THE IMPACT OF UNANTICIPATED NEWS ANNOUNCEMENTS BY THE US FEDERAL RESERVE ON SOUTH AFRICAN STOCK RETURNS

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Student Number: g09s3314

FEBRUARY 2018

Thesis submitted in partial fulfilment of the requirements for the degree of

MASTER OF COMMERCE (FINANCIAL MARKETS)

DEPARTMENT OF ECONOMICS AND ECONOMIC HISTORY

RHODES UNIVERSITY, GRAHAMSTOWN

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DECLARATION

I Lorna Natsai Sibanda do declare that except for references specifically indicated in the text and such help as has been provided to me by my supervisors, that this thesis is wholly my own work and has not been submitted at any other University or Technikon for any degree purposes.

Signed by _____ on this 27th day of February 2018.

ABSTRACT

This thesis analyses whether monetary policy announcement shocks are transmitted across countries, with special emphasis on the impact of US Federal Reserve announcements on the South African stock market. Monetary policy is an important source of economic news and affects the risk perceptions of market participants. This study will improve the understanding of stock price determinants and possibly influence SA monetary policy in guarding against possible shocks originating from abroad. Using Federal Reserve Open Market Committee (FOMC) announcements over the period 2008 – 2014, the research studied changes in volatility of the South African FTSE/JSE All Share Index returns over this period. An event study and GARCH model approach was adopted to reach the goals of the analysis.

The findings were a statistically insignificant connection between SA stock returns and both anticipated and unanticipated US Federal Reserve announcements. Over the sample period, each shock to SA stock returns persisted for approximately 4-5 months. Although SA stock return volatility demonstrated clustering behaviour (indicating sensitivity to economic shocks), the research could not find an obvious relationship between these spikes in volatility and US Federal Reserve announcements. It is concluded that South African stock returns do not change in response to unexpected US monetary policy announcements.

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CHAPTER ONE: INTRODUCTION

1.1. CONTEXT OF THE RESEARCH

Financial markets are known to be influenced by the prevailing sentiment of market participants at any given time. News announcements that affect risk perceptions are therefore key drivers of investor sentiment. For example, strikes in the South African mining sector as well as the political tensions in Ukraine contributed in 2014 to a prevailing negative risk perception of emerging markets and this resulted in a depreciating Rand (Reuters, 2014). The Nkandla report controversy and the results of the 2014 general election also impacted on risk perceptions of South Africa (van Rooyen, 2014a).

Price movements at the Johannesburg Stock Exchange (JSE) have also been linked to events abroad such as unanticipated Federal Reserve monetary policy announcements (van Rooyen, 2014b) as well as overall sentiment towards emerging markets originating from Wall Street (van Rooyen, 2014c). These sources of news that affect investor risk perceptions highlight the need to study stock market responses to news announcements. Such studies will enable market participants and policy makers to have a better understanding of stock price determinants and may contribute to the conduct of policies, including monetary policy, in future (Ioannidis and Kontonikas, 2007).

In terms of the kind of information that investors react to, Chen, Roll and Ross (1986) suggest that general economic variables indicating the state of the economy, and any other systematic variables that are assumed to affect the economy's pricing operators, affect investor sentiment. Chen, Roll and Ross tested the effect of changes in economic variables on the New York Stock Exchange (NYSE) index: they found that the most influential economic variables included industrial production, the risk premium, the term structure of interest rates, unanticipated inflation and changes in expected inflation – information that is usually inferred from central bank announcements. Bodurtha, Cho and Senbet (1989) did the same study on an international scale. Their results internationally supported those of Chen, Roll and Ross (1986) for the US. International evidence suggested that the money supply and any variables that characterise international risk parity relationships also affect investor sentiment and therefore stock prices.

News announcements by the United States Federal Reserve provide an important source of information about economic variables and therefore affect investor sentiment. This Information is taken seriously because the Federal Reserve is assumed to have superior information about the needs of the economy at any given time (Waud, 1970). Evidence has been found to suggest that unanticipated announcements made by the Federal Reserve have spill-over effects that also affect foreign assets prices (Hausman and Wongswan, 2011), particularly assets in countries that are the US's trading partners. Laeven and Tong (2010) found that countries that are more financially integrated with other economies globally tend to be more vulnerable to shocks produced by changes in the US monetary policy stance. It is also known that stock prices in small open economies are easily affected by shocks originating from other parts of the world. This is partly because the fact that small economies participate in international financial markets, means that the capital inflows and outflows of these countries form a significant percentage of their GDPs, and also because small economies tend to have less diversified economics structures compared to larger economies (Li, Ïşcan and Xu, 2010).

Emerging market countries, most of which are small open economies, have been found to be the most vulnerable to unanticipated actions of not only the Federal Reserve but the US in general. In June 2013, the shock announcement of a gradual end to the Federal Reserve's Quantitative Easing (QE) programme resulted in emerging market economies taking a hit in the form of capital outflows, rising interest rates and depreciating currencies - a direct reversal of the advantages initially experienced after the implementation of the QE programme. The negative news enticed investors to move their assets out of emerging markets and back to the US. Empirical evidence shows that in response to the Federal Reserve's surprise tapering announcement in 2013, currencies like the Indian Rupee and the Brazilian Real depreciated by over 15%, while the main Indonesian and Turkish stock indices fell by almost 20% (Kumar and Barua, 2013).

South African bond and equity markets have likewise experienced significant capital outflows since markets players started anticipating the beginning of the Federal Reserve's tapering program (Jones, 2014: 1). In fact, the markets could possibly continue to suffer as South Africa seems to be in a more vulnerable position due to its large current account deficit and domestic inflationary pressures (Kumar and Barua, 2013). Business confidence is

an important channel through which US supply shocks are transmitted to South Africa. On the other hand, US demand shocks were found to be transmitted through a number of variables, including interest rates and stock prices (Kabundi, 2009). Jefferis and Okeahalam (2000) and Junkin (2011) analysed macroeconomic determinants of stock prices in the South African context. While their findings were consistent with Chen, Roll and Ross' (1986) findings that general economic indicators impact on stock prices, they found also that the US real interest rate had a significant impact on South African stock returns. This impact could be further amplified by South Africa's multiple links to the US, outside of the financial markets. A study by Ncube *et al*. (2012) highlighted the extent of South Africa's connections to the US through trade channels. From 1998Q4 to 2007Q4, the value of exports from South Africa to the US increased by more than US$170 million. In 2013, it was reported that US goods imports from South Africa had increased by 83% from 2012 levels, while services imports had increased by 157% from 2012 levels (United States Trade Representative, 2014).

Given that markets react to all these variables that affect expectations about monetary policy, it is clear why emerging market economies experienced capital withdrawals after unanticipated Federal Reserve announcements. The magnitude of the reaction to these withdrawals and the duration of the reaction can be attributed to a number of factors, including the extent to which such news announcements are unanticipated, the extent to which the expectations have to be revised, and the prevailing state of the economy (Bernanke and Kuttner, 2005).

Several methods have been used to study the impact of monetary policy shocks on macroeconomic and financial variables. These methods include Event studies with OLS regression models, Markov Switching models, Vector Autoregressive (VAR) models, Generalised Autoregressive Conditional Heteroscedasticity (GARCH) models, and Simultaneous Equation models. Markov Switching models, Vector Autoregressive (VAR) models have been criticised for their complexity while OLS models have been criticised for keeping the variance of other shocks constant while that of the monetary shock becomes infinitely large on event days (Bouakez, Essid and Normandin, 2013).

The purpose of this research therefore is to examine whether unanticipated news announcements, particularly those made by the Federal Reserve, impact on volatility in the South African stock markets.

1.2. GOALS OF THE RESEARCH

The goal of the research is to investigate whether or not unanticipated news announcements made by the US Federal Reserve Bank have an impact on South African stock returns. In order to answer the question, the following sub-goal will be addressed:

- Measuring the magnitude of the reaction of South African stocks returns to unanticipated news announcements by the US Federal Reserve.

1.3. METHODS, PROCEDURES AND TECHNIQUES

This research will employ event study and Generalised Auto-Regressive Conditional Heteroscedasticity (GARCH) methodology to measure changes in SA stock market volatility resulting from unanticipated US Federal Reserve news announcements. The event study approach will also be used to determine the timing and nature of the relevant news announcements by the Federal Reserve. Federal Open Market Committee (FOMC) meeting dates will be used as news announcement dates. Volatility on SA stock markets is persistent because of the South Africa's high level of dependence on international capital flows for investment. Rather than inspecting SA stock returns for the existence of volatility on Fed Reserves announcement dates, the research will use a GARCH model within the event study framework, in order to analyse clustering behaviour and spikes in volatility of SA stock returns after US Federal Reserve announcements.

In line with the literature (Bouakez, Essid and Normandin, 2013), GARCH methodology is used in this study. A GARCH (1,1) model will be used to investigate the relationship between SA stock returns and expected/unexpected US Federal Reserve announcements. The GARCH (1,1) model is also preferred because of its relative simplicity.

To make the results of GARCH model robust, dummy variables will be used to signify days when either expected or unexpected news announcements were made. The method used to distinguish between expected and unexpected announcements is adopted from Fischer (2016) where changes in interest rate expectations around the announcement date are

used. Interest rate expectation is defined as the daily change in the two-year short-rate of a shadow rate term structure model – i.e. the Arbitrage-Free Nelson-Siegel model, which was developed by Christensen and Rudebusch (2013) and assumes interest rates have a zero lower bound.

The data concerning the SA stock returns is obtained from Thomson Reuters Datastream, while that concerning Federal Reserve announcements is obtained from the US Federal Reserve Bank website. Announcements made during the financial crisis (in 2008) up to the end of the Federal Reserve's Quantitative Easing programme (in 2014) are considered.

1.4. ETHICAL CONSIDERATIONS

The research is conducted using secondary data that is publicly available. Results obtained are deductive. Consequently, no foreseeable ethical implications were experienced in writing the thesis.

1.5. ORGANISATION OF THE RESEARCH

The study is organized as follows: Chapter 2 reviews the literature about monetary policy and transmission mechanisms. Chapter 3 addresses, in detail, the methodology and data introduced in section 1.3 above. In Chapter 4, the results of the preliminary and econometric analyses are presented and discussed to highlight any implications. Lastly, Chapter 5 summarises and concludes the study. Possible areas for further research are also discussed in this Chapter.

CHAPTER TWO: LITERATURE REVIEW

2.1. INTRODUCTION

Monetary policy and financial assets lie at the core of the research; this literature review is thus focused on the effects of monetary policy on the stock market. Section 2.2 compares the monetary policies and tools of the US and South Africa in preparation for a discussion on the transmission of monetary policy in Sections 2.3 and 2.4. The aim is to show that transmission mechanisms exert significant influence on financial market prices outside of the US, and that South Africa is no exception. Section 2.5 gives empirical evidence for this argument and section 2.6 concludes the Chapter.

2.2. MONETARY POLICY IN PRACTICE

2.2.1 US FEDERAL RESERVE

In the US, the central banking system, known as the US Federal Reserve System (Fed), operates through 12 regional reserve banks (Federal Reserve, 2014). Friedman (1982) argues that experience rather than theory has shown central bankers that the most appropriate strategy for monetary policy is to focus solely on stabilising prices. As such, the mandate of the Fed is to maintain price stability whilst maximising employment and moderating long-term interest rates. This price stability trend follows the New Keynesian policy framework.

Interest Rate Targeting: To achieve its goal of price stability, the Fed has a 2% inflation target which it attempts to reach by targeting a short-term interest rate called the Federal Funds Rate. Other central banks around the world have different interest rate targets ranging from the overnight bank market rate, interest rate on secured loans (e.g. Bank of Canada), the interbank market rate (Eisner, Martin, and Søvik, 2016).

The Federal Funds rate is the weighted average interest rate at which banks and other depository institutions lend excess reserves to each other overnight. Due to the Fed's reserve requirements, a depository institution with a deficit in reserves would need to cover the deficit by borrowing from another depository institutions at a rate agreed upon by the

two banks. The effective Federal Funds rate is the weighted average of theses bilateral interest rate agreements across the interbank overnight market (Federal Reserve Bank of St Louis, 2018). As of January 2018, the effective Federal Funds rate stood at 1.41% which is with the Federal Funds rate target range of 1.25-1.50%.

The Fed targets the Federal Funds rate by using a few tools including the discount rate, open market operations, reserve requirements, and repurchase agreements. In addition to these tools, the Fed now pays an interest rate on required and excess reserves (Federal Reserve, 2014).

By targeting this short-term interest rate, the Fed can exercise some control over the availability and cost of credit (i.e. other short-term interest rates) in the US and world economies through arbitrage induced capital flows. As the central bank changes the short-term interest rate to control the supply, the market eliminates opportunities for arbitrage by forcing other short-term interest rates to change. Jorda (2005) found strong empirical evidence to support this relationship. Fisher (2013) studied the role of monetary policy in the context of long and short run interest rates and real consumption. Fisher revealed that a central bank's intervention in the loanable funds market directly caused the short-term interest rate to fall, and indirectly decreased long-term interest rates. The Fed's monetary policy, through the Federal Funds Rate, also has an impact on the cost of other interest sensitive assets such as bonds, stocks, foreign exchange, household durables and real estate (Labonte, 2018).

The discount rate: Banks and other depository institutions have a reserve requirement at the central bank. The Fed offers these financial institutions a secured loan facility to use when they have a reserve deficit. The interest rate for these loans is known as the discount rate. Regional Federal Reserve Banks offer 3 types of discount rate loans: primary credit for overnight loans to financial institutions; secondary credit for short-term loans to institutions in liquidity crises or severe financial difficulty; and seasonal credit for small depository institutions with recurring fluctuations in liquidity needs. The discount rate for primary credit is set at a level above the short term interbank rate (i.e. Federal Funds Rate), and the other discount rates are derived from the primary discount rate (Federal Reserve, 2014).

The discount rate does not affect the Federal Funds rate through the discount rate's effect on the supply of money. In fact, the discount rate only affects the allocation of total reserves between borrowed reserves and non-borrowed reserves. Despite its limited impact through the supply of money, the discount rate remains a useful tool for the Fed because it is the ceiling for the Federal Funds rate. Depository institutions would rather borrow from the central bank at the discount rate than from the interbank market if it was cheaper to do so. This would create an opportunity for arbitrage as banks borrowed from the central bank and lent funds to the interbank market at the Federal Funds rate, until the two rates equalised. In the past, changes in the discount rate have caused changes in the Federal Funds rate of the same direction and approximately the same magnitude (Broaddus and Cook, 1983). The discount rate has even more impact on the Federal Funds rate in the post financial crisis era where the Fed pays interest on reserves.

Open market operations: One of the main tools for targeting the Federal Funds rate is open market operations – i.e. when the Fed buys and sells financial securities to/from depository and other financial institutions. When the Fed sells securities in the open market, it drains liquidity or reserves from the banking system, causing a shortage of reserves. As depository institutions try to meet their reserve requirements, they increase the demand for scarce reserves, thus pushing the interest rate on borrowed reserves (the Federal Funds rate) up.

Conversely, the Fed purchases securities from the open market to put downward pressure on the effective Federal Funds rate and other longer-term interest rates. This is how the Federal Funds rate reached the zero lower bound during the 2008/9 financial crisis – as the Fed undertook large scale purchases of securities to support economic activity and prevent job losses (Federal Reserve, 2014).

The choice to conduct monetary policy on a larger scale than normal with limited private market intervention was a discretionary measure that deviated from the normal central bank rules (Gertler and Karadi, 2011). The discretionary stance was taken because the usual policy had lost effectiveness during the crisis, because it was based on a model that assumes frictionless markets, meaning that it could not internalise any financial market disruptions. Other policy models which do account for financial market frictions have failed to justify direct intervention in private credit markets.

The large-scale purchases of securities that were used to dampen the effects of the global financial crisis on the US economy led to the expansion to the Fed's balance sheet. This was a threat because it could end up creating market distortions that would further prolong financial instability (Cecioni *et al*., 2011). The Fed sought to reverse this situation once the economy had somewhat recovered in 2015 by introducing a supplementary type of open market operation called an Overnight Reverse Repurchase Agreement (ON-RRP).

Whereas normal purchases/ sales of securities in the open market are classified and permanent operation, ON-RRPs are naturally classified as temporary operations. There are two kinds of ON-RRPs, namely repurchase agreements and reverse repurchase agreements. Under these agreements, the Fed agrees to buy/sell collateralised securities to market, with the promise to repurchase/resell the same securities the next day. The difference in price between the sale and purchase becomes the interest rate on the transaction. These supplementary open market operations are designed to cater for the transitory reserve needs of the liquidity market. The Fed currently has US$ 2 trillion in collateralised Treasury Bills available for ON-RRPs (Federal Reserve, 2018).

Required and Excess reserves: The Fed implements its monetary policy by mandating depository institutions to keep a percentage of their reserve in their accounts at the Fed, based on the size of the depository institution's balance sheet. Once there is a reserve requirement, central banks can use open market operations to drain/pump liquidity from/into the market, and thus reach their monetary policy goals.

Before and during the 2008/9 financial crisis, there was no incentive for US depository institutions to keep anything more than the minimum level of reserves at the Fed. This meant that the Fed had less control over the cost of credit. To gain more control over the cost of credit and gradually reduce its balance sheet, the Fed introduced interest on required and excess reserves to encourage banks to save their reserves at the Fed. The interest rate on excess reserves also serves as a lower bound or floor for the Federal Funds rate. With the presence of an interest rate on reserves, depository institutions would prefer to lend their funds (i.e. excess reserves) to the Fed rather than the interbank market, if the interbank market rate (Federal Funds rate) went below the interest rate on excess reserves (Eisner, Martin, and Søvik, 2016). In a scenario were the Federal Fund rate sunk below the

interest on excess reserves, depository institutions would take advantage of the arbitrage opportunity by borrowing funds on the Federal Funds market and lending the same funds to the central bank where they would earn an interest on excess reserves and make a profit. These trades would eventually cause the Federal Funds rate to rise until it was equal to the interest on excess reserves. When the Fed wants to decrease the Federal Funds rate, they set the interest on excess reserves below the effective Federal Funds rate such that banks see an opportunity to lend more reserves in the Federal Funds market. This would then increase the supply of reserves available for loan in the market, causing the Federal Funds rate to fall (Williamson, 2016).

2.2.2 SOUTH AFRICAN RESERVE BANK

According to SARB (2014), the South African Reserve Bank (SARB) has been mandated to by the government, to achieve and maintain price stability, to assist in achieving the overall economic goal of development and growth.

Target Interest Rate: Where the Federal Reserve System controls inflation by targeting Federal Funds Rate, the SARB controls inflation by targeting the Repurchase Rate (Repo Rate). The SARB tries to maintain the inflation rate, or the Consumer Price Index, between 3-6%, but does allow for some flexibility around this target band, especially after a supply shock such as a change in the price of oil or a major political event.

Required Reserves: The system of mandated required reserves in South Africa is very similar to that of the US, except that depository institutions in SA are required to keep cash reserves only. This gives room for the SARB to use repurchase agreements as their main tool for implementing monetary policy.

