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2021
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The Impact of Monetary Policy Announcements by the South African Reserve Bank on Stock Market Returns Using Forward Rate Agreements

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A dissertation submitted to the Wits Business School, University of the Witwatersrand, Johannesburg, South Africa, in fulfilment of the requirements for the Master of Management in Finance & Investment.

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Johannesburg: March 2021

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DECLARATION

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ABSTRACT

The objective of this paper is to explore the unanticipated impact of monetary policy announcements on stock market returns using Forward Rate Agreements (FRAs). This paper looks at the Johannesburg Stock Exchange (JSE) All Share Index and two other sectoral specific stock market indices (Financial and Industrial sector indices) and assess the responsiveness of these stock market returns to unanticipated monetary policy announcement shock. In an attempt to understand this relationship between monetary policy and the stock market, the main empirical view suggests that decomposing monetary policy changes into anticipated and unanticipated components is crucial for discerning their effects. The decomposition of unexpected policy rates is based on the futures market. In the absence of the South African interest rate futures market, this study employs a FRA which serves as a measure of monetary policy surprise.

This study begins with a 1-day event study, which examines the immediate impact of monetary policy shocks on the stock market, and then use an Ordinary Least Squares (OLS) regression analysis, which provides insight to into the dynamic effects of the unanticipated interest rate shock on the stock market. This study employs a time series percentage change daily closing prices of the South African stock market (JSE all share Index, sub-indices), actual changes in the South African Reserve Bank(SARB) repo rate, and the FRA, spanning the period January 2010 through to December 2019, which explores the post-global recession dynamics. The study shows that a hypothetical unanticipated increase of 1% repo rate results in a decline of 0.32 percentage of the Johannesburg Stock Exchange ALL SHARE Index. The findings and recommendations are crucial for the South African central bank authorities and stock market participants as it explains the process through which monetary policy outcomes are transmitted to the real economy, inflation and employment. A future piece of work could contemporarily assess the impact of monetary policy and other sector related and political events on the stock market

DEDICATION

First and foremost, I want to thank God for empowering me with knowledge to withstand this work during uncertain and abstract times. I dedicate this Dissertation to my mother for her love and support throughout my life. Thank you for giving me strength to reach for the stars and chase my dreams.

ACKNOWLEDGEMENTS

I would like to thank my supervisor Dr. Euphemia Godspower-Akpomiemie for her great guidance and support during this study, without her this would not have been possible. I would also like to thank my sisters (Khanyisa and Yvonne), who without this would have not been possible. My sincere thanks go to Mr Mothupi Modiba for having shown faith in me by pledging financial resources for me to pursue this Master's degree, without his generous hand, I wouldn't be a Masters holder today. Lastly, I want to thank my good friends, Russel Mulamula, Vukosi Era Maluleke, Nathi Ndlovu and Vukosi Sambo, thank you for taking interest in my work.

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LIST OF SYMBOLS

Δ	Percentage Change

NOMENCLATURE

ADF	Augmented Dickey Fuller
ANC	African National Congress
BA	Bankers' Acceptance
BRICS	Brazil, Russia, India, China, South Africa
BVAR	Bayesian Vector Autoregression
CPI	Consumer Price Index
DW	Durbin-Watson
ECB	European Central Bank
EMH	Efficient Market Hypothesis
FED	Federal Reserve
FOMC	Federal Open Market Committee
FRA	Forward Rate Agreement
FEVD	Forecast Error Variance Decomposition
GARCH	Generalized Autoregressive Conditional Heteroskedasticity
GDP	Gross Domestic Product
JIBAR	Johannesburg Interbank Agreement Rate
JSE	Johannesburg Stock Exchange
MPC	Monetary Policy Committee
NDP	National Development Plan
OECD	Organization for economic operation and development
OLS	Ordinary Least Squares
REPO	Repurchase Agreement
S.A	South Africa
SARB	South African Reserve Bank
SVAR	Structural Vector Autoregressive
SVEC	Structural Vector Error Correction
UK	United Kingdom
USA	United States of America
VAR	Vector Auto Regressive

Chapter 1: Introduction

1.1 Context of the study

The majority of countries in Africa have encountered many economic challenges over the years, and regular changes to monetary policy have not yielded any desired economic results (Iddrisu, Harvey & Amidu, 2016). This raises many questions about the effectiveness of monetary policy in stimulating economic activities. Aziza (2010) defines monetary policy as a tool utilised by Central banks to influence the required rate of inflation, growth in real economic activity, stabilisation of the exchange rate, real output, employment. As a result, monetary policy outcomes tend to affect the broader financial markets ranging from the stock market, foreign exchange market, and the bond market to list a few.

The overriding objective of monetary policy is usually to maintain and restore financial market stability within the economy (Bissoon et al., 2016). Such policies can either be expansive or restrictive depending on the type of instruments (interest rates and money supply) used by central banks (Bissoon et al.,2016). Expansionary policy is achieved through decreasing interest rates or increasing the stock of money in circulation in the economy. This is done traditionally to stimulate the economy and also used to increase employment opportunities in a recession (Aziza, 2010). Whereas, restrictive policy on the other hand is achieved by increasing interest rates or decreasing the money in circulation in the economy. This is done to keep inflation within the targeted range. Monetary policy is implemented by the central bank to realise a set of objectives that are demonstrated in terms of macroeconomic variables such as inflation, real output, and employment (Ioannidis & Kontonikas, 2008). However, monetary policy instruments are found to influence these variables at best indirectly (Bernanke & Gertler, 2005).

Petelis (1997) shows that monetary policy decisions play a significant role in predicting asset returns in the United States of America (USA). He contends that a relationship between future expected excess stock returns and monetary policy variables exists. The most immediate and direct impact of monetary policy actions is on the financial markets through changes in the federal funds rate which affects asset returns and prices (Bernanke & Gertler, 2005).

Monetary policy tools used by the central bank include interest rates, reserve requirements (cash requirements or cash ratio and liquidity), rediscount rate, selective credit controls, treasury rate amongst others (Aziza, 2010). Stock prices can be affected by changes in interest rates in two ways: firstly, it affects the discount rate which financial market participants use to calculate the present value of the firm's future cash flows, and secondly, it influences expectations of future performance of companies (Schrey & Hafdísarson, 2017).

Bernake & Gertler (2005) holds a view that, in the context of short-term monetary policy management, central banks should pursue a unified policy framework that treats financial stability and price stability as highly complementary and mutually consistent. The global equity market volatility that was experienced in 2007/08 and the economic instability that followed revived the debate on whether stock prices influence economic activities as well as the role of monetary policy in protecting economies against disruptive effects of stock market volatility (Bonga-Bonga, 2012).

Apart from the 2007/08 financial crisis that befell global economies, previous centuries recorded two other major economic events of unexpected asset price reversals after sustaining long periods of stock price increases. The two major events were; 1929 US market crush and the Japanese experience of the late 1980s and early 1990s. Both events were characterised by asset price boom-bust cycles, which is the decline in asset prices that triggered increased banking and financial sector instability that consequently slowed down real economic activity (Ioannidis & Kontonikas, 2008).

Bernanke & Gertler (2005) points out that the volatility in asset prices has been a major preoccupation for academics as it has the potential to destabilise financial markets. Although there is wide consensus on what constitutes volatility in the stock market, to a lesser degree to quantify it, the causes of changes in stock market volatility have generated huge debates (Mala & Reddy, 2007). Some argues that the changes in stock price returns is as a result of unanticipated information or events like the terrorist attack of 2001 in the United States, while some claim that volatility could be due to changes in trading volumes, patterns, or practices (Mala & Reddy, 2007).

However, it is strongly argued by most economists that monetary policy has a strong influence on stabilising financial market activities. Under new Keynesian theory, central banks through monetary policy tools can exert some level of control on real interest rates as a result of sticky prices in the short run (Bjørnland & Leitemo, 2009). In the emerging market context, the role of the stock market in influencing real economic activity is increasing, hence proponents are arguing for a much proactive role of central banks (Muroyiwa, Ezeoha, & Mushunje, 2017). From the viewpoint of monetary policy setters, asset prices are a key determinant in the evaluation of the transmission process of interest rates (Bohl, Siklos & Sondermann, 2008). Hojat (2015) argues that changes in monetary policy both quantitative (through changes in interest rates) and qualitative methods (through wording in statements released by central banks) provides forward guidance about the future economic path.

Information communicated by central banks about monetary policy decisions is incorporated by financial markets to improve investment decisions, which eventually reflect stock prices (Gupta & Reid, 2013). Central banks have moved towards greater transparency in the past decade by increasing the channels of communication and the level of information provided to the public (Amato, Morris, & Shin 2002).

The effectiveness of monetary policy is not only measured by the instruments they employ to execute their mandate, but also involves a high degree of transparency in communicating their decisions. Blinder et al., (2008) highlight that, independent central banks have a responsibility to explain their decisions and rationale underpinning their actions to increase transparency in their operations.

Before period 1994, central banks across the globe were not transparent in the way they used to implement monetary policy. It was only after February 1994, when the Federal Open Market Committee (FOMC) began publishing in its statements an assessment of its bias concerning future changes in monetary policy (Blinder et al., 2008). Central bank communication has evolved as a significant instrument for central bankers over the past 15 years (Neuenkirch, 2013). Blinder et al., (2008) define Central bank communication as the provision of information to the public highlighting the monetary policy strategy, objectives, economic outlook, and the outlook for future

policy actions. By providing information to the public, Central banks can influence economic activity as market participants continuously incorporate information provided in their investment decisions. Lately, it is broadly accepted that central banks can affect the economy by influencing market expectations about the future path of overnight interest rates (Blinder et al., 2008).

This research provides an empirical analysis on the effect of interest rate announcement on the South African (S.A) stock market between 2010 and 2019. It establishes a link between monetary policy outcomes and financial assets which is determining the role of the transmission mechanism in economic development (Ioannidis & Kontonikas, 2008).

1.2 Problem Statement

The South African Stock Exchange, popularity known as the JSE is by far the largest and most liquid stock market in Africa which makes it the most lucrative investment destination of market investors in the equity space (Muroyiwa, Ezeoha, & Mushunje, 2017). By the end of October 2018, the JSE market capitalization stood at around 891.71 USD Billion which records a decrease of from the previous number of 988.339 USD Billion for September 2018 (CEICDATA, 2018). The JSE has consistently been in the top 20 most capitalized stock exchange and also falls within the top 6 of emerging market economies with more than 400 firms listed (Hassan, 2018). The South African stock market importance to the national economy, measured by the ration of the market capitalization to the GDP is at 332% in 2018 and this is unusually large which placed it second largest in the world (Bloomberg, 2018). The mining sector is both the foundation of the bourse and a reason for development and growth of the South African financial services sector (Hassan, 2013). The role played by equity market in South Africa is also increasing by day, hence it is important for the SARB to understand the role and impact the JSE has on their decisions, the economy and ultimately goals they seek to achieve.

A considerable amount of theoretical and empirical contributions suggest that stock prices play a crucial role in economic development via wealth and balance sheet effects (Kontonikas & Montagnoli, 2008; Ioannidis & Kontonikas, 2008; Bjørnland & Leitemo 2009). Changes in monetary policy outcomes affect investor's decisions and stock market returns. Based on the

literature review, studies carried out in other countries across different economies have empirically displayed that macroeconomic policy outcomes influence the performance of the stock market. Studies by Kuttner (2001); Bernanke & Kuttner (2005); Bredin, Gavin & O Reilly (2003); Wiranto (2008), Rigobon & Sack (2002) did event studies that discriminated between anticipated and unanticipated changes in the policy instrument to assess the impact of monetary policy on the stock market. It is argued that studies that fail to isolate monetary changes into the anticipated and unanticipated components are most likely to record biased results due to an error in variables problems (Bredin, Gavin & O Reilly, 2003).

In the South African context, a recent study has investigated the sensitivity of industry stock returns to monetary policy and macroeconomic news (Gupta & Reid, 2013). Their study was able to decompose the expected and unexpected components of monetary policy surprise by using the change in the 3 months Banker's acceptance (BA) rate on the day of the day of MPC meeting announcement. Another study by Ramatlo (2019) was able to make a distinction between anticipated and unanticipated policy changes and found that a surprise 100 basis points increase cause a short-term decrease of the JSE ALL Share index by 2.71%. Her study used Johannesburg Interbank Agreed Rate (JIBAR) to capture the unanticipated component of monetary policy. To the best of my knowledge, there is no study that has examined the impact of monetary policy announcements on the South African stock market performance using Forward Rate Agreements (FRAs) to identify unanticipated monetary policy announcement shocks post the global financial crisis of 2007/08. However, a related study to this topic was done by Aron & Muellbauer (2007) who used FRAs as a proxy for expectations on future interest rates to assess the credibility and predictability of monetary policy since the adoption of inflation targeting framework in S.A. Therefore, this study was considered to empirically identify, investigate, and understand the impact of monetary policy decisions on stock market returns in South Africa using the FRAs.

1.3 Research Objectives

Based on the identified problems, the objective of this study is to assess the impact of monetary policy announcements on the South African stock market at an aggregate and industry specific level in an event type study between period 2010 and 2019. Firstly, the study decomposes policy

rate changes for South African stock market returns into their expected and unexpected components on the day of the policy change on information gathered from forward rate agreements. Next, I regress these surprise and anticipated repo rate changes on the Stock market returns on the day of the change in the respective policy rate cycle. Ultimately, this would aid to material stakeholders within the market environment to make investment decisions based on a balance of risks decision attached to the stock market reaction after the monetary policy announcement has been made on the last day of the Monetary Policy Committee meeting.

1.4 Significance of the study

This study analyses the impact of monetary policy announcements on stock market returns in South Africa. It deepens our knowledge of the nature of transmission mechanism of monetary policy in the South African economy. This study also provides additional information on financial asset investors (Equity and Bonds Investors), policymakers, the academic community, and other stock market stakeholders on how monetary policy announcements by the SARB impact stock market returns. Moreover, it further provides investors with information on how monetary policy outcomes alter the performance of their portfolios, therefore will aid investment decisions.

