The Effects of Monetary Policy Shocks on Stock Returns in South Africa: A Structural Vector Error Correction Model

MICHAEL HEWSON
LUMENGA BONGA-BONGA

June 2005

Abstract

This study investigates the possibility of an evolving relationship between monetary policy and assets prices. A structural VAR is used over two time periods to consider the relationships between monetary policy, the exchange rate, inflation rate and the stock returns for three classes of assets. The strengths of these relationships vary at different times and across different sectors. International economic conditions over the past few years have also contributed to the change in responsiveness of one of the sectors to monetary policy.

University of Johannesburg
Department of Economics

1. INTRODUCTION

Little of the current literature on securities analysis gives accurate methods of forecasting stock prices based on "fundamentals". However, there is ample evidence to suggest that the tightening of monetary policy, and hence the rising of interest rates, has been used by many Central Banks to counteract the equity bubble and restore asset prices to their fair values. This suggests that asset prices could respond effectively to fundamentals (Miller, 1996).

While bubbles may persist for quite some time, experience shows that asset prices eventually return to a level more consistent with fundamentals, following some monetary shocks initiated by a monetary authority (Bollard, 2004). It is therefore rational to suggest that fundamentals, such as interest rates, which often reflect monetary policy action, play a very important role in influencing asset prices.

This study is founded on the complex mechanism behind the determination of stock prices and returns, and the important role of fundamental, volatility and noise factors will be emphasized. The aim is to evaluate the extent to which monetary policy, through interest rates (an important fundamental for asset returns), influences returns in the main equities traded on the Johannesburg Stock Exchange (JSE). Three indices in particular are considered, namely Resource, Financial and Industrial sectors.

According to Aron and Mauellbauer (2000), previous models by the South African Reserve Bank (SARB) have neglected two of the most important aspects of the transmission mechanism, namely wealth effects and expectations. The aim here is to better understand the changing role of expectations through the wealth channel.

This study endeavors to answer the following:

a) What is the role of monetary policy in influencing the stock prices of a given asset?
b) Does the extent to which monetary policy influences the stock price change over time?
c) Does the ability of monetary policy to influence asset prices vary across sectors?

Structural vector autoregressive (SVAR) models are used to answer the above mentioned questions empirically by analyzing the effect of an interest rate move on asset returns.

2. LITERATURE REVIEW

In order to test the effects of a change in policy on asset prices, Bernanke (2003) used the unanticipated change in interest rate because the anticipated change should already be discounted into the stock price. He found that although the impact of an unanticipated move in the Federal Funds rate is significant, it accounts for only a tiny degree of the volatility in stock prices. In the US, the reason that the interest rate affects stock prices is because of what it suggests about the riskiness of stocks, as opposed to other reasons like expected dividends or risk-free interest rate. It was also found that not all policy effects were in fact intended.

In addition, Kearney (1996) explains that the degree of unexpectedness of a policy announcement will influence the size and direction of the effect that the policy has. He noticed that the level of significance of the unexpectedness changes over time. This is because policy announcements are a means for the market participants to learn about policy. Therefore an unexpected announcement will suddenly rush new information into the market and will immediately be incorporated into prices. However, the public may not fully expect the degree of an interest rate change, or may incorrectly build up its own expectations.

A study by Kuttner and Mosser (2002) highlighted the distinction between shocks and propagation of monetary policy. It is possible for a change in volatility to occur either because the size of shocks has

changed, or because of a change in the propagation of monetary policy. The condition of the channels that monetary policy travels through is therefore as important for successful policy implementation as are the actual policy announcements.

It is necessary to know how policy affects key markets, as well as how changes in asset prices and returns affect economic participants (Bernanke, 2003). As is elaborated further on, Friedman (1998) did just this and found that the influence of stock prices on money demand is significant. Morley (2003) showed that Friedman's channels from stock prices to money demand are dynamic and so, as our second question suggests, change over time

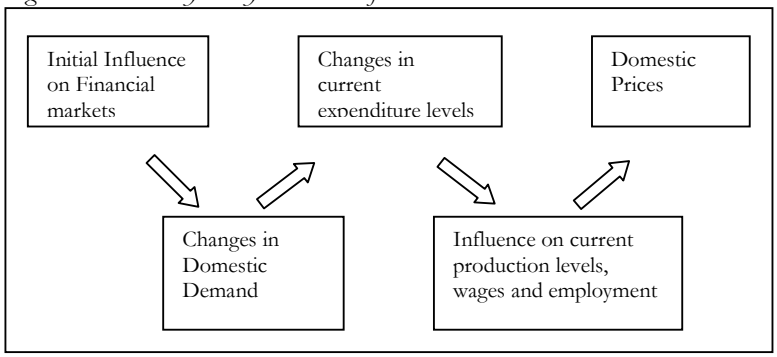
From the above, it is clear that the impact of monetary policy on not only stock prices and returns, but also saving and consumption, changes over time.

3. TRANSMISSION MECHANISM AS A LINK BETWEEN MONETARY POLICY AND STOCK RETURNS

The transmission mechanism describes the pathways that monetary policy takes to affect its ultimate target variable. By observing how it travels, it is possible to understand that monetary policy can affect different sectors by varying degrees at different times.

There are several different channels that policy can follow. Figure 3.1 illustrates how monetary policy operates in South Africa. Even before policy announcements are made, investors and financial market participants factor into prices what they expect the interest rate to do. The change in interest rates means that the price of borrowing money has also changed which will influence the buying patterns of consumers. A decline in consumption, for example, (which would result from an increase in the interest rate) would leave surplus supply of goods on the market. To get rid of their stock, suppliers will have to lower their prices thus reducing costs (including wages). The ultimate effect has been a decrease in prices.