Open Market Operations: To meet the inflation target, the SARB creates a reserve shortage through the reserve requirement and then offers a loan facility to banks through repurchase agreements, reverse repurchase agreements and other open market operations. The repurchase (repo) rate is determined by the SARB when they conduct repurchase auctions on a weekly basis with commercial banks against eligible collateral. The repurchase rate is used to derive other interest rates such as the prime lending rate and other economic aggregates such as money supply and the rate of inflation (SARB, 2016).

At the end of each business day, banks need to settle outstanding balances amongst each other based on the transactions of the day, but may struggle to do so because of the shortage of reserves in the market. The SARB takes advantage of this scenario, and gains more control over the cost of credit, by using the interbank rate (which in determined in the interbank market) to lend reserves to banks for squaring off end-of-day settlement accounts. The interbank rate is always lower than the repo rate to limit arbitrage opportunities where banks would borrow unlimited funds from the SARB and lend the same funds to the interbank market at a profit. The provision of reserves at both the repo rate and the interbank rate is the defensive role of the SARB (SARB, 2016).

Open market operations including the buying and selling of government securities and SARB debentures are also frequently used by the SARB to address the liquidity needs of the market and therefore give effect to the policy interest rate. This is the accommodative role of the SARB (SARB, 2014).

The SARB's overall aim, in carrying out all these monetary policy actions, is to use various signalling tools to affect the marginal cost of capital, rather than the actual interest rate and, by extension, to control the inflation rate; the latter also helps to control inflation expectations. Controlling inflation expectations is important because the expectation of an inflationary economy in the future could lead to the development of an asset price bubble.

2.3. HOW INVESTORS FORM EXPECTATIONS

Investors make their investment decisions based on their expectations of different markets/situations ranging for economic and business fundamental, political climate, emotional state of mind, and what others are doing. Greiner (2014) identified the four basic drivers of stock market behaviour as expectations about monetary policy, other investors' sentiments, stock valuations and earnings. Investor sentiment can also be driven by expectations about permanent and transitory productivity shocks (Cassola and Morana, 2004). A survey by Colliers International on global investor sentiment found that the top five drivers of sentiment, ranked in order of importance, were expectations about asset fundamentals, economic growth, yield, asset appreciation and ease of entry/exit (Horell, 2014). Merrin, Hoffmann and Pennings (2014) found that investor sentiment was also driven by expectations about risk and the stock market. Dasgupta and Chattopadhyay (2014) came

to a similar conclusion as Merrin *et al*. (2014) and addded that investor sentiment was influenced by expectations about information uncertainty, and trading volumes and momentum.

2.3.1 TAYLOR RULE'S ROLE IN FORMING EXPECTATIONS

Central bankers publish their forecasts of interest rates, inflation and output. Market participants' respond to the information expected from the central bank before the information in published because they view the central bank as holding superior information about the state of the economy. Sims (2007) argues that by announcing forecasts, central banks can prevent public perception of a normal interest rate cut as an indication that the economy is heading for a recession.

The Federal Open Market Committee (FOMC) of the US uses the Taylor Rule to derive the appropriate level for its Federal Funds rate target before it makes an announcement (Federal Reserve Bank of Atlanta, 2018). The Taylor Rule is an economic model used to forecast short term interest rates based on the rational expectations theory and past values of economic fundamental such as the rate of inflation, GDP, and unemployment. In summary, the Taylor Rule suggests that the real short-term interest rate should be 1.5 times the inflation rate (Constâncio, 2017). Before the central bank's announcement, investors form their expectations about monetary policy and economic fundamentals based on the knowledge that the Federal Reserve uses the Taylor Rule.

There is a lot of evidence to confirm that investors form their expectations about monetary policy before the central bank makes the actual announcement. Prior to the September 2017 Federal Reserve announcement, US stock indices rose on the expectation that the Federal Reserve would implement their plan to increase US interest rates and reduce the central bank's balance sheet (Sjolin and Vlastelica, 2017).

The formation of expectations, based on the Taylor Rule alone can result in a distorted perception of economic fundamentals and irrational investment decisions. This may occur because the Taylor rule relies on past and possibly invalid/obsolete information to make forecasts, and it only considers short-term economic prospects. On the other hand, the central bank's actual targets are derived from the Taylor Rule, but may also be based on the

FOMC's discretion, and longer term economic concerns (Constâncio, 2017). These differences can be seen in reality as the Taylor Rule implied Federal Funds Rates is approximately 3.75% based on an inflation rate of approximately 2%. Instead, the Federal Funds rate has a target of between 1-1.25% (Reynolds, 2017).

The tendency to use past information to drive expectations extends beyond the Taylor Rule. Jones and Martinez (2013) studied the pattern of investor expectations formation and found that investors ignored their expectations about future asset price performance. They found instead that investors relied on the perceived past performance of assets in forming the real expectations and in making their investment decisions. Jones and Martinez attributed this attitude to an agency problem where asset managers must justify their actions to the fund owners using "tangible" proof of past performance. Similar evidence of the use of past performance data in forming expectations was found by Barberis, Greenwood, Jin, and Shleifer (2015).

Some investors take an alternative approach by using forward looking Taylor Rules rather than the traditional backward-looking models to build their economic fundamental expectations. Heimonen, Junttila and Kärkkäinen (2017) examined the impact of using a forward-looking Taylor rule in forming stock market and exchange rate expectations in 14 OECD countries over a period of 18 years. They found a strong relationship between the Taylor Rule determined interest rate and movements in the stock market and exchange rate markets. Hafner and Lauwers (2017) also studied a forward-looking Taylor Rule and found that the central bank took consideration of stock prices in their monetary policy design particularly when these prices were misaligned with their fundamentals. Essentially, this means that investors expect the central bank to adjust interest rates using the Taylor Rule if there is significant disequilibrium in stock markets.

2.3.2 RISK PERCEPTIONS AND INVESTOR EXPECTATIONS

Risk perception and attitude are important themes in the formation of investor expectation. This was shown by Chen, Roll and Ross (1986) who tested the effects of changes in economic variables on the New York Stock Exchange (NYSE) and found that the most influential economic variables included industrial production, the risk premium, term structure of interest rates, unanticipated inflation and changes in expected inflation. These

variables are expressions of market risk. Bodurtha, Cho and Senbet (1989) conducted the same study on an international scale and their results supported Chen, Roll and Ross (1986). They add that money supply and any variables that characterised the international risk parity relationship affect international stock returns. De Bondt (2008) conducted a more recent study of stock price determinants in 12 major world economies including the US, UK, Germany, Japan and Australia. De Bondt (2008) found that investor sentiment and stock prices were influenced by earnings, the risk-free interest rate and the long-run equity risk premium. This long-run equity risk premium was a function of earnings yield and the 10-year government bond yield. An earlier study by Campbell (1998), which was concerned with the consumption-based asset pricing model, pointed out that investors' expectations about future excess returns were a product of the price and quantity of risk.

The way investors quantify, or price risk depends on how risk averse they are. The level of risk aversion can also affect how investors form irrational expectations. Campbell (1998) found that highly risk averse investors, who were pessimistic about economic growth, usually over-priced short-term treasury bills and under-priced stocks.

2.3.3 INVESTOR EMOTIONS AND THEIR EXPECTATIONS

The emotional state of the investor is yet another important factor influencing the direction of investor expectations. Lerner, Small and Loewenstein (2004) found that emotions resulting from prior, irrelevant situations affected the buying and selling decisions of investors. Lerner and Keltner (2001) highlighted that emotions, such as fear and anger, produced opposing effects on the buying and selling trends of investors. Where fearful investors were observed to be pessimistic, angry investors were surprisingly observed to be optimistic. The emotional state also influenced investors' decisions on whether the market followed a trend or reverted to its mean fundamentals.

Information about the macroeconomic environment and the level of financial sector development affects emotional state of investors. This information is usually provided by the financial news media. Tetlock (2007) confirmed this by researching the direct relationship between news media outputs and movements in the stock market. Although statistical tests could not confirm whether news media output contained new information that could influence stock market returns, there were some interesting findings. Tetlock

(2007) found that stock market prices were mean reverting after periods of high media pessimism, and that market trading volumes rose significantly during periods of unusually high or low media pessimism. Statistical tests could be used to confirm these findings because the observed market reactions did not occur immediately after the news releases but were dispersed throughout the day.

The recent volatility in South African financial asset markets could be explained by Tetlock's findings. The media, which had wide coverage of the African National Congress (ANC) presidency succession race, portrayed candidate Cyril Ramaphosa as one who would revive South Africa's economy and put up an effective fight against corruption. The media portrayed the other candidate, Nkosazana Dlamini-Zuma, as one who would pursue radical economic transformation at the expense of the fiscal budget and further credit ratings agency downgrades. These media portrayals had a significant impact on building investor expectations about the South African economy after the ANC elections. The expectation that Cyril Ramaphosa would take over as the new ANC President could be seen in the market movements (e.g. strengthening Rand and rising price of bank stocks), even before the actual announcement of his victory (El Baltaji and Wallace, 2017).

Other research papers supported the view that news media played a large role in the formation of investor sentiment and expectations. By identifying common linguistic features that related fear, worry and anxiety, Gilbert and Karahalios (2010) measured how investor sentiment in the online media community affected the S&P 500 stock index. Their conclusion was that a spike in the presence of words that expressed high levels of anxiety was connected to falling S&P 500 index values. Fang and Peress (2009) investigated the impact of mass media news releases on the stock market and found that stocks with low mass media coverage had higher returns than stocks with higher media coverage. They also discovered that stocks with informational discrepancies were more sensitive to mass media coverage.

2.3.4 INVESTOR EXPECTATIONS IN EMERGING MARKETS

Bai and Green (2010) considered country and industry stock return determinants in 13 emerging market economies. Their main finding was that macroeconomic variables, the level of financial sector development and the legal environment were important at the country level, while industrial and geographical concentration were important at industry level. Trevedi and Behera (2012) also provided a targeted analysis of stock price determinants in emerging markets with their study of the Bombay Stock Exchange Sensex. They observed strong and long-run co-movement between stock returns and industrial production, the wholesale price index (proxy for inflation), interest rates, money supply, foreign institutional investments and the Morgan Stanley Capital International world index (proxy for international stock price movements). Similar results were observed by Osamwonyi and Evbayiro-Osagie (2012) in the Nigerian stock market; and by Singh, Mehta and Varsha (2010) in the Taiwanese stock market. These co-movement findings indicate that investor expectations about inflation, monetary policy and some international factors play a role in the determination of stock market behaviour.

Some recent studies have investigated the stock price determinants in BRICS emerging markets. Bhuyan, Robbani, Talukdar and Jain (2016) investigated how information about returns and volatility was transmitted between US stock markets and BRICS country stock markets in the 13 year period between 1999 and 2012. The results of their empirical analysis suggested that US stock market return and volatility movements have spillover effects in BRICS countries. Interestingly, the study also identified strong spillover effects between BRICS markets, particularly between Chinese and Indian stock market return and volatility movements. These findings are similar to those reported by Mensi, Hammoudeh, Reboredo and Nguyen (2014) who examined the dependence of BRICS stock markets on global stock and commodity markets, and US stock market volatility between 1997 and 2013. Although Mensi *et al.* (2014) found this connection, their results surprisingly indicated that there was no relation between US economic policy uncertainty and BRICS stock markets. The literature discussing spillover effects between US and BRICS stock markets suggests that investor expectations in emerging markets are significantly influenced by developed stock market movements. A possible explanation for this dependence system is the high share of foreign investors or external capital in emerging stock markets. For

example, foreigners hold over half of the equity on the South African FTSE/JSE stock index (Hogg, 2015).

Before the global financial crisis, African country stock markets were affected by national factors more than global economic variables. Since the global financial crisis induced structural break observed by Boamah, Loudon, and Watts (2017), African stock markets have become increasingly affected by global economic factors. This could be explained by the growing search for higher returns in developing economies after developed economies lowered interest rates to stimulate their local economies. The shift in the balance of factors that affect investor expectations can be observed in South Africa. In this country, fluctuation in industrial production, money supply, inflation and exchange rates affect investor expectations and stock returns (Shawtari, Salem, Hussain, Hawariyuni, and Thabet, 2015). However, global factors have gained more importance in the view of investors. For example, there is a growing risk of international credit ratings agencies downgrading South African bonds to junk status. Investors in South African markets take note of the credit ratings status because a significant portion of South African bonds are financed by foreign capital (Wilson, 2016).

2.3.5 HERDING BEHAVIOUR

It was suggested that investors also base their expectations and decisions on the behaviour of other market participants. This idea was introduced by Keynes (1936) in a discussion about “beauty contests” in financial markets and was revisited by Kahneman and Tversky (1979) in their discussion about the representativeness heuristic. The beauty contest metaphor was described as a situation where investors did not necessarily buy securities that they perceived to be superior. Instead, they bought securities that they thought other investors will buy (Hommes, Sonnemans, Tuinstra, van de Velden, 2004).

Investor expectations are not only affected by other market participants’ beliefs, but also by higher order beliefs. Allen, Morris and Shin (2006) investigated the relevance of higher order beliefs. They concluded that investors that prioritised their expectation of average opinion usually perceive public information, contained in news media, to be more important than private information.

2.4. TRANSMISSION MECHANISMS

2.4.1 HOW US MONETARY POLICY AFFECTS ASSET PRICES

The path through which monetary policy reaches the real economy is explained as the transmission mechanism. Monetary policy transmission mechanisms work via short term interest rates and affect the interbank market first. By altering short term interest rates, monetary policy helps to set the cost of capital. The cost of capital directly influences financial asset prices, while indirectly affecting these prices through an economy's level of consumption and investment.

Since long term interest rates are determined by expected future short-term interest rates (according to term structure theory), the central bank induced changes in the short-term interest rate filter down to the long-term interest rate (Cecioni, Ferrero and Secchi, 2011).

Most households have long term savings in the form of pension plans, life insurance and durable goods (e.g. real estate) by obtaining medium to long term finance from banks. These long-term savings plans are usually linked to financial assets like unit trusts or stock indices that are affected by short-term interest rates. Businesses also participate in investment activities by issuing corporate bonds to reach their growth goals. Therefore, the levels of consumption and investment across households and businesses are directly dependent on short term interest rates. A rise in short term interest rates, after monetary policy tightening, could slow down investment and consumption activities, resulting in the poor performance of the linked financial assets and the consequent decline in their prices.

All the above-mentioned developments demonstrate that monetary policy can be used to control credit market conditions and financial asset prices by extension, through transmission channels (Orr, Edey and Kennedy, 1995).

2.4.2 PURE MONEY CHANNEL

The pure money channel of transmission assumes that there are only two assets – money and bonds – and that the only role of bank intermediation is to create money by providing bank deposits. Contractionary monetary policy will negatively affect banks' ability to issue demand deposits and therefore reduce the banks' bond holdings. This means that

households would have to hold more bonds and less cash. Assuming that prices do not adjust completely and instantaneously, an adjustment back to equilibrium requires real interest rates to rise. This shift in real interest rates affects investment negatively because it means that the cost of borrowing is higher. As real interest rates rise, the price of bonds falls because the inverse relationship between prices and interest rates (Kashyap and Stein, 1994).

2.4.3 BANK CREDIT CHANNEL

Bernanke and Blinder (1988) attempted to establish a monetary transmission mechanism that depended on bank loans as well as bank deposits. Unlike conventional transmission mechanisms that assumed perfect substitutability between customer market credit (loans) and auction market credit (bonds) as well as credit rationing, Bernanke and Blinder's mechanism ignored these assumptions. They assumed instead that market participants' choices between bonds and loans were influenced by the respective interest rates on these instruments. In the short run, a contractionary monetary policy shock caused market players to respond by selling off bank deposits, while there was no impact on loans. However, in the long-run, the contractionary action affected the loan recipients of banks and subsequently their demand for goods and services. When the central bank implemented contractionary monetary policy, the level of excess bank reserves was reduced and thus reduced the volume of loans that banks could extend to customers. As a result, bank credit dependent customers were directly affected by the actions of the central bank and responded by reducing their consumption of all goods including financial securities. Bernanke and Blinder's (1992) theory on the bank credit transmission mechanism suggested that the volume of bank loans was affected by monetary policy innovations, although this transmission occured at a slower rate than that of bank deposits. They attributed the slow response to the fact that bank loans are contractual commitments.

To support their theory, Bernanke and Blinder (1992) measured the effects of monetary policy on the real economy by isolating a direct measure of monetary policy (changes in the US Federal funds rate) and observing its impact on bank balance sheet variables. Their approach provided empirical evidence in support of the bank credit transmission channel.

Kashyap and Stein (1994) referred to this bank credit channel as the lending channel and found empirical evidence to support it.

Kashyap and Stein (1994) discussed the practical implications of the lending channel. Most importantly, they referred to the skewed distributional effect of the lending channel because of its targeted impact on bank credit dependent firms and individuals. When contractionary monetary policy was implemented, individuals and smaller firms that only had access to bank credit carried a large portion of the higher cost of credit – possibly causing them to encounter cash flow problems. Poor business performance on a large scale pushed stock prices down. Larger firms that were financed by corporate bonds benefited from increased interest rates because their bonds become cheaper when offering higher returns.

2.4.4 BALANCE SHEET CHANNEL

According to Bernanke and Gertler (1995), the balance sheet channel affects net worth through changes in the supply of credit, both directly and indirectly. At the peak of the business cycle, it is common for borrowers to have accumulated debt because of the low interest rates that prevailed during the upswing. Subsequent monetary policy tightening causes the interest expenses of borrowers to increase, therefore decreasing their net cash flows. Since the present value of assets is affected by short term interest rates, monetary policy tightening also causes asset prices to fall, meaning that borrowers have less collateral. The combined effect of reduced cash flows and diminished collateral values weakens borrowers' balance sheets. Market players could perceive a weaker balance sheet position as a reason to sell company stock – causing the stock price to fall. This is the direct effect. The indirect effect is the second-round consequences of the direct effect. Increasing the interest rate decreases consumer spending and company revenues. These individuals and companies will thus demand less goods and services, including stocks and bonds.

There is strong evidence to indicate that the credit channel of transmission (which encapsulates the bank lending and balance sheet channels) is the main channel in most economies, and most importantly, in emerging market economies. Samantaraya and Kamaiah (2011) found evidence to support the dominance of the credit channel, but further identified it as a common source of economic shocks. Mohanty and Turner (2008) found

similar evidence and highlighted that the short-term interest rate had a stronger and longer lasting effect on bank deposits and loans compared to long term bonds. The impact on long term bonds was found to be strong but short lived. The implication was that monetary policy affected long term asset prices in the short term; however, these prices reverted to their fundamentals after a while.

Mohanty and Turner (2008) additionally found that emerging market economies with large external financing requirements, like South Africa, could cause the inflation risk premium or the country risk premium on local debt to increase as expansionary monetary policy was implemented. This means that South African financial assets would have to offer higher returns at lower prices, even after their central bank decreased interest rates.

