a direction relationship from monetary conditions to the stock market. The transmission of monetary conditions being through the credit and exchange rate channels.

The credit channel will thus in the future together with the exchange rate channel play an increasing role in transmitting monetary conditions in South Africa. Investors and market players will, on the other hand, have to keep a close eye on domestic monetary conditions in their asset allocation decisions.

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Appendix A

ECONOMETRIC ANALYSIS OF THE RELATIONSHIP BETWEEN STOCK RETURNS (ALSI40) AND THE NOMINAL EFFECTIVE EXCHANGE RATE (EFFEN) OF THE RAND

1. Determining stationarity

We have already determined that stock returns are $I(1)$, i.e. the time series are not stationary. We must, therefore, first transform the time series, i.e. work with the first difference of the variable (change in stock returns). Employing the Augmented Dickey-Fuller Unit Root Test indicates that the trade weighted exchange rate is also $I(1)$ (see table A1).

Table A1: *Unit root test of the trade weighted exchange rate*

```
Unit-root tests for DLEffen (first difference of the log
of the trade weighted exchange rate)
The present sample is: 1992 to 2001

\sigma = 0.0246298  DW = 2.01  DW(DLEffen) = 1.91
ADF(DLEffen) = -3.614**
Critical values used in ADF test: 5%=-2.888 1%=-3.49
RSS = 0.05762968316  for 15 variables and 110
observations
```

Both variables thus have to be transformed to allow statistical inference.

2. Graphical analysis of the variables

The graphical analysis (figures A1-A3) seems to suggest that an inverse relationship between the variables exists. This inverse relationship is, also, much more apparent in the long run than in the short run. The short run relationship between the variables is uncertain, suggesting that the short run movements in stock prices are not primarily influenced by the day-to-day fluctuations in the exchange rate.

Figure A1: *Graphical comparison between the trade weighted exchange rate and stock returns*

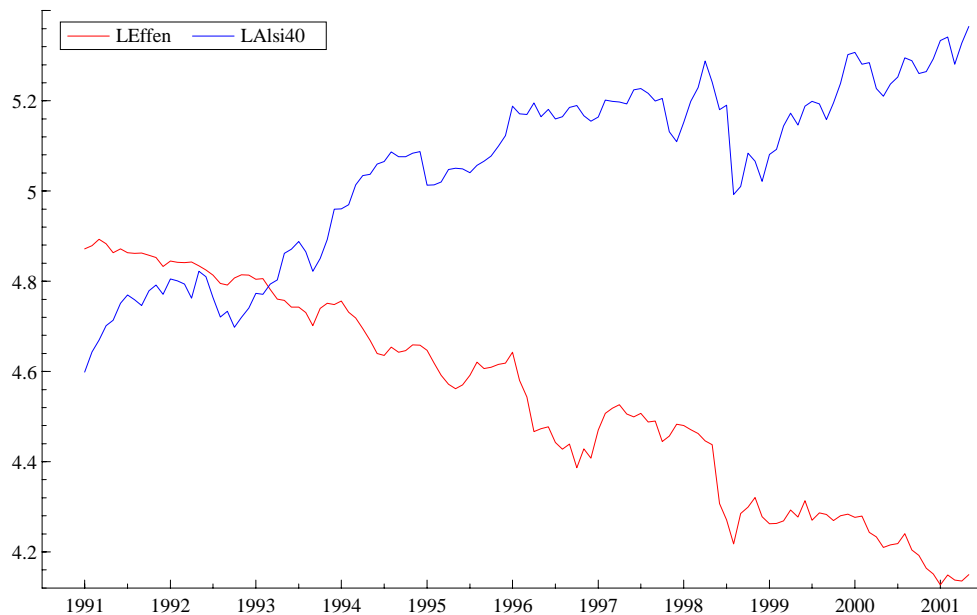


Figure A2: *Cyclical components of the trade weighted exchange rate and stock returns*