Figure 3.1 Monetary Policy in South Africa



Source: Smal and De Jager (2001)

Smal and De Jager (2001) distinguish between the following three channels through monetary policy influences aggregate demand:

- Interest rate channel
- Asset price channel
- Credit channel

Since our focus is on monetary policy and asset prices we discuss the asset price channel in more detail.[1]

Asset Price Channel

Three general categorizations of assets are considered, namely, the exchange rate, equities and bonds. (Since the focus is on financial markets the effects via housing prices are not discussed here.)

[1] For more on the other channels refer to Smal and de Jager (2001) and Lewis and Mizen (2000).

An increase in the interest rate is expected to have the same directional effect on output regardless of whether it travels through the foreign exchange rate, equity or bond prices.

a) Foreign Exchange
An increase in the repo rate results in an increase in the commercial interest rates. Ceteris paribus, the exchange rate should appreciate because foreign investors can gain a higher return for their investments in South Africa. Also, future inflation is expected to decrease which means that long-term investments and contracts in South Africa will appreciate in real terms. Both of these result in an increased demand for the Rand, which leads to an appreciation of the currency. A stronger Rand has two effects: firstly, it makes it cheaper for local entities to import while exports become more expensive. Both the increase in imports and decrease in exports have negative effects on total production and output. Secondly, cheaper imports mean that the imported inflation is lower.

b) Equity and Bond Prices
For both equity and bond prices, an increase in the repo rate results in individuals having less money to spend, and so theoretically they would sell their stocks in order to increase their income which would bring down the stock or bond prices. This decrease in wealth means that there will be a contraction in the production and output.

Monetary policy has changed over time as financial innovations, legislation and economic conditions have changed. There are many paths that monetary policy follows in order to influence the real economy and inflation. It is becoming easier to see the potential for particular sectors to be more affected, or become more sensitive to monetary policy at different points in time. It is also apparent how an unexpected block in one of the channels could distort the application of inflation targeting.

4. SEGMENTATION OF THE ASSET PRICE CHANNEL

The pathway along which monetary policy affects output via the asset price channel can be bisected as follows:

4.1 The effect of the interest rate on asset prices.
4.2 The effect of asset prices on output.

4.1 THE EFFECTS OF INTEREST RATE ON ASSET PRICES

Bernanke (2003) suggests three reasons why interest rates affect asset prices. These are:

a) News regarding dividends – an increase in the interest rate makes a specific future dividend less valuable because the opportunity cost is higher, thereby decreasing the value of the stock.
b) Real interest rates – an increase in real interest rates means that other investments (like bonds) become more preferable to equities.
c) Risk premium – during a recession, the macroeconomic environment becomes more uncertain than other times. This may mean stocks become more risky. Also during a recession the income and wealth of investors drop. They may sell off some stocks to maintain their lifestyle.

In terms of its influence on stock prices, Bernanke (2003) found in the US that it was the interest rate's effect on risk that was most significant. He suggests two main implications of this: firstly, a decrease in the repo rate may decrease perceived risk and reduce precautionary saving. Individuals would then be more willing to spend which may accentuate the impact of policy through the other channels over the short term. Secondly, the following two reasons are added to the argument that asset bubbles should not be combated using monetary policy:

- It requires a very large movement in interest rates to impact the asset prices.
- As noted above, the risk premium is the main reason why interest rates affect stock prices.

The macroeconomic environment would therefore be significantly worsened if stock prices (asset bubbles) were reduced through interest rates.

4.2 THE EFFECTS OF ASSET PRICES ON OUTPUT

Friedman (1998) suggests four reasons why stock prices influence demand. These are:

a) Stock prices vary more than income. Therefore they are largely responsible for changes in wealth to income ratios. (An individual is more likely to increase spending as this ratio increases.)
b) An increase in equity prices implies that the prices of risky assets have increased relative to non-risky assets. To reduce the individual's risk there will be a move to less risky assets which could include money.
c) An increase in stock prices implies an increase in transactions and also an increase in the demand for money.
d) An increase in equity prices means that there will be an increased demand for equities which will result in a switch from money to equities.

The first three of Friedman's channels suggest that an increase in equity prices will lead to increased demand for money, which is in contrast to what the last suggests.

Sections 4.1 and 4.2 show that a shift in the interest rate, via a change in opportunity cost and risk, influences output by changing consumer expenditure and investment behaviour.

From a policy perspective it is very important to monitor asset price changes because they could indicate developments in financial markets that are relevant to inflation. Van der Merwe (2004) asserts that asset price inflation can lead to sharp increases in credit extension, excessive debt accumulation, and accelerated inflation. Consequently, dealing with such inflation requires the use of appropriate tools. While it was noted above that the interest rate should not be used, Lewis and Mizen (2000) explained that intermediate variables should not themselves be directly targeted since this could destroy some of the relationships with the ultimate variable.

5. FACTORS AFFECTING STOCK PRICES

A stock price is said to follow a Markov process. This means that the best estimate of a future value is based on the value today, because this current value incorporates all past information. Hull (2003) explains that this is because of the high degree of competition in financial markets which ensures that any new information that emerges is immediately incorporated into the stock price via a buy or sell of the stock.

The particular form of Markov process that stock prices follow is the Generalized Weiner process. This implies that the price has a particular drift and variance per unit of time.

$$\delta S = \mu S \delta t + \sigma S \in \sqrt{\delta t} \qquad (1)$$

Where S indicates the stock price, μ indicates the mean, and t indicates the time period.
The mean of the percentage change in the stock price is $\mu\delta t$ while the standard deviation is $\sigma\sqrt{\delta t}$.