Adrian and Shin (2009) discussed the increased prominence of the credit channel due to the growing role of non-bank capital markets in the supply of credit. They explained that the introduction of securitisation, which was driven mostly by market-based institutions, further opened the real economy to monetary policy control; however, the size of this effect has shrunk since the global financial crisis. Adrian and Shin (2009) concluded by suggesting that short-term interest rates played a larger role than implied by modern economists in that short-term interest were only used for the determination of long-term interest rates.

2.4.5 CONSUMPTION WEALTH CHANNEL

The consumption wealth channel or the long-term interest rate channel affects the market value of individuals' assets or their wealth through changes in the long-term interest rate. Changes in long term interest rates are said to affect wealth in two ways; through the value of real estate and through the value of financial asset holdings. If a central bank reduces short-term interest rates and long-term interest rates follow suit, the value of property increases thus benefitting existing real estate owners because they can earn capital gains. These gains can be converted into cash through mortgage equity withdrawals and then used to increase consumption spending on other financial assets.

The reduction in interest rates by the central bank would also have a positive impact on the value of financial asset holdings because of the decreased discount factor on their present value. As financial asset holders begin to feel wealthier after an interest rate reduction, they

also begin to spend more, possibly on more financial assets. The strong relationship between asset prices and consumption is the reason why the impact of monetary policy shocks on asset prices needs to be closely monitored.

Tobin's Q theory clearly articulates the relationship between asset prices, wealth and monetary policy by defining the variable "q" as the ratio of market value of firms relative to the replacement cost of capital. Where "q" is high (i.e. market value of firms > replacement cost of capital), firms have the room to issue a small amount of stock in exchange for more money to use in funding capital intensive projects. An expansionary monetary policy stance decreases interest rates on bonds, thus making stocks more profiTable to own relative to bonds. As stocks appreciate, Tobin's "q" value increases and this leads to an increase in total investment across the economy and an eventual increase in output. In the international context, an expansionary monetary policy stance by the Fed would make foreign bonds and stocks more attractive relative to US bonds, thus causing an outflow of capital from the US economy (Mishkin, 2001).

The strength of asset price and consumption relationship is amplified in countries with developed financial markets that provide easy access to mortgage equity withdrawals, mortgage refinancing, and the cheap trading of shares (MacDonald, Mullineux and Sensarma, 2011). Aron, Duca, Muellbauer, Murata and Murphy (2011) confirmed the importance of the consumption wealth channel in the US, UK and Japan, but highlighted that it had the opposite effect on asset prices in Japan. The effect of house prices on consumption in South Africa was investigated by Peretti, Gupta and Ingleti-Lotz (2012) and their evidence supported the existence of the consumption wealth channel in South Africa, especially after financial liberalisation.

2.4.6 EXCHANGE RATE CHANNEL

The exchange rate channel is another frequently documented transmission mechanism. Mishkin (2009) suggested that the effect of foreign output gaps on domestic inflation was transmitted through a non-Phillips curve kind of mechanism and proposed that this mechanism could be the exchange rate. The exchange rate channel is present in countries with open economies that operate under the uncovered interest parity condition. As monetary policy is implemented in these economies, changes in interest rates affect

international capital flows. A policy induced interest rate reduction causes capital to flow out of the country as investors seek to maximise returns elsewhere. The local currency depreciates as investors withdraw their capital. The exchange rate has an impact on several variables that affect the real economy including local demand, private sector expectations, the balance sheets of households and firms with foreign currency denominated asset and liabilities, and the volume of export and imports. The changes in local demand and expectations have the potential to cause other financial prices to fall e.g. commodity and resources stocks (Taylor, 1995). Mohanty and Turner (2008) found the exchange rate channel to be dominant in South Africa.

2.4.7 MONETARY POLICY TRANSMISSION IN ECONOMIC CRISES

Cecioni, Ferrero and Secchi (2011) noted that monetary policy transmission mechanisms are different during periods of economic crisis. This is due to the more complex nature of financial market frictions that exist at times of crisis. During a financial crisis, the demand for reserves becomes more volatile and the movement of liquidity within the interbank market is severely restricted. This limits the amount of control that the central bank has over the interbank market. The malfunctioning of other financial markets could magnify the effects of the economic shock (Cecioni, Ferrero and Secchi, 2011).

When the normal transmission channels are not suitable, central banks rely on other transmission mechanisms to impact the real economy. Two examples of these transmission channels include the signalling/expectations channel and the portfolio balance channel.

Signalling Channel: With the signalling channel, the central bank uses various kinds of communication to relay information about the monetary policy stance, and influence private expectations, even after the interest rate has reached the zero lower bound. For this channel to be effective, the central bank must be relatively credible, and private expectations and confidence levels must be influential in the determination of macroeconomic conditions.

The information communicated by the central bank shapes investor expectations about the willingness of the central bank to inject money into the economy during times of stress, and to counter undue volatility in asset markets (Cecioni, Ferrero and Secchi, 2011). The US

Federal Reserve has become more reliant on this channel of transmission since the beginning of the global financial crisis. On a regular basis, the Federal Open Market Committee communicates its expectations of the future path of the policy interest rate (D'Amico, English, Lopez-Salido and Nelson, 2012).

Portfolio Balance Channel: The portfolio balance channel involves the buying of private and public securities in quantities larger than normal, by the central bank. This channel relies on the imperfect substitutability of private sector balance sheet items that occurs because of the heightened financial frictions during an economic crisis. Some of the reasons for imperfect substitutability include locked portfolio positions, differing degrees of risk aversion, and differing degrees of willingness to consume.

By buying private and public securities, the central bank can control the size of unusually wide yield spreads, and provide funding to cash strapped markets, and thereby influence the prices of these and related financial assets (Cecioni, Ferrero and Secchi, 2011). Undertaking large scale open market purchases of longer term securities allows the central bank to manipulate the yields on other securities across the maturity spectrum (D'Amico *et al*., 2012).

2.4.8 INTERNATIONAL MONETARY POLICY TRANSMISSION

Globalisation and international trade have introduced the possibility of international monetary policy spillovers. The traditional Mundell-Fleming-Dornbusch (MFD) model has been the main model used to analyse international monetary policy transmission. This MFD model suggests that monetary policy is transmitted across countries through the exchange rate, which then affects the volume of imports and global demand.

Other models of international monetary transmission have been established because the MFD model is criticised for assuming that prices remain fixed or adjust mechanically during the period of analysis (Landry, 2005).

Svensson and van Wijnbergen (1987), and Obstfelt and Rogoff (1995) worked towards establishing a model that tried to overcome the limitations of the MFD framework by introducing a new financial channel in which the real interest rate parity condition always held. This meant that when one country decreased its interest rates, other countries would

have to follow suit by decreasing their interest rates. The financial channel is the international manifestation of the consumption wealth channel.

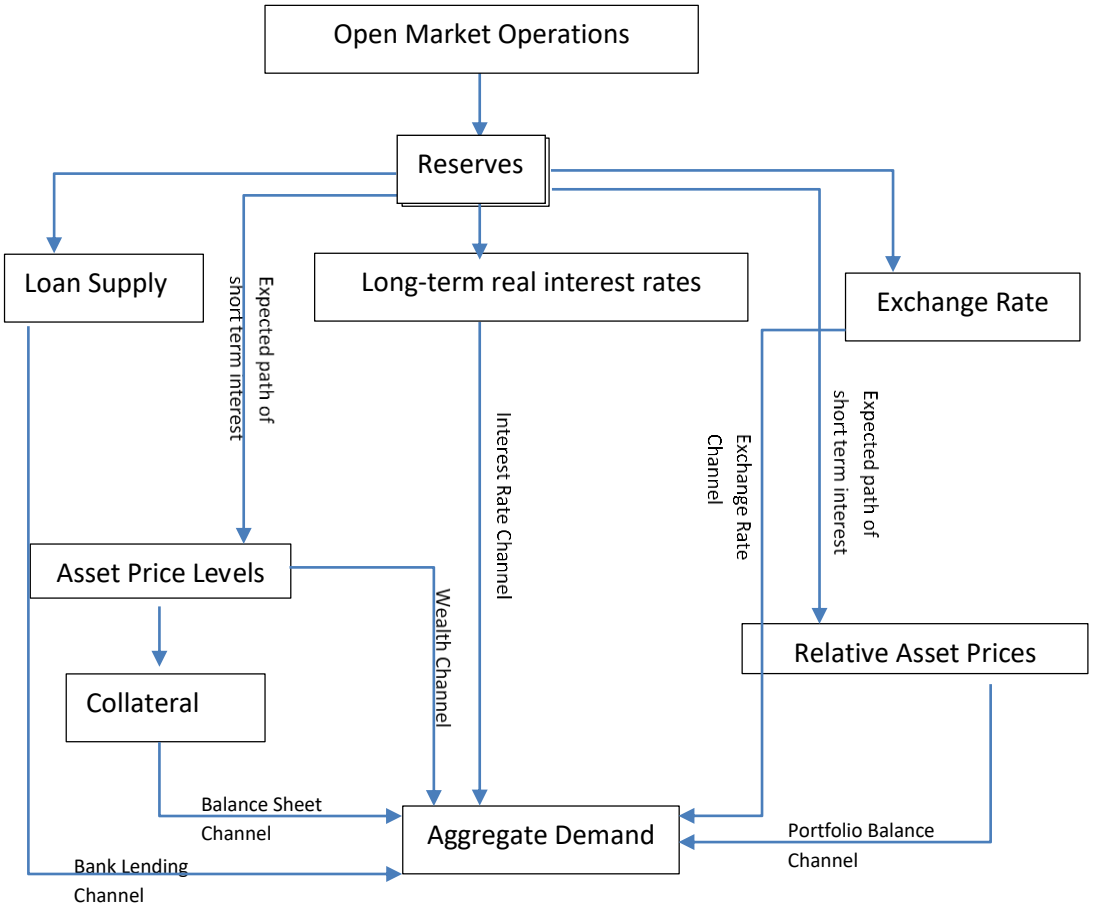
Central bankers must consider their monetary policy from an international perspective because of the flexibility of prices that has been introduced by globalisation. The increased flexibility of prices can be explained by a steeper Phillips curve that occurs because of the increased ease with which investments can be moved to any other part of the world. As the Phillips curve gets steeper the trade-off between inflation and unemployment increases. This means that the cost of implementing an expansionary monetary policy, in the pursuit of lower unemployment, is higher inflation and risk of capital flight. The withdrawal of capital from an economy initially causes the local currency to depreciate and may eventually cause other financial asset prices to fall (Mishkin, 2009).

The global banking system uses the US dollar as the main currency of exchange. This suggests that any policy moves that affect the supply of US dollars would have international transmission effects. After an expansionary monetary policy move by the Fed, international banks with branches in the US gain access to more bank credit (either by borrowing reserve from the central bank or by issuing financial instruments to private investors at a lower interest rate) and can extend that credit to the international community. If a given country has a significant number of international banks in its economy the US expansionary policy can lead to increased consumption and investment. In some cases, the reaction to the Fed's policy stance can be greater than the reaction to local monetary policy (Montoriol-Garriga, 2016).

2.4.9 FEDERAL RESERVE MONETARY POLICY TRANSMISSION MECHANISM

The Fed's monetary policy affects the real economy via all the mechanisms discussed above. The diagram below summarises these transmission channels.

Figure 1: US Monetary Policy Transmission (Brózda, 2016).



2.5. EMPIRICAL EVIDENCE OF INTERNATIONAL TRANSMISSION OF US MONETARY POLICY

The Mundell-Fleming-Dorbusch model predicts that monetary expansion in one country has recessionary effects on other countries. Svensson and van Wijnbergen (1987) tested the international transmission of US monetary shocks to other countries and found results that are contrary to the suggestions of the Mundell-Fleming-Dorbusch model. They found that the extent of international spillovers depended on the state of world markets i.e. if there was excess capacity or binding liquidity constraints. More recent studies on the

international spillover effects of monetary policy were conducted by the likes of Kim (2001), Boorman (2009) and Jo (2010).

Kim (2001) researched the impact of US monetary policy shocks on G6 countries within a flexible exchange rate framework. Kim founds that US expansionary monetary policy shocks generally led to economic growth in the countries under analysis. This result could be explained by the change in the interest rate parity condition arising from the US expansionary action. As the US lowered interest rates, investors began to see an opportunity to earn higher returns in other countries with relatively higher interest rates.

Ammer, Vega and Wongswan (2010) used international stock prices to investigate the spillover effects of US monetary shocks. Their main finding was that international firms were equally sensitive to US monetary shocks as US firms. In addition, they established that firms in cyclically sensitive industries were relatively more responsive to US monetary shocks compared to other firms. This evidence is consistent with the interest rate channel. Erhmann and Fratzscher (2009) carried out a similar study on 50 world equity markets. The results of their paper were consistent with Ammer *et al*. (2010); however, they concluded that a country's degree of international integration, rather than the extent of its bilateral relations with the US, is a key determinant in the transmission of shocks.

Ono (2018) investigated the impact of US monetary policy on Russian stocks and found that austere Fed monetary policy moves led to a fall in stock prices, while an expansionary Fed policy move had no impact on stock prices. The results imply that the investors view Russia as somewhat of a haven for their capital in times when US interest rates cannot produce profitable returns.

Another study by Kim and Yang (2009) showed that the exchange rate channel was not significant in the transmission of US monetary policy shocks to East Asian countries with floating exchange rates. This was explained by the fact that these countries had no monetary policy autonomy as their interest rates were pegged to the US interest rate. In such cases, a change in the US policy rate does not change the interest rate parity condition. These East Asian economies pegged their interest rates to the US policy rate because they wanted to limit the floating of their exchange rates.

The transmission of US monetary shocks to East Asian countries with fixed exchange rates like China and Malaysia is restricted because the interest rates in those countries are not significantly responsive to US interest rate changes. This is not in line with the research findings of Giovanni and Shambaugh (2008) and Ammer *et al*. (2010) that suggested that countries with fixed exchange rates had stronger responses to US monetary shocks. The findings did, however, confirm the importance of the exchange rate channel of transmission.

The literature on the transmission of monetary policy shocks to developing and emerging market economies is quite extensive. Bowman, Londono and Sapriza (2015) found that unconventional US monetary policy had a strong impact on sovereign yields in emerging markets, including South Africa. Chen, Filardo, He and Zhu (2016) used vector error correction (VEC) methodology to compare the transmission of US monetary policy to advanced economies and emerging markets. The research found that the effects of US quantitative easing measures after the financial crisis were larger and more diverse on emerging market economies compared to advanced economies. Anaya, Hachula and Offermanns (2017) used a structural vector auto-regression (VAR) model to measure how capital flows to emerging markets responded to the US Fed's quantitative easing programme. They found that capital flowed from the US to the emerging markets under study, causing changes in real and financial variables in those economies. They go further to suggest that unconventional US monetary policy measures influenced monetary policy easing in some emerging markets. Takáts and Vela (2014) studied the impact of international monetary policy on policy rates in emerging market economies through the short and long term interest rates, exchange rates, bank lending and the market's appetite for risk taking. They used two methods – regression analysis and vector auto-regression (VAR) analysis. Short and long term interest rates were found to be the main medium of transmission of US monetary policy to emerging market economies. Furthermore, there was evidence to suggest that long term interest rate changes caused portfolio flows from the US to emerging market economies, even when the US Fed implemented unconventional monetary policy measures. Buch, Bussière, Goldberg and Hills (2018) found evidence in support of the transmission of US monetary policy through interest rates. According to their research, the impact of US interest rate changes affects some countries through changes in

bank lending activity, and other countries through asset reallocation or the portfolio channel.

Although the bank lending may be a strong channel for cross-border US monetary policy transmission, Demirgüç-Kunt, Horváth and Huizinga (2017) found that the presence of foreign banks in borrower countries limits the impact of US monetary policy transmission. This happens because foreign banks in borrower countries have direct control over their loan supply and interest rates offered to borrower countries.

South African economy is no exception to the impact of US international monetary policy transmission mechanism. According to Rey (2016), there is evidence of US monetary policy transmission to inflation targeting economies like South Africa, despite the use of flexible exchange rates to achieve the inflation target and limit import substitution effects. Other indicators have pointed to the same idea. For example, examination of the SA stock market revealed that investors in SA stocks priced in expected increases in the US interest rate before the January meeting of the FOMC. As a result, SA and other emerging market stocks lost value (Harmse, 2018).

The importance of the interest rate channel and the exchange rate channel in the transmission of monetary policy shocks, both domestically and internationally, illustrates the strong link between monetary policy and related asset prices, more specifically stock prices. Furthermore, the identification of US monetary policy as the dominant source of international monetary shocks highlights the importance of the state of the US economy to the rest of the world. The consensus seems to be that although the information content of US monetary policy news releases may be the same to all securities market participants around the world, the effect of such news should not be expected to be the same across different economic regions (Nikkinen, Omran, Sahlstrom and Aijo, 2006).

2.6. CONCLUSION

The aim of this Chapter was to review existing literature on monetary policy and its connection to financial assets. The Chapter began by discussing the various aspects of monetary policy implementation in the US compared to South Africa. Some similarities in the monetary policy targets and tools of implementation were identifies. Sections 2.3 began the discussion on the connection between monetary policy and financial assets by highlighting the pattern of expectations formation in guiding investment decisions. Section 2.4 then discussed the technical relationship between monetary policy and the real economy by discussing the transmission mechanisms of monetary policy. The review identified a variety of transmission mechanism, many of them similar in definition, with an additional two channels that were operational during crisis times. The following section provided empirical evidence of US monetary policy's international impact. From the empirical evidence, it was concluded that the interest rate channel is the most important channel of transmission across all contexts, while the exchange rate channel was particularly dominant in the international context. The literature review points to need to investigate the relationship between US monetary policy and the SA stock market, as strong links were identified in other economies.

CHAPTER THREE: ECONOMETRIC METHODOLOGY AND DATA

3.1. INTRODUCTION

The goals of the research, as set out in Chapter one, refer to the use of econometric analysis to investigate whether or not unanticipated news announcements made by the US Federal Reserve Bank (the FED) have an impact on South African stock returns, as measured by changes in the volatility of these returns. This Chapter is focused on the specific econometric framework to be used. An event study methodology will be employed as the main tool to identify monetary policy announcement dates. South Africa is highly dependent on international capital flows, both for investment purposes and to fund current account deficits; against this background, and as a result of uncertainty, shocks to the ALSI tend to persist. Accordingly, rather than inspecting stock returns for the existence of volatility on Federal Reserve announcement dates, a Generalized Auto-Regressive Conditional Heteroscedasticity (GARCH) model (within the event study framework) will be used to analyse clustering behaviour and spikes in volatility of SA stock returns after Federal Reserve announcements.

This Chapter is organised as follows: Section 3.2 discusses the variety of models used to investigate the effects of monetary policy shocks on asset prices, and to justify the use of the event study framework. Section 3.3 discusses the GARCH framework chosen to quantify the relationship between volatility clustering / spikes and monetary policy shocks. Section 3.4 introduces variables selected for the mean equation of the GARCH model. Section 3.5 concludes.