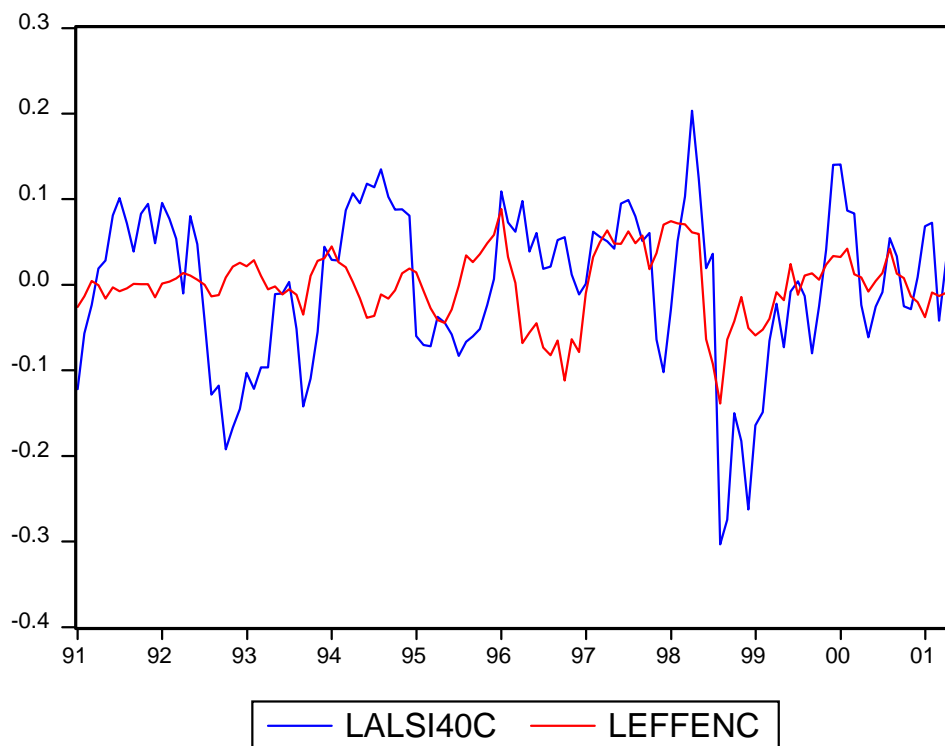
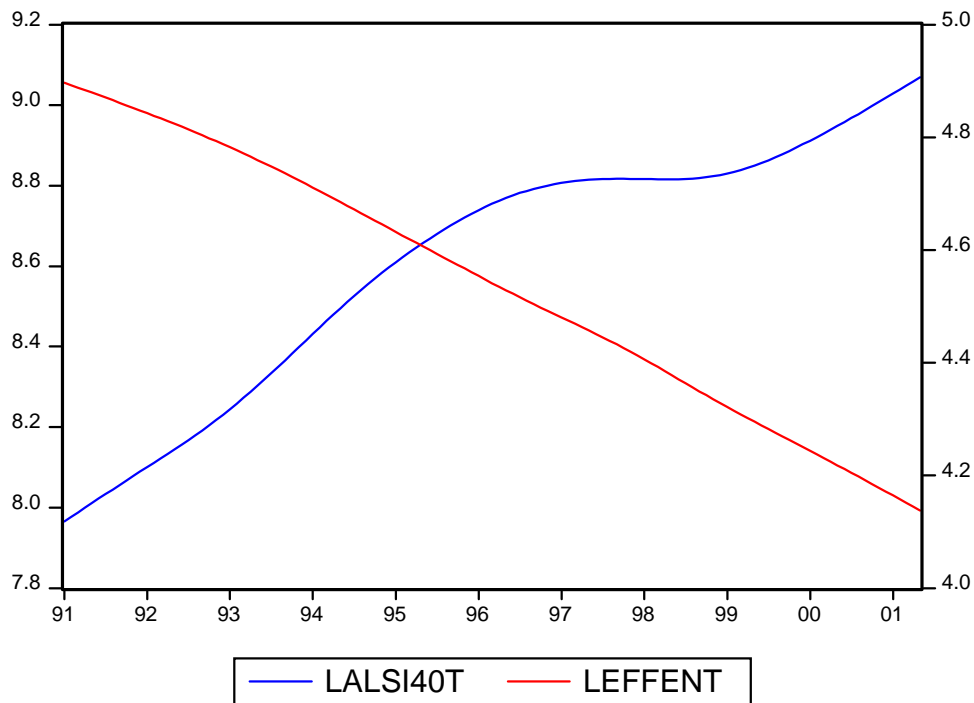