1.5 Outline of the Study

This study was organised into five chapters. The first chapter constituted an introduction to the study which comprised the background to the study, problem statement, research objectives, and significance of the study. The second chapter presented the theoretical framework for the monetary policy transmission mechanism, review of literature on various papers, journals, theses that discuss monetary policy outcomes and the stock market. The third chapter discussed the methodology and the estimation process for the impact of monetary policy outcomes on stock market returns in South Africa. The fourth Chapter covered the results and the discussions on the findings of the study. Chapter Five focused on the research summary, findings, conclusion, and recommendations.

Chapter 2: Brief Literature Review

2.1 Introduction

The relationship between monetary policy decisions and financial asset prices has been studied in academia at great length across the world. The causal complexities between monetary policy outcomes and asset returns have become an interesting subject matter for financial economists as policy changes affect investor's required rate of return on assets (Stoica & Diaconasu, 2012).

The role of monetary policy in determining equity returns is either through changing the discount rate or by influencing the expectations of market participants about the future of economic activities (Ioannidis & Kontonikas, 2008). Having discovered contradictions in the literature concerning the relationship between monetary policy outcomes and the stock market performance, this section discusses different academic positions to critically evaluate the arguments and findings pronounced in different studies and economies the world over.

2.2 Efficient Market Hypothesis consistent

During the 1960s, the efficient market hypothesis (EMH) was introduced into the literature of financial economics and the theory was coined to refute claims of technical stock analysis which predicates future price movements on past price patterns of stocks (Schrey & Hafdísarson, 2017). Fama (1995, p.76) defines an "efficient market hypothesis as a market where there are a large number of rational Profit-Maximiser's actively competing, with each other trying to predict future market values of individual securities, and where important current information is almost freely available to all participants".

It is generally believed when financial market participants become aware of new information, the news will quickly be reflected into the prices of securities without any delay and consequently, stock prices should be consistent with fundamentals. The EMH in the modern stock market is described by trading conditions due to the free flow of information and trade execution is faster than ever (Degutis & Novickytė, 2014).

Apart from the definition of efficient markets, Fana (1970) produced an article that provided a distinction between three forms of efficiency- weak, semi-strong, and strong form. The weak form efficient market hypothesis is consistently tied to the idea of a "random walk. In the finance literature, random walk is described as a price series where all successive asset price variations represent arbitrary departures from previous prices (Malkiel, 1989). The rationality around the random walk theory is rooted in the idea of a free flow of information and the immediate reflection of such information on stock prices once available to market participants. Therefore, it further implies that tomorrow's changes in asset prices reflect tomorrow's information independent of the changes in asset prices of today.

Bodie, Kane, and Marcus (2014) gave a detailed description of market efficiency as follows:
The **weak-form hypotheses** state that market trading data such as the historical prices, short interest, and trading volume will be reflected in today's stock market levels. This form of market efficiency denotes that trend analysis is regarded as ineffectual. Previous stock price data is freely available to the public and at no cost, and therefore this hypothesis indicates that all investors already would have learned to exploit the signals derived from the publicly available data to predict future stock market performance. Eventually, the signals become obsolete as they are broadly identified because a sell signal, for example, would result in an instant price decrease.

The **semi-strong form** hypotheses assert that stock prices must reflect all publicly available information regarding the prospects of a firm. The said information includes amongst others quality of management, balance sheet composition, patents held, earnings forecast, accounting practices, product line. Again, if financial market participants freely have access to this kind of information from publicly available sources, it should be expected that it will be reflected in stock prices.

Lastly, **the strong-form** hypotheses highlight that not only reflects all information relevant to the firm but also information available only to insiders privy to the inner workings of a firm. This market hypothesis is rather extreme and it could be argued that insiders are fortunate enough to gain access to pertinent information in advance before public release could use that advantage to profit from trading on that information.

These theories demonstrate that the financial markets cannot function optimally without data and therefore the distribution of information is illustrious through different forms of market efficiencies. Investors rely on information to optimally allocate savings by accurately estimating the future values of a financial asset. The efficient market hypothesis was tested in many capital markets across global economies, thus demonstrating different outcomes. Examining the Istanbul Stock Exchange (ISE) on a monthly return index-20 from January 1986 to November 2005, Aga & Kocaman (2008) concluded that the time series analysis demonstrates that the returns can be described only by the constant term, which is mean and there is a weak form of efficiency in ISE. Meaning that the market is weakly efficient if the current prices cannot be explained with the historical values.

Findings by Borges (2010) on the efficient market hypothesis for six European stock markets (Greece, France, Germany, UK, Portugal, Spain) from January 1993 to December 2007 showed evidence that monthly prices and returns follow random walks in all six countries. However, Daily returns demonstrate mixed results. Daily returns are not normally distributed due to being negatively skewed and leptokurtic; Germany, UK, and Spain display a random walk behavior whilst the hypothesis did not meet most of the criteria for Portugal and Greece as a result of serial positive correlation.

Guduza & Phiri (2017) investigated a weak form efficiency for 4 stock and 7 bond market return on the JSE from 2002 to 2016. The study used both individual and panel-based unit root testing methods to overwhelmingly conclude that there is evidence of weak-form efficiency as the integration test failed to establish evidence of unit root behavior amongst the time series data observed. Therefore, the study by Guduza & Phiri (2017) on the efficiency of debt and stock markets in the South African economy given the global financial crisis is thus confirmed. A study done on the South African stock market by Van Heerden et al., (2013) examined the efficient market hypothesis on the JSE between 2001 and 2013. It is worth noting that the study deviated away from the orthodox use of the linear approach to employ the Threshold Autoregressive (TAR) model and corresponding asymmetric unit root test to show how the stock market progresses as highly persistent and nonlinear. The study found that for most of the time series under observation,

the stationarity hypothesis among the variables is rejected by the formal unit root test. These findings bridge two contrasting views derived from previous studies by deducing that even though several stock prices on the JSE may not change as pure unit root methods, the time series are, conversely, highly robust to be regarded as weak-form efficient.

2.3 Quantity Theory of Money

There are at least two consistent explanations regarding the assumptions that stock prices are negatively related to unanticipated announced changes in money supply (Pearce & Roley ,1983; Lucas, 1980). The first explanation is that the unexpected rise in money supply, market participants revise upward their future inflation expectations. Consequently, there are several channels in which the rise in inflation expectation subdues the equity returns. Feldstein (1983), argues that the reason why the expected rise inflation depresses the stock market is due to the fact that inflation raises effective tax rate on corporate source income. Lower expected corporates profits require stock prices to fall in order for stock to regain its competitive advantage. The second channel relates to the notion that the rise in inflation expectation would cause the equity prices to fall as it raises the expected returns on alternative assets such as real estate ((Pearce & Roley ,1983). Lastly, Feldstein (1993) contends that equity prices are subdued because the rise in expected inflation raises the rate of interest rate that can be derived by investing in nominal return on bonds. He argues that this argument be overruled since the higher nominal rate of interest rate generally corresponds to unchanged real rate of interest rate.

According to Pearce & Roley (1983), the second explanation is that the response of equity prices to unexpected money supply reflects market participant's expectations of the reaction of the Federal Reserve Bank to the surprise. Lucas (1980, p.1005) posits that these assumptions outlines above "possess a combination of theoretical coherence and empirical verification shared by no other propositions in monetary economics".

In Particular, central banks increases short term interest rates to offset the surge in money. Furthermore, with lagged reserve accounting, short term interest rates may rise even in the absence of central banks actions if market players increase their assessment of the excess demand for reserves (Pearce & Roley, 1983).

The first step in assessing the reaction of the stock prices to announced changes in money is usual linear model is employed as represented by Pearce & Roley (1983, p. 4) using the following models:

$$\Delta SP_t = a + b\ (\Delta M_t^a - \Delta M_t^e) + e_t$$

Where ΔSP_t = Change in stock prices observed after the money announcement

ΔM_t^a = announced change in the money stock

ΔM_t^e = expected change in the money stock

e_t = random error term

The basic proposition of the efficient markets theory is that only the unexpected change in money should influence stock prices so that the data should not reject the restriction that the coefficients on ΔM_t^a and ΔM_t^e sum to zero. The hypothesized behavior of security market participants outlined above further stipulates that b should be negative

However, assertions about the theory of money assumptions discussed above by Pearce & Roley (1983) have been empirically and theoretically critisised by other economists. Firstly, Smith, (1988) argues that in order for the theory of money propositions to hold, monetary changes need to have a material impact on the consolidated balance sheet of the Nations treasury and central bank. However, monetary actions that fails to alter this consolidate balance sheets can be immaterial for stock prices and interest rates. Sargent & Smith (1988) demonstrated this point by providing a once and for all change in money stock that produced a no effect impact on prices or interest rates. One of their finding is that central banks open market operations accomplished with fiscal policy held constant (that occur with the consolidated balance sheet of the Central bank and National Treasury unchanged) have no impact on prices. Secondly, they found that Governments attempt to intervene in the foreign exchange market can be effective if can only be effective if complemented by fiscal policy actions that have redistributive outcomes. Smith (1988) explains this further by highlighting that when central banks engage in in open market operations, they achieve that by exchanging interest bearing liabilities like bonds and non-interest bearing liabilities like currency.

2. 4 Standard Valuation Model: Discounted Cash Flow Model

The Discounted cash flow model provides critical insights on the effects of monetary policy actions on the stock market. Ioannidis & Kontonikas (2008, p.4) expanded on this theory by providing a more detailed explanation:

According to this widely used model, the stock price (S_t) is the Present value of expected future dividends (D_{t+j}), Under the assumption of constant discount rate (R), It can be shown that

$$\boldsymbol{S_t = E_t}\left[\sum_{j=1}^{k}\left(\frac{1}{1+R}\right)^{J} D_{t+J}\right] + \boldsymbol{E_t}\left[\sum_{j=1}^{k}\left(\frac{1}{1+R}\right)^{K} S_{t+k}\right] \quad \textbf{(1)}$$

Where, E_t is the conditional expectations operator based on information available in the market participants at time *t*, *R* is the rate of return used by market participants to discount future dividends, and K is the investor's time horizon (stock holding period). The standard transvesality condition implies that as the Horizon *k,* increases the second term in the right hand sight of Eq. 1 vanishes to zero (no rational stock price bubbles):

$$\lim_{n\to\infty} \boldsymbol{E_t}\left[\left(\frac{1}{1+R}\right)^{K} S_{t+k}\right] = \mathbf{0} \quad \textbf{(2)}$$

Thus, we obtain the familiar version of the present value model:

$$\boldsymbol{S_t = E_t}\left[\sum_{j=1}^{k}\left(\frac{1}{1+R}\right)^{J} D_{t+J}\right] \quad \textbf{(3)}$$

Eq. (3) indicates that a change in monetary policy can affect stock returns in a dual manner. First, there is a direct effect on stock returns by altering the discount rate used by market participants. Tighter monetary policy leads to an increase in the rate at which firms' future cash flows are capitalised causing stock prices to decline. The underlying assumptions are that, first, the discount factors used by market participants are generally linked to market rates of interest and second, the central bank is able to influence market interest rates. Second, monetary policy changes exert an indirect effect on the firms' stock value by altering expected future cash flows. Monetary policy easing is expected to increase the overall level of economic activity and the stock price responds in a positive manner (expecting higher cash flows in the future). Hence, this channel generally assumes the existence of a link between monetary policy and the aggregate real economy. As

Patelis (1997) argues, stocks are claims on future economic output, so if monetary policy has real economic effects then stock markets should be influenced by monetary conditions. The application of this theory is further expanded in section 2.5 below.

2.5 Central Bank Communication and Announcement effect

Since financial market participants are forward-looking, central banks affect the economy as much by influencing expectations through any direct, mechanical effects of central bank trading in the market for overnight cash (Woodford, 2005). Shaping and managing market expectations is an important part of monetary policy and this process is only possible with an effective channel of communication between a central bank and financial markets (Amato, Morris, & Shin, 2002). Central banks manage expectations by reducing noise or creating news. News creation focuses on how the central bank's announcement influence expectations and therefore drive movements in asset prices (Blinder et al., 2008).

Noise reduction focuses on the ability of the central bank to increase the predictability of its actions to reduce volatility in the financial markets (Blinder et al., 2008). This indicates that, if financial markets have all the information, they can accurately assess the developments of the economy and thus reduce levels of uncertainty in the market (Lehtimäki & Palmu, 2019). Woodford (2005) argues that the central bank's willingness to share with the public information and assumptions on future policy increases the predictability of monetary policy to achieve financial markets stability. With the help of new technologies, the amount of information central banks produces and communicate has been expanded in response to the increasing weight of transparency (Lehtimäki & Palmu, 2019).

Evidence by Blinder et al., (2008) indicates that communication can be a significant component of the central bank's toolkit as it can influence movements in the financial markets, assist central banks to achieve their macroeconomic objectives, and potentially improve the predictability of monetary policy decisions. The study from Neuenkirch (2013) supports the idea of a relationship between monetary policy change signals and asset prices. The study analysed the Swiss Economic Institute's Monetary Policy Communicator to measure the future path of the European Central Bank's monetary policy and found that communication influences prices and output. The study

further shows that communication partially crowds out the impact of the short-term interest rate as the latter's influence is lower and its implementation lag increases compared to a benchmark model without central bank communication.

Luangaram & Sethapramote (2016) did a broad assessment of communication on Thailand's monetary policy effectiveness looking at the following aspects, i.e., predictability of short-run policy interest rate, monetary transmission mechanism, and the ability to anchoring long-run inflation expectations. The study augmented the communication measure with various Taylor-type rule specifications and determined that monetary policy statements assist in improving the predictability of short-run interest rates. The study further used structural vector autoregression to find that when communication is incorporated, the impulse responses of policy rate shock on inflation and output are robust, demonstrating the enhanced effectiveness of the transmission mechanism process. Lastly, increasing interest rates can anchor inflation in the short run, whereas monetary policy communication drives long-term inflation expectations.