3.2. METHODS USED TO STUDY THE IMPACT OF MONETARY POLICY SHOCKS ON ASSET MARKETS

Several methods have been used in the literature to study the impact of monetary policy shocks on macroeconomic and financial variables. These include Event studies with OLS regression models, Markov Switching models, Vector Autoregressive (VAR) models, Generalised Autoregressive Conditional Heteroscedasticity (GARCH) models, and

Simultaneous Equation models. An overview of some of the existing studies is presented below, with more detail provided in Table 1 in the Appendix.

Vector Autoregressive (VAR) models are commonly used to describe the relationship between, as well as to forecast, economic and financial variables. In researching the relationship between macroeconomics and reality, Sims (1980) found that VAR models provided superior forecasts to the simultaneous equation and other univariate models that were popular at the time. VAR models have also been used effectively in policy analysis and structural inference. The relationship between the variables in a VAR can be examined by observing their behaviour after inducing a shock to the VAR model through the residual vector. The effects of a shock can be examined by using either, or both of, the impulse response function or by conducting a forecast error variance decomposition. A Structural VAR (restricted model caused by the inclusion of an exogenous variable) model imposes more causal restrictions, such that some variables will not be allowed to react instantaneously to the induced shock (Luetkepohl, 2011).

VAR methodology, which encompasses VAR and Structural VAR (SVAR) models, has been used widely in the literature to study the impact of monetary shocks on both nominal and real economic variables. As shown in Table 1, Aron & Muellbauer (2001) used a VAR model to study the impact of the interest rate changes on output in South Africa. Cassola & Morana (2004) used a SVAR model to examine the effect of monetary shocks on stock returns in the Euro area. Using VAR models, Bernanke & Kuttner (2005) analysed the stock market's reaction to Federal Reserve policy and, more recently, Gospodinov & Jamali (2014) studied the link between stock market volatility and unexpected monetary shocks. Examples of other papers include Alves, Brandao de Brito, Gomes & Sousa (2011), Bojesteanu & Bobeica (2011) and Johansson (2012).

Despite the rising popularity of VAR and SVAR models in the literature, these techniques have been criticised for not being complex enough to incorporate structural breaks, relevant lags or many variables, resulting in incorrect forecasts. Bouakez, Essid & Normandin (2013) argued that most SVAR models impose restrictions that limit the interaction of variables in a way that is inconsistent with the data and that these models assume homoscedasticity

following a structural shock. A possible solution for these issues is provided by estimating an SVAR model that assumes conditional heteroscedasticity of any structural shocks.

To remedy the fact that the standard VAR model cannot incorporate many variables, a more robust Factor Augmented VAR (FAVAR) model was developed. The FAVAR model can accommodate a larger number of variables, so that it can be used to represent a larger subset of the macroeconomy, and possibly be used to investigate not only the changing dynamics amongst variables but also the changing transmission of shocks to the real economy (Mumtaz, Zabczyk & Ellis 2011). Research using FAVAR models includes Bernanke & Boivin (2003) who tested the impact of US monetary shocks on 120 variables (both real and nominal), and Chua (2012) (see Table 1) who analysed for Malaysia the impact of monetary shocks on 78 variables.

Markov regime-switching models have also been used to test the effect of monetary shocks on the real economy. This kind of statistical model is a non-linear time series model with uses multiple equations to describe how variables behave in different regimes. The use of multiple equations allows the model to overcome the constraints of the VAR model by being able to capture more complex dynamic patterns. To switch from one regime to another, the model uses an unobservable state variable whose current value is influenced by its previous value. The difference between Markov regime-switching and VAR models is that the VAR model incorporates only occasional exogenous changes while the Markov regime-switching model can be used for correlated data. Since the main focus of the Markov-regime switching model is on the mean behaviour of variables, it has commonly been used in conjunction with conditional variance models like the Generalised Autoregressive Conditional Heteroscedasticity (GARCH) model (Hamilton, 1989). The Markov regime switching model was used to test the impact of monetary shocks on real estate prices in the US by Anderson, Boney & Guirguis (2012) discussed in Table 1. Yang & Hamori (2014) used a more complex variation of the model, the Multivariate Markov-Switching Intercept Autoregressive Heteroscedasticity (MSIAH) model, in order to investigate the spill-over effects of US monetary shocks on stocks in Indonesia, Singapore and Thailand. Applications of the Markov switching framework with GARCH models have also been conducted by Nikkinen, Omran, Sahlstrom & Aijo (2006) and Miyakoshi & Jalolov (2005).

Other models used to identify the effects of monetary policy on economic variables include Gaussian Dynamic Term Structure Models (GDTSM), Linear Simultaneous Equation models and Heteroscedasticity-based models like the Generalised Method of Moments (GMM). The GDTSM is a no-arbitrage model used to study asset prices, where the interest rate is a function of a set of dynamic risk factors believed to influence all interest rates. The market equilibrium condition for a particular interest rate is therefore set up to be influenced by the set of dynamic risk factors and the market price of risk (Kim, 2007). The GDTSM used by Bauer and Neely (2014) (see Table 1) to study the impact of the Federal Reserve's LSAP programme on bond yields was constructed using three separate models, including a time series model for the risk factors, an equation linking the short rate to the risk factors, and a specification of the stochastic discount factor (SDF) used to price bonds.

A linear simultaneous equation model is a system of equations in which there is at least one exogenous variable that interacts with endogenous variables to demonstrate the structure of a given economy. Craine and Martin (2008), discussed in Table 1, use a linear simultaneous equation model, in which the US monetary shock is the exogenous variable, to study the impact of Federal Reserve monetary shocks on US and Australian equity prices. Sims (1980), however, argued against the use of simultaneous equation models because of the exogeneity assumption, which was claimed to be *ad hoc* and usually not fully supported in theory.

The Generalised Method of Moments (GMM) approach is a model which relaxes some of the assumptions used in event study methodology. More specifically, this model would identify a monetary shock as a rise in the variance of a variable used to measure the shock on event days; the variance of other shocks is assumed to be constant on these days. Event studies, on the other hand, allow for the variance of other shocks to be non-constant on event days while assuming that the variance of the monetary shock is infinitely large (Duran, Ozcan, Ozlu and Unalmis, 2012). This kind of model was also used by Rigobon and Sack (2004) to study the impact of monetary policy on asset prices in the US.

Bernanke & Kuttner (2005) used an event study and OLS regression model to study the impact of changes in monetary policy on equity prices. This is a simple statistical technique available to test the relationship between two variables while holding all other factors

constant; an event study methodology was used to identify the monetary shock event days and inspect the immediate reaction of stock returns. This methodology then uses OLS to measure the direct impact of unanticipated news announcements on stock returns. Other papers that have used event studies in combination with OLS regression models include, Ionnidis & Kontonikas (2008), Jensen & Tsai (2010), Kurov (2010), Mann, Atra & Dowen (2004), Ozdagli & Yu (2012), Rogers, Scotti & Wright (2014), Rosa (2011), Berge & Cao (2014), Conover, Jensen & Johnson (1999), Doh & Connolly (2013), Ehrmann & Fratzscher (2009) and Fatum & Scholnick (2008).

The event study / OLS approach has been criticised for keeping the variance of other shocks constant while that of the monetary shock becomes infinitely large on event days. If the model assumed non-constant variance of other shocks, it would mean that other news announcements could also be responsible for any asset price spikes on or around event days. The failure to account for the variance of other shocks on event days is an indication of an assumption made in event study / OLS methodology, namely that other asset price-changing news announcements are not made on the same date as monetary policy announcements (Bouakez, Essid & Normandin, 2013). This issue has been addressed by using an interaction between the monetary surprise variable and a dummy variable, equal to one when monetary announcements coincide with other economic news announcements (Bernanke & Kuttner, 2005) and by using a short event window of one day or less (Wang & Mayes, 2012). Another potential problem that has been raised regarding the use of event studies in the analysis of the international spill-over effects of monetary policy include the fact that many international financial markets do not trade during US business hours. Wongswan (2005) and Ehrmann & Fratzscher (2009) used overnight returns (the difference between the closing price on the day before the announcement and the opening price on the morning after the announcement) on international stocks as a remedy.

The use of Event study / OLS models on the impact of macroeconomic news on stock price returns have previously failed to find statistically significant links between the two variables. Bernanke & Kuttner (2005) found a few instances of insignificant responses of equity prices to the Federal funds rate. For example, while the coefficient of a Federal funds rate surprise for the entire period of analysis was statistically insignificant, statistical significance of the

coefficient post-1994 was ascribed to the fact that there were more than 6 outlier news announcements in that period. Birz & Lott (2011) concur that the stock price effects of macroeconomic news are commonly found to be statistically insignificant, and subsequently find a statistically insignificant reaction of stock returns to macroeconomic surprises about GDP, unemployment, durable goods and retail sales. Rigobon & Sack (2004) studied the impact of noisy macroeconomic news announcements on both asset prices and monetary policy expectations using the event study / OLS methodology. While they found statistically significant responses of monetary policy expectations and Treasury yields to incoming news announcements, they did not find significant relationships between the equity market and different economic news announcements. Furthermore, the R^2 statistics for their regression results are all relatively small. Glick & Leduc (2012) found that positive LSAP surprise announcements reduced some stock prices, but only at the 10% level of significance and only for Federal Reserve announcements (compared to Bank of England announcements). On the other hand, negative LSAP surprise announcements by the Bank of England were all found to be statistically insignificant in their effect on stock prices.

Birz & Lott (2011) attribute the poor results of event study models to changes in the nature of business cycles as well as the asymmetrical effects of good and bad news announcements. Funke & Matsuda (2006) suggest that models used to capture this relationship have a better chance of finding statistically significant results if they consider the possibility of asymmetries and volatility clustering – two characteristics common to stock market return data. GARCH models are known to be best at capturing these two characteristics. Funke & Matsuda (2006) used a GARCH model and found that US GDP, unemployment and interest rate news surprises had statistically significant impacts on both US and German stock returns. Chen, Chiang & So (2003) analysed the impact of US stock return shocks on Japanese and European stock markets using GARCH methodology, and found statistically significant relationships.

Following from the success of Chen, Chiang & So (2003) and Funke & Matsuda (2006), this thesis will use an event study approach to determine the timing of the relevant news announcements by the Federal Reserve, and a GARCH (1,1) model to investigate the

relationship between SA stock volatility and US Federal Reserve announcements. The GARCH (1,1) model is preferred because of its relative simplicity.

3.3. GENERALIZED AUTO-REGRESSIVE CONDITIONAL HETEROSCEDASTICITY (GARCH) ANALYSIS

The GARCH historical model is a model in which the conditional variance is calculated using the long term mean of the variance, lags of this long term mean and lagged values of the conditional variance. When specified in the form of a set of equations the GARCH model can be written as follows:

Mean equation: $r_t = \mu + \varepsilon_t$ (1)

Variance Equation: $\sigma^2_t = \omega + \alpha_1 \varepsilon^2_{t-1} + \alpha_2 \sigma^2_{t-1}$ (2)

where r_t is the return of an asset at time t, μ is the average return, σ^2_t is the conditional variance and ε_t is the residual. The restrictions on the parameters, which are imposed to ensure that the conditional variance σ^2 is always positive (Abdalla & Winker, 2012: 164), are $\omega > 0$, $\alpha_1 \geq 0$, and $\alpha_2 \geq 0$.

Before the GARCH model is estimated, stationarity tests have to be conducted on the return series. This is done because the GARCH model can only be estimated accurately using stationary time series data. The Augmented Dickey-Fuller (ADF) test is suggested as a test for stationarity. If the return series is found to be non-stationary, it has to be differenced an appropriate number of times until the series is stationary.

The next step is to check for any lingering autocorrelation using the Autocorrelation Function (ACF) and Partial Autocorrelation Function (PACF) plot of the stationary series. The number of significant spikes in the ACF and PACF determines the number of MA and/or AR terms required to correct for autocorrelation respectively.

Another test that should be conducted prior to the estimation of the GARCH model is the ARCH-LM test. This diagnostic test, which was designed by Engle in 1982, examines the presence of heteroscedasticity in the residual series of an estimated Autoregressive Moving

Average (ARMA) model. The null hypothesis is that there are no ARCH effects present. If the null hypothesis cannot be rejected, then a GARCH model may not be estimated. The Akaike Information Criteria (AIC) will be used to determine the appropriate number of ARCH and GARCH terms in the conditional variance equation. This information criteria is used to determine the goodness of fit of a model relative to the true model. The AIC is based on the Kullback-Leibler criterion (a popular method of distinguishing between two densities), and is applicable to a wide variety of modelling applications. The AIC is particularly useful for regression and autoregressive models with large sample size, such as the sample to be used in this study, because it becomes less biased as the sample size increases (Kim, Cavanaugh, Dallas, and Foré, 2013). The model with the smallest AIC is the best. Other information criterion such as the Schwarz Information Criteria (SIC), the Bayesian Information Criteria (BIC), and Hannan and Quinn Information Criteria (HQIC) will not be used in this analysis. Our GARCH analysis will be conducted from a maximum likelihood perspective. The SIC and the BIC are constructed from a Bayesian perspective, making them unsuitable for this analysis. The HQIC has a higher probability of over-fitting models than all the other information criterion (Giles, 2013).

3.3.1 DUMMY VARIABLES

To deepen the search for spikes in volatility on or around FED Announcement dates, 2 dummy variables will be incorporated into the variance equation of the GARCH model. According to expectations theory, market participants incorporate expectations into asset prices before news announcements. Depending on whether or not these expectations are in line with the news announcements, asset prices either remain unchanged or readjust to fit the fundamentals implied in the news announcement. Dummy variables will allow the study to highlight whether market players had to change their expectations, and consequently asset prices, after an announcement.

The first dummy, EXPECT, will signify an **expected** FED announcement which will be equal to 1 on the day of the actual announcement, and zero otherwise. The dummy variable, UNEXPECT, will equal 1 on the day of an **unexpected** announcement was made by the FED, and zero otherwise. The research will consider asset price changes on the same day as the

announcement; FED announcements are usually made an hour before the close of SA stock markets. The parameters for the dummy variables EXPECT and UNEXPECT, are predicted to have negative signs because positive US economic news typically results in capital outflows from SA, and falling SA stock prices (Harmse, 2018).

The dummy variables will be tested for equality using an F-test. The Wald F-test will be used in this instance because it is equivalent to similar linear restriction hypothesis tests such as the Likelihood Ratio Test (LRT), and the Lagrange Multiplier Test (LMT). Additionally, compared to the LRT, the Wald test is broadly applicable and can be used for a single model. The LRT requires at least 2 models (Edgerton, Assarsson, Hummelmose, Laurila, Rickertsen, & Vale, 1996: 23). The null hypothesis for the Wald F-test will be: parameter of EXPECT = parameter of UNEXPECT. If these two parameters are not significantly different (are equal) from each other, then the research will fail to reject the null hypothesis and conclude that unexpected announcements have no effect relative to expected announcements. Alternatively, if the two parameters are statistically different, then the research will conclude that unexpected announcements have a different effect on stock returns than expected announcements.

To further expand on the GARCH analysis, the study will run alternative specifications of the GARCH model using an additional dummy variable - SARB. The dummy variable SARB will be equal to 1 on days when the South African Reserve Bank made monetary policy announcements during the period of analysis, and zero otherwise. This dummy variable will be used separate the international monetary policy transmission effects from domestic monetary policy transmission effects. It is necessary to separate these effects because previous studies such as May, Farrell and Rossouw (2017) and Maserumule and Alagidede (2017) have found a strong relationship between SARB announcements and the real economic variables such as the rand/dollar exchange rate. Secondly, there are reported incidences of market shock after SARB announcements (Cronje, 2017).

3.3.2. GARCH MODEL SPECIFICATION

Given the structure of a GARCH model expressed in equations (1) and (2), and the explanation of variables to be used, the baseline regression model to be tested will be as follows:

$$r_t = c + \beta_1 \mathbf{r_{t-1}} + \varepsilon_t \quad (3)$$

$$\sigma^2_t = \omega + \alpha_1 \varepsilon^2_{t-1} + \alpha_2 \sigma^2_{t-1} + \alpha_3 \mathbf{Z_t} \quad (4)$$

where r_t refers to the one day return of the FTSE/JSE ALSI after the announcement made on day t, c is a constant term, ε_t is the residual, σ^2_t is the conditional variance, $\mathbf{Z_t}$ represents the dummy variables mentioned above, and ω, β_1, α_1, α_2, and α_3 are parameters.

Returns on equities will be calculated as follows:

$$r_t = \ln\left(\frac{P_t}{P_{t-1}}\right) \quad (5)$$

where r_t is the equity index return **on the day of** the announcement, P_t is the equity index closing value **on the day of** the announcement and P_{t-1} is the equity index closing value **on the day before** the announcement. The natural logarithm method of calculating % changes is preferred to the normal method ($\frac{P_t - P_{t-1}}{P_{t-1}}$) because the latter is not symmetrical ($(\frac{P_t - P_{t-1}}{P_{t-1}}) \neq (\frac{P_{t-1} - P_t}{P_t})$) or additive ($(\frac{P_t - P_{t-1}}{P_{t-1}}) + (\frac{P_{t-1} - P_{t-2}}{P_{t-2}}) \neq (\frac{P_t - P_{t-2}}{P_{t-2}})$). The natural log method eliminates these issues (Whetherell, 1986).

3.3.3 EXPONENTIAL GARCH (EGARCH) AND THRESHOLD GARCH (TGARCH) MODELS

The estimated GARCH model will be tested to evaluate if it is a good fit for the JSE return series using a Brock, Dechert & Scheinkman (BDS) independence test on the residuals of the GARCH model. The BDS independence test evaluates whether or not the residuals in a model are independently and identically distributed, and was selected because it known to identify dependence in residuals across a wide variety of linear and non-linear models (Belaire-Franch & Contreras, 2002). The null hypothesis for this test is "Residuals are

independently and identically distributed"; the null hypothesis is rejected if observed BDS observed values are greater than the critical values.

If the residuals of the GARCH model are not independently and identically distributed, two extended GARCH models will be estimated and compared, in order to determine the best fitting model for JSE index returns. The Exponential GARCH (EGARCH) and the Threshold GARCH (TGARCH) models were selected for this comparison because they relax the linear restriction imposed on the GARCH model's conditional variance. It may be necessary to relax this condition to cater for JSE index returns that are expected to be highly volatile, and exhibit high levels of kurtosis and skewness (Ali, 2013). Once the TGARCH and EGARCH models have been estimated, their log-likelihood statistics will be compared. The model with the higher log-likelihood will be taken as the best fitting model. To confirm this result, the residual of the "winning" model will also be tested for independence using the BDS test.