Figure A3: *Long-turn trends of the trade weighted exchange rate and stock returns*



3. Estimating the Regression Equation

The time series data for the trade weighted exchange rate of the rand and Alsi40 are non-stationary. It is thus important to work with the first differences of the variables, which is also the change in the trade weighted exchange rate and stock returns. Stock returns associated with the trade-weighted exchange rate are examined by estimating the regression equation:

$$\Delta S_t = \alpha + \beta \Delta R_t + \epsilon_t \quad (\text{eq A1})$$

Where S_t the local monthly stock return, measured in local currency, and R_t is the trade-weighted exchange rate. The data is in logs.

Table A2: *Results of the regression equation; 1991-2001*

Modelling DLAlsi40 by RLS					
The present sample is: 1991 to 2001					
Variable	Coefficient	Std.Error	t-value	t-prob	PartR ²
Constant	0.014630	0.0053897	2.714	0.0076	0.0570
DLEffen	0.70333	0.21039	3.343	0.0011	0.0839
R ² = 0.083914 F(1,122) = 11.175 [0.0011] \sigma = 0.0584462 DW = 1.94					
RSS = 0.4167467363 for 2 variables and 124 observations					

The regression equation indicates that a positive relationship between the two variables exists (see table A2), i.e. the coefficient (0.70333) has a positive sign. The coefficient is statistical significant as indicated by the t-value (3.343). The results also indicate that only 8% of the variation in stock returns can be attributed to the trade weighted exchange rate of the rand. Changes in the trade-weighted exchange rate, thus positively contribute to the changes in stock returns, albeit very modest.

Table A3: *Results of the regression equation; 1998 - 2001*

Modelling DLAlsi40 by RLS					
The present sample is: 1998 to 2001					
Variable	Coefficient	Std.Error	t-value	t-prob	PartR ²
Constant	0.019103	0.012491	1.529	0.1345	0.0580
DLEffen	1.2149	0.39552	3.072	0.0039	0.1989
R ² = 0.198903 F(1,38) = 9.435 [0.0039] \sigma = 0.0762439 DW = 2.07					
RSS = 0.2208987383 for 2 variables and 40 observations					

The regression equation (1998 to 2001), also, indicates that a positive relationship between the two variables exists (see table A3), i.e. the coefficient (1.2149) has a positive sign. The coefficient is statistical significant as indicated by the t-value (3.072). The results also indicate that 20% of the variation in stock returns can be attributed to the trade weighted exchange rate of the rand.

Comparing the results of the two regression equations (table A2 and A3) indicates that the variation in stock returns attributed to the trade-weighted exchange rate of the rand has more than doubled from 1998. The positive relationship is somewhat of

a surprise, especially when looking at the graphical analysis. One must, however, remember that when using the first differences in estimating regression equations the tendency to remove any long-run information arises.

4. Cointegration Analysis

In modeling time series data we need to retain this long-run information, thus while we must avoid non-stationarity, long-run information must not be excluded. Utilizing cointegration will supply more unambiguous results with regards to the relationship between the two variables.

This study will utilize the maximum likelihood method of cointegration analysis developed by Sören Johansen (Doornik and Hendry, 1997:60).

The results from the cointegration test (table A4) suggest that no long-run equilibrium relationship between the trade weighted exchange rate of the rand and Alsi40 exist. Further analysis of the relationship seems necessary because it seems strange to think of these two variables not having a long-run relationship.