A study by Waud (1970) supports the existence of a relationship between signals of changes in monetary policy and stock prices. He assessed the public interpretation of federal discount rate changes experimenting with the announcement effect. According to Schrey & Hafdísarson (2017), Market participants will always have expectations about future cash flows and economic trends. Waud (1970) argues changes in the discount rate have a psychological impact on Market wide expectations about the future performance of the economy. His study concludes that there is a notable effect of the announcement effect on expectations associated with changes in the discount rate and that days preceding to the reduction of the discount rate, the seems to exists evidence of the anticipation of change. The conclusion that can be drawn from Waud's findings is that impact associated with interest rate outcomes and monetary policy decisions comprise of information that provide clues about the future economic conditions.

Bomfim (2003) analyses pre-announcement and news effects on the stock market returns in the context of public disclosure of monetary policy decisions. His study focused on two vantage points: days around FOMC scheduled meetings and days of actual policy announcements involving the target level of the federal funds rate. He concludes that the equity market tends to be

moderately muted and conditional volatility is abnormally low on days prior to regular monetary policy announcements.

Chen, Mohan and Stener (1999) examine the impact that the discount rate changes has on the equity market returns, volatility, and trading volumes using intraday data. The study found that the returns in the stock market largely react negatively and significantly to the unexpected announcements, whereas the impact of impact of expected changes on stock is insignificant. Moreover, the study also finds that stock prices react to announcements within trading hour/period after the information has been made public. This then supports the idea that unexpected changes in the discount rates impact returns regardless of the FOMC operating procedure.

2.6 Monetary Policy Transmission Channel to the Stock Market and the Real Economy

It is generally accepted by economists that monetary policy changes are transmitted through the stock market via changes in the cost of capital and the wealth effect (Bernanke & Kuttner, 2005). A study by Ioannidis & Kontonikas (2008); Bjørnland & Leitemo (2009) concluded that shifts in monetary policy greatly affect stock returns and as a consequence, the idea of monetary policy transmission through the stock market is reinforced. Moreover, the quantity theory of money further qualifies the relationship between money supply as a monetary policy instrument and stock prices. When central banks increase the quantity of money in the economy, this action creates a surplus and as a result, banks lend to households and firms thus inducing demand for consumption and investment (Bissoon et al., 2016). The main link in the transmission mechanism of monetary policy can be best illustrated in the flow chart diagram below:

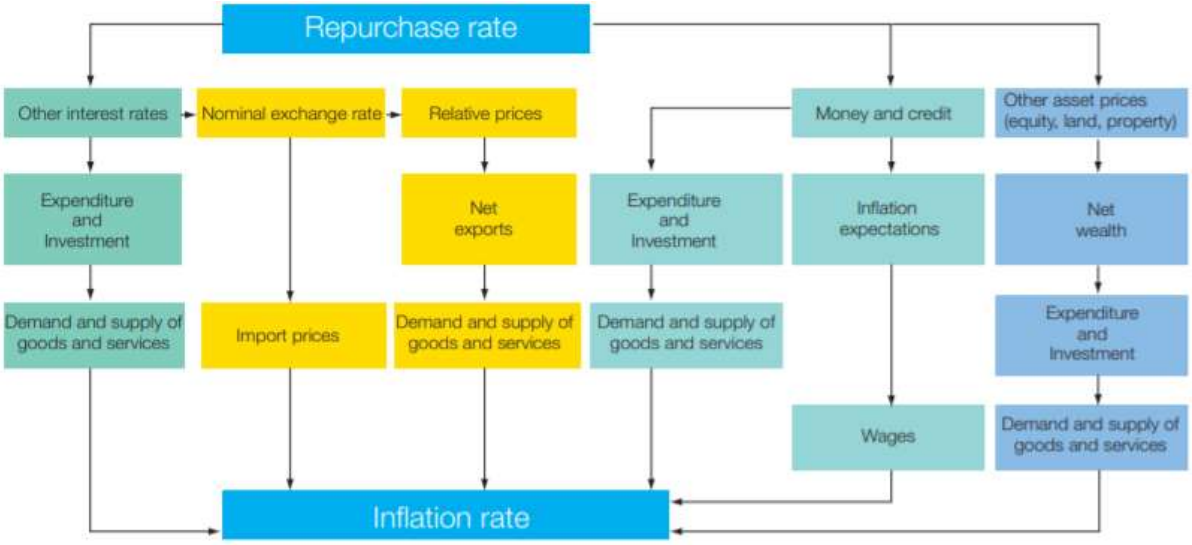


Figure 2.1 : Monetary Policy Transmission Mechanism

Source: Smal & De Jager, 2001

Asset prices are affected by monetary policy outcomes through changes in the discount rate and/or changes in expected future dividends (Kontonikas & Montagnoli, 2002). It is widely assumed that equity prices are determined in a forward-looking manner, reflecting the anticipated future discounted sum of returns on the assets. Bjørnland & Leitemo (2009) argues that changes in asset prices can either be as a result of changes in expected future interest, changes in the premium of stock returns, or changes in expected future dividends. Stock valuation is achieved through future cash-flows and discounting at the appropriate interest rate level, estimated by taking into account the prevailing interest rate in the market (Bissoon et al., 2016). Earlier studies done by cook and Hahn (1989) find little evidence that market interest rates can be influenced by the decisions of the Federal Reserve (Fed). Roley and Sellon (1995) found a much closer connection but the Fed interventions and long-run interest rates appear more variable and looser. Therefore, these findings contradict conclusions made by Kuttner (2001) that changes in monetary policy have an effect on interest rates and therefore can impact discount rates. What is notable about studies that failed to distinguish that did not find monetary policy having an impact on interest rates, is that they failed to discern between anticipated and unanticipated components of monetary policy changes. The complication with approximating the response of the stock market to monetary policy sterns from the fact the stock market is unlikely to react to anticipated policy actions (Bernanke & Kuttner,

2001). What is interesting to observe in the literature involving the effects of monetary policy channel is the constant distinction made during announcements to capture the component of anticipated and unanticipated interest rate changes. According to Bernanke & Kuttner (2005), making a distinction to separate the effect of monetary policy into expected and unexpected on interest rates is crucial for understanding the relationship between policy actions and market interest rates. Kuttner (2001) posits that the anticipated and unanticipated effect of monetary interventions is different, he explains that the anticipated change in monetary interventions is small, whereas a big change can be observed on the unanticipated shift.

The majority of economists agree that real economic activity relates to the stock market performance, whilst a few claim that stock returns play any role beyond just serving as an indicator for anticipated future corporate profits (Aziza, 2010). Bonga-Bonga (2012), highlights that equity prices affect real economic activities through various channels (consumption wealth channel and balance sheet channel).

In the context of the consumption wealth channel, it relates to households owning shares in the stock market listed entities. Whenever stock prices appreciate in value, households feel wealthier as this increases their financial wealth resulting in higher consumption. However, Neri (2004) has argued that empirical evidence concluded in the US, Canada, and the UK shows that the relationship between financial wealth and consumption in reaction to changes in stock prices is not impressive. Although the effects on aggregate demand and the output passing through this channel may be small in these countries, it does not invalidate the fact that stock price increases may create incentives for consumers to take effect.

The balance sheet channel effect presents itself in the form of investment decisions taking into consideration the quality of the company's balance sheet. A rise in asset value increases the value of shareholder's equity and thus making it favourable to raise debt funding by offering quality collateral.

2.6.1 Empirical evidence from the Developed Economies

Schrey & Hafdísarson (2017) examined the Icelandic stock market reaction to changes in the interest rate and also to determine if the stock market was efficient between 2009 and 2017. The study was conducted using a constant mean return model and market model to estimate expected returns. Linear regression was also applied to estimate the effects that unanticipated interest rates have on stock prices. The results show that on announcement day, the anticipated interest rate changes do not affect stock prices. However, the study further demonstrated that changes in unanticipated interest rates have a statistically significant impact on stock prices on the day of the announcement. Schrey & Hafdísarson (2017) also found that the Icelandic stock market is efficient when interest rate changes are incorporated, arguing for semi-strong market efficiency.

Ioannidis & Kontonikas (2008) conducted a study which looked at the impact that monetary policy has on stock returns in thirteen Organization for economic operation and development (OECD) countries between the period 1972 and 2002. The results indicate that monetary policy shifts significantly affect stock returns, thereby supporting the notion of monetary policy transmission through the stock market. The study further examined the contemporaneous impact of monetary policy outcomes on equity returns paying due regard to non-normality typically inherent as well as the significant co-movements on global stock markets. The study concluded that expansionary monetary policy boost stock prices remain largely robust in most sample countries.

Although on aggregate, it has been proven that that shifts in monetary policy significantly affect stock returns in 13 OECD countries, the extent of the link between decisions by monetary policy authorities and stock markets reaction varies across economies (Ioannidis & Kontonikas, 2008). In another study, Li, Iscan & Xu (2010) conducted a comparative study on the impact of monetary policy shocks on stock prices between the United States (US) and Canada using structural VAR models. The study concluded that Canada's instantaneous reaction of equity market prices to the central bank contractionary shock is insignificant and a brief response to the shock is recorded. Whilst in the United States, when a similar shock is induced on its domestic stock market, the impact of the monetary shock is large and a protracted response is recorded.

The economic architecture of these two countries explains the differences in results largely driven by differences in financial market openness. The findings of the study to this effect highlight that for a small open economy like Canada, unanticipated changes in the U.S federal funds rate significantly affect the forecast error variance of the Canadian stock market. This is consistent with the hypotheses anchored on that contractionary domestic monetary policy shocks in the context of small open economies would have a small negative impact on equity price (Li, Iscan & Xu, 2010). Li, Iscan & Xu (2010) expand this further by indicating that, in a small open economy, monetary policy is influenced by global interest rates and as a result, the impact on the discount rate is limited on the domestic stock market. At the same time, stock prices in small open economies are largely influenced by shocks originating from the rest of the world due to unexpected capital inflows and outflows.

In the context of Europe, Bohl, Siklos & Sondermann (2008) measured the response of European Stock market returns to unexpected interest rate decisions. The study found that there is a negative and significant relationship between unexpected European Central Bank (ECB) decisions and European Stock Market's performance. This implies that the ECB successfully communicates its monetary policy stance to financial market participants. The interesting observation about the study is that it extracted the unexpected component of monetary policy through utilising EURIBOR future and EONIA Swap data as well financial market participants survey data covering opinions. Moreover, a study by Stoica & Diaconasu (2012) examining the impact of monetary policy on equity indexes in European Union countries also found that there is a long and short-term relationship between stock prices and interest rates. The study further discovered that during the economic crisis period, their long-run comovement between interest rates and equity markets is lower.

For the US economy, Bernanke & Kuttner (2005) analysed the impact of changes in monetary policy on equity prices in the U.S and concluded that a hypothetical unanticipated 25 basis point cut in the federal funds rate target is related to about a 1% increase in broad stock indexes. The VAR model study by Bjørnland & Leitemo (2009) reached a similar conclusion that there is a great interdependence between interest rate setting and stock prices, whereby a Monetary shock

that raises the federal funds rate by ten basis points immediately pushes stock prices to fall by 1.5 percent.

2.6.2 Empirical evidence from the Developing Economies

Iddrisu, Harvey & Amidu (2016) comprehensively examined the monetary policy and stock market dynamics from the African perspective over the period 1979-2013 using the VAR technique. The study found that the stock market of the 12 African countries is positively affected contemporaneously by their respective monetary policies through the interest rate channel, but was not able to find evidence of the reverse reactions. Furthermore, the study looked at the impulse response and established that both interest rates and money supply fall in response to positive and negative shocks in the stock market. The study through the forecast error variance decompositions (FEVD) tried to establish which monetary policy tool (Money supply and real interest rate) had the greatest influence on the stock market and found that real interest rate had the greatest impact on the stock prices.

Ajie & Nenbee (2010) examined the relationship between monetary policy and stock prices in the Nigerian stock exchange. The study employed a co-integration and error correction modeling to conclude that both money supply and interest rate were significantly correlated with stock prices. The data sample was quite extensive which looked at the periods 1986-2008 taking into consideration the financial sector liberalization.

Ali, Adeeb & Saeed (2014) studied the dynamic impact of monetary policy on stock returns focusing on the manufacturing sector of Pakistan between the period 2001 and 2010. The study reveals that monetary policy and company-specific factors have a significant impact on stock returns, thereby confirming the notion of the monetary policy transmission mechanism.

In the South African Context, Gupta & Reid (2013) explored the sensitivity of industry stock returns to monetary policy and macroeconomic news through the Bayesian Vector Autoregressive (BVAR). The study concluded that monetary policy surprise is the only variable that significantly

and consistently negatively affects the stock market, whilst the Consumer Price Index (CPI) surprise plays a significant role.

Another study by Muroyiwa, Ezeoha, & Mushunje (2017) estimated the relationship between SARB's monetary policy decisions and JSE performance instrumenting with Structural Vector Autoregression (SVAR). The study concluded that a monetary policy announcement that increases the interbank rate by 100 basis points result in a decrease of 1% in the S.A stock returns. This however shows that the strength of the link is moderately minimal for S. A compared to other countries in the developed world. Furthermore, a study by Mangani (2011) looked at the effects of monetary policy on JSE portfolios using a Generalised Autoregressive Conditional Heteroskedasticity (GARCH) model which covered periods 1990-2009. The results revealed that changes in the discount rate are very crucial in describing the mean returns and return volatilities of the JSE portfolios.