The specification of the TGARCH model is:

$$r_t = c + \beta_1 \mathbf{r_{t-1}} + \varepsilon_t \quad (6)$$

$$\sigma^2_t = \omega + \alpha_1 \boldsymbol{\varepsilon^2_{t-1}} + \alpha_2 \boldsymbol{\varepsilon^2_{t-1}} \text{Dum}_{t-1} + \alpha_3 \boldsymbol{\sigma^2_{t-1}} + \alpha_4 \mathbf{Z_t} \quad (7)$$

where Dum_{t-1} is a lagged dummy variable = 1 if $\varepsilon_{t-1} < 0$, and 0 if $\varepsilon_{t-1} \geq 0$; and where r_t refers to the one day return of the FTSE/JSE ALSI after the announcement made on day t, c is a constant term, ε_t is the residual, σ^2_t is the conditional variance, $\mathbf{Z_t}$ represents the dummy variables EXPECT, UNEXPECT, and SARB, and c, ω, β_1, α_1, α_2, α_3, and α_4 are parameters.

The specification of the EGARCH model is:

$$r_t = c + \beta_1 \mathbf{r_{t-1}} + \varepsilon_t \quad (8)$$

$$\text{Ln}(\sigma^2_t) = \omega + \alpha_1 \left| \frac{\varepsilon_{t-1}}{\sqrt{\sigma^2_{t-1}}} \right| + \alpha_2 \frac{\varepsilon_{t-1}}{\sqrt{\sigma^2_{t-1}}} + \alpha_3 \text{Ln}\, \boldsymbol{\sigma^2_{t-1}} + \alpha_4 \mathbf{Z_t} \quad (9)$$

where r_t refers to the one day return of the FTSE/JSE ALSI after the announcement made on day t, c is a constant term, ε_t is the residual, σ^2_t is the conditional variance, $\mathbf{Z_t}$ represents the

dummy variables EXPECT, UNEXPECT, and SARB, and c, ω, β_1, α_1, α_2, α_3, and α_4 are parameters.

3.3.4 CLASSIFICATION OF FEDERAL ANNOUNCEMENTS

The research will use Fischer's (2017) classification of expected and unexpected news announcements. Expected and unexpected news announcements are calculated as changes in interest rate expectations around the announcement date. Fischer defines interest rate expectations as daily changes in the two-year short rate of the shadow rate term-structure model – i.e. the Arbitrage-Free Nelson-Siegel model, and assumes interest rates have a zero lower-bound. According to Fischer, the Nelson-Siegel (1987) term structure model is very popular because it produces a yield curve that fits a variety of yield patterns.

To classify the announcements, Fischer calculated the absolute value of the percentage change in daily expectations of interest rates for each announcement. After calculating the average percentage change in daily expectations (absolute value) across the sample, Fischer then compared the percentage change in expectations to the mean percentage change in expectations for each day. Where the percentage change in expectations on an announcement day is above the average percentage change in expectations, then the announcement is classified as unexpected. If the percentage change in expectations on an announcement day is below the average percentage change in expectations, then the announcement is classified as expected. The relevant dates are shown and categorized in Table 6 of the Appendix.

The research covers the global financial crisis period of high market volatility across all world market. During this time, it is possible that some investors changed their expectations based on the high market volatility by using different strategies such as hedging (Shadab, 2009). As such, the study will cater for the possibility of investors getting accustomed to high volatility in particular periods by using a moving average absolute interest rate change to classify news announcements as expected and unexpected. Where the percentage change in expectations on an announcement day is above the moving average percentage change in expectations, then the announcement is classified as unexpected. If the percentage change

in expectations on an announcement day is below the moving average percentage change in expectations, then the announcement is classified as expected.

The moving average percentage change in FF24 is calculated using the following formula

Moving Av. % change in $FF24_t$

$$= (|\%\ Change\ FF24_t| \times \gamma) + (\text{Moving Av. \% change in } \text{FF24}_{t-1} \times (1-\gamma)) \quad (10)$$

Where γ is a smoothing factor covering a period of 30 days. The smoothing factor causes the moving average calculation to give more weight to monthly changes in FF24. The formula for γ is:

$$\gamma = \frac{2}{1+30}$$

3.4. IDENTIFICATION OF VARIABLES AND DATA SETS USED

The main area of focus in this study is the series of South African stock returns. South African stock returns will be represented by data from the FTSE/JSE All Share Index (ALSI). Stock returns will be calculated using one-day price changes on the FTSE/JSE ALSI: that is, the closing price on the date of the FED monetary announcement and the opening price on the next day.

The analysis will be concerned with the US monetary announcements made from October 2008 to October 2014; this covers stock market behaviour during the global financial crisis up to the end of the Federal Reserve's Quantitative Easing programme. All the data are available at daily frequency. Aside from Federal Reserve monetary announcement dates obtained from the Federal Reserve's website, all the data used in the event study was obtained from Thomson Reuters Datastream.

3.5. CONCLUSION

This Chapter discussed the econometric framework to be used in achieving the goals set out in Chapter one. The event study approach in combination with a GARCH model was selected as the preferred model for analysing the relationship between US Federal Reserve policy announcements and returns on the South African stock market. The ARCH/GARCH framework was discussed, and the preliminary tests to be conducted on the data as well as the statistical inference techniques were set out. This was followed by a discussion regarding the use of dummy variables to make the model results more robust. Finally, the dataset to be used was identified and the baseline model specified.

CHAPTER FOUR: EMPIRICAL RESULTS

4.1. INTRODUCTION

The aim of this Chapter is to estimate the GARCH models presented in Chapter 3; this will satisfy the objective set out in Chapter 1 – to observe whether or not South African stocks returns react to unanticipated news announcements by the Federal Reserve and, if so, to measure the magnitude of this reaction.

Section 4.2 provides a brief description of the sample data, and Section 4.3 has a preliminary analysis of the data contained in the sample. In Section 4.4, the research discusses the GARCH results individually, before leading on to Section 4.5 where the overall results are reviewed, and their implications discussed. Section 4.6 concludes.

4.2. DESCRIPTION OF SAMPLE

The sample used in this study contains 50 FOMC announcement events spanning the period from 9th October 2008 to 30th October 2014, which was the end of the FED's Large-Scale Asset Purchase (LSAP) programme. Each announcement is classified as either anticipated or unanticipated, using the Fischer (2016) method defined in Chapter 3. The minutes of FOMC meetings include release date announcements, announcements about pending auctions, the results of auctions, and approvals of the discount rate. As these announcements are irrelevant to the research, they were excluded from the sample.

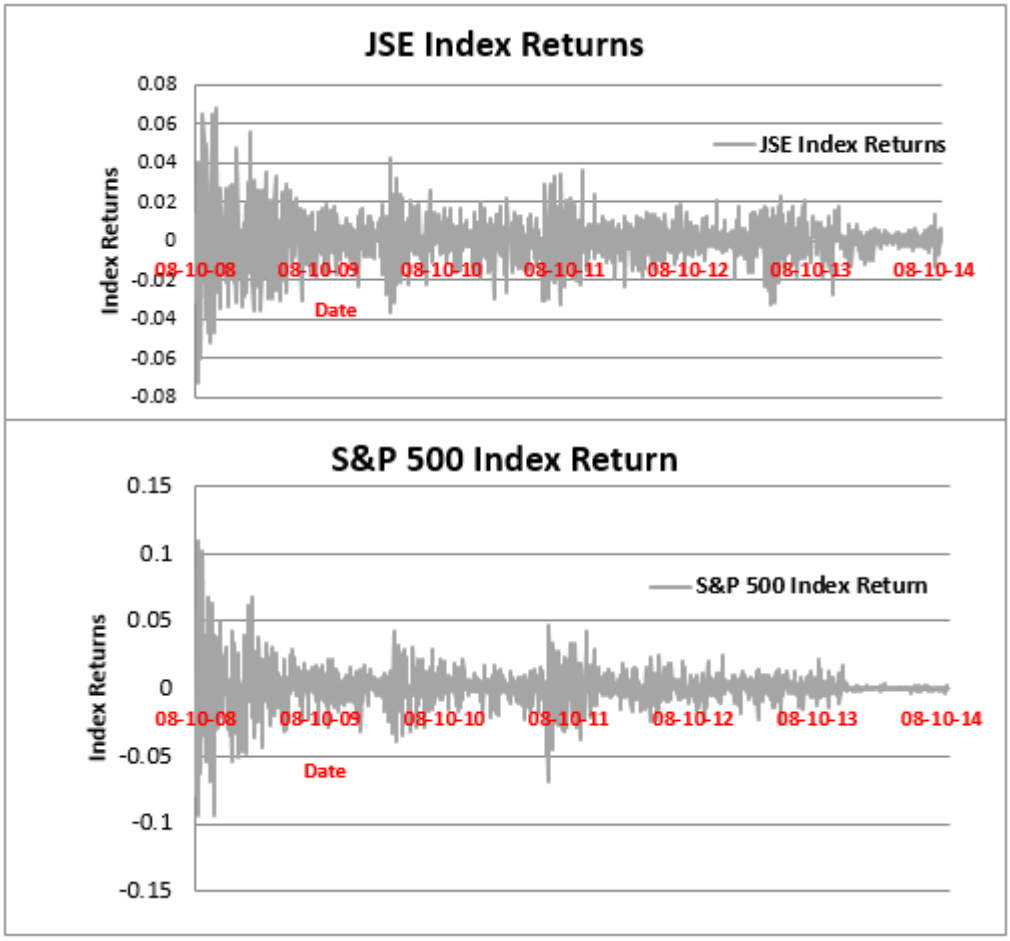
4.3. PRELIMINARY ANALYSIS OF THE DATA

If the results of the empirical analysis reveal that the South African stock market does indeed react to US monetary policy shocks (FED announcements), this would provide preliminary evidence of the presence of an international transmission mechanism, and of financial linkages, between the US and SA financial markets. The first step in establishing whether such evidence exists is to look for any co-movements in stock prices and / or returns. Returns on stocks contained in the FTSE/JSE ALSI and the S&P 500 were examined, as these indices are regarded as being representative of overall stock market behaviour in

the two countries. Figure 2 displays the path of daily index returns for the FTSE/JSE ALSI and the S&P 500 during the period under analysis (2008-2014).

Figure 2 suggests that spikes in stock returns on both stock indices tend to occur at around the same time. This suggests either that both indices react to the same information, or that the JSE follows the S&P 500 closely. The graphs show that the largest shocks were felt during the financial crisis; this is to be expected, given the high levels of market uncertainty at the time. Both indices yielded similar levels of returns (-0.04% <JSE Index Return<0.04% compared to -0.05% <S&P Index Return<0.05%) over the majority of the sample period. The broad correspondence in the behaviour of the two indices suggests the possibility of financial linkages between the two countries through an international transmission mechanism. Table 2 of the appendix presents the full summary statistics for the FTSE/JSE index returns.

Figure 2: JSE vs S&P 500 Index Returns over the sample period



Across 1 611 observations during the sample period, the JSE index had mean overnight returns of 0.0524%, with a standard deviation of 0.011820. Although skewness (0.042036) of the FTSE/JSE returns is positive - indicating that the data is skewed to the right - the value of skewness is close to zero and returns are thus taken to be normally distributed. Kurtosis (8.063730) is positive and greater than 3. The distribution of FTSE/JSE returns is more peaked around the mean, and has fatter tails, than the standard normal distribution. There is, accordingly, an increased risk of extreme results being found in the returns series, hinting at the possible presence of conditional heteroscedasticity in the returns. The heightened risk of extreme returns is expected because foreigners hold over half of the equity on the FTSE/JSE (Hogg, 2015). These investors, who are already wary about performance in emerging markets, especially since the slowdown in Chinese economic growth, are therefore inclined to have a more extreme reaction to negative news. News that causes a negative perception about South Africa could cause these market players to panic and withdraw their funds.

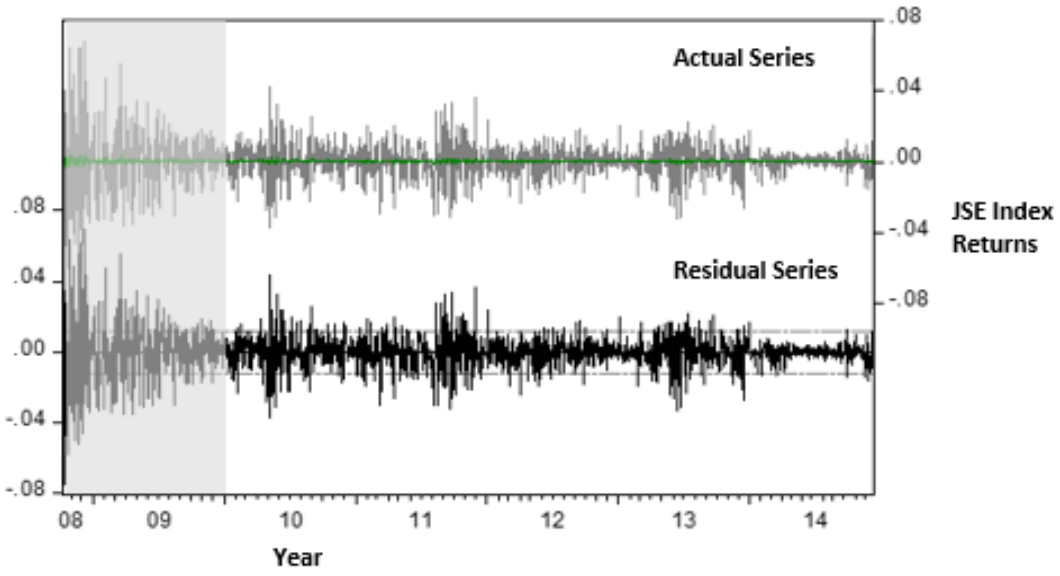
Before running the GARCH model, the research inspected the FTSE/JSE ALSI index return series for stationarity and tested the residuals of the mean equation for autocorrelation. An Augmented Dickey-Fuller (ADF) test was used to test for stationarity, while the residuals were tested by inspecting the autocorrelation and partial autocorrelation functions (ACF/PACF). Summarised results of the tests are shown in the Table below, and in full in Table 3 of the Appendix. Against a null hypothesis of a unit root in the return series, the observed ADF test statistic is less than the critical value. As a result, the null hypothesis is rejected and it can be concluded that the return series is stationary. The ACF and PACF plots for the residual series both have at lags close to zero, and insignificant Q-statistics after 2 lags, thus suggesting that there is no serial correlation in the residuals. Based on these observed results, there was no reason to use the first (or higher order) difference of the JSE/FTSE series in the GARCH model.

Observed ADF Test Stat	**P-value**	**Critical T-statistic (1% Level)**	**Null Hypothesis**
-37.96809	0.0000	-3.434207	Series has a unit root

4.4. GARCH RESULTS

To confirm whether the apparent trend shown in Figure 2 is due to an international transmission mechanism between South Africa and the US, a GARCH model was estimated. The GARCH process was used to determine whether changes in the volatility of the FTSE/JSE returns coincided with Federal Reserve announcement dates. The first step is to identify clustering behaviour in the residuals of the FTSE/JSE series. Using the results of the estimated mean equation (7), Figure 3 below illustrates the clustering patterns of the actual and residual series. Compared to the rest of the sample period's residuals, there are taller and more frequent spikes surrounding the financial crisis (shaded in grey). The research therefore conducted a test for ARCH effects in an effort to analyse the clustering behaviour.

Figure 3: Actual vs Residual Series evolution over the sample time period



The test for ARCH effects revealed an observed F-statistic that is greater than the χ^2 critical value (summary Table below). Therefore, the null hypothesis of no ARCH effects is rejected, suggesting that there may be ARCH effects in the data. The presence of ARCH effects indicates that the return series exhibits conditional heteroscedasticity (i.e. return residuals exhibit periods of high volatility, followed by periods of relative calm), thus warranting the estimation of a GARCH model which can be used to analyse volatility.

Observed F-Stat	P-value	Critical χ^2 statistic (1% Level)	Null Hypothesis
101.9595	0.0000	6.64 (DF=1)	no ARCH effects

The full results of the GARCH model estimations are presented in Tables 4 to 27 of the Appendix. The results presented below are extracted from these estimation equations.

The results of the GARCH model estimation, (Table 4) ***without*** any dummy variables in the variance equation, were:

$$r_t = 0.0007 - 0.0078\ \mathbf{r_{t-1}}$$

$$\sigma^2_t = 1.7400\ (E\text{-}7) + 0.0706\ \varepsilon^2_{t-1} + 0.9291\ \sigma^2_{t-1}$$

The coefficient of the squared lagged residual term (0.0706) in the variance equation suggests that a 1% change in SA stock returns volatility (which occurs in response to an announcement shock in the previous period), increases stock returns by 0.07% in the current period. The coefficient of the GARCH term (lagged conditional variance) indicates that 0.93% of the previous period's conditional variance is present in the current period. The coefficients of the non-constant terms in the variance equation have p-values < 0.01, indicating that the variables are individually significant at the 1% level. The effects of shocking Federal Reserve announcements are highly persistent in SA stock returns (the sum of the α_1 and α_2 coefficients in the variance equation is 0.99) the day after the announcement, suggesting the possible presence of an international transmission mechanism.

The research estimated a GARCH model with EXPECT and UNEXPECT as the dummy variables (Table 5 in Appendix), where the results were:

$$r_t = 0.0007 - 0.0067\ \mathbf{r_{t-1}}$$

$$\sigma^2_t = 1.00\ (E\text{-}7) + 0.0577\boldsymbol{\varepsilon^2_{t-1}} + 0.9432\boldsymbol{\sigma^2_{t-1}} - 1.2400\ (E\text{-}5)\ \textbf{EXPECT} - 3.3500\ (E\text{-}6)\ \textbf{UNEXPECT}$$

Log-Likelihood = 4992.612

The coefficient of the squared lagged residual term (0.0577) in the variance equation suggests that a 1% change in SA stock returns volatility (which occurs in response to an announcement shock in the previous period), increases stock returns by 0.06% in the

current period. The coefficient of the GARCH term (lagged conditional variance) indicates that 0.94% of the previous period's conditional variance is present in the current period. The effects of shocking Federal Reserve announcements are highly persistent in SA stock returns (the sum of the α_1 and α_2 coefficients in the variance equation is 0.99) the day after the announcement, suggesting the possible presence of an international transmission mechanism.

According to the variance equation, the coefficient of EXPECT (p-value of 0.0094) is statistically significant at the 10% level (p-value < 0.1), while the coefficient of UNEXPECT (p-value of 0.5500) is statistically insignificant at the 10% level (p-value > 0.1). This suggests that expected Federal Reserve announcements affect returns on SA stocks while unexpected Federal Reserve announcements have no effect on SA stock returns. The results support the idea that market participants anticipate the impact of some announcements before the announcements actually occur, and factor these changes into their portfolios accordingly. The *a priori* expectation is that expected announcements would not have any contemporaneous effect on share prices / returns since any related capital flows would have occurred prior to the announcement date. It is only in the case of unexpected announcements that some contemporaneous effect on SA stock prices / returns would be affected, but there is no statistically significant evidence to support this.