Table A4: *Cointegration analysis 1991 to 2001*

Cointegration analysis 1991 to 2001						
eigenvalue	loglik for rank					
	777.595	0				
0.0591601	781.101	1				
0.000502433	781.130	2				
Ho:rank=p	-Tlog(1-\mu)	using T-nm	95%	-T\Sum log(.)	using T-nm	95%
p == 0	7.013	5.793	14.1	7.071	5.841	15.4
p <= 1	0.05779	0.04774	3.8	0.05779	0.04774	3.8

The results from the cointegration test, but only from 1998, (table A5) indicates that a long-run equilibrium relationship indeed exists. This confirms the results of the regression equations (table A2 and A3) of the increasing interaction between the exchange rate and stock returns.

Table A5: *Cointegration analysis 1998 to 2001*

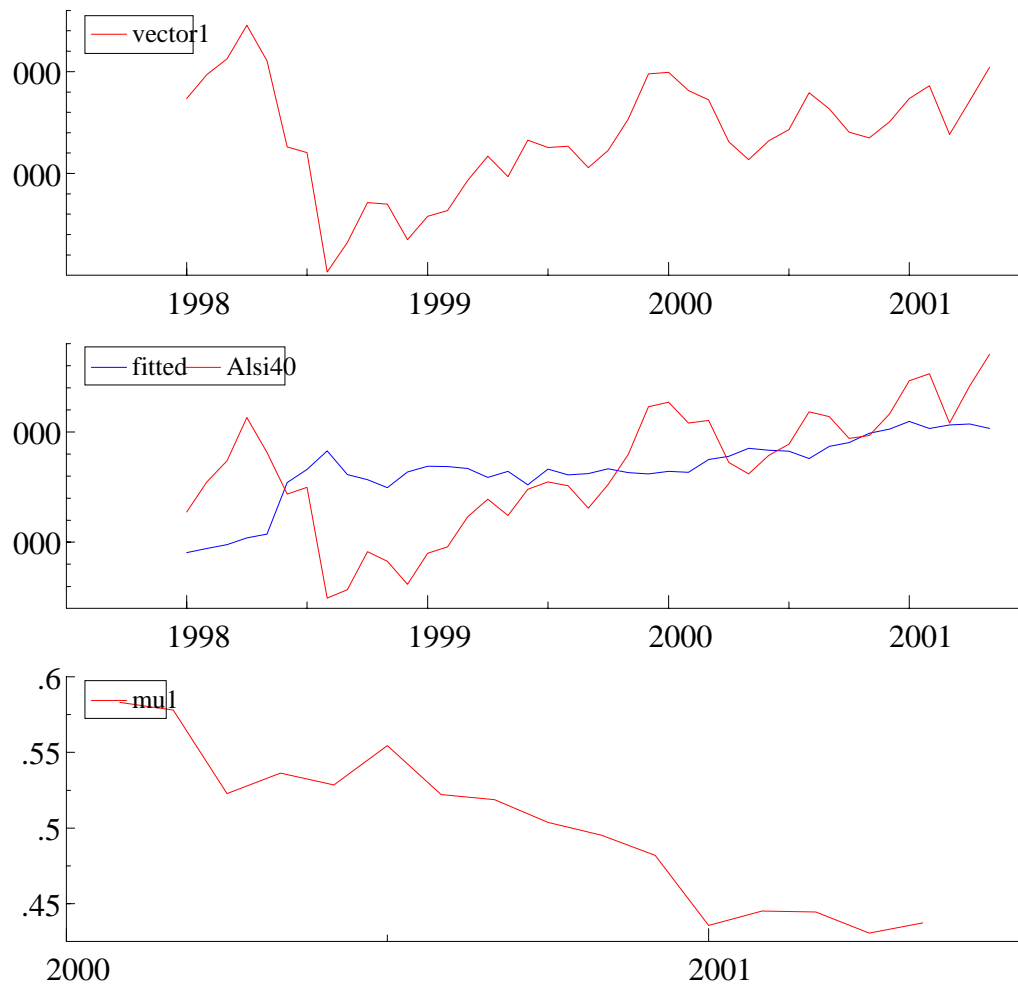
Cointegration analysis 1998 to 2001							
eigenvalue	loglik for rank						
		-252.266	0				
0.465561		-239.422	1				
0.162526		-235.786	2				
Ho:rank=p	-Tlog(1-\mu)	using T-nm	95%	-T\Sum log(.)	using T-nm	95%	
p == 0	25.69**	10.65	15.7	32.96**	13.67	20.0	
p <= 1	7.272	3.015	9.2	7.272	3.015	9.2	