Equation (1) indicates that the stock price changes due to one of two elements:

1. Change in the mean or drift factor ($\mu S \delta t$)
2. Noise or variability of the path followed by the stock price ($\sigma S \in \sqrt{\delta t}$)

(Noise is any irregular fluctuation accompanying a transmitted signal but not relevant to it (Tulloch, 1996). It is that part of a price movement that is due to perception, feeling or any element other than a change in a relevant variable.)

5.1 CHANGE IN THE DRIFT FACTOR

The drift factor is driven by fundamentals which are those variables on which a price is based. Stock prices are affected by several such international, national, sector-specific, company-specific, location-specific factors. Understanding how these factors affect stock prices can suggest likely impacts that changing policies will have on the rest of the economy. Figure 5.1 shows some of the general factors that affect equities.

Figure 5.1 Fundamentals and their affects on stock prices

Stimulus	Inference	Equities
GDP rises	Growing economy	Up
GDP falls	Shrinking economy	Down
Rising Inflation	Positive pressure on interest rates	Down
Rising Consumption	Growing economy	Up
Rising Unemployment	Slowing economy	Down
Budget Surplus	Negative pressure on interest rates	Up
Budget Deficit	Positive pressure on interest rates	Down
Current Account Surplus	Demand for domestic assets is high	Up
Current Account Deficit	Demand for foreign assets is high	Down
Domestic Instability	Confidence in domestic economy is down	Down
Easing Monetary Policy	Negative pressure on interest rates	Up
Tightening Monetary Policy	Positive pressure on interest rates	Down
Higher Reserve Requirements on banks	Tightening effect on domestic liquidity	Down

Source: http://www.eforex-asia.com/intermarket.html

5.2 NOISE

In a world with noise and fundamental traders, it is possible for prices to deviate from the drift value without any change in actual underlying fundamentals. This is because the unpredictable nature of noise trading makes it difficult and risky for fundamental-based traders to take a position of arbitrage (make a riskless profit), especially if the latter are trading over the short term. Therefore, the very existence of noise traders creates its own risk (De Long et al, 1989).

For example, Lyons (2001) explains that investors might trade for the sole reason that they are holding too much stock and wish to offload some of the risk. Another case is that many investors trade based on technical analysis of patterns and past events, rather than on underlying structural issues. In fact, only a very small proportion of the change in stock prices is due to a change in fundamentals, most is due to noise-based trading.

6. HISTORIC CHANGES TO MONETARY POLICY IN SOUTH AFRICA

The mandate of the SARB is to protect the value of the Rand. The SARB has regarded excessive growth in the supply of money to be a major cause of inflation. For this reason, during the 1980's and up until 2000, the SARB's focus of monetary policy involved influencing the demand side of the money market in order to influence the growth of the money supply. It did this by setting interest rates that were expected to generate an appropriate level of money supply growth.

Targeting the money supply (in particular the M3) relies heavily on the assumptions that there exists: a definable quantity of money; a stable demand for the money; and that the process of money supply is well controlled by the authorities. According to Lewis and Mizen (2000), before financial deregulation, monetary policy appeared to work through three possible channels, namely the interest rate, credit rationing and the quantity of money. Deregulation of the financial system meant the removal of some methods of implementing policy, while financial innovation saw the developing of credit markets and opening up of capital markets. The relationship between interest rates, inflation and money supply had become clouded (Smal and De Jager, 2001), money supply was not exogenous and under the complete control of the SARB, and the velocity of circulation of money was not constant. This meant the failure of the three assumptions.

In March 1998 it was decided that the repurchase rate (the rate at which the SARB lends to commercial banks) would be used to conduct monetary policy in the hope that this would bring more flexibility to policy implementation and speed up the impact on market interest rates. On February 23, 2000, the Minister of Finance announced that an inflation target of 3-6% had been set for 2002.

The system of inflation targeting still influences the demand for money but now with the aim of influencing the demand for goods and services (as opposed to the money supply). Inflation targeting has the advantages of being more transparent and clear which helps with expectations and so makes planning in the public and private sectors easier (Fourie, 2000).

Every two months the Monetary Policy Committee meets to decide on a repo rate that will be most suitable for the economy while keeping inflation between 3 to 6%. The full effects of monetary policy are expected to take between 18 and 24 months.

7. EMPIRICAL RESEARCH

In order to capture the multi-directional relationships that exist between policy variables, it was necessary to make use of a multi-variate model which could be molded according to the nature of the economic relationships. Neri (2004) explains that "few works have tried to evaluate the effects of monetary policy on stock markets and all of these have made use of structural VAR's" (amongst others Kim, 1999; Neri, 2004; Clark, 1999; Cassola and Morana, 2004; as well as Piffanelli and Erturk, 2001).

7.1 STRUCTURAL VAR METHODOLOGY

A structural VAR aims to simulate the environment within which variables are operating and has the advantage of requiring fewer restrictions than would a simultaneous equation model. In order to model the economic environment, it is necessary to place restrictions on the relationships that the variables have with one another based on economic theory. The shocks are usually considered to be mutually uncorrelated (Lutkepohl et al., 2004) and so the Choleski decomposition should be used to describe the relationships among the variables. As there are several unknowns that need to be determined, it should be ensured that there are sufficient known values and that the relationships are appropriate so that the equations can be identified. The impact that a shock to one variable will have on the other variables can then be assessed.

In the Choleski decomposition method each variable's forecast error is affected by its own structural innovation (the shock that it receives), as well as that of at least one other variable. The structural form parameter matrix A which specifies the instantaneous relationship between the variables y_{tr} is written as $Ay_t = A_1^* y_{t-1} + \ldots + A_p^* y_{t-p} + B\varepsilon_t$

From this we obtain $u_t = A^{-1}B\varepsilon_t$ which relates the reduced-form disturbances υ_t to the underlying structural shocks ε_t. This is known as the AB model (developed by Amisano and Giannini (1997). Identification of the structural form parameters requires that restrictions are placed on the parameter matrices.