The Wald F-test (Table 6) was used to analyse any difference in the impact of expected and unexpected announcements on volatility. Given the null hypothesis that the coefficient of EXPECT is equal to the coefficient of UNEXPECT, and that the p-value of the Wald F-test F-statistic (0.0009) was less than 0.1, the research rejected the null hypothesis at the 10% level and concluded that the two coefficients were not equal. Therefore, it can be said that expected announcements have a different impact on SA stock returns compared to unexpected announcements.

The results obtained from the GARCH model results could be an indicator of a poorly fitted model, primarily because the GARCH models are not well suited to accommodate volatility persistence, high levels of kurtosis, and skewness and because an appropriate measure of the risk perceptions in South Africa does not exist. To check whether the GARCH model estimated above is a good fit for the JSE return series, the residuals were tested for

independence and identical distribution using a Brock, Dechert and Scheinkman (BDS) independence test in table 7 (summary Table below). The computed BDS test statistic is less than the critical value and the research fails to reject the null hypothesis at the 1% level – the residuals are independently and identically distributed. The BDS statistics at dimensions 3 to 6 exhibit similar behaviour. The results imply that the GARCH model estimated above was adequately specified.

Observed BDS-Stat	**P-value**	**Critical Value (1% Level)**	**Null Hypothesis**
0.026498 (Dimension 2)	0.0000	10.26331	Residuals are independently and identically distributed

The research also used the moving average measure of investor expectations to analyse the GARCH model with EXPECT and UNEXPECTm as the dummy variables (Table 8 in Appendix), where the results were:

$$r_t = 0.0007 - 0.0070\ \mathbf{r_{t-1}}$$

$$\sigma^2_t = 2.68\ (E\text{-}7) + 0.0579\boldsymbol{\varepsilon^2_{t-1}} + 0.9424\boldsymbol{\sigma^2_{t\text{-}1}} - 1.47\ (E\text{-}5)\ \textbf{EXPECT} - 2.54\ (E\text{-}6)\ \textbf{UNEXPECTm}$$

Log-Likelihood = 4992.554

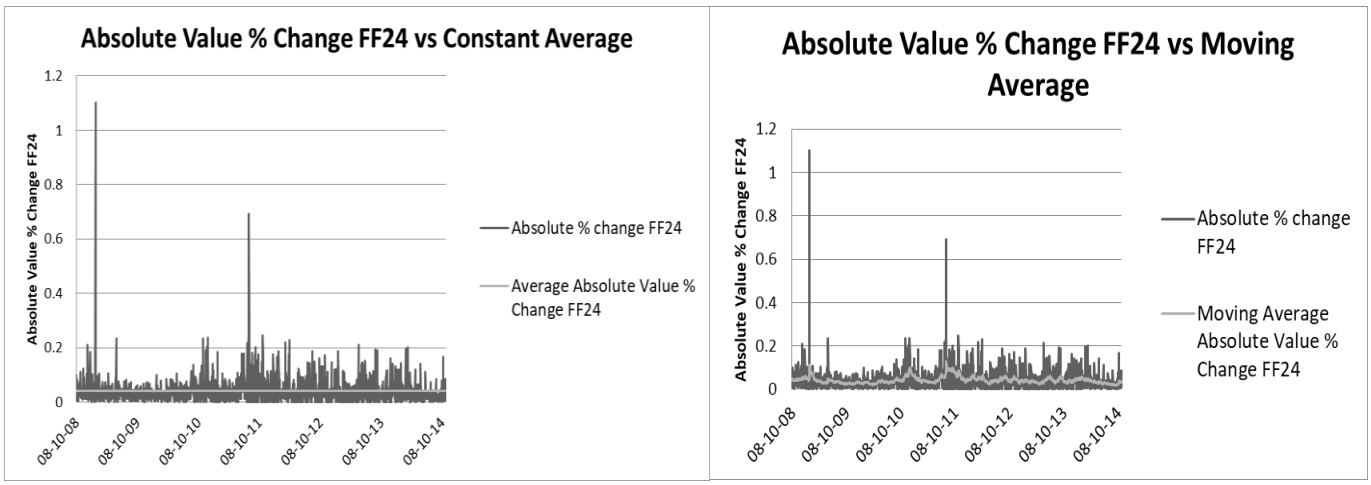
According to the variance equation, the coefficient of EXPECT (p-value of 0.0009) is statistically significant at the 10% level (p-value < 0.1), while the coefficient of UNEXPECTm (p-value of 0.5813) is statistically insignificant at the 10% level (p-value > 0.1). This suggests that expected Federal Reserve announcements affect returns on SA stocks while unexpected Federal Reserve announcements have no effect on SA stock returns.

The Wald F-test (Table 9) was used to compare any differences in the impact of expected and unexpected announcements on volatility. Given the null hypothesis that the coefficient of EXPECT is equal to the coefficient of UNEXPECTm, and that the p-value of the Wald F-test F-statistic (0.0086) was less than 0.1, the research rejected the null hypothesis and concluded that the two coefficients were not equal.

The GARCH model with EXPECT and UNEXPECT as dummy variables has the higher log-likelihood than the GARCH model with EXPECT and UNEXPECTm, and therefore the former is taken as the best fitting model.

Figure 4 below show how interest rate expectations change over the sample period when compared to the constant average interest rate expectations and the moving average interest rate expectations. From the analysis of the diagrams below, the moving average measure of interest rate expectations more closely follows the actual changes in interest rate expectations. This finding reinforces the herding behavior theory discussed in section 2.3.5.

Figure 4: Evolution of Interest Rate Expectations Compared to Average and Moving Average Measures of Interest Rate Expectations



Alternative specifications of the GARCH model, such as the Threshold GARCH (TGARCH), or the Exponential GARCH (EGARCH), were used to make the results of the study more robust, because they cater for high kurtosis, skewness and volatility persistence. These two models were estimated (results presented fully in Tables 10 to 27 of the appendix) and compared to determine the best fitting model.

The results of the estimated TGARCH model with EXPECT and UNEXPECT as the dummy variables results were:

$$r_t = 0.0006 - 0.0035\ \mathbf{r_{t-1}}$$

$$\sigma^2_t = 1.0500(E\text{-}7) + 0.0071\boldsymbol{\varepsilon^2_{t-1}} + 0.0868\boldsymbol{\varepsilon^2_{t-1}}\ Dum_{t-1} + 0.9484\boldsymbol{\sigma^2_{t-1}} - 1.6999(E\text{-}5)\ \textbf{EXPECT} + 4.51(E\text{-}6)\ \textbf{UNEXPECT}$$

Log-Likelihood = 5004.523

where Dum_{t-1} is the 1 period lagged dummy variable = 1 if $\varepsilon_{t-1} < 0$; and 0 if $\varepsilon_{t-1} \geq 0$;

According to the variance equation, the coefficient of EXPECT (p-value of 0.0007) is statistically significant at the 10% level (p-value < 0.1), while the coefficient of UNEXPECT (p-value of 0.4173) is statistically insignificant at the 10% level (p-value > 0.1). This suggests that expected Federal Reserve announcements affect returns on SA stocks while unexpected Federal Reserve announcements have no effect on SA stock returns.

The Wald F-test (Table 11) was used to compare any differences in the impact of expected and unexpected announcements on volatility. The p-value of the Wald F-test F-statistic (0.0000) was less than 0.1, therefore the research rejected the null hypothesis and concluded that the two coefficients were not equal.

The results of the estimated TGARCH model with EXPECT and UNEXPECT (using the moving average measure of investor expectations) as the dummy variables results were:

$$r_t = 0.0006 + 0.0033\ \mathbf{r_{t-1}}$$

$$\sigma^2_t = 3.3400(E\text{-}7) + 0.0066\boldsymbol{\varepsilon^2_{t-1}} + 0.0866\boldsymbol{\varepsilon^2_{t-1}}\ Dum_{t-1} + 0.9482\boldsymbol{\sigma^2_{t-1}} - 2.00(E\text{-}5)\ \textbf{EXPECT} - 3.25(E\text{-}6)\ \textbf{UNEXPECTm}$$

Log-Likelihood = 5004.402

where Dum_{t-1} is the 1 period lagged dummy variable = 1 if $\varepsilon_{t-1} < 0$; and 0 if $\varepsilon_{t-1} \geq 0$;

The coefficient of EXPECT (p-value of 0.0000) in the equation above is statistically significant at the 10% level (p-value < 0.1), while the coefficient of UNEXPECT (p-value of 0.4490) is statistically insignificant at the 10% level (p-value > 0.1) - suggesting that expected Federal Reserve announcements affect returns on SA stocks while unexpected Federal Reserve announcements have no effect on SA stock returns.

The Wald F-test (Table 13) was used to compare the coefficient of EXPECT to the coefficient of UNEXPECT. Since the p-value of the Wald F-test F-statistic (0.0004) was less than 0.1, the research rejected the null hypothesis and concluded that the two coefficients were not equal.

The results of the estimated TGARCH model with EXPECT, UNEXPECT and SARB as the dummy variables results were:

$$r_t = 0.0006 + 0.0036\ \mathbf{r_{t-1}}$$

$$\sigma^2_t = 8.69(E\text{-}7) + 0.0074\boldsymbol{\varepsilon^2_{t-1}} + 0.0866\boldsymbol{\varepsilon^2_{t-1}}\ Dum_{t-1} + 0.9480\boldsymbol{\sigma^2_{t-1}} - 1.6800(E\text{-}5)\ \textbf{EXPECT} + 4.25(E\text{-}6)\ \textbf{UNEXPECT} + 1.04(E\text{-}6)\ \textbf{SARB}$$

Log-Likelihood = 5004.549

where Dum_{t-1} is the 1 period lagged dummy variable = 1 if $\varepsilon_{t-1} < 0$; and 0 if $\varepsilon_{t-1} \geq 0$;

According to the variance equation, the coefficient of EXPECT (p-value of 0.0007) is statistically significant at the 10% level (p-value < 0.1), while the coefficient of UNEXPECT (p-value of 0.4495) is statistically insignificant at the 10% level (p-value > 0.1). These results indicate that expected Federal Reserve announcements affect returns on SA stocks while unexpected Federal Reserve announcements have no effect on SA stock returns. The coefficient of SARB (p-value > 0.1) is statistically insignificant, suggesting that SA Reserve Bank announcements have no direct impact on SA stock returns.

The Wald F-test (Table 16) was used to compare any differences in the impact of expected and unexpected announcements on volatility. Given the null hypothesis that the coefficient of EXPECT is equal to the coefficient of UNEXPECT, and that the p-value of the Wald F-test F-statistic (0.0004) was less than 0.1, the research rejected the null hypothesis and concluded that the two coefficients were not equal.

The research also used the moving average measure of investor expectations to analyse TGARCH model with EXPECT, UNEXPECTm, and SARB as the dummy variables. The results were:

$$r_t = 0.0006 - 0.0037\ \mathbf{r_{t-1}}$$

$\sigma^2_t = 2.8300(E\text{-}7) + 0.0071\boldsymbol{\varepsilon^2_{t-1}} + 0.0866\boldsymbol{\varepsilon^2_{t-1}}\ Dum_{t-1} + 0.9478\boldsymbol{\sigma^2_{t-1}} - 1.9600(E\text{-}5)$ **EXPECT** $-3.13\ (E\text{-}6)$ **UNEXPECTm +** $2.01\ (E\text{-}6)$ **SARB**

Log-Likelihood = 5004.481

where Dum_{t-1} is the 1 period lagged dummy variable = 1 if $\varepsilon_{t-1} < 0$; and 0 if $\varepsilon_{t-1} \geq 0$;

According to the variance equation, the coefficient of EXPECT (p-value of 0.0000) is statistically significant at the 10% level (p-value < 0.1), while the coefficient of UNEXPECTm (p-value of 0.4840) is statistically insignificant at the 10% level (p-value > 0.1). This suggests that expected Federal Reserve announcements do affect returns on SA stocks while unexpected Federal Reserve announcements have no effect on SA stock returns. The coefficient of SARB (p-value > 0.1) is statistically insignificant, suggesting that SA Reserve Bank announcements have no direct impact on SA stock returns.

The Wald F-test (Table 18) was used to compare any differences in the impact of expected and unexpected announcements on volatility. Given the null hypothesis that the coefficient of EXPECT is equal to the coefficient of UNEXPECTm, and that the p-value of the Wald F-test F-statistic (0.0006) was less than 0.1, the research rejected the null hypothesis and concluded that the two coefficients were not equal.

The TGARCH model with the highest log likelihood is the TGARCH with the dummy variables EXPECT, UNEXPECT, and SARB in the variance equation (Table 14). This model is therefore taken to be the best fitted TGARCH model. To confirm this result, the residuals of the "winning" model were tested for independence using the BDS test method. The result of the BDS test are shown in table 15 and summarised below.

Observed BDS-Stat	**P-value**	**Critical Value (1% Level)**	**Null Hypothesis**
0.026246 (Dimension 2)	0.0000	10.17525	Residuals are independently and identically distributed

The BDS test results show that the observed BDS test statistic is less than the critical value. Therefore, the research failed to reject the null hypothesis at the 1% level – the residuals are independently and identically distributed. The BDS statistics at dimensions 3 to 6 exhibit similar behaviour. The results imply that the TGARCH model estimated above was adequately specified.

A closer analysis of this winner TGARCH model shows that the coefficient of the squared lagged residual term (0.007487) in the variance equation suggests that a 1% change in SA stock returns volatility (which occurs in response to an announcement shock in the previous period), increases stock returns by 0.007% in the current period. The coefficient of the GARCH term (lagged conditional variance) indicates that 0.95% of the previous period's conditional variance is present in the current period. The coefficient of the lagged squared lagged residual term and the leverage dummy term (0.086838) is greater than zero, therefore the it can be concluded that the impact of bad news Fed announcements was greater than the impact of good news Fed announcements. The effects of shocking Federal Reserve announcements are highly persistent in SA stock returns (the sum of the α_1 and α_3 coefficients in the variance equation is 0.95) the day after the announcement, suggesting the possible presence of an international transmission mechanism.

The results of the estimated EGARCH models are given below.

The estimated results for the EGARCH model with EXPECT, UNEXPECT, as the dummy variables were:

$$r_t = 0.0005 - 0.0034\ \mathbf{r_{t-1}}$$

$$\ln(\sigma^2_t) = -0.1451 + 0.1149\left|\frac{\varepsilon_{t-1}}{\sqrt{\sigma^2_{t-1}}}\right| - 0.0941\frac{\varepsilon_{t-1}}{\sqrt{\sigma^2_{t-1}}} + 0.9943 \ln \mathbf{\sigma^2_{t-1}} - 0.1888\ \mathbf{EXPECT} + 0.1203\ \mathbf{UNEXPECT}$$

According to the variance equation, the coefficient of EXPECT (p-value of 0.1680) is statistically insignificant at the 10% level (p-value > 0.1). The same is true for the coefficient of UNEXPECT at the 10% level of significance. This suggests that neither expected nor unexpected Federal Reserve announcements affect returns on SA stocks.

The Wald F-test (Table 20) results was used to compare the coefficients of EXPECT and UNEXPECT dummy variables. The p-value of the Wald F-test F-statistic (0.0304) was less than 0.1, therefore the research rejected the null hypothesis and concluded that the two coefficients were not equal.

The estimated results for the EGARCH model with EXPECT, UNEXPECT (moving av), as the dummy variables were:

$$r_t = 0.0005 - 0.0038\ \mathbf{r_{t-1}}$$

$$\ln(\sigma^2_t) = -0.1417 + 0.1152\left|\frac{\varepsilon_{t-1}}{\sqrt{\sigma^2_{t-1}}}\right| - 0.0936\frac{\varepsilon_{t-1}}{\sqrt{\sigma^2_{t-1}}} + 0.9942\ \ln\ \mathbf{\sigma^2_{t-1}} - 0.2634\ \mathbf{EXPECT} - 0.0506$$

UNEXPECTm

In the model results shown above, the coefficient of EXPECT (p-value of 0.0508) is statistically significant at the 10% level (p-value < 0.1). However, the coefficient of UNEXPECTm is not statistically significant at the 10% level (p-value > 0.1). This suggests that expected Federal Reserve announcements affect SA stock returns, while unexpected Federal Reserve announcements have no real impact on SA stock returns.

The Wald F-test (Table 22) was used to compare the coefficients of EXPECT and UNEXPECTm dummy variables. The research failed to reject the null hypothesis and concluded that the two coefficients were equal because the p-value of the Wald F-test F-statistic (0.1245) is greater than 0.1.

The estimated results for the EGARCH model with EXPECT, UNEXPECT and SARB as the dummy variables were:

$$r_t = 0.0005 + 0.0040\ \mathbf{r_{t-1}}$$

$$\ln(\sigma^2_t) = -0.1529 + 0.1162\left|\frac{\varepsilon_{t-1}}{\sqrt{\sigma^2_{t-1}}}\right| - 0.0945\frac{\varepsilon_{t-1}}{\sqrt{\sigma^2_{t-1}}} + 0.9939\ \ln\ \mathbf{\sigma^2_{t-1}} - 0.1866\ \mathbf{EXPECT} + 0.1048$$

UNEXPECT + 0.1256 **SARB**

The model results show that the coefficient of EXPECT (p-value of 0.1739) is not statistically significant at the 10% level (p-value > 0.1). The coefficient of UNEXPECT is also not

statistically significant at the 10% level (p-value > 0.1). This suggests that both expected and unexpected Federal Reserve announcements do not have a real effect on SA stock returns. The coefficient of SARB (p-value > 0.1) was found to be statistically insignificant.

The Wald F-test (Table 24) was used to compare the coefficients of EXPECT and UNEXPECT dummy variables. The p-value of the Wald F-test F-statistic (0.0427) is less than 0.1, therefore the research rejected the null hypothesis and concluded that the two coefficients were not equal.

The estimated results for the EGARCH model with EXPECT, UNEXPECT (moving average measure) and SARB as the dummy variables were:

$$r_t = 0.0005 + 0.0039\ \mathbf{r_{t-1}}$$

$$\ln(\sigma^2_t) = -\ 0.1500 + 0.1163\left|\frac{\varepsilon_{t-1}}{\sqrt{\sigma^2_{t-1}}}\right| -\ 0.0940\ \frac{\varepsilon_{t-1}}{\sqrt{\sigma^2_{t-1}}} +\ 0.9938\ \ln\ \mathbf{\sigma^2_{t\text{-}1}} -\ 0.2580\ \mathbf{EXPECT} -\ 0.0495\ \mathbf{UNEXPECTm} + 0.1346\ \mathbf{SARB}$$

The coefficient of EXPECT (p-value of 0.0614) is statistically significant at the 10% level (p-value < 0.1). The coefficient of UNEXPECT is also not statistically significant at the 10% level (p-value > 0.1). This suggests that expected announcement have an impact on SA Stock returns, while unexpected announcements do not have a real effect on SA stock returns. The coefficient of SARB (p-value > 0.1) was found to be statistically insignificant.

The Wald F-test (Table 27) was used to compare the coefficients of EXPECT and UNEXPECTm dummy variables. The p-value of the Wald F-test F-statistic (0.1439) is greater than 0.1, therefore the research failed to reject the null hypothesis and concluded that the two coefficients were equal.