The long run equilibrium relationship being ($\beta_2 = -1$):

Alsi40	Effen	Constant
+1.0000	-90.352	11055.

This long run equilibrium relationship indicates an inverse long run relationship, supporting the results of the graphical analysis in figure A1 and A2.

The cointegration vector (first graph of figure A4) looks fairly stationary confirming the theory that although the variables might individually be $I(1)$ a stationary relationship between the two non-stationary variables can and does exist. The actual and fitted values are reasonably close and the eigenvalues are relative constant, thus more support of a long-run equilibrium relationship.

Figure A4: *Cointegration graphics*

5. Impulse Response Function

Estimating a VEC model composed of the trade weighted exchange rate of the rand and Alsi40 yields the following results (see table A6).

Table A6: *Vector error correction model*

<u>Cointegrating Eq:</u>		<u>CointEq1</u>		
LALSI40(-1)		1.000000	R-squared	0.763358
			Adj. R-squared	0.501807
LEFFEN(-1)		2.899702	Sum sq. resids	0.066188
		(1.11343)	S.E. equation	0.059022
		(2.60429)	F-statistic	2.918580
			Log likelihood	73.61449
C		-21.27264	Akaike AIC	-2.517780
			Schwarz SC	-1.598302
			Mean dependent	0.010606
			S.D. dependent	0.083621

Standard errors & t-statistics in parentheses

The VEC model being:

$$\begin{aligned}
 D(LALSI40) = & - 0.1533441197*(LALSI40(-1) + 2.899702301*LEFFEN(-1) - \\
 & 21.2726401) - 0.1070822065*D(LALSI40(-1)) - 0.6464604602*D(LALSI40(-2)) - \\
 & 0.3950372806*D(LALSI40(-3)) - 0.8084558419*D(LALSI40(-4)) - \\
 & 0.7127059382*D(LALSI40(-5)) - 0.4580917128*D(LALSI40(-6)) - \\
 & 0.6160011164*D(LALSI40(-7)) - 0.1784154983*D(LALSI40(-8)) - \\
 & 0.1101791699*D(LALSI40(-9)) - 0.1631678381*D(LALSI40(-10)) - \\
 & 0.02810514045*D(LEFFEN(-1)) + 1.969163543*D(LEFFEN(-2)) + \\
 & 0.7835297883*D(LEFFEN(-3)) + 0.9689404487*D(LEFFEN(-4)) + \\
 & 2.008137059*D(LEFFEN(-5)) + 2.605933889*D(LEFFEN(-6)) + \\
 & 1.366886539*D(LEFFEN(-7)) + 0.8677056398*D(LEFFEN(-8)) + \\
 & 1.765396004*D(LEFFEN(-9)) + 0.7556125952*D(LEFFEN(-10)) + 0.1286158584 \\
 & \hspace{10em} \text{(eq A2)}
 \end{aligned}$$

Figure A5 and A6 graphically illustrates the residuals obtained from the VEC model. The residuals for stock returns (Alsi40) look fairly stationary. Stationarity of the residuals are confirmed with formal statistical tests (table A7). The results thus confirm our previous finding of a cointegration relationship between the trade-weighted exchange rate of the rand and stock returns. It also confirms the theory that although the variables might be of the order $I(1)$ a linear combination of them can be of the order $I(0)$.