Through the Structural Vector Error Correction (SVEC) model, Bonga Bonga (2009) investigated the interconnection between monetary policy, equity prices, and economic activities on emerging markets using South Africa as a case study. The study found that the impulse response functions display that, the response of expected inflation to equity price shocks is negative for the first two quarters before it becomes positive and statistically significant in the seventh quarter. The findings are consistent with a study done by Chinzara (2010) to investigate the effect of macroeconomic volatility on equity markets volatility using the multivariate Vector Autoregression Model. The study found that there is a negative volatility spillover from inflation and this can be attributed to the possible structural breakdown of the relationship between inflation uncertainty and stock market volatility. This was due to the introduction of the inflation targeting policy framework by the South African Reserve bank (SARB).

Mallick & Sousa (2011) extended the study on the monetary policy transmission to cover the fastest-growing emerging market economies: Brazil, Russia, India, China, and South Africa (BRICS). The monetary policy (interest rate) shocks are identified using modern Bayesian Methods and the panel Vector Autoregression framework and the study found that contractionary monetary policy has a strong and negative impact on equity markets. The panel VAR exercise

provided further robustness on the findings that contractionary monetary policy harms output for this group of key emerging market economies. However, Adam & Tweneboah (2008) established that there is a positive relationship between monetary variables such as inflation and stock price returns in Ghana. The study looked at the role of macroeconomic variables in the movement of stock prices between 1991 and 2006 by exploring the long-run relationship between the variables utilizing Johansen's multivariate cointegration tests. The short-run dynamics were explored through the impulse response function and forecast error variance decomposition analysis.

Moolman & Du Toit (2005) developed a structural, theoretically-founded model for the South African stock market estimated using co-integration and error-correction techniques between the period 1993 and 2003. The study found that short factors such as interest rates, the rand-dollar exchange rate, and the S&P 500 index influenced the short-run movements, while the discounted dividends determined the long-run movements of the stock market.

2. 7 Application of Forward Rate Agreements

The standard view of the monetary transmission mechanism relies on a simple version of the expectations theory of interest rates (Roley & Sellon, 1995). This theory implies that long term rates are an average of short term rates and expected future short term rates. Roley & Sellon (1995) further illustrated on this theory by explaining that an increase in the desired level of federal funds rate causes current short term rates and expected future short term rates to rise, which ultimately pushes interest rates across all maturities. Central banks and market agents of ten find the forward interest rate market to be of greater interest since it states explicitly expectations of future interest rates and thus, Forward rate agreements can serve as an indicator for the term structure of interest rate (Malz, 1998). He further argues that FRAs can communicate a message about the consensus of future short term rates and the near term policy position of the monetary policy.

Mwaza (2020, p.6) defines Forward rate agreements as an "over the counter agreement to earn or pay an interest rate on a deposit starting at a future point in time". This simply means that two parties agree to set future borrowing rates in advance. It is often argued in the simple efficiency specifications of forward exchange market that, forward rate will fully incorporate all available

information about the future rate expectations (Chiang, 1988). Therefore, this means that forward rates can be used to predict the spot price of interest rates in an unbiased manner as long as market participants are able to process information rapidly. Wesso (1999) posits that through the arbitrage activities of economic players and market adjustments, the forward rate market reflects information that is expected to predict future spot rates or the future discount rate that can be used in stock valuations. In determining monetary policy, central banks must take into account relationships that exist spot exchange rates, forward rates and interest rate margins (Wesso , 1999). A disruption of these relationships could easily lead to new speculative transactions in the stock exchange market.

FRA prices are expressed as the rate the buyer pays on the notional deposit, that is, as a forward interest rate. FRAs are cash settled, by the present value of the difference the realised short term rate and the FRA price, so no deposit will actually be made (Malz, 1998). The quote on FRAs is the risk neutral market estimate of the future money market rate. A standard FRA involves three points in time, (a) the current time (b) the expiry time T_{i-1}, (c) the maturity time T_i, with $t \leq T_{i-1} \leq T_i$. At any point in time $s \in [t, T_{i-1}]$, the fair value of a FRA with a FRA rate of K to the buyer is given by:

$$V_{FRA} = N_\tau (T_{i-1}, T_i) [L (s; T_{i-1}, T_i) - K] Z (s, T_i) \quad (1)$$

Where:

- N is the notional amount of the trade;
- $\tau (T_{i-1}, T_i)$ is the difference between time points T_{i-1} and T_i in year fractions ;
- $L (s; T_{i-1}, T_i)$ is the simple fair forward rate at a time for the period$[T_{i-1}, T_i]$;
- $Z (s, T_i)$ is the discount factor from time s to time T_i

In the market, FRAs are denoted by short hand notation like 3x6. This refers to a FRA with start date 3 months from now and maturing 3 (6-3) months later. Thus, a 3x6 FRA is contract fixing the 3-months JIBAR rate in 3 months' time.

Although FRA's are over the counter instruments in South African as it does not have a futures market to trade repo rates like it is the case in the U.S that has a well-functioning futures market, the principle is well aligned. According to Malz (1998) FRAs indicate expected future interest rate at a specific horizon which aid in monitoring market expectations of the interest rate on or around a specific date and this make them more preferable also to monitor expectations of the pace of, for example, interest rate changes over the next 12 months.

2.8 Overview of the South African Monetary Policy in last 10 years

With the ever-changing globalised economy, the South African monetary policy has become increasingly exposed to a variety of challenges in its efforts to achieve domestic price and financial market stability (Smal & De Jager, 2001). When the reserve bank decides to intervene in the market by employing monetary tools at its disposal, it stimulates a series of economic events. Monetary policy in South Africa is executed by the South African Reserve Bank (SARB) which derives its mandate from the constitution of the republic. Section 224 of the constitution of South Africa mandates the SARB to achieve and maintain price stability in the interest of balanced and sustainable economic growth. Although inflation targeting by the SARB is its primary concern, it also attempts to steer the economy off recessions, stabilises the rand or output fluctuations, as well as other financial instabilities. The SARB must perform its functions independently and without fear, favor, and prejudice. Whilst independent in its operations, the SARB is further mandated to have regular consultations with the Minister of Finance to ensure that both fiscal and monetary policy are well aligned to achieve the stability of the financial system. The responsibility of the SARB also extends to accumulating foreign currency reserves and consequently, it will venture into the foreign currency market although it not directed by the constitution to follow the movements of currencies in the exchange rate market (Ramatlo, 2019). Repo rate changes have a short impact on the exchange rate.

The monetary policy of S.A in the past 10 years have been overseen by two governors: the ninth governor, Ms. Gill Marcus, and the 10th Governor, Mr. Lesetja Kganyago. Both serving under the government of the African National Congress (ANC). The monetary policy regime pursued under the two Governors has been anchored around inflation targeting adopted in February 2000. This

move was critical to repositioning the SARB amongst world central banks as a credible and reputable institution as inflation targeting enhanced policy transparency, accountability, and predictability. A Stable inflation environment is one form of growth-enhancing certainty that is enabled by greater predictability of both monetary and fiscal policy. For example, transparent and effective inflation targeting will guide inflation path and constraints (Aron & Muellbauer, 2005). A clear inflation path creates a conducive environment for the private sector to plan on future expenditure and investment which also makes it easy for wage settlements and pricing of goods and services to take effect.

The sampled period was further characterised by a post-recession recovery period which recorded a wide range of monetary responses across the globe. There was a convergence from developed economies central banks to engage in a wide-scale quantitative easing to stabilise financial markets and to arrest the decline in inflation, growth, and employment induced by the global recession. The recent global economic downturns have placed monetary policy interventions in the spotlight. It is now argued by economists that monetary policy should be deployed as the first line of defense to stabilise the economy during economic slowdowns (Matemilola, Bany-Ariffin, & Muhtar, 2015). However, the rate at which economic stability can be realised depends on the pass-through to the bank lending and how developed the capital markets are.

The South African monetary policy in the last 10 years has made significant strides in stabilising prices by maintaining inflation within the target range of 3-6% as observed in figure 2, underpinned by the stability of the financial system and financial markets. The SARB uses different policy tools such as the, reserve requirement, liquidity requirement, repo (repurchase rate) rate etc. in its attempt to effectively maintain price stability. The repurchase rate is defined as the rate at which the commercial banks borrows money from the SARB and therefore represents a cost of credit to the banking sector (Matemilola, Bany-Ariffin, & Muhtar, 2015). The mandate of the SARB of stabilising prices within the target range of 3-6% is executed by changing the repo rate. To illustrate, when inflation moves close to the upper or even breaches the 6% band, the reserve bank adjusts the repo rate higher to pull inflation back to the target range. The repo rate is adjusted lower when inflation moves in the opposite direction to the lower band. The monetary policy outcomes are communicated by the Governor of the bank on behalf of the Monetary Policy Committee

(MPC) meeting. The SARB take the local and international audience into confidence by explaining the reasons behind their decision(s) about adjusting repo rates differently in response to inflation.

Table 2.1 MPC scheduled and Unscheduled Meetings

Period	**Sample Period: 2010-2019**
Total no. of scheduled meetings per year	6
Total no. of unscheduled meetings per year	0
Total no. of MPC meetings for sample period	60
Increase in repo rate	7
Decrease in Repo rate	7
Unchanged	46

Data Source: SARB MPC Policy Statements, 2010-2019.Table constructed by author

Table 2.1 demonstrate that the South African Monetary Authorities settled on 6 fixed meetings per year which have been the case since 2010. Period 2004 to 2008 scheduled MPC meetings varied between 2 to 3 whilst 2009 had about 9 meetings. This was necessary due to the rising risks posed by the Global recession on the South African economy.

There were no unscheduled meetings in 10 years under investigation. Unscheduled meetings are normally called to respond to an emergency event that has a material impact on inflation or the South African rand. Therefore, this paints a positive picture of the stability of inflation within the required target range that did not necessitate the SARB to call extra-ordinary meetings during the period. The above table further shows that 77% of MPC meetings voted to leave repo rates unchanged, meaning that the risk of inflation was perceived delicately balanced. The remainder of the meetings (23% of MPC meetings) adjusted repo rates equally to respond to the downward and upward risk on inflation. 7 meetings voted to increase interest rates, whilst the other 7 voted to decrease interest rates. From table A3 in the appendix, it can be concluded that when the SARB does change the repo rate, the changes are usually between 25 basis points and 100 basis points.

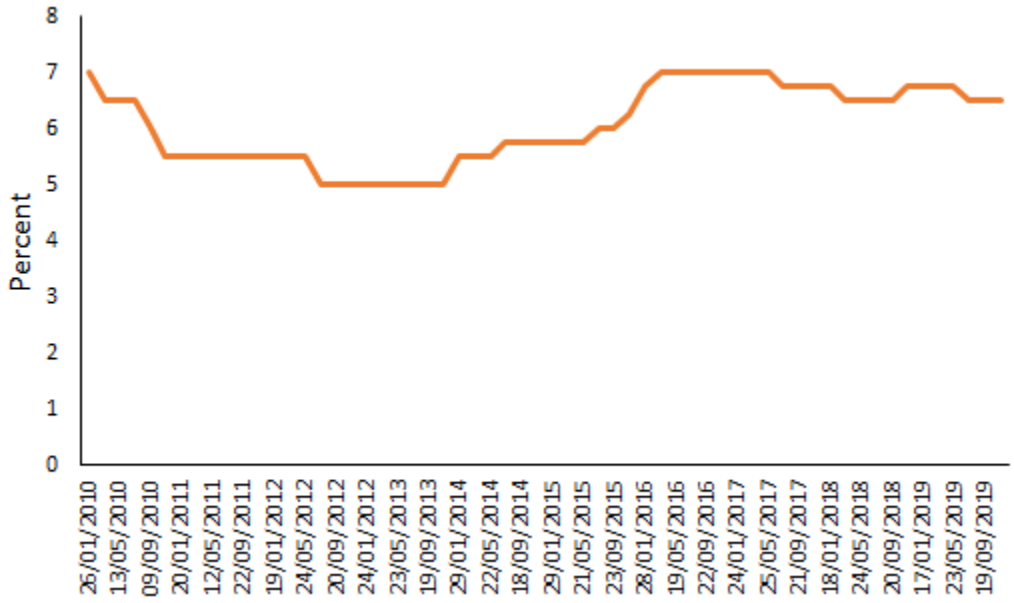


Figure 2.2 SARB Repo Rate (%)

Data source: Bloomberg. Graph plotted by author

Figure 2.2 shows us the repo rate during our sample period. Successive rate cuts brought the repo rate from its high of 7 percent in the year 2010 to the lowest point of 5 percent around mid-2012. A gradual tightening cycle began lifting the rates to around a 7 percent level beginning of 2016. This is the high recorded at the beginning of the sample period (2010). In general, monetary policy easing occurs when economic growth is slowing, while monetary policy tightening occurs when economic growth starts picking up.