The EGARCH model with the highest log likelihood is the EGARCH with the dummy variables EXPECT, UNEXPECT, and SARB in the variance equation (Table 14). This model is therefore taken to be the best fitted EGARCH model. To confirm this result, the residuals of the "winning" model were tested for independence using the BDS test method. The result of the BDS test are shown in table 25 and summarised below.

Observed BDS-Stat	P-value	Critical Value (1% Level)	Null Hypothesis
0.026244 (Dimension 2)	0.0000	10.17449	Residuals are independently and identically distributed

The BDS test results show that the observed BDS test statistic is less than the critical value. Therefore, the research failed to reject the null hypothesis at the 1% level – the residuals are independently and identically distributed. The BDS statistics at dimensions 3 to 6 exhibit similar behaviour. The results imply that the EGARCH model estimated above was adequately specified.

A closer analysis of this winner EGARCH model shows that α_1 (0.1162) in the variance equation suggests that a 1% change in SA stock returns volatility (which occurs in response to an announcement shock in the previous period), increases stock returns by 0.116% in the current period. The coefficient of the GARCH term α_3 (log of lagged conditional variance) indicates that 0.99% of the previous period's conditional variance is present in the current period. The coefficient of leverage term α_2 (-0.094579) is less than zero, therefore the it can be concluded that the impact of bad news Fed announcements was greater than the impact of good news Fed announcements. This EGARCH model is unstable because the sum of the α_1 and α_3 coefficients in the variance equation is greater than 1 – suggesting that Federal Reserve news announcement may have an immediate impact on SA stock returns, rather than an effect that can be observed overnight.

4.5. IMPLICATIONS OF RESULTS

The GARCH models estimated in this study indicated that, regardless of the source, Federal Reserve announcement shocks to SA stock returns were highly persistent the day after the announcement. This is because the conditional variance coefficient was found to be high (> 0.94) and statistically significant in all the estimated models. The implication is that SA stock returns are very sensitive to economic shocks, but not necessarily US monetary policy shocks.

In some instances, the dummy variable for EXPECT was found to be statistically significant, while in all cases, the dummy variable for UNEXPECT had a statistically insignificant impact on conditional variance in all the models estimated. The measure method used to measure

investor expectations (average vs. moving average), did not change the overall results of the research. The main conclusion drawn from these results is that investors anticipate Federal Reserve announcements and price them into asset prices before the actual announcement.

Alternatively, it could be that the Federal Reserve's monetary policy stance does not have an obvious impact on SA stock returns that can be observed through changes in volatility models estimated in this research.

To answer the research question, the study concludes that unanticipated (unexpected) Federal Reserve news announcements do not have a statistically significant impact on South African stock returns.

While the results are disappointing they are perhaps not surprising as many international studies discussed in Chapter 3 such as Birz & Lott (2011) also found that the stock price effects of macroeconomic news are commonly found to be statistically insignificant.

The relationship observed between the South African stock market and US monetary policy supports some of the results observed by Wang and Mayes (2012) and Wongswan (2009). Wongswan (2009) argues that this weak relationship could be attributed to difference in economic growth paths between the two countries.

Another possible reason could be the adoption of Basel Accord regulations by the South African banking system. Compliance with the Basel Accord regulations could have contributed to the perceived immunity of the South African stock market to US financial shocks.

An alternative view is that financial indices in SA exhibit high volatility as result of various socio-economic and political developments both locally and internationally. This theory was partially explored by adding the dummy variable SARB to some of the estimated GARCH model. In all the instances where SARB was included in the variance equation, this coefficient was found to be statistically insignificant. The results indicate that SA stock returns do not respond to SA monetary policy changes on the day of the announcement. Most likely, there are a multitude of other variables that could also be used to explain the day-to-day movements in the South African stock market.

4.6. CONCLUSION

The findings of the preliminary analysis (e.g. high level of kurtosis, presence of ARCH effects, clustering behaviour in return pattern) indicated a possible connection between South African stocks returns and external shocks. This was taken as a possible indicator of an international monetary policy transmission mechanism. The aim of the research was to investigate whether the observed clustering was a result of unanticipated FOMC announcements; no evidence was found to support this.

CHAPTER FIVE: CONCLUSION

5.1. SUMMARY OF STUDY AND CONCLUSIONS

Chen, Roll and Ross (1986) and Bodurtha, Cho and Senbet (1989) suggested that general economic variables like money supply and international risk parity variables affect investor sentiment and the economy's pricing operator. The research therefore began by pointing out how sensitive financial markets were to both global and domestic news announcements about the general state of the economy. News announcements are said to affect the risk perceptions of financial market participants and consequently financial asset prices. Announcements made by the United States Federal Reserve are known to provide an important source of information about the state of the global economy. Accordingly, the aim of the research was to investigate the impact of US Federal Reserve announcements on South African stock returns. Section 1.2 of Chapter 1 laid out the specific goal of the research; namely to measure the magnitude of the reaction of South African stocks returns to unanticipated news announcements by the US Federal Reserve.

Chapter 2 of the thesis conducted a literature review of different monetary policy stances and of transmission mechanisms. To examine the set of differing monetary policy stances, Chapter 2 discussed how US and South African monetary policy stances used interest rates to maintain financial stability. The Chapter reviewed the literature of transmission mechanisms and US monetary policy in particular affected financial assets outside the US as a result of globalisation. The most important channel in this regard was said to be the financial channel, which was taken to be the international manifestation of the consumption wealth channel. The review identified a variety of transmission mechanism, many of them similar in definition, with an additional two channels that were operational during crisis times. The following section provided empirical evidence of US monetary policy's international impact. From the empirical evidence, it was concluded that the interest rate channel is the most important channel of transmission across all contexts, while the exchange rate channel was particularly dominant in the international context. The literature review suggested a need to answer this thesis' research question.

Chapter 3 justified the method used to conduct the study. Section 3.2 discussed a range of methods that have previously been used to answer similar research questions – a significant proportion of these studies employed GARCH methodology. The research therefore followed the event study approach in combination with GARCH methodology to study the impact of US monetary policy shocks on South African stock returns. The event study was chosen to identify specific events in US monetary policy history and categorise them into expected/unexpected announcements, while the GARCH model was chosen to measure changes in volatility on the identified dates. The discussion of the various methodologies used in past studies also highlighted the simplicity and effectiveness of GARCH methodology. Some remedies, for the short comings of GARCH methodology were also discussed. Dummy variables, overnight returns, TGARCH and EGARCH models were used as the main remedies in the research. Section 3.3 explained the specifics of GARCH models, including how to ensure the model's results would be reliably interpreted (preliminary tests). The Chapter continued by introducing the three dummy variables, and the extended GARCH models, used to make the GARCH model more robust.

In Chapter 4, the results of the empirical analysis were presented, and initial inferences were made. A preliminary analysis of the data set provided evidence of clustering behaviour in SA stock returns, especially during the 2008/9 financial crisis. Other preliminary statistics (kurtosis and the test for ARCH effects) reinforced the direction that the research was taking.

Chapter 4 presented and discussed the GARCH model results. The results show that the dummy variable for EXPECT was statistically significant, while the dummy for UNEXPECT was mostly found to be statistically insignificant in affecting the conditional variance of SA stock returns. These results suggest that investors anticipate the direction of Federal Reserve monetary policy before the actual announcement, and this causes asset prices to change before the monetary policy announcement. The persistence of previous period shocks was consistently high in the period following the shock because the sum of ARCH and GARCH coefficients was less than or very close to 1. The implication is that SA stock returns are very sensitive to economic shocks, but not necessarily US monetary policy shocks. The main conclusion drawn therefore was that the Federal Reserve's monetary policy stance does not

have an obvious impact on SA stock returns that can be observed through changes in volatility. This outcome fails to provide evidence of an international monetary policy transmission mechanism from the US to South Africa. The unclear relationship observed between the South African stock market and US monetary policy could be attributed to other variables (e.g domestic) having a stronger impact on South African stock market than unexpected changes in US monetary policy.

After analysing the GARCH results, the research can conclude that unanticipated (unexpected) Federal Reserve news announcements do not have a statistically significant impact on South African stock returns.

5.2. AREAS OF FURTHER RESEARCH

In future studies, this research could be extended to examine possible sector specific responses of stock returns to Federal Reserve announcements. The financial sector may be especially interesting as it deals with financial assets which are highly liquid and whose values are possibly impacted by unexpected changes in US monetary policy.

Another possible area of extension could be to use a Vector Auto Regressive (VAR) model to gain a better understanding of the nature of relationships under analysis.

Future research could also use a different method to classify expected and unexpected Federal Reserve announcements. One such example is the use of classification trees where for each Federal Reserve announcement, the level of significance and level of contribution to stock price earnings is examined closely and individually. Alternatively, future researchers could use Artificial Intelligence to build a better or closely fitting model investor expectation.

APPENDIX

Table 1: Methods used to study the effect of monetary policy on economic variables

Paper	Topic	Methodology	Variable of Interest	Results
Aron and Muellbauer (2001)	Interest rate effects on output: evidence from a GDP forecasting model for South Africa.	Single equation, reduced-form VAR with smooth non-linear stochastic trend – i.e. Kalman filter is used to apply trend instead of using Hodrick-Prescott Filter to detrend output and other variables.	National output	Nominal rises in interest rates and the level of the real rate both have strong negative effects on subsequent output growth. The real interest rate's effect on output is relatively persistent.
Alves, Brandao de Brito, Gomes and Sousa (2011)	The transmission of monetary policy and technology shocks in the euro area	Structural VAR. Both technology and monetary shocks are identified simultaneously by imposing restrictions. Monetary policy shocks are identified as deviations from a policy rule.	National output, labour hours per capita, inflation, consumption, investment, capacity utilisation, real wage, interest rate, money velocity and money growth	The impulse response functions for real variables in the euro area follow a hump-shaped pattern after a monetary policy shock, with the peak effect occurring 1.5–2 years after the shock. Monetary policy shocks were found to have a substantial contribution to the variations in the short-term interest rate.
Ammer, Vega and Wongswan (2012)	International Transmission of U.S. Monetary Policy Shocks: Evidence from Stock Prices	Event Study with OLS model. The target surprise is computed as the change in the current-month federal funds futures contract rate in a 30-minute window around the FOMC announcement.	Individualised US equity prices and Foreign equity prices	An unexpected monetary policy tightening of 25 basis points is associated with a decrease of 1.59% in U.S. equity prices and a decrease of 1.71% in foreign equity prices, but with considerable variation across firms. Foreign firms tend to be more sensitive if the firm belongs to a more cyclically sensitive industry and has a higher proportion of sales outside their home country.

Anderson, Boney and Guirguis 2012	The impact of Switching Regimes and Monetary Shocks: An Empirical Analysis of REITs	Constant-variance, first-order, Markov regime-switching model with error correction terms. First difference in the Federal Funds Future rate is used as a proxy for unexpected changes in monetary policy	Real Estate Investment Trust index returns during high- and low-variance regimes	A negative, short-term relationship between monetary shocks and performance in all periods. However, this relationship is significant only during the high-variance periods associated with recession and crisis events.
Bauer and Neely (2014)	International channels of the Fed's unconventional monetary policy	Event Study with a combination of Gaussian Dynamic Term Structure Models (DTSM) (including Gaussian VAR model, OLS, Bias Corrected model, Random Walk model)	International government bond yields (U.S., Canada, Japan, Germany, and Australia)	Both the signalling channel and the portfolio balance channel made substantial contributions to the decline in yields in most countries. Evidence on the effects of the Fed's LSAP programs on foreign yields are largely consistent with past sensitivity to conventional U.S. monetary policy surprises and with the covariance of foreign and U.S. bond returns
Bojesteanu and Bobeica (2011)	The propagation of European monetary policy shocks into Romania's economy	Structural Vector Autoregressive (SVAR) model. Survey is used to isolate monetary policy shocks	Output gap, interbank interest rate and inflation	External monetary shocks do influence the chosen variables. In general, Romania appears to be less influenced by external shocks than other non-euro area members. The evolution of inflation in Romania, and especially that of the output gap, can mainly be attributed to an idiosyncratic component.
Cassola and Morana (2004)	Monetary policy and the stock market in the euro area	Vector Autoregressive model (VAR). Monetary shocks are given as the change in the growth rate of nominal money.	National output, real M3 balances and real stock market prices	Permanent productivity shocks are the driving force of the stock market in the long-term and contribute significantly to its cyclical behaviour. Nevertheless, the bulk of cyclical dynamics in the stock market is explained by transitory shocks including monetary policy shocks

Chua (2012)	Assessing the Effects of Monetary Policy Shocks in Malaysia: A Factor Augmented Vector Autoregressive Approach	Factor Augmented Vector Autoregressive model (FAVAR). Monetary shocks are identified as a change in the policy rate.	Industrial production, inflation, government securities, monetary aggregates, stock market, exchange rates, employment, retail sales, and consumer confidence	In general, financial and real variables react negatively to the monetary policy shocks. In particular, inflation, exchange rates and durable expenditure reacted immediately to monetary contraction. However, employment, exports and industrial production responded to the monetary shocks with a lag.
Craine and Martin (2008)	International monetary policy surprise spillovers	Linear simultaneous equation model. Monetary shocks are identified as a change in the Target rate.	Bond yields, the equity returns in the US and Australia, and the US/AU exchange rate	US money surprises have a large impact on US and Australian equity returns. A positive one standard deviation in the US money surprise reduces the daily US equity return by 0.5% and the Australian equity return by 0.5%.
Glick and Leduc (2012)	Central bank announcements of asset purchases and the impact on global financial and commodity markets	Event study and OLS regression model. Monetary shocks are identified as the first principal component of the yield changes of U.S. bond futures and also as Reuters surveys of Citi economists' expectations about their forecast of the total amount of asset purchases by the Bank of England	Long term yields, US and British exchange rates, commodity price indices	On days when information about those programs was announced, long-term interest rates fell globally and the value of the dollar or the pound depreciated. Positive U.S. monetary surprises led to declines in commodity prices, even as long-term interest rates fell and the U.S. dollar depreciated.
Gospodinov and Jamali (2014)	The Response of Stock Market Volatility to Futures-Based Measures of Monetary Policy Shocks	VAR model. Monetary shocks are identified as a change of the Fed funds future rates	Stock returns (S&P 500) and implied and realised volatility represented by the Chicago Board Options Exchange (CBOE) VIX	The paper finds a significant response of stock market volatility to monetary policy shocks as well as an asymmetric return-volatility response to a monetary policy shock.

Johansson (2012)	China's Growing Influence in Southeast Asia – Monetary Policy and Equity Markets	Structural VAR model. Monetary shocks are identified as a change in China's M2 money supply	Industrial production, consumption price index and domestic real stock prices (Indonesia, Malaysia, Philippines, Singapore and Thailand)	China's monetary policy has a significant but temporary effect on a majority of the Southeast Asian stock markets
Rigobon and Sack (2004)	The impact of monetary policy on asset prices	Identification through heteroscedasticity	Stock returns, treasury yield and Eurodollar futures	Increases in the short-term interest rate have a negative impact on stock prices, a significant positive impact on market interest rates and a positive impact on Eurodollar futures rates.
Yang and Hamori (2014)	Spill-over effect of US monetary policy to ASEAN Stock markets: Evidence from Indonesia, Singapore, and Thailand	Multivariate Markov-Switching Intercept Autoregressive Heteroscedasticity (MSIAH) Model. Monetary shocks are identified as a change in the 3-month Treasury bill rate.	Return on equity bases on the Morgan Stanley Capital International (MSCI) stock price index	We find that the US policy rate has a negative effect on the selected ASEAN stock markets during economic expansion periods and that the ASEAN stock markets have a positive co-movement with the US stock market in both expansionary and contractionary regimes for all cases.
Miyakoshi and Jalolov (2005)	Money-income causality revisited in EGARCH: Spillovers of monetary policy to Asia from the US	EGARCH model. Monetary shocks are identified as a change in US interest rates and money supply.	Money-income causality represented by industrial production and money supply (Pakistan, India, Malaysia, Indonesia, Philippines and Korea)	Spill-over effects from US interest rates and the money supply unambiguously influence money-income causality for each of the economies examined.
Funke and Matsuda (2006)	Macroeconomic News and Stock Returns in the United States and Germany	EGARCH model	Stock returns (US, Germany), Macroeconomics (GDP, business confidence, inflation, interest rates)	There is evidence of an asymmetric reaction of stock returns to news announcements in the US. Further evidence indicates that US news affects German stock returns.
Chen, Chiang and So (2003)	Asymmetrical reaction to US stock-return news: Evidence from major stock markets based on a double-threshold model	Double-threshold GARCH model	US Stock return shocks, Stock returns in Japan and some European countries	Negative US stock return news have a larger impact on international stock returns than positive news

Table 2: Summary Statistics for the FTSE/JSE ALSI returns

Sample Period	***No of observations***	***Mean Return***	***Standard Deviation***	***Skewness***	***Kurtosis***
2008 – 2014	1611	0.000524	0.011820	0.042036	8.063730

Table 3: Augmented Dickey-Fuller test for stationarity of JSE returns and ACF/PACF for residuals

Test: Augmented Dickey-Fuller test	**Null Hypothesis**: Index Return has a unit root	**Test Stat** = -- 37.96809 **P-value** = 0.0000 **Critical Value** = -3.434207	**Conclusion**: Reject $H_{0.}$ Index Return series does not have a unit root – Series is **stationary**
Test: Autocorrelation	**Test Result**: ACF and PACF at all lags is close to zero. Insignificant Q-stat after 2 lags	**Conclusion**: No serial autocorrelation	
Test: Arch Effect in Residuals	**Null Hypothesis:** No Arch Effects	**Test Stat:** Observed F-Stat = 101.9595 **P-value** = 0.000 **Critical Value** = 6.64	**Conclusion: P-value <0.01 therefore reject H_0 → Arch Effects present**

Table 4: GARCH Results (No Other Regressors (Z t) in Variance Equation)

The Table analyses movements in South African Stock returns using a GARCH models. The model is used to observe volatility in SA stock returns and whether the changes in volatility coincide with Federal Reserve announcement dates. Dummy variables have been excluded from the model. Along with the values for each coefficient, the values of the standard error, z-statistic, p-value and the Durbin Watson statistic are also presented

MEAN EQUATION				
Dependent Variable: *FTSE/JSE Index Return*	**No. of Observations**: 1522 *(after adjustments)*	**Method**: *Least Squares ARCH (Student's t distribution)*	**Sample Range**: *09/10/2008 to 30/10/2014*	
Independent Variables	**Coefficient**	**Standard Error**	**z-Statistic**	**P-Value**
Intercept	0.000713	0.000175	4.085364	0.0000
1 period lagged FTSE/JSE Index Return	-0.007752	0.027092	-0.286127	0.7748
VARIANCE EQUATION				
Intercept	0.000000174	0.000000135	1.287433	0.1979
1 period lagged Residual	0.070599	0.011888	5.938771	0.0000
1 period lagged Conditional Variance	0.929059	0.010557	88.00456	0.0000
Durbin Watson Stat: 1.856871	DW Stat is almost = 2 (above 1.5 and <2) → no serial autocorrelation			

Table 5: GARCH Results (EXPECT AND UNEXPECT in Variance Equation)

The Table analyses movements in South African Stock returns using a GARCH models. The model is used to observe volatility in SA stock returns and whether the changes in volatility coincide with Federal Reserve announcement dates. The dummy variables for EXPECT AND UNEXPECT have been included as regressors in the variance equation, where EXPECT=1 the day of an expected Federal Reserve announcement and =0 otherwise; and where UNEXPECT=1 the day of an unexpected Federal Reserve announcement and =0 otherwise. Along with the values for each coefficient, the values of the standard error, z-statistic, p-value and the Durbin Watson statistic are also presented.