Figures A5 and A6: *Vector error correction residuals*

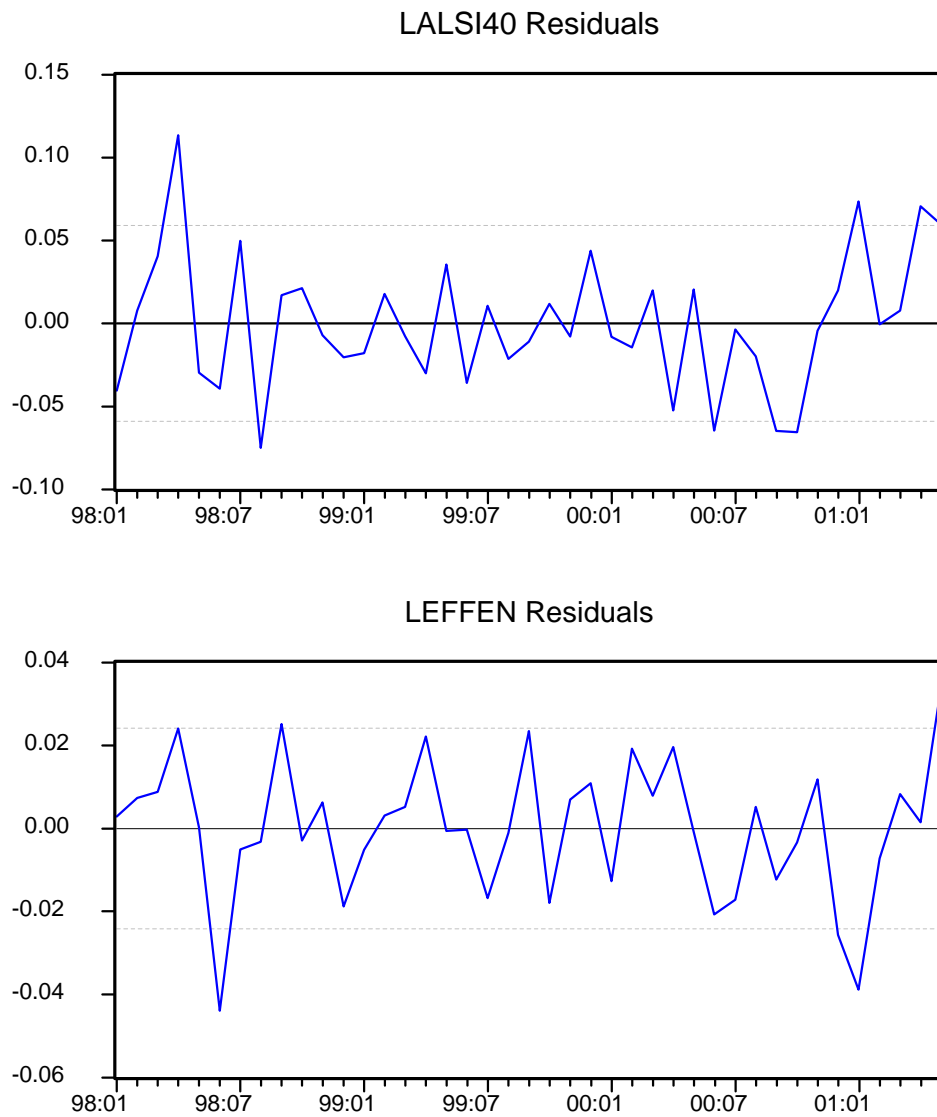


Table A7: *Stationarity test for LAlsi40 Residuals*

```

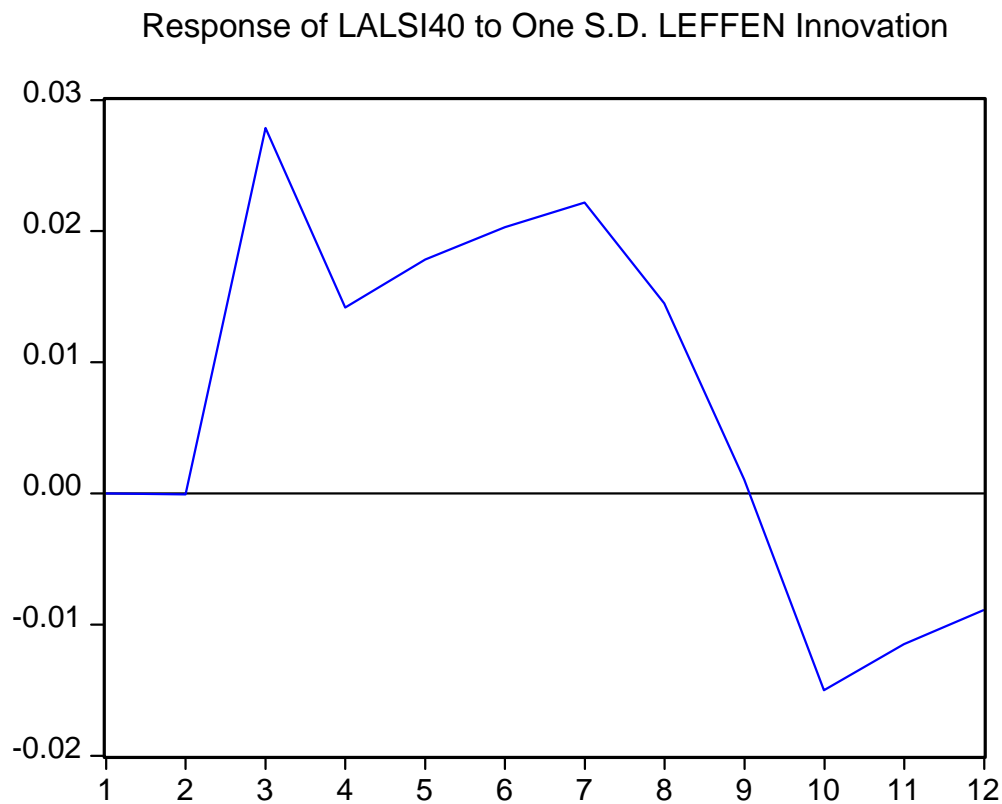
Unit-root tests for Lalsi40 Residuals
The present sample is: 1998to 2001

sigma = 0.0492346  DW = 1.74  DW(Lalsi40) = 2.017
ADF(Lalsi40) = -4.032**
Critical values used in ADF test: 5%=-2.942 1%=-3.617
RSS = 0.07756955265  for 5 variables and 37 observations

```

The effect of a one standard deviation trade weighted exchange rate innovation on stock returns is demonstrated in figure A7. It is clear that an exchange rate disturbance initially has no effect on stock returns. The innovation only influences stock returns after a two-lag period and is this effect positive. Stock returns decreases slightly, but increase gradually over a 4 to 6 period lag, but dramatically decreases after an 8 period lag. It is also interesting to note that it seems if stock returns tends to revert back to its long run mean. Exchange rate shocks, therefore, seems not to have a long run effect on stock returns.

Figure A7: *Response of Alsi40 to one S.D. trade weighted exchange rate innovation*



CONCLUSIONS

The importance of the exchange rate of the rand in influencing stock market performance has increased over the study period. The variance in stock returns explained by changes in the exchange rate has more than doubled over the study period.

The long run relationship between the variables seems to be of an inverse nature. The short run relationship, on the other hand, seems to be positive. There is a definite long run equilibrium relationship as indicated with the cointegration analysis, but only from 1998. The impulse-response analysis seems to support to above findings, i.e. the first reaction by stock returns to an exchange rate innovation is positive, thus a positive relationship in the short run. After a period of 8 months this positive relationship changes into an inverse relationship.

It also seems that exchange rate shocks have no long-term effects on stock performances.

It is thus clear that the exchange rate has become an important variable in influencing stock market returns. This might primarily be because of the role and weight rand-hedge stocks have on the overall performance of the Alshi40.