With this approach (as opposed to an unrestricted VAR approach) it is not simply assumed that there is no effect from an innovation of one variable, to the error of another variable. If 'no effect' had merely been assumed, then the impulse response and variance decomposition functions would be inappropriate for policy analysis.

7.2 PREVIOUS APPLICATIONS OF STRUCTURAL VAR

Lastrapes (1998) tested for the effects of monetary policy on asset prices from 1960 to 1994. Neri (2004) then tested using monthly data from 1985 until 2000 for the G7 countries and Spain. He found that there was an effect from monetary policy through to the stock prices in most of the countries. However, the magnitude, timing and the persistence of the impact varied from country to country. His results have been summarized in table 7.2.

A 1% contractionary move in monetary policy had a tremendous effect on the economies of Germany, the USA, Spain and the UK in the 4th month, whereas in Japan, such an effect occurred only in the 12th month. On the other hand, we see that the French exchange had virtually no regard for a policy change!

Table 7.2 Effect of Monetary Policy on Stock Prices in G7 Countries

Country	*Move of stock exchange to 1% contractionary monetary shock*	*Period of the maximum shock*
US	4%	4th month
Canada	1%	12th month
UK	3.1%	4th month
Germany	6.3%	4th month
France	0.1%	2nd month
Italy	2.7%	2nd month
Japan	4.6%	12th month
Spain	3.6%	4th month

Source: Neri (2004)

7.3 DATA ANALYSIS

Three models were created - one for each market sector. They each include four variables – the stock index, interest rate, inflation rate and the exchange rate – and are analysed over two periods so that the impact of the change in monetary policy could be observed.

The interest rate used was the Prime overdraft rate. It was used as a proxy for monetary policy because, while the analysis is from 1992, the repo rate was only introduced in 1998. Friedman (1998) explains that there exists an inverse relationship between interest rates and stock prices.

For the inflation rate, the CPIX was used. This is the rate that is targeted by the SARB because it excludes interest on mortgage which is, inappropriately for this report, directly influenced by interest rates. Stock prices are inversely related to inflation and are most volatile during times of low inflation (Thibadeau, 2004). This is because low inflation rates will encourage more investors to enter the market.

The exchange rate is included because it is "used to capture external shocks that may generate inflationary pressure" – Neri (2004). Smets (1997) found that models for Germany, France, and Italy that included the exchange rate produced better results than models which excluded it. Generally, models for small open economies benefit from its inclusion. The exchange rate used is the Rand / US Dollar rate. Although the proportion of trade between South Africa and Europe is far greater than its trade with the USA, the Dollar is still the main international currency for reserves and so makes comparisons easier.

Morley (2003) found that the relationship between asset prices and the exchange rate varies from country to country. His work focused on Europe and found that in the UK and the Netherlands there was an inverse relationship. Italy and France also had an inverse, but much weaker relationship whilst in Germany it was 'unstable'.

Exchange rates affect stock prices though three channels (Kim, 2003). The first two are the influence on profits from domestic sales, and profits from exports. As the exchange rate appreciates, imported inputs become cheaper and so domestic prices drop. Also, an appreciation means that exporters must lower their prices so as to remain internationally competitive. Therefore these two channels bring an inverse relationship. The third channel involves a positive relationship. When the exchange rate appreciates then

profits are likely to increase because the prices of inputs are lower. Although there is controversy as to the direction of the influence (Soenen and Hennigar, 1988 and Goodwin et al, 1992 as opposed to Aggarwal, 1981 and Bahmania-Oskooee and Sohrabian, 1992), Kim rationalizes that the negative influence more than compensates for the positive influence.

For the stock prices, indices were used to incorporate industry-specific risk while excluding firm-specific risk. Monthly figures of the following were used:

Resources	-	J000
Industrials	-	J211
Financials	-	J080

For the interest rate, the exchange rate and inflation rate the actual rates were used, while for the stock indices, returns were used. This was firstly because stocks are usually analysed in terms of returns and secondly because it makes for easier comparison of the three indices. It is unnecessary for the variables to be differenced purely so that they are stationary because as Brooks (2002) explains, this is only required when testing for the statistical significance of the coefficients, and it may lead to the loss of some information. This article, however, purely considers the nature of the relationships between the variables.

7.4 ESTIMATION OF RESULTS

This section intends to answer empirically our research question by explaining:

1. The role of the interest rate in influencing different classes of stock returns
2. The duration of monetary policy
3. The time-varying sensitivity of stock prices to monetary policy

To do so, we classify each of the three sectors a) Financial, b) Industrial and c)Resource into two time periods. The first is from February 1992 until January 2000, and the second from February 2000 to November 2004. This is done to account for the effect of the implementation of inflation targeting as the core monetary policy in South Africa.

Because theory tells us that monetary policy in South Africa lasts for 18 to 24 months (Smal and De Jager, 2001), the period of 22 months is considered to assess the impulse response of a monetary shock on asset prices.

The following sections describe the effect of interest rate shocks on asset prices for different types of stocks.

Structural VAR Analysis

To see how an interest rate shock affects asset prices in the financial sector of stocks listed with the JSE, we apply the SVAR analysis of the AB-model (Lutkephol, 2004). With this model the relationship to the reduced form residuals is given by $A\,\mu_t = B\,\varepsilon_t$. This relates the reduced form disturbance μ_t to the underlying structural shock ε_t .