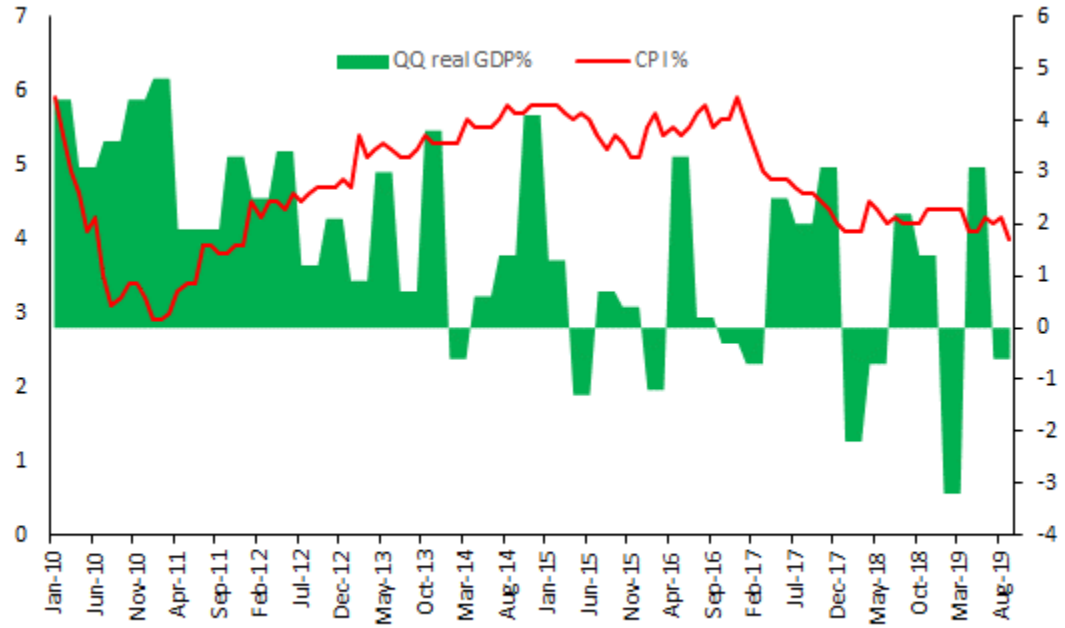


Figure 2.3 Inflation and GDP Growth in (%)

Data source: Bloomberg. Graph plotted by author

From Figure 2.3, we can see that the economy show signs of slowing from the end of 2010, with real growth declining steadily by the end of 2013. A short rebound from negative growth was observed in the first quarter of 2014 but the economy has experienced a sideways growth until the end of the sample period. What is interesting to observe from figure 2.3, inflation faired above SARB's midterm point of 4.5 percent for most of the sample period disregarding the sideway movements of economic growth.

Although the South African monetary policy targets inflation and made price stability its sole objective, data on a range of macroeconomic indicators such as real economic output and unemployment shows that the attempt by the SARB to influence these variables is muted. Figures 2.2 and 2.3 shows that while the SARB was continuously cutting rates between 2010 and 2013, economic growth was declining until the South African economy registered a negative growth of 0.6% in the first quarter of 2014. There are several explanations for the persistent decline and unexpectedly sluggish recovery of the South African economy during the sampled period which cannot be blamed squarely on the inadequacies of monetary policy to boost economic growth. For

example, there is a high level of policy uncertainty that undermines confidence in the South African economy, and the lack of political will to implement reforms contained in the National Development Plan (NDP), high regulatory costs, corruption both in the public and private sector etc. These factors are some of the big contributors that undermine economic activity and may impair the monetary policy transmission channel from effectively stimulating output.

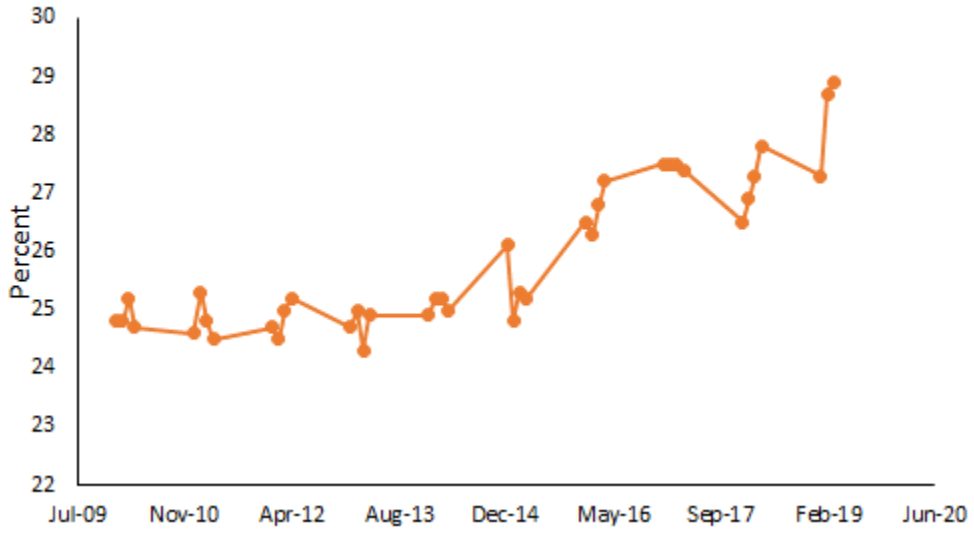


Figure 2.4 Unemployment Rate in (%)

Data source: STATS SA (2010 to 2019). Graph plotted by author

Employment is a key macroeconomic variable in which monetary policy objectives are measured. From figure 2.4, it can be observed that unemployment held steady at around 25.5% from the beginning of the sampled period until it started rising rapidly in mid-2013. The rising period of unemployment coincides with the rapid decline in economic growth as observed in figure 2.3. What is notable about the unemployment trend before it started rising end of 2013, the period of stability was supported by successive cuts in repo rates until the end of 2013 as observed in figure 2.2. As repo rates started to increase in response to the steady rise in inflation, unemployment started to creep up.

2.9 Chapter Summary

The literature in this study provides a broad background of how monetary policy can directly impact financial assets and how this relationship can feed into the real economy. The channel in which monetary policy affects the stock market has been fully explored by examining empirical studies both in the developed and developing world. The majority of studies were able to establish a relationship between monetary policy outcomes and the stock market, however, very few were unable to trace this link. It was uncovered that those studies which were unable to observe a link between monetary and asset prices did separate the anticipated and unanticipated component of monetary interventions. Furthermore, a background of how central bank communications can shape and manage expectations in the financial markets was explored. Due to the linkages between Central bank communication and transparency, it was important to look at this component in detail as it can stabilise financial markets.

Literature also shows that many researchers have employed the event study by instrumenting with a VAR methodology to examine this relationship (see for example Bernanke and Kuttner, 2005; Bjørnland & Leitemo, 2009; Iddrisu, Harvey & Amidu (2016)). And all the studies mentioned above found a negative relationship between an interest rate shock and stock returns. Bredin, Gavin & O'Reilly (2003) used an OLS (Ordinary Least Squares) method to arrive at similar conclusions to the researchers above. This shows us that there several methodologies to conduct this kind of a study. Also, many considerations and assumptions were made to analyse the relationship between monetary policy interventions and the equity market. This presents an interesting area of study to explore further methodological approaches to arrive at robust conclusions that is consistent with theory.

Lastly, literature also looked at the development of monetary policy in South Africa in the past 10 years. Literature delved deeper to identify the mandate under which the SARB operates under which is used to attain a set of objectives. South African monetary policy mandate is clearly defined in the constitution and has given the SARB powers to stabilises prices. Within the sampled period under investigation, the SARB was successful in maintaining price stability.

Chapter 3. Data Description and Research Methodology

3.1 Introduction

Babbie and Mouton (2001) define research methodology as methods, procedures, and techniques used in the process of the research plan and design implementation. This chapter explores the conceptual framework on the impact of monetary policy outcomes on the South African stock market. It also took a critical look at the methodology for assessing the impact of monetary policy variable(s) on the stock market, specified the model, and diagnostics tests were done to determine the precision of the model.

3.2 Research Design

Research design is a plan that maps out the process which the writer followed to clarify the research objective outlined in section 1.4. Williams (2007) notes that the research process is a systematic attempt to define the objective, organising and managing data, and presenting the findings. The first step followed to gather preliminary information on the impact of monetary policy announcements on stock returns was through reading published empirical journals, books, and other relevant papers. This study also looked at literature on various economic jurisdictions as well as the importance of stock market development to ascertain the variables to be used.

This study utilised secondary data between the period January 2010 and November 2019 sourced from the Bloomberg terminal which provides credible digital data and news for financial, economic institutions, and other market participants. This study further used descriptive statistics to sufficiently explore the characteristics of the variables.

3.3 Population and Sample

The ultimate objective of quantitative research is to generalize findings, as it is impossible to study the entire population of the research interest (Khalid, Abdullah & Kumar, 2012). Therefore, this study identified a defined population and sample that was instrumental in generalising the research findings. Sample represents a subgroup of a population, therefore allowed this study to draw

inferences about the population. The population is defined as a complete set of units (persons or objects) that displays some common characteristics defined by the sampling criteria established by the researcher (Molenberghs, 2010).

This study followed a non-probability and purposive sampling technique. Purposive sampling also called a judgmental or subjective sampling is described as deliberate choice made by a researcher to identify a representative sample with qualities and characteristics similar to the population of the study (Sharma, 2017). The sample in this study is made up of the Johannesburg Stock Exchange (JSE) all-share index, JSE Financial Index, and the JSE Industrial Index. The JSE All-share index was selected because it represents a total (broad-base) index, reflecting a total picture of the behaviors of the common quoted stocks on the South African Stock Exchange. The Sub-indices used in this study were selected to further examine the impact of monetary policy on stock returns at the sectoral level.

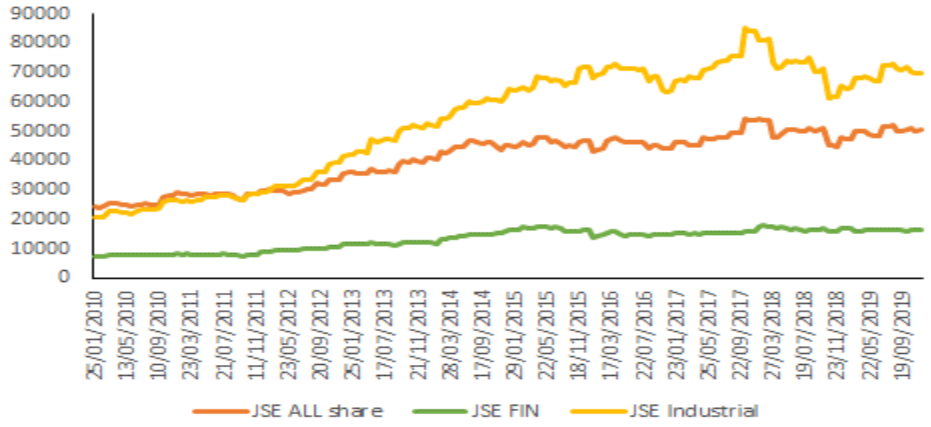


Figure 3.1 Plot of Stock Market Variables

Data source: Bloomberg. Graph plotted by author

Figure 3.1, shows that the stock market represented by the JSE ALL Share, Industrial Sector, and the Financial Sector had modest growth and never returned to the early recovery periods of 2010. It encompasses the allure of high yields that attracted investors with a higher risk appetite to emerging markets like South Africa, contributing to the faster recovery and the stability of the JSE.

This study employed time series percentage change daily closing prices of the South African stock market (Johannesburg Stock Exchange All Share Index, sub-indices), actual alterations in the SARB repo rate, and the FRA (Future Rate Agreement) derived from Bloomberg terminal, spanning the period January 2010 through to December 2019, which looked at the post-global recession dynamics. This period was considered to shed light on the impact of monetary policy announcements on stock prices because it covers a period where many economies especially those with heavy natural resource dependence, such as South Africa, experienced a slowdown in economic growth and a decline in many economic activities.

FRAs were considered and used in this study because they indicate expectations of changes in future policy. Ioannidis & Konotonikas (2006); Bernanke & Kuttner (2005) used federal futures data as the official monetary policy rate representation. Whilst in the South African context, Ramatlo (2019) used a one month Johannesburg Interbank Agreed Rate (JIBAR). Figure 3.2 below shows the movement of the 2 x 5 movement of the FRA in relation to the repo rate during 2010-2019 period. Kuttner (2001) argues that the advantage of using forward rate data as a measure of expected monetary policy; there are no problems with model selection, no generated regressor issues and lastly, the out-of-date to produce the estimates are a non-issue. This embodies short-term expectations of the SARB repo rate, as it offered a promising way to measure the unanticipated element of specific MPC actions. The other advantage FRA 2x5 brought into this study, its price is based on a specific day of the month and it gives a correct measure of the expected repo rate. This study considered a short duration FRA to properly evaluate expectations of monetary policy. MPC policy announcements are six weekly, the 2x5 FRA is preferred over other shorter rates (1x4 and 3x6) as it effectively incorporates expectations for the future monetary policy rate as meetings rarely exceeds 2 months. The 1x4 FRA is a 3-month interest rate in one-

month time and therefore does not sufficiently cover the period, while the 3x6 incorporates expectations of two meetings.

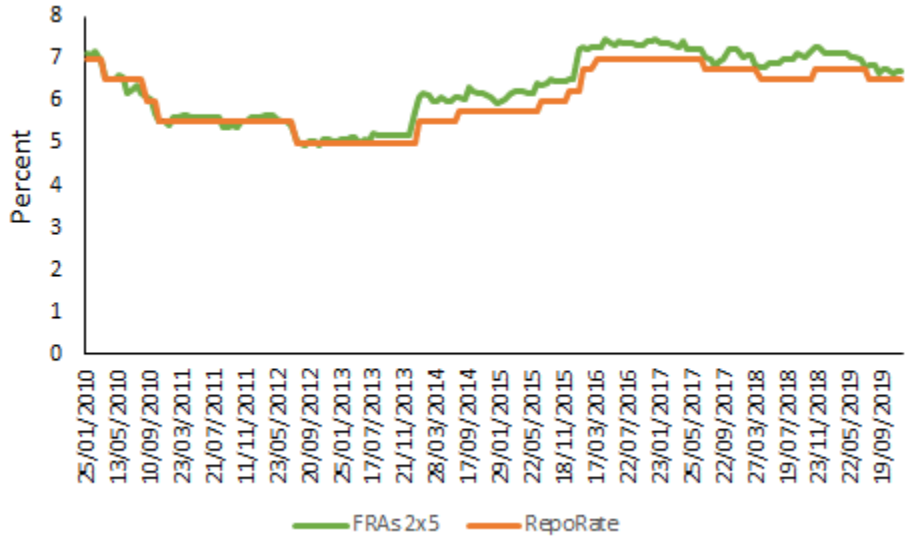


Figure 3.2 Plot of Repo Rate and Fras 25

Data source: Bloomberg. Graph plotted by author

3.4 Data Collection

Data used in this study was collected from Bloomberg Terminal. The data collected is daily closing stock price data for the JSE all-share index, Repo rates, and Forward Rate Agreements (FRA's). The daily data covers period: Jan 2010 to Nov 2019. The period was identified to enable the study to assess the post-recession dynamics, also most studies in the South African context by (Gupta & Reid, 2008; Mangani, 2011; Bonga Bonga, 2009) looked at data before the Global Financial Crisis of 2007/08.