With a system constituting of 4 variables (k=4) the condition for identification requires k(k-1)/2 restrictions. Matrices A and B will therefore need 6 restrictions. Imposing a lower triangular matrix for matrix B, using reduced form VAR(2), we impose the just-identifying restriction and estimate the structural parameter by means of the maximum likelihood estimator.

To identify the four relationships among the contemporaneous innovation we restrict the B matrices such as:

$$\begin{vmatrix} 1 & 0 & 0 & 0 \\ b_{21} & 1 & 0 & 0 \\ b_{31} & b_{32} & 1 & 0 \\ b_{41} & b_{42} & b_{43} & 1 \end{vmatrix} \begin{vmatrix} I \\ p \\ ex \\ s \end{vmatrix} = \begin{vmatrix} \varepsilon_i \\ \varepsilon_p \\ \varepsilon_{ex} \\ \varepsilon_s \end{vmatrix}$$

Where I is the interest rate, p is the inflation level, ex represents the exchange rate and s shows stock returns.

The following contemporaneous equations are identified:

$I = \varepsilon_i$

$P = b_{21}I + \varepsilon_p$

$Ex = b_{31}I + b_{32}p + \varepsilon_{ex}$

$S = b_{41}I + b_{42}p + b_{43}ex + \varepsilon_s$

The first equation assumes interest rate to be exogenous (since it is set by the SARB). The second determines price as a function of interest rate. The third equation assumes that interest rate and inflation play a very important role in determining the exchange rate while the last equation determines the stock prices as a function of the exchange rate, interest rate and inflation rate.

7.4 a) Financials

Appendix 1A indicates the nature of the relationship between monetary policy and the Financial Index prices before the implementation of inflation targeting.

The impulse response function that applies to the structural vector autoregression reveals a weak response of the returns of Financials to the interest rate. It shows that a 1% change in the interest rate leads to an inverse move in Financials by just more than 0.02% and lasts for a maximum of 5 months. (The inverse relationship is explained in section 7.3.)

These findings reveal the importance of noise factors, such as sentiments, in influencing financial stocks prices on the JSE. This is supported by the variance decomposition function. Although it shows that almost 20% of a change in the stock price is caused by the interest rate, around 80% is explained by Financials itself.

Appendix 1B shows the relationship during the period after the implementation of inflation targeting. The effect of monetary policy on Financials has changed tremendously in two ways. The size of the impact is no longer significant, nor does it even last two months. The variance decomposition function shows that virtually none of the change in the stock price can be attributed to the interest rate, inflation or exchange rate.

Since the implementation of inflation targeting, the Financials stock return appears to no longer be measurably influenced by a change in fundamentals, let alone policy.

7.4 b) Industrials

During the first period, the Industrials stock return experienced a short-lived, small effect of an interest rate shock. Once again a 1% increase in the interest rate brings about a 0.02% decrease in the returns of Industrials and the impact becomes insignificant by the 5th month.

Once again, interest rate is the second most significant of the variables in explaining a change in the stock return (stock return itself being the main determinant). Noise trading is also highly prevalent with the Industrials stocks which explain around 85% of their own deviation.

Since the implementation of inflation targeting, Appendix 1C, the policy impact on these stocks has changed. Whereas the main effect used to occur immediately, it is now delayed by two months and dies out in the third. The delay can be explained as follows. Since stock returns are nowadays determined far more by expectations and less by fundamentals, by the time policy is due to change, investors have already invested their money based on heir expectations.

Together with that, just as Bernanke (1995) found that certain industries in the US were less sensitive, and slower to respond to interest rate changes, the same is true in South Africa. These reasons explain why the minimum period of investment in the Industrials sector is longer than it is for Financials. The investment therefore gets 'locked in' for a period of time and so there is no initial impact on the stock returns.

Initially, any deviation that Industrials experiences, is due to the value of the stock return itself (Appendix 1D). From then on, only insignificant amounts of its deviation are due to fundamentals.

7.4c) Resources

During the first time period the 1% shock to the interest rate resulted in an inverse move of Resources by over 0.2%. Unlike the other two stock prices, the impact only lasts for two months. The reason for this is quite simple. In the Financial and Industrial sectors, the interest rate had direct, as well as several indirect relationships with the stock price that took a few months to get factored in. With Resources, on the other hand, the relationship was far more direct, and while it was permanent, there were not additional effects that were included after a couple of months (Appendix 1E).

During the second period significant changes to the dynamics between the Resource sector and fundamentals appear to have occurred. It was found that the exchange rate had become significantly more important in influencing this index than prior to 2000. This change is due largely to the severe crash, and then tremendous recovery of the Rand. Since much of South Africa's exports are Resources, the strong moves of the exchange rate hit this sector hardest. Not only has the effect of the exchange rate on the stock price strengthened, but also its effect on the inflation and interest rates. For example, whereas the effect on interest rate used to last 5 months reaching a maximum of 0.1%, it now reaches a maximum of 0.3% and lasts for over two years.

In terms of the effect of interest rate, it now endures for 7 months with a maximum impact of 0.01%. The reason for the prolonged impact is that much of the effect now occurs indirectly via the exchange rate.

8. CONCLUSION

This article set out to answer the following questions:

a) What is the role of monetary policy in influencing the stock returns of a given asset?
b) Does the extent to which monetary policy influences the stock returns change over time?
c) Does the influence vary with the types of stock, and what can be the reason behind such a variation?

The impact of monetary policy on different asset returns, namely Financials, Industrials and Resources – was assessed. Consistent with findings abroad, monetary policy in South Africa clearly affects different sectors by varying degrees and over different time periods. The role of monetary policy in influencing stock returns as a result of individual interest rate changes was found to be very small, and its duration was not very long.

Since 2002 the interest rates have dropped considerably. Over the same time period the price earning ratios on the JSE have increased considerably. Therefore there has been a strong long run correlation

between interest rates and stock prices. During the same time our tests have shown there to be very little response from stock returns to individual interest rate changes.
The graphs show that since monetary policy can now be anticipated more easily, each individual interest rate change appears to almost insignificantly affect stock prices. However over the long term stock prices do follow the trend of interest rates.

In response to the second question, the results show an apparent change in the effects that monetary policy has on the stock market. The most significant factors to have caused these changes are the introduction of the repo rate and the volatility of the exchange rate. The use of the interest rate by the SARB as the policy instrument has enabled the market to better judge the impact that a policy change is likely to have on stock prices. This has helped the credibility and transparency of the SARB to increase tremendously to the point where investors are prepared to back their expectations of what future policy is likely to be.

For these reasons, a potential shift in the repo rate will have been accounted for in the stock price before the announcement takes place. It was found that the impact of policy on stock returns (particularly on Finanacials and Industrials) is much smaller, and the duration much shorter. Kearney (1996) supports this in his finding that the degree of unexpectedness of a policy announcement will affect the size and direction of the effect of policy. Consistent with Frisch's conclusions (Kuttner and Mosser, 2002), we found that it is not always the size of shock that determines the extent of impact, but also the strength of propagation.

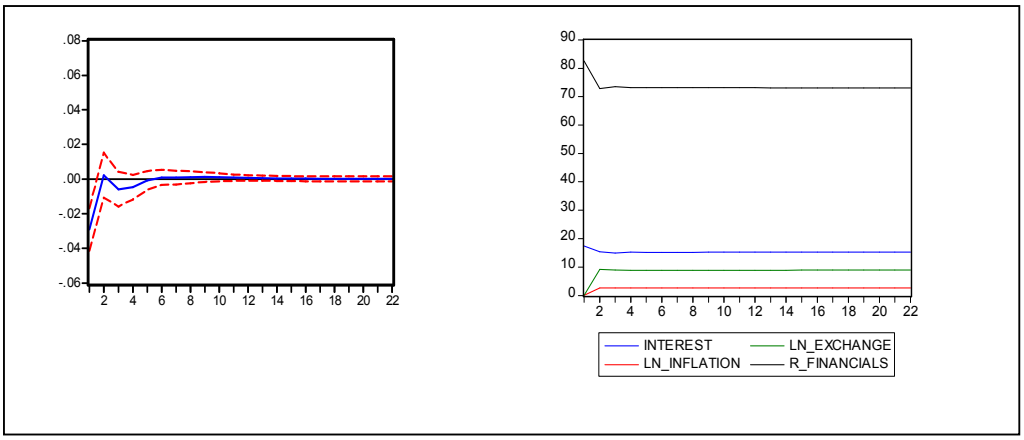
Evidence elsewhere suggests that the effects of policy do not just vary by type of asset, but also by several other factors including the size of business, and stage of business in the production process. This study found another factor that determines the responsiveness of a sector to monetary policy. Suppose there are a few other fundamentals that, although they do not appear to have large effects on a particular sector, are nevertheless important in the production process (such as the exchange rate). If this other fundamental were to then experience some abnormal volatility, then the way that this, and other fundamentals affect that sector, would change. It was found that since the Resources sector is particularly important in South Africa's foreign trade, the recent exchange rate volatility has changed the relationship between the interest rate and this sector from a direct, to an indirect one. The sector has become considerably more sensitive to exchange rate movements, to the extent that the interest rate's effect on resources is the result of its effect on the exchange rate. Most of the impact of an interest rate change on Resources now occurs via the exchange rate. This is not the case with the other two sectors.

Bollard's finding that asset bubbles return to their fundamental value after some policy intervention does not hold for South Africa. This study found that stock prices would require a significant move in the interest rate to be influenced in a meaningful way. By the time that the pressure from the bubble was eased, other sectors of the economy that are far more sensitive to the interest rate than the one with the bubble would have been severely hampered. Since 2000, the three sectors considered here have become noticeably less sensitive to monetary policy.

This study has found a change in sensitivity of the stock market to the interest rate. It also found that the part of policy's propagation through the wealth channel has changed over time (the changed relationship between Resources and interest rate). Further work on this topic could explore in more detail the reasons for the change in sensitivity towards monetary policy. It would also be interesting to know the extent to which local, and foreign investors are influenced via the stock market.