3.5 Measurement of Variables

A researcher must have a proper understanding of the nature of variables under study and how to measure it (Khalid, Abdullah & Kumar, 2012). In this study, the dependent variable used is the (JSE all share index), whilst the independent variables were Forward Rate Agreement (FRA) and

Repurchase Rate (REPO). Although the two variables are easily identifiable, the researcher also paid attention to extraneous variables or often called experimental errors which may not be related to the study but could affect the dependent variable.

3.6 Data Analysis

The section below describes the data analysis approach in detail

3.6.1 Event Studies

Bredin, Gavin & O'Reilly (2003) used the event study methodology to measure the response of the equity returns to unexpected changes to monetary policy outcomes on the day of the announcement. However, the market may also react to the lack of change in the repo rate if there was a market-wide expectation for a change (Bernanke & Kuttner, 2005). According to Bredin, Gavin & O'Reilly (2003), the appropriate identification of monetary policy changes and the need to discriminate between expected and unexpected changes in policy interventions have been the most methodological considerations that have influenced this type of study.

The event study assumes that scheduled monetary policy announcements are the dominant influence on the level of stock prices on the day of the announcement and the day immediately after the announcement. The event study method was carefully selected to try to control the influence of other variables or information outside of monetary policy announcements. This was achieved by using high-frequency data (Daily) which enabled the study to examine a narrow time interval surrounding the policy action. In particular, this study chose the event data which represents the announcement date (t) and a day preceding (T-1) and succeeding (T+1) the announcement day, as captured in figure 3.3, event window. Therefore, the changes in the level of stock prices can largely be attributed to this announcement. An event study examines the return behavior for a sample of stocks experiencing a common type of event.

Given the above explanation, the event might take place at different points in calendar time or it might be clustered at a particular date (e.g., African National Congress elective conference

outcome affecting an industry or a subset of the population of firms). Let t =0 denotes the time of the event. For each sample security i, the return of the security for time period t relative to the event, R_{it}, is:

$$R_{it} = K_{it} + e_{it} \quad (1)$$

Where K_{it} is the "normal" (i.e., expected or predicted return given a particular model of expected returns), and e_{it} is the component of returns which is abnormal or unexpected. Given this return decomposition, the abnormal return, e_{it} , is the difference between the observed return and the predicted return:

$$e_{it} = R_{it} - K_{it} \quad (2)$$

Equivalently, e_{it}, is the difference between the return conditional on the event and the expected return unconditional on the event. Thus, the abnormal return is a direct measure of the (unexpected) change in stock returns associated with the event of the monetary policy announcement. Therefore, the one-day event window size considered for this study removes the possibility of endogeneity or causation running from the opposite side.

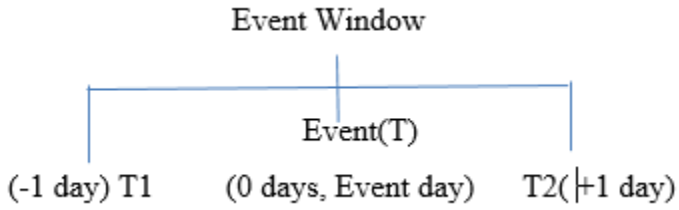


Figure 3.3 Event window

In this study, the relevant sample of events is described as the union of all days between January 2010 and November 2019 when the repo rate was changed, with days corresponding to MPC meetings. The first event in our sample is on the 26th January 2010 where rates were left unchanged at 7%, and the last corresponds to the MPC meeting on the 21st November 2019 where

the rates were also left unchanged at 6.5% as captured in Table A3. During this period, the SARB published 60 interest rate announcements. Of these announcements, 7 were to decrease interest rates, 7 were to increase interest rates, and the remaining 46 times the SARB announced no change on the main interest rate. All 60 MPC meetings were considered in this study, which included all policy decisions varying from decreasing or increasing interest rates, and also no policy change outcomes were considered as argued by Bernake and Kuttner (2005).

3.6.2 OLS Regression

This study adopted the OLS method of Bredin, Gavin & O'Reilly (2003) to assess the impact of unexpected monetary policy actions on stock market returns. Brooks (2019) defines OLS as a type of linear least square method for estimating a linear regression model for unknown parameters.

This study initially ran the following baseline regressions:

$$\Delta JSEALLs_t = \alpha_0 + \alpha_1 \Delta i_t^s + \alpha_2 \Delta i_t^{s,f} + \varepsilon_t \quad (3)$$

Where, $\Delta JSEALLs_t$ is the percentage change in the JSE ALL share index between t and t +1; $\Delta i_t^{s,f}$ represent the one day change in forward rate agreement on day t of a change in the repo rate change; Δi_t^s denotes the expected change in the repo rate at date *t.* ε_t is a disturbance term representing events unrelated to SARB MPC meeting outcomes on announcement day.

$$\Delta JSEFINs_t = \alpha_0 + \alpha_1 \Delta i_t^s + \alpha_2 \Delta i_t^{s,f} + \varepsilon_t \quad (4)$$

Where, $\Delta JSEFINs_t$ is the percentage change in the JSE financial index between t and t +1; $\Delta i_t^{s,f}$ is the one day change in forward rate agreement on day t of a change in the repo rate change; Δi_t^s is the expected change in the repo rate at date *t.* ε_t is a disturbance term representing events unrelated to SARB MPC meeting outcomes on announcement day.

$$\Delta JSEINDs_t = \alpha_0 + \alpha_1 \Delta i_t^s + \alpha_2 \Delta i_t^{s,f} + \varepsilon_t \quad (5)$$

Where, $\Delta JSEINDS_t$ is the percentage change in the JSE industrial index between t and t +1; $\Delta i_t^{s,f}$ is the one day change in forward rate agreement on day t of a change in the repo rate change; Δi_t^s is the expected change in the repo rate at date *t*. ε_t is a disturbance term representing events unrelated to SARB MPC meeting outcomes on announcement day.

Several assumptions were made to estimate the OLS regression models. Brooks (2019) describes these assumptions in detail:

Assumption 1: $\boldsymbol{E(u_t) = 0}$ **;** The assumption requires that the average value of errors is zero. If this is violated, it could result in a situation where regression has no intercept and could lead to potentially severe biases slope of coefficient estimates.

Assumption 2: var ($\boldsymbol{u_t}$ **)** $= \boldsymbol{\sigma^2 < \infty}$**;** This assumption requires that the variance of the error terms is constant. If this is not controlled, it could lead to errors not having a constant variance or often described as to be heteroscedasticity. One could test for heteroscedasticity using a white test.

Assumption 3: $\boldsymbol{cov(u_i, u_j) = 0 \; for \; i \neq j}$ **;** error terms must not be correlated or best known as autocorrelation. This problem reduces the efficiency of estimation leading to spurious regression. Autocorrelation can be detected using a Durbin-Watson test (DW).

Assumption 4: $\boldsymbol{x_t}$ **are non-stochastic;** Regressors should not be correlated with error terms. If regressors are found to be correlated with the error term, it will lead to inconsistent estimates.

Assumption 5: $\boldsymbol{u_t \sim N(0, \sigma^2)}$**;** disturbances are normally distributed; a normal distribution is said to have a coefficient of excess kurtosis of zero. Non-normality could be tested using the Bera-Jarque test.

Time series data, such as equity prices are known to display what is called random walk discussed in chapter 2. In this study, the shock was only induced by scheduled monetary policy announcements by the SARB.

3.7 Ethical Considerations

According to Orb, Eisenhauer & Wynaden (2001), any kind of research presents some form of ethical issues and the research process needs to apply appropriate ethical principles. Dattalo (2010) explained that ethical issues may emanate from the methodological tools used to collect data, research questions asked, the population and setting studied, and the kind of information sought.

This is a non-human quantitative study that utilised theories, hypotheses, models, equations, samples, data, or parameter estimates to clarify the research objective. It used secondary data publicly available and sourced from a global financial and economic terminal. Therefore, this study did not pose any risk to human rights, privacy, and confidentiality. As stated, data is publicly available and therefore doesn't require any form of permission from the institution it is sourced from. The university has open access for students to obtain data from the Bloomberg terminal which was downloaded into a hard drive and saved in password-protected computer to avoid external tempering.

Furthermore, this study was carried out in such a way that there was no apparent legal objection to the nature of the method of the research. This study did not compromise staff or students or other responsibilities of the University.

3.8 Validity and Reliability

Validity and reliability observe the fitness of measure. According to Whitelaw (2001), reliability suggests that the degree to which the measure produces consistent results and free from random error. The primary source of data is the Bloomberg Terminal. To enhance the reliability of the data, the researcher used other data sources such as the South African Reserve Bank (SARB) to confirm the repo rate. Data on stock returns were crossed checked against data from the Johannesburg Stocks Exchange (JSE). To avoid tampering, the collected data was stored on a password-protected computer and backed up on a portable hard drive stored in a locked drawer.

3.9 Chapter Summary

The methodology used in this study shows all steps followed in conducting the OLS event study on the short run impact of monetary policy interventions on the stock market. It laid out a road map on how the research arrived at its conclusions. The data has been described and the section provided where the data was sourced. It provided details on the set of assumptions and described the diagnostic tests conducted before a model was fitted. This was done to circumvent some of the methodological problems when dealing with OLS estimation.

Beyond the violation of assumptions, estimating the response of stock prices to monetary policy instruments, often encounter the problem of dual causality and the omission of other an identified variable. The event study has been used by many researchers such as Bernanke & Kuttner (2005); Bjørnland & Leitemo (2009) to attempt to control the influence of other variables on stock prices. This research followed earlier studies that used a similar event study approach to minimize the problems of endogeneity.

This study was referenced on the already tested methodology by Bredin, Gavin & O'Reilly (2003). Their study produced results consistent with the theory on the transmission mechanism of monetary policy. The rationale for using OLS was motivated by the time horizon of interest and the variables the study attempted to control.

Chapter 4: Presentation of Results

4.1 Introduction

This chapter presents the results of the OLS regressions. Furthermore, it shows the summary statistics for the JSE ALL Share, JSE FINI, JSE IND, Repo Rate, and the FRA.

4.2 Descriptive statistics

The table below shows summary statistics of the All-Share index and the tradable sector indices i.e. Financials and Industrials on the JSE over the sampled period. Also included are the summary statistics of the repurchase rate and the 2x5 FRA, representing the forward market of interest rate.

Table 4.1 Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
allshareret	179	.0017589	.0122929	-.0529745	.0482829
finret	179	.0019073	.0134401	-.0767364	.0586578
induret	179	.0029407	.0133902	-.0641576	.0517996
reporet	179	-.0001798	.0076964	-.0413927	.0413927
fra25ret	179	-.0001482	.0087284	-.0303943	.0442251

Source of data: Bloomberg Terminal. Results Tabulated by author

The All Share index serves as the overall market proxy, has recorded a moderate mean return of 0.00175; with a moderate risk of 0.0122 as measured by the standard deviation. The mean daily return at a disaggregated level is higher for the industrial compared to the financial index. The financial index has the lowest mean compared to industrials and has recorded a mean return of 0.0019 during the sampled period; with above-average standard deviation of 0.0134, whilst the industrial index recorded a mean return of about 0.00294 with a standard deviation of 0.0133.

The S.A industrial sector mean returns are way above the JSE All-share index. From the performance summary discussed above, it can be seen that the industrial index has performed better than the financial index on a risk-adjusted basis. The reason why industrial stocks did way better than the financial index can be ascribed to large global industrial firms such as the SAB

miller, Naspers, and Richmont coupled with investor appetite favoring firms with an international footprint. The industrial sector has gone from 31 percent of the top 40 indexes in 1999, to a peak at 70% in 2015 (Businesstech, 2016).

Concerning short term interest rates represented by the repo rate, the South African average interest rate were 0.000179 during the sampled period. The deviation of interest rates was substantially lower compared at 0.00769 to what was observed for stock prices, indicating the level of uncertainty associated with equity returns represented by the All-Share index at a standard deviation level of 0.01229. Short-term interests signal a future path of monetary policy hence the there is a growing number of interest economists and policymakers.

4.3 Pre Estimation Analysis

The following results were conducted on the data to check if all OLS classical assumptions were met before any estimations of parameters could be done. The first test conducted was the linearity test between variables. Both figure 4.1 and 4.2 below shows that the scatter plot has a linear trend, hence the data follows a linear trend doesn't violet the assumptions.