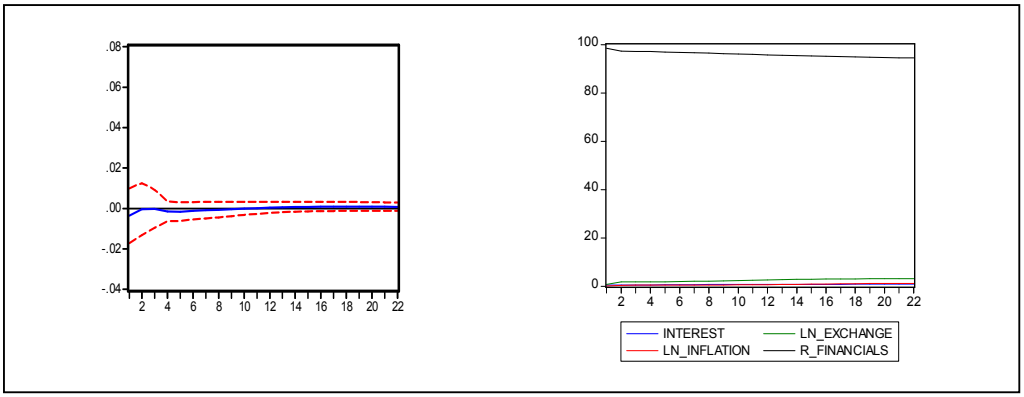
APPENDIX

Appendix 1A



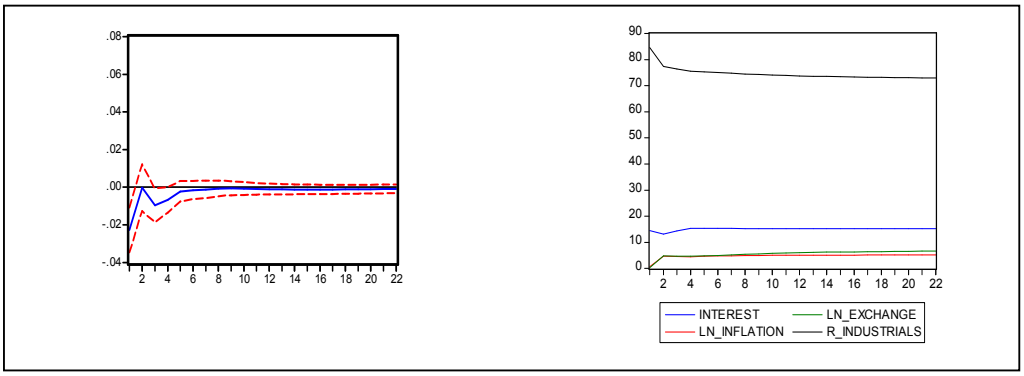
The impulse response function and variance decomposition of Financial returns to interest rates: February 1992 - January 2000.

Appendix 1B



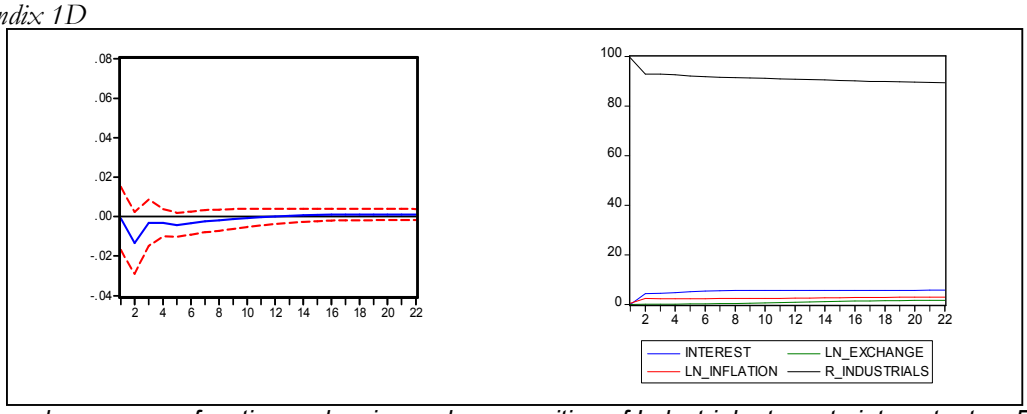
The impulse response function and variance decomposition of Financial returns to interest rates: February 2000 - November 2004.

Appendix 1C



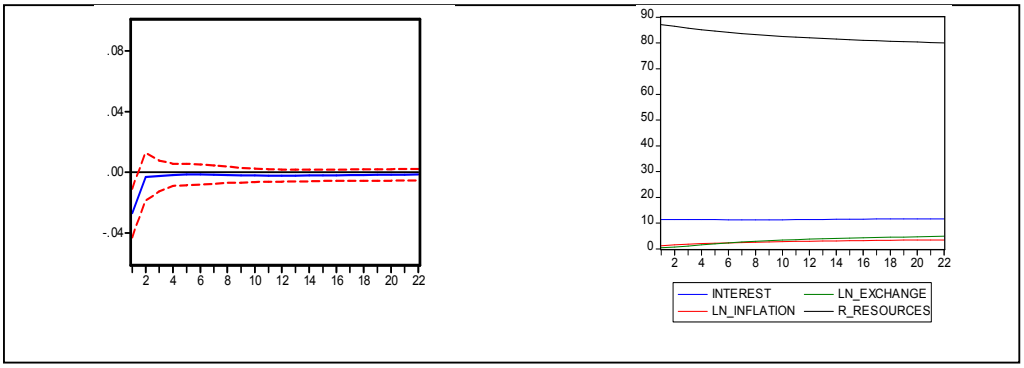
The impulse response function and variance decomposition of Industrial returns to interest rates: February1992 - January 2000.

Appendix 1D



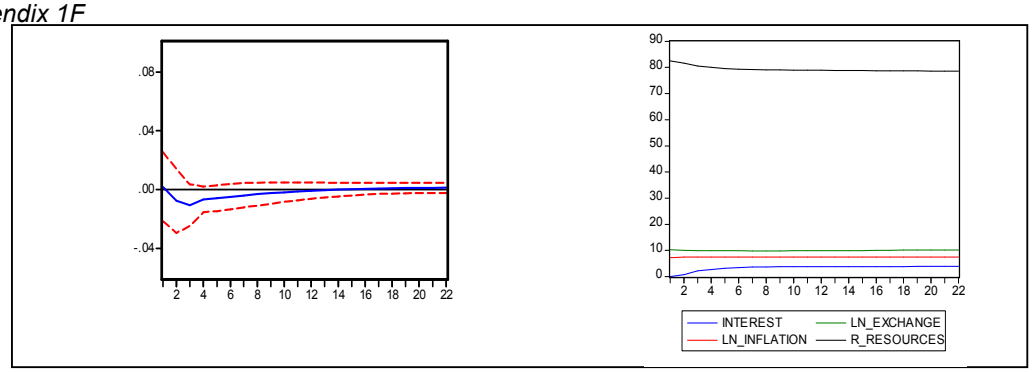
The impulse response function and variance decomposition of Industrial returns to interest rates: February 2000 - November 2004.

Appendix 1E



The impulse response function and variance decomposition of Resource returns to interest rates: February 1992 - January 2000.

Appendix 1F



The impulse response function and variance decomposition of Resource returns to interest rates: February 2000 - November 2004.

REFERENCES

Aggarwal, R. (1981). Exchange rates and stock prices: A study of the U.S. capital markets under floating exchange rates. *Akron Business and Economic Review*, 7-12.

Amisano, G. and Giannini, C. (1997). *Topics in Structural VAR Econometrics, 2nd ed.*, Springer-Verlag, Berlin.

Aron, J. and Mauellbauer, J. (2000). Estimating Monetary Policy Rules for Sout Africa, *Central Bank of Chile Working Papers*, no. 89, December.

Bahmani-Oskooee, M., Sohrabian, A. (1992). Stock prices and the effective exchange rate of the dollar. *Applied Economics*, 24, 459-464.

Bernanke, B. and Gertler, M. (1995). Inside the Black Box: the credit channel of monetary policy transmission. *Journal of Economic Perspectives*, Vol. 9, p 27-48.

Bernanke, B.S. (2003). Monetary Policy and the Stock Market: Some Empirical Results. *Fall 2003 October Banking and Finance Lecture*, Pennsylvania.

Bollard, A. (2004). Asset Prices and Monetary Policy. *Address to the Cantebury Employers' Chamber of Commerce*, Christchuch.

Brooks, C. (2002). *Introductory Econometrics for Finance*. Cambridge University Press, Cambridge, UK.

Cassola, N. and Morana, C. (2004). Monetary Policy and the Stock Market in the Euro Area; *Journal of Policy Modeling*, 26 (2004) 387-399. Germany.

Clark, T. (1999). The Responses of Prices at different stages of production to monetary policy shocks. *The Review of Economics and Statistics*, 81(3): 420-433, August.

De Long, J.B., Shleifer, A., Summers, L.H. and Waldmann, R.J. (1989). *Noise Trader Risk in Financial Markets*.

Fourie, F. (2001). *How to Think and Reason in Macroeconomics*, Juta, Cape Town, South Africa.

Friedman, M. (1998). Money and the Stock Market. *Journal of Political Economy*, 96, 221-245.

Goodwin, T.H., Farsio, F. and Willett, T.D. (1992). The Dollar and the Dow. *Rivista Internazionale di Science Economiche e Commerciali,* 39, 899-906.

Hull, J.C. (2003). *Options, Futures, and Other Derivatives, Fifth Ed.* Prentice Hall, USA.

Kearney, A.A. (1996). The Effect of Changing Monetary Policy Regimes on Stock Prices. *Journal of Macroeconomics*, Summer, Vol. 18, No. 3 pp. 429-447, Louisiana State University Press.

Kim, S. (1999). Do Monetary Policy Shocks Matter in the G-7 Countries? Using Common Identifying Restriction Assumptions about Monetary Policy across Countries. *Journal of International Economics*, Vol. 48, No. 2, pp 387-412.

Kim, K. (2003). Dollar exchange rate and stock price: evidence from multivariate cointegration and error correction model. *Review of Financial Economics,* 12 (2003) 301-313.

Kuttner, K.N. and Mosser, P.C (2002). The Monetary Transmission Mechanism: Some answers and further questions. *Economic Policy Review – Federal Reserve Bank of New York. New York*, Vol.8 Iss.1 pg.15-27 (May).

Lastrapes, W.D. (1998). International Evidence on Equity Prices, Interest Rates and Money; *Journal of International Money and Finance*, Vol. 17, No. 3, pp. 377-406.

Lewis, M.K. and Mizen, P.D. (2000). *Monetary Economics*; Oxford University Press, Oxford.

Lütkepohl, H. (2004). *Applied Time Series Econometrics*, Cambridge University Press, UK.

Lyons, R.K. (2001). *The Microstructure Approach to Exchange Rates*; The MIT Press, London.

Miller, G. (1996). The role of a Central Bank in a Bubble Economy, *Law Review*, Vol. 18, No.3, December

Morley, B. (2003). Equities and the Monetary Model of the Exchange Rate: An ARDL Bounds Testing Approach. *School of Management and Business*, University of Wales, Wales.

Neri, S. (2004). Monetary policy and stock prices: theory and evidence. Banca d'Italia. July.

Piffanelli, S. and Erturk, Y. (2001). The Instrument of Monetary Policy for Germany. A Structural VAR Approach. *Discussion Paper of the United Nations Department of Economic and Social Affairs*. September.

Smal, M.M. and De Jager, S. (2001). The Monetary Transmission Mechanism in South Africa. *South African Reserve Bank Occasional Paper,* No. 16, September 1.

Smets, F. (1997). Measuring Monetary Policy Shocks in France, Germany, Italy: The Role of the Exchange Rate. *Bank for International Settlements working paper*, No.42.

Soenen, L.A. and Hennigar, E.S. (1998). An analysis of Exchange Rates and Stock Prices: The US Experience between 1980 and 1986. *Akron Business and Economic Review,*7-16.

Tulloch, S. (1996). *Reader's Digest Oxford Complete Wordfinder*. Oxford University Press, London.

Thibadeau, R. (2004). Another Saturday Afternoon on the Internet. http://rack1.ul.cs.cmu.edu/sinflat

Van der Merwe, E.J. (2004). Inflation Targeting in South Africa. *South African Reserve Bank Occasional Paper*, No 19, July, South African Reserve Bank.