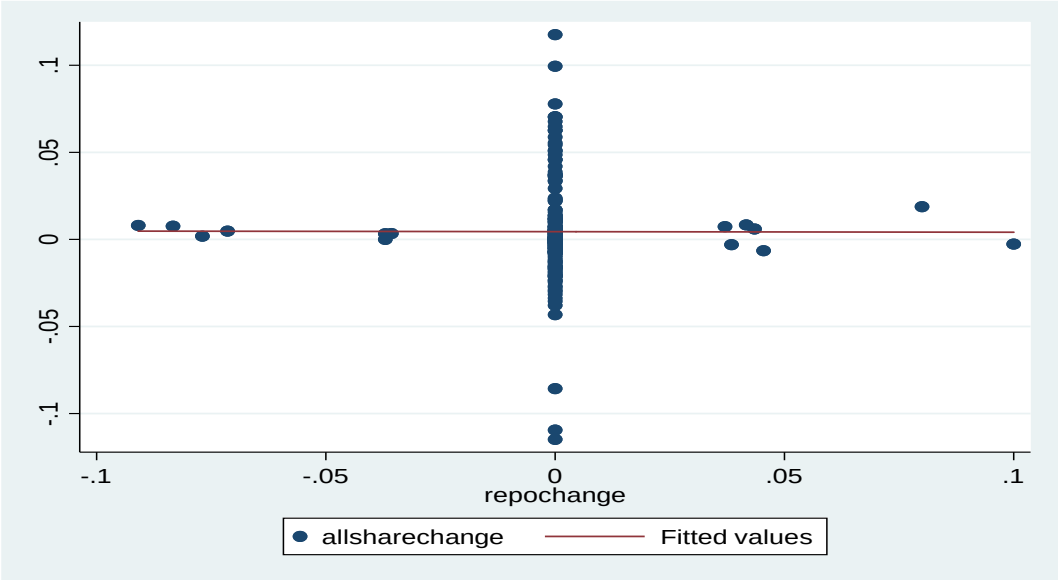


Figure 4.1 Plot JSE All Share and Repo Rate

Data source: Bloomberg. Plotted by author

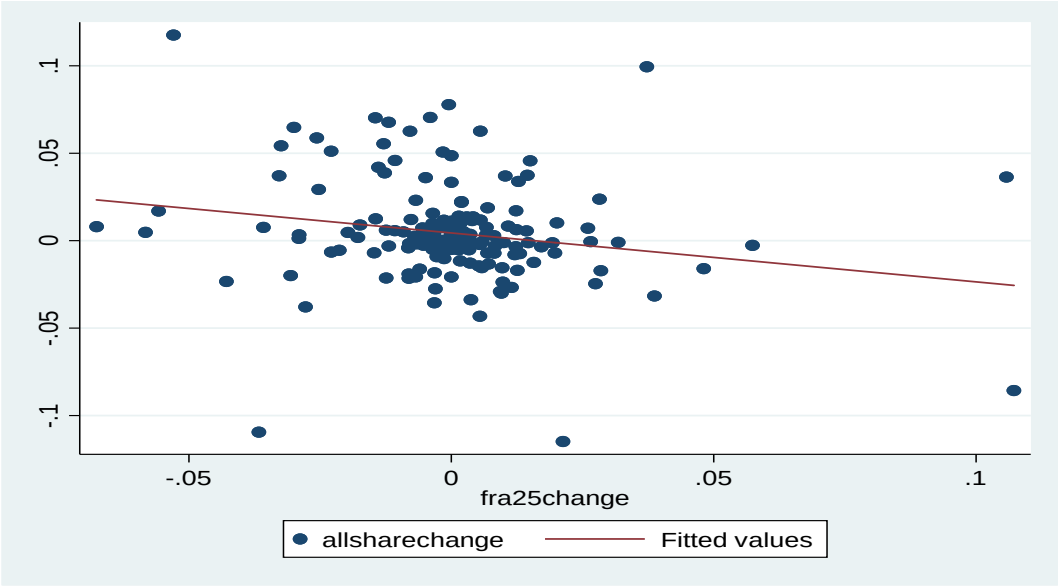


Figure 4.2 Plot JSE ALL Share and FRA

Data source: Bloomberg. plotted by author

The second test conducted was the multicollinearity test. Table 4.2 displays the VIF's (Variance inflation factor**)** and the tolerance. VIF's are less than 10, indicating that there is no concern for multicollinearity.

Table 4.2 Variance Inflector Factor

Variable	VIF	1/VIF
fra25change	1.14	0.880844
repochange	1.14	0.880844
Mean VIF	1.14	

Data source: Bloomberg. Calculations by author

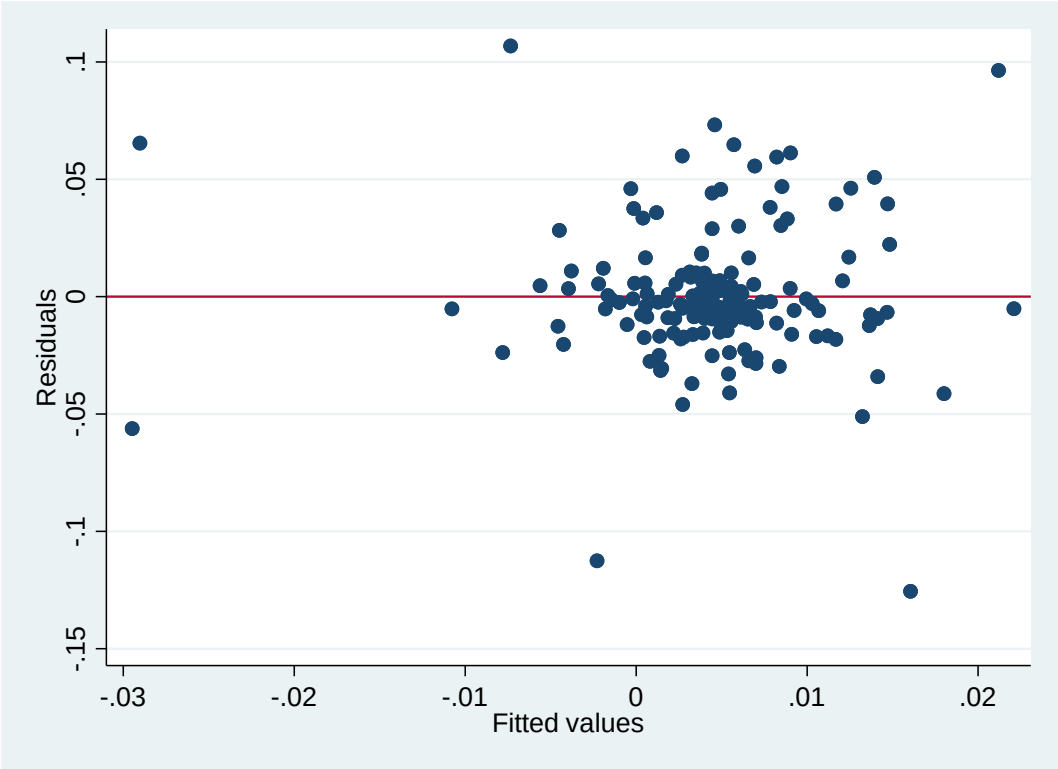


Figure 4.3 Plot of Residuals

Data source: Bloomberg. Plotted by author

The third test conducted is the heteroscedasticity test (constant variance). The test is done to see if the distribution of errors has a constant variance. We use a Breusch-Pagan / Cook-Weisberg test as follows:

Ho: Constant variance

Variables: fitted values of allshare

Chi2(1) = 0.06

Prob > chi2 = 0.8134

Reject H0 if pvalue < 0.

Looking at the above conditions, we do not reject the null hypothesis and conclude that we have constant variance.

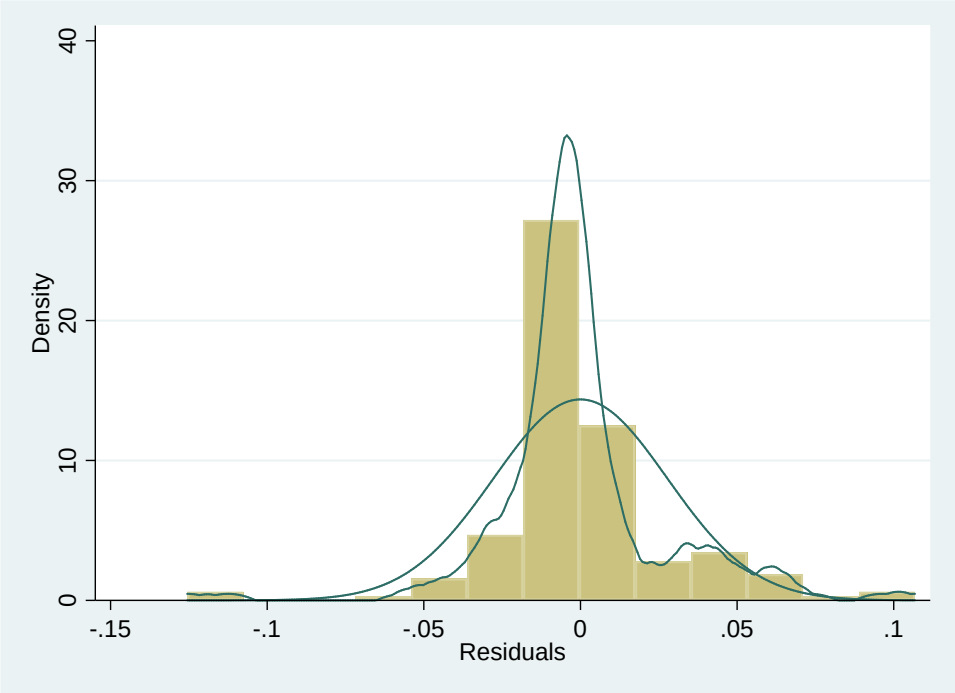


Figure 4.4 Normality plot of residuals - histogram

Data source: Bloomberg. Plotted by author

Figure 4.4 above shows a histogram for the normality test. It can be seen from the histogram of residuals that the residuals are normally distributed.

The last test conducted is the unit root test displayed in table 4.3 below:

Table 4.3 Unit Root Test Results

Variable	ADF Level	ADF first Difference
JSE ALL Share Index	-1.704937 (0.4271)	-14.18868 (0.0000)
JSE Financial Index	-1.658931(0.4504)	-14.78218 (0.0000)
JSE Industrial Index	-2.386749(0.1469)	-14.18191(0.0000)
SARB Repo Rate	-1.761240 (0.3988)	-14,05523 (0.0000)
FRA 2x5	-1.227835 (0.6621)	-11.84208 (0.0000)

Data source: Bloomberg. Calculations by author

Table 4.3 displays stationarity test results for the modeling variables. The Augmented Dickey-Fuller (ADF) test was used to obtain the results. As seen from the table above, all variables are non-stationary but only become stationary after the first difference. Therefore, variables are integrated of order 1or I (1).

4.4 Baseline specification Results

The tables that follow display the quantitative estimations for stock returns in response to the SARB MPC outcomes. The results presented below were estimated using an OLS time series regression method on the JSE all share, Financial and Industrial returns instrumenting with independent variables, i.e. the repo rate and Fra2x5 respectively.

Anticipated and Unanticipated changes in SARB Repo Rate on the $\Delta JSEALLs_t$ Employing Forward Rate Agreements

Table 4.4 shows the OLS regression results on the JSE ALL Share in response to changes to the official anticipated and unanticipated SARB policy rate as captured in equation 3. No auto-correlation was detected from the Durbin Watson D Statistic (DW) 2.09. The VIF test detects no multicollinearity.

Table 4.4 OLS regression Results: $\Delta JSEALLs_t$

Source	SS	df	MS	Number of obs	=	179
				F(2, 176)	=	4.15
Model	.006469954	2	.003234977	Prob > F	=	0.0174
Residual	.137279526	176	.000779997	R-squared	=	0.0450
				Adj R-squared	=	0.0342
Total	.143749481	178	.000807581	Root MSE	=	.02793

allsharech~e	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
repochange	.1227156	.1266809	0.97	0.334	-.1272935	.3727248
fra25change	-.3164523	.1098812	-2.88	0.004	-.5333067	-.099598
_cons	.0044455	.0020877	2.13	0.035	.0003254	.0085657

Source of data: Bloomberg Terminal. Results tabulated by author

Table 4.4 above shows that when a distinction is made between anticipated and unanticipated components, the JSE All Share is seen to change. The study finds that a surprise change in the SARB repo rate is statistically significant with a negative sign, i.e. an unexpected change in the repo rate has a negative effect on the South African equity returns. These results collaborate the findings of studies that looked at the link between central bank policy actions and the performance of the stock market as concluded by Ioannidis & Konotonikas (2006); Bernanke & Kuttner (2005); Ramatlo (2019). The results denote that a surprise 1% rate hike shock reduce the South African All Share stock returns by 0.32%.

The theory on the transmission mechanism of monetary policy dictates expansionary monetary policy to increase the performance of the stock market. Whilst contractionary monetary policy decreases the performance of the stock market. Table 4.4 further proves Kuttner's (2001) theory that the unanticipated component of monetary policy is significantly stronger than the change in the target rate itself; meaning that a minimal response by the stock market to the anticipated component can be observed.

On the table above we can see that the impact of the repo rate is insignificant with a P-value of 0.33, larger than the 5% significance level. The value of R^2 is recorded at 4.5%, which highlights that the negative reaction of the JSE All Share Index can be attributed to the unanticipated shock of monetary policy. The shock appears to have little significant influence on the JSE and therefore reinforces the argument by Wiranto (2008) that firm-specific factors, and also factors such as sector and industry groups and foreign earnings exposure have a larger significant influence.

Anticipated and Unanticipated changes in SARB Repo Rate on $\Delta JSEFINs_t$ Employing Forward Rate Agreements

Table 4.5 Shows the OLS regression results on the JSE Financial sector in response to changes to the official anticipated and unanticipated SARB policy rate as captured in equation 4. No auto-correlation was detected from the Durbin Watson D Statistic (DW) 2.17. The VIF test detects no multicollinearity.

Table 4.5 OLS Regression results: $\Delta JSEFINs_t$

Source	SS	df	MS	Number of obs =	179
				F(2, 176) =	15.33
Model	.025404716	2	.012702358	Prob > F =	0.0000
Residual	.145863932	176	.000828772	R-squared =	0.1483
				Adj R-squared =	0.1387
Total	.171268649	178	.000962183	Root MSE =	.02879

finchange	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
repochange	.2803649	.1305817	2.15	0.033	.0226575	.5380724
fra25change	-.6264386	.1132647	-5.53	0.000	-.8499703	-.4029068
_cons	.0048639	.002152	2.26	0.025	.0006169	.0091109

Source of data: Bloomberg Terminal. Results tabulated by author

From Table 4.5 the influence of SARB monetary policy changes on the financial services sector is represented as $JSEFINs_t$, the study ran regression estimation similar to the ALL Share above and found that 1% unanticipated policy shock dropped the financial Index by 0.63%. What is distinct from what was observed in the ALL Share index, the repo rate has a significant impact with a P-value of 0.033. Bredin, Gavin & O'Reilly (2003) found similar results for the Irish equity market. This phenomenon could be explained by the fact that the $JSEFINs_t$ which represents banking and other financial sector stocks are the first direct contact sectors for the monetary policy interventions. The value of R^2 is recorded at 3.8%, which highlights that the reaction of the JSE Financial Index can be attributed to both the anticipated and unanticipated shock of monetary policy.

Anticipated and Unanticipated changes in SARB Repo Rate on the $\Delta JSEINDs_t$ Employing Forward Rate Agreements

Table 4.6 shows the OLS regression results on the JSE ALL Share in response to changes to the official anticipated and unanticipated SARB policy rate as captured in equation 5. No auto-correlation was detected from the Durbin Watson D Statistic (DW) 2.12. The VIF test detects no multicollinearity.

Table 4.6 OLS Regression results: $\Delta JSEINDs_t$

Source	SS	df	MS	Number of obs =	179
				F(2, 176) =	3.56
Model	.006669638	2	.003334819	Prob > F =	0.0306
Residual	.164994272	176	.000937467	R-squared =	0.0389
				Adj R-squared =	0.0279
Total	.17166391	178	.000964404	Root MSE =	.03062

induchange	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
repochange	.1247344	.138881	0.90	0.370	-.1493519	.3988208
fra25change	-.3212998	.1204634	-2.67	0.008	-.5590384	-.0835612
_cons	.0072574	.0022888	3.17	0.002	.0027405	.0117743

Source of data: Bloomberg. Results tabulated by author

Represented in table 4.6 above, the results contained in this table are relatively similar to the All Share results. The regression results show that a 1% shock of the unexpected policy change drops the Industrial Index by 0.32%. The impact of the anticipated policy rate insignificant impact consistent with findings of the ALL Share regression. This similarity could be explained by that the movement of the ALL Share index is highly explained by industrials as it has the greater representation in terms of the number of encounters and market cap (FANEWS, 2015). The value of R^2 is recorded at 3.8%, which highlights that the negative reaction of the JSE All Share Index can be associated to the unanticipated shock of monetary policy.

4.5 Summary

In this study, we assessed the impact of monetary policy announcements on the South African stock market. During this study, an event study approach applied similar methods that were conducted in other markets by (Bernanke & Kuttner, 2005: Bomfim, 2003; Ioannidis, & Kontonikas, 2008).

The pre-diagnostic tests conducted in this section have satisfied the set out in OLS assumptions. The results obtained from the JSE shows a significant impact of the stock market on unanticipated monetary policy shock. This was not a surprise as enough care has been made to control other unrelated noises that could impact the model specifications. Theory dictates that a contractionary monetary policy intervention would drop the stock market. Our results in this study shows that a

100 basis point hike in the unexpected component of monetary policy, dropped the stock market by 0.32%. The financial index experienced a significant shock from the anticipated component of monetary policy but this could be attributed to its reliance on a repo rate to price its interest rate sensitive assets. The bank's balance sheet is largely populated by interest-rate sensitive assets and liabilities.

When looking at the summary statistics results, the financial sector proves to be riskier compared to the JSE All-Share and the industrial index. A highly expected scenario that the All-Share would be less sensitive to shocks compared to the others as it is used as a safe haven by passive investors.

Chapter 5: Summary and Conclusions

5.1 Introduction

This section discusses the overall conclusion of the entire study. In part, it is critical of its methodological shortcomings and highlight areas of improvements in the estimations of parameters. It concludes by giving recommendations to new areas of research that other scholars could pursue.

5.2 Discussion of the objectives & Conclusion

This study empirically assessed the short run impact of unexpected monetary policy announcements on stock market returns using forward rates agreements. This was instrumented through an event study on the JSE All-share index, JSE financial index, and the JSE Industrial Index between January 2010 and November 2019. An event window period was estimated at 1 day pre and post-event day, which means the findings of this study will capture any the relationship precisely within the event window period.

The results of this study were tested against the body of both domestic and international literature on the subject to confirm or invalidate the results. In the Short Run, the study has found that a 1% or 100 basis point unexpected increase, would on average, result in a decrease of 0.32% in stock prices. This is in line with several widely cited studies on this subject by Bernanke and Kuttner (2005); Kontonikas & Montagnoli (2002) proved that the idea of announcement effect is statistically significant when interest rates are unexpected. However, Kuttner (2001) has argued that the impact of the anticipated component of monetary policy could be minimal. Furthermore, the results of this study show a minimal impact of the anticipated policy action only on the financial index (JSEFIN). However, neither the JSE All Share nor Industrial Index have recorded any significant impact of the anticipated changes in policy rates.

In general, this study has extensively reflected on the distinction between expected and unexpected policy instruments by looking at different forward or futures market rates. For example, this study

looked at the study by Ramatlo (2019) who used a 1-month JIBAR as a perfect proxy for repo futures to arrive at her results. Other similar studies by Bernake & Kuttner (2005) used Federal Fund Futures Rate to capture the unexpected component of monetary policy. Deciding on the correct proxy for a repo rate in the forward market is made difficult by the contract's time-averaged structure.

This study further discussed the importance of communications and transparency as an effective tool to guide market participants about the future path of monetary policy. Central banks across the globe have adopted this approach to communicate with market participants to reduce noise. The SARB has communicated effectively within the sampled period to even adopt a framework of releasing votes after MPC meetings by members of the committee. This is important in maintaining a well-functioning financial system and help market participants properly estimate monetary policy paths to improve consensus in the market.

Even though our results are consistent with a variety of studies, it is however limited by several factors. Even with the use of an event study to control the problem of endogeneity, other unrelated events could have been unconsciously incorporated into the analysis. In total, the study contained 60 MPC meetings which this study identified as the union of all days when the MPC made announcements on monetary policy direction. This study failed to identify any other unrelated event that could have impacted the stock market within the event window. Bernanke & Kuttner (2005) were able to exclude from the analysis the 17 September 2001 event as it has occurred on the first day trading day after the September 11 terrorist attack in the U.S. Secondly, the method this study followed does not allow us to determine the effect of dissenting votes in the MPC meetings. Wiranto (2008) analysed whether a lack of unanimity in FOMC decisions affects the reaction of stock prices. His study concluded that a split vote impacts stock prices directly. In the South African context, the approach announcing the votes in the MPC meetings only started under Governor Lesetja Kganyago in 2015. Even if this study would have considered to analyse the impact of dissenting votes in the MPC, data would not have been sufficient to cover the entire 10-year problem as it been introduced 5 years ago.

Although, the study study's objective was mainly focused on the short run relationship between monetary policy outcomes and the stock market, it could have also looked at the impulse response of the dependent variable in the VAR system to trace the shocks in the error term. Impulse response function traces the impact of such shocks for several periods in the future. This would have assisted the study to ascertain whether unexpected rate changes affect stock prices in a persistent manner, beyond the announcement date. Conducting the impulse response tests could have allowed the study to further to test if market participants are efficient in incorporating repo rate changes. Lastly, the VAR equation with lagged values should have been estimated to strengthen the findings of the results.

5.3 Policy Recommendations

Navigating a link between monetary policy and the stock market can be a challenging exercise for both central bankers and stock market investors. The monetary policy transmission mechanism is an important channel for central bankers as it explains the process through which monetary policy outcomes are transmitted to the real economy, inflation and employment. For the market participants, the relationship is important due to its direct impact on stock price valuations, asset management and portfolio formations. Another, implication for the South African Reserve Bank (SARB) and Minister of Finance, is whether or not monetary policy institution should respond to movements in unemployment. Other monetary institutions such as the Federal Reserve Bank (FED) have been given a clear mandate to support the goals of maximum employment, stable prices and moderate long term interest rates. In our analysis in this study, establishes that the preoccupation of the SARB has been observed to be anchored around stabalising inflation whilst unemployment is left to run loose.

Lastly, this study has shown that different sectors react differently to monetary policy actions. Therefore, is important to make differential consideration by industry in the South African economy when executing monetary policy, the SARB authorities should pay more attention to the reaction of sectors capable of creating much needed employment, generating real economic growth when adjusting repo rates.

5.4 Recommendation for further research

Further research could be conducted to assess the impact of South African Monetary policy interventions using intra-day data. Intra-day prices are significant because are affected by the events of the day and not affected by the possibility of overnight events that has a material impact on asset prices. Also, there are more areas identified to improve this study, more work could be done to study the impact of monetary policy pre and post-financial crisis employing longer time frame to contrast the performance of stock market looking at two distinct market conditions. Another future piece of work could concurrently assess the impact of monetary policy actions and other sector related (labour disputes that leads to long protracted strikes) and political events (ANC policy resolution on the Nationalisation of the reserve bank, firing of cabinet ministers, etc.) on the S.A equities market. This would create positive estimation capabilities for the OLS analysis if more variables are accounted for to improve the precision of the model. Further research could also could look at the long run impact of the relationship between monetary policy and stock returns by experimenting with forward rate agreements to trace the time it takes for the shock to remain in the market after the announcement. To further strengthen the robustness of the OLS estimations, other studies could lag dependent variables to provide robust estimates of the independent variable (s).

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Appendix

Table A. 1 Summary of Estimation of Results

	(1)	(2)	(3)
	allsharechange	finchange	induchange
repochange	0.123	0.280*	0.125
	[-0.127,0.373]	[0.0227,0.538]	[-0.149,0.399]
fra25change	-0.316**	-0.626***	-0.321**
	[-0.533,-0.0996]	[-0.850,-0.403]	[-0.559,-0.0836]
Constant	0.00445*	0.00486*	0.00726**
	[0.000325,0.00857]	[0.000617,0.00911]	[0.00274,0.0118]
Observations	179	179	179
R^2	0.045	0.148	0.039
Adjusted R^2	0.034	0.139	0.028
AIC	-770.0	-759.2	-737.1
BIC	-760.4	-749.6	-727.5

Data source: Bloomberg. Calculations by author. 95% confidence intervals in brackets

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A.2 Test for Serial Correlation

Model	**Durbin Watson Statistic**
Model 1	2.091725
Model 2	2.175391
Model 3	2.126307

Data source: Bloomberg. Calculations by author

Monetary policy announcements for period 2010-2019

Table A3 displays the MPC announcement made by SARB on monetary policy changes and their corresponding dates, made during the sample period.

Table A.3 MPC Announcements Date

Date	Announcement Description
26/01/2010	Rates unchanged at 7%
25/03/2010	Reduced repo rate by 50 basis points to 6.5%
13/05/2010	Rates unchanged at 6.5%
22/07/2010	Rates unchanged at 6.5%
09/09/2010	Reduced repo rate by 50 basis point to 6.0%
18/11/2010	Reduced repo rate by 50 basis points to 5.5%
20/01/2011	Rates unchanged at 5.5%
24/03/2011	Rates unchanged at 5.5%
12/05/2011	Rates unchanged at 5.5%
21/07/2011	Rates unchanged at 5.5 %
22/09/2011	Rates unchanged at 5.5%
10/11/2011	Rates unchanged at 5.5%
19/01/2012	Rates unchanged at 5.5%
29/03/2012	Rates unchanged at 5.5%
24/05/2012	Rates unchanged at 5.5%
19/07/2012	Reduced repo rate by 50 basis points to 5.0%
20/09/2012	Rates unchanged at 5.0%
22/11/2012	Rates unchanged at 5.0%
24/01/2013	Rates unchanged at 5.0%
20/03/2013	Rates unchanged at 5.0%
23/05/2013	Rates unchanged at 5.0%
18/07/2013	Rates unchanged at 5.0%
19/09/2013	Rates unchanged at 5.0%
21/11/2013	Rates unchanged at 5.0%
29/01/2014	Increased repo rate by 50 basis points to 5.5%
27/03/2014	Rates unchanged at 5.5%
22/05/2014	Rates unchanged at 5.5%
17/07/2014	Increased repo rate by 25 basis points to 5.75%
18/09/2014	Rates unchanged at 5.75%
20/11/2014	Rates unchanged at 5.75%

Date	Announcement Description
29/01/2015	Rates unchanged at 5.75%
26/03/2015	Rates unchanged at 5.75%
21/05/2015	Rates unchanged at 5.75%
23/07/2015	Increased repo rate by 25 basis points to 6.0%
23/09/2015	Rates unchanged at 6.0%
19/11/2015	Increased repo rate by 25 basis points to 6.25%
28/01/2016	Increased repo rate by 50 basis points to 6.75%
17/03/2016	Increased repo rate by 25 basis points to 7%
19/05/2016	Rates unchanged at 7%
21/07/2016	Rates unchanged at 7%
22/09/2016	Rates unchanged at 7%
24/11/2016	Rates unchanged at 7%
24/01/2017	Rates unchanged at 7%
30/03/2017	Rates unchanged at 7%
25/05/2017	Rates unchanged at 7%
20/07/2017	Reduced repo rate by 25 basis points to 6.75%
21/09/2017	Rates unchanged at 6.75%
23/11/2017	Rates unchanged at 6.75%
18/01/2018	Rates unchanged at 6.75%
28/03/2018	Reduced repo rate by 25 basis points to 6.50%
24/05/2018	Rates unchanged at 6.50%
19/07/2018	Rates unchanged at 6.50%
20/09/2018	Rates unchanged at 6.50%
22/11/2018	Increased repo rate by 25 basis points to 6.75%
17/01/2019	Rates unchanged at 6.75%
28/03/2019	Rates unchanged at 6.75%
23/05/2019	Rates unchanged at 6.75%
18/07/2019	Reduced repo rate by 25 basis points to 6.50%
19/09/2019	Rates unchanged at 6.50%
21/11/2019	Rates unchanged at 6.50%

Data Source: SARB MPC Statements 2010-2019. Table constructed by author