MEAN EQUATION				
Dependent Variable: *FTSE/JSE Index Return*	**No. of Observations**: 1522 *(after adjustments)*	**Method**: *Least Squares ARCH (Student's t distribution)*	**Sample Range**: 09*/10/2008 to 30/10/2014*	
Independent Variables	**Coefficient**	**Standard Error**	**z-Statistic**	**P-Value**
Intercept	0.000748	0.000171	4.374501	0.0000
1 period lagged FTSE/JSE Index Return	-0.006680	0.026849	-0.248795	0.8035
VARIANCE EQUATION				
Intercept	0.0000001	0.000000193	1.520134	0.6030
1 period lagged Residual	0.057722	0.009955	5.798220	0.0000
1 period lagged Conditional Variance	0.943213	0.008904	105.9330	0.0000
EXPECT	-0.00000124	0.00000476	-2.596366	0.0094
UNEXPECT	0.00000335	0.0000056	0.597778	0.5500
Durbin Watson Stat: 1.858709	DW Stat is almost = 2 (above 1.5 and <2) → no serial autocorrelation			

Table 6: Wald F-test Results for GARCH (EXPECT AND UNEXPECT in Variance Equation)

Null Hypothesis	***Observed F-Statistic***	***Degrees of Freedom***	***Critical F-Statistic***	***P-value***
Coefficient of EXPECT = Coefficient of UNEXPECT	11.00291	1; 1514	2.70554 (at 10% level)	0.0009

Table 7: Results of BDS Independence Test for GARCH model (EXPECT AND UNEXPECT in Variance Equation)

Null Hypothesis	**BDS Test Statistic**	**Critical Value**	**P-value**
Residuals are Independently and Identically Distributed	**Dimension 2**: 0.026498	10.26331	0.0000
	Dimension 3: 0.059128	14.42007	0.0000
	Dimension 4: 0.084103	17.23108	0.0000
	Dimension 5: 0.098807	19.42764	0.0000
	Dimension 6: 0.104914	21.39427	0.0000

Table 8: GARCH Results (EXPECT AND UNEXPECTm in Variance Equation)

The Table analyses movements in South African Stock returns using a GARCH models. The model is used to observe volatility in SA stock returns and whether the changes in volatility coincide with Federal Reserve announcement dates. The dummy variables for EXPECT AND UNEXPECT have been included as regressors in the variance equation, where EXPECT=1 the day of an expected Federal Reserve announcement and =0 otherwise; and where UNEXPECT=1 the day of an unexpected Federal Reserve announcement and =0 otherwise. Along with the values for each coefficient, the values of the standard error, z-statistic, p-value and the Durbin Watson statistic are also presented.

MEAN EQUATION				
Dependent Variable: *FTSE/JSE Index Return*	**No. of Observations**: 1522 *(after adjustments)*	**Method**: *Least Squares ARCH (Student's t distribution)*	**Sample Range**: 09*/10/2008 to 30/10/2014*	
Independent Variables	**Coefficient**	**Standard Error**	**z-Statistic**	**P-Value**
Intercept	0.000726	0.000173	4.198549	0.0000
1 period lagged FTSE/JSE Index Return	-0.007043	0.026890	-0.261941	0.7934
VARIANCE EQUATION				
Intercept	0.000000268	0.000000178	1.507450	0.1317
1 period lagged Residual	0.057929	0.010089	5.741905	0.0000
1 period lagged Conditional Variance	0.942368	0.009092	103.6475	0.0000
EXPECT	-0.00000147	0.00000444	-3.308467	0.0009
UNEXPECTm	-0.00000254	0.0000046	0.551478	0.5813
Durbin Watson Stat: 1.858148	DW Stat is almost = 2 (above 1.5 and <2) → no serial autocorrelation			

Table 9: Wald F-test Results for GARCH Model (EXPECT AND UNEXPECTm in Variance Equation)

Null Hypothesis	***Observed F-Statistic***	***Degrees of Freedom***	***Critical F-Statistic***	***P-value***
Coefficient of EXPECT = Coefficient of UNEXPECT	6.915528	1; 1514	2.70554 (at 10% level)	0.0086

Table 10: TGARCH Results (EXPECT AND UNEXPECT in Variance Equation)

The Table analyses movements in South African Stock returns using a GARCH models. The model is used to observe volatility in SA stock returns and whether the changes in volatility coincide with Federal Reserve announcement dates. The dummy variables for EXPECT AND UNEXPECT have been included as regressors in the variance equation, where EXPECT=1 the day of an expected Federal Reserve announcement and =0 otherwise; and where UNEXPECT=1 the day of an unexpected Federal Reserve announcement and =0 otherwise. Along with the values for each coefficient, the values of the standard error, z-statistic, p-value and the Durbin Watson statistic are also presented.

MEAN EQUATION				
Dependent Variable: *FTSE/JSE Index Return*	**No. of Observations**: *1522 (after adjustments)*	**Method**: *Least Squares ARCH (Student's t distribution)*	**Sample Range**: *09/10/2008 to 30/10/2014*	
Independent Variables	**Coefficient**	**Standard Error**	**z-Statistic**	**P-Value**
Intercept	0.000629	0.000171	3.673012	0.0002
1 period lagged FTSE/JSE Index Return	0.003470	0.026809	0.129450	0.8970
VARIANCE EQUATION				
Intercept	0.000000105	0.000000186	0.563124	0.5734
1 period lagged Residual^2	0.007177	0.011394	0.629894	0.5288
1 period lagged Residual^2 x 1 period lagged Leverage Dummy	0.086840	0.017892	4.853668	0.0000
1 period lagged Conditional Variance	0.948371	0.008199	115.6757	0.0000
EXPECT	-0.0000169	0.00000497	-3.407884	0.0007
UNEXPECT	0.00000451	0.00000556	0.811102	0.4173
Durbin Watson Stat: 1.878433	DW Stat is almost = 2 (above 1.5 and <2) → no serial autocorrelation			
Log Likelihood	5004.523			

Table 11: Wald F-test Results TGARCH (EXPECT AND UNEXPECT in Variance Equation)

Null Hypothesis	***Observed F-Statistic***	***Degrees of Freedom***	***Critical F-Statistic***	***P-value***
Coefficient of EXPECT = Coefficient of UNEXPECT	19.35162	1; 1513	2.70554 (at 10% level)	0.0000

Table 12: TGARCH Results (EXPECT AND UNEXPECTm in Variance Equation)

The Table analyses movements in South African Stock returns using a GARCH models. The model is used to observe volatility in SA stock returns and whether the changes in volatility coincide with Federal Reserve announcement dates. The dummy variables for EXPECT AND UNEXPECTm have been included as regressors in the variance equation, where EXPECT=1 the day of an expected Federal Reserve announcement and =0 otherwise; and where UNEXPECTm=1 the day of an unexpected Federal Reserve announcement and =0 otherwise. Along with the values for each coefficient, the values of the standard error, z-statistic, p-value and the Durbin Watson statistic are also presented

MEAN EQUATION				
Dependent Variable: *FTSE/JSE Index Return*	**No. of Observations**: *1522 (after adjustments)*	**Method**: *Least Squares ARCH (Student's t distribution)*	**Sample Range**: *09/10/2008 to 30/10/2014*	
Independent Variables	**Coefficient**	**Standard Error**	**z-Statistic**	**P-Value**
Intercept	0.000592	0.000173	3.420482	0.0006
1 period lagged FTSE/JSE Index Return	0.003295	0.026836	0.122769	0.9023
VARIANCE EQUATION				
Intercept	0.000000334	0.000000165	2.029348	0.0424
1 period lagged Residual^2	0.006649	0.011593	0.573553	0.5663
1 period lagged Residual^2 x 1 period lagged Leverage Dummy	0.08620	0.017951	4.825334	0.0000
1 period lagged Conditional Variance	0.948240	0.008426	112.5413	0.0000
EXPECT	-0.00002	0.00000459	-4.364670	0.0000
UNEXPECTm	-0.00000325	0.00000429	-0.757001	0.4490
Durbin Watson Stat: 1.878189	DW Stat is almost = 2 (above 1.5 and <2) → no serial autocorrelation			
Log Likelihood	5004.402			

Table 13: Wald F-test Results TGARCH (EXPECT AND UNEXPECTm in Variance Equation)

Null Hypothesis	***Observed F-Statistic***	***Degrees of Freedom***	***Critical F-Statistic***	***P-value***
Coefficient of EXPECT = Coefficient of UNEXPECTm	12.66059	1; 1513	2.70554 (at 10% level)	0.0004

Table 14: TGARCH Results (EXPECT, UNEXPECT and SARB in Variance Equation)

The Table analyses movements in South African Stock returns using a GARCH models. The model is used to observe volatility in SA stock returns and whether the changes in volatility coincide with Federal Reserve announcement dates. The dummy variables for EXPECT AND UNEXPECT have been included as regressors in the variance equation, where EXPECT=1 the day of an expected Federal Reserve announcement and =0 otherwise; and where UNEXPECT=1 the day of an unexpected Federal Reserve announcement and =0 otherwise. The dummy variable SARB =1 on the date of a South African Reserve Bank monetary policy announcement, and 0 otherwise. Along with the values for each coefficient, the values of the standard error, z-statistic, p-value and the Durbin Watson statistic are also presented

MEAN EQUATION				
Dependent Variable: *FTSE/JSE Index Return*	**No. of Observations**: *1522 (after adjustments)*	**Method**: *Least Squares ARCH (Student's t distribution)*	**Sample Range**: *09/10/2008 to 30/10/2014*	
Independent Variables	**Coefficient**	**Standard Error**	**z-Statistic**	**P-Value**
Intercept	0.000625	0.000172	3.641498	0.0003
1 period lagged FTSE/JSE Index Return	0.003635	0.026814	0.135552	0.8922
VARIANCE EQUATION				
Intercept	0.0000000869	0.000000216	0.402253	0.6875
1 period lagged Residual^2	0.007487	0.011486	0.651831	0.5145
1 period lagged Residual^2 x 1 period lagged Leverage Dummy	0.086838	0.017998	4.830460	0.0000
1 period lagged Conditional Variance	0.948004	0.008273	114.5931	0.0000
EXPECT	-0.0000168	0.00000498	-3.381179	0.0007
UNEXPECT	-0.00000425	0.00000562	-0.756166	0.4495
SARB	0.00000104	0.00000425	0.243758	0.8074
Durbin Watson Stat: 1.878189	DW Stat is almost = 2 (above 1.5 and <2) → no serial autocorrelation			
Log Likelihood	5004.549			

Table 15: Results of BDS test for TGARCH (EXPECT, UNEXPECT and SARB in Variance Equation)

Null Hypothesis	**BDS Test Statistic**	**Critical Value**	**P-value**
Residuals are Independently and Identically Distributed	**Dimension 2**: 0.026246	10.17525	0.0000
	Dimension 3: 0.058670	14.32232	0.0000
	Dimension 4: 0.083623	17.15037	0.0000
	Dimension 5: 0.098337	19.35636	0.0000
	Dimension 6: 0.104447	21.32355	0.0000

Table 16: Wald F-test Results

Null Hypothesis	***Observed F-Statistic***	***Degrees of Freedom***	***Critical F-Statistic***	***P-value***
Coefficient of EXPECT = Coefficient of UNEXPECT	18.31275	1; 1512	2.70554 (at 10% level)	0.0000

Table 17: TGARCH Results (EXPECT, UNEXPECTm, and SARB in Variance Equation)

The Table analyses movements in South African Stock returns using a GARCH models. The model is used to observe volatility in SA stock returns and whether the changes in volatility coincide with Federal Reserve announcement dates. The dummy variables for EXPECT AND UNEXPECTm have been included as regressors in the variance equation, where EXPECT=1 the day of an expected Federal Reserve announcement and =0 otherwise; and where UNEXPECTm=1 the day of an unexpected Federal Reserve announcement and =0 otherwise. The dummy variable SARB =1 on the date of a South African Reserve Bank monetary policy announcement, and 0 otherwise. Along with the values for each coefficient, the values of the standard error, z-statistic, p-value and the Durbin Watson statistic are also presented

MEAN EQUATION				
Dependent Variable: *FTSE/JSE Index Return*	**No. of Observations**: *1522 (after adjustments)*	**Method**: *Least Squares ARCH (Student's t distribution)*	**Sample Range**: *09/10/2008 to 30/10/2014*	
Independent Variables	**Coefficient**	**Standard Error**	**z-Statistic**	**P-Value**
Intercept	0.000590	0.000174	3.396108	0.0007
1 period lagged FTSE/JSE Index Return	0.003667	0.026841	0.136625	0.8913
VARIANCE EQUATION				
Intercept	0.00000283	0.000000212	1.338640	0.1807
1 period lagged Residual^2	0.007080	0.011702	0.605006	0.5452
1 period lagged Residual^2 x 1 period lagged Leverage Dummy	0.086616	0.018080	4.790592	0.0000
1 period lagged Conditional Variance	0.947775	0.008519	111.2530	0.0000
EXPECT	-0.0000313	0.00000447	-4.210843	0.0000
UNEXPECTm	-0.00000313	0.00000447	-0.699920	0.4840
SARB	0.00000201	0.00000465	0.432812	0.6652
Durbin Watson Stat: 1.878899	DW Stat is almost = 2 (above 1.5 and <2) → no serial autocorrelation			
Log Likelihood	5004.481			

Table 18: Wald F-test Results TGARCH (EXPECT, UNEXPECTm, and SARB in Variance Equation)

Null Hypothesis	***Observed F-Statistic***	***Degrees of Freedom***	***Critical F-Statistic***	***P-value***
Coefficient of EXPECT = Coefficient of UNEXPECTm	11.83612	1; 1512	2.70554 (at 10% level)	0.0006

Table 19: EGARCH Results (EXPECT, UNEXPECT in Variance Equation)

The Table analyses movements in South African Stock returns using an EGARCH model. The model is used to observe volatility in SA stock returns and whether the changes in volatility coincide with Federal Reserve announcement dates. The dummy variables for EXPECT AND UNEXPECT have been included as regressors in the variance equation, where EXPECT=1 the day of an expected Federal Reserve announcement and =0 otherwise; and where UNEXPECT=1 the day of an unexpected Federal Reserve announcement and =0 otherwise. The dummy variable SARB =1 on the date of a South African Reserve Bank monetary policy announcement, and 0 otherwise. Along with the values for each coefficient, the values of the standard error, z-statistic, p-value and the Durbin Watson statistic are also presented

MEAN EQUATION				
Dependent Variable: *FTSE/JSE Index Return*	**No. of Observations**: *1522 (after adjustments)*	**Method**: *Least Squares ARCH (Student's t distribution)*	**Sample Range**: 09*/10/2018 to 30/10/2014*	
Independent Variables	**Coefficient**	**Standard Error**	**z-Statistic**	**P-Value**
Intercept	0.000494	0.000170	2.896325	0.0038
1 period lagged FTSE/JSE Index Return	0.003407	0.026862	0.126833	0.8991
VARIANCE EQUATION				
Intercept	-0.145067	0.030486	-4.758415	0.0000
|(1 period lagged residual)/ (√ 1 period lagged conditional variance)|	0.114859	0.020659	5.562064	0.0000
1 period lagged residual)/ (√ 1 period lagged conditional variance)	-0.094143	0.016619	-5.664934	0.0000
Log (1 period lagged conditional variance) C6	0.994277	0.003556	388.9926	0.0000
EXPECT	-0.188834	0.136964	-1.378710	0.1680
UNEXPECT	0.120316	0.149915	0.802561	0.4222
Durbin Watson Stat: 1.878460	DW Stat is almost = 2 (above 1.5 and <2) → no serial autocorrelation			
Log Likelihood	5005.997			

Table 20: Wald F-test Results EGARCH (EXPECT, UNEXPECT in Variance Equation)

Null Hypothesis	***Observed F-Statistic***	***Degrees of Freedom***	***Critical F-Statistic***	***P-value***
Coefficient of EXPECT = Coefficient of UNEXPECT	4.695919	1; 1513	2.70554 (at 10% level)	0.0304

Table 21: EGARCH Results (EXPECT, UNEXPECTm in Variance Equation)

The Table analyses movements in South African Stock returns using an EGARCH model. The model is used to observe volatility in SA stock returns and whether the changes in volatility coincide with Federal Reserve announcement dates. The dummy variables for EXPECT AND UNEXPECT have been included as regressors in the variance equation, where EXPECT=1 the day of an expected Federal Reserve announcement and =0 otherwise; and where UNEXPECTm =1 the day of an unexpected Federal Reserve announcement and =0 otherwise. For each coefficient, the values of the standard error, z-statistic, p-value and the Durbin Watson statistic are also presented

MEAN EQUATION				
Dependent Variable: *FTSE/JSE Index Return*	**No. of Observations**: *1522 (after adjustments)*	**Method**: *Least Squares ARCH (Student's t distribution)*	**Sample Range**: 09*/10/2018 to 30/10/2014*	
Independent Variables	**Coefficient**	**Standard Error**	**z-Statistic**	**P-Value**
Intercept	0.000495	0.000170	2.912869	0.0036
1 period lagged FTSE/JSE Index Return	0.003738	0.026868	0.139057	0.8894
VARIANCE EQUATION				
Intercept	-0.141745	0.031296	-4.529135	0.0000
|(1 period lagged residual)/ (√ 1 period lagged conditional variance)|	0.115244	0.020655	5.579515	0.0000
1 period lagged residual)/ (√ 1 period lagged conditional variance)	-0.093517	0.016630	-5.623451	0.0000
Log (1 period lagged conditional variance) C6	0.994239	0.002581	385.2251	0.0000
EXPECT	-0.263434	0.137433	-1.953198	0.0508
UNEXPECTm	0.050582	0.149008	-0.339457	0.7343
Durbin Watson Stat: 1.879086	DW Stat is almost = 2 (above 1.5 and <2) → no serial autocorrelation			
Log Likelihood	5005.715			

Table 22: Wald F-test Results EGARCH (EXPECT, UNEXPECTm in Variance Equation)

Null Hypothesis	***Observed F-Statistic***	***Degrees of Freedom***	***Critical F-Statistic***	***P-value***
Coefficient of EXPECT = Coefficient of UNEXPECTm	2.362087	1; 1513	2.70554 (at 10% level)	0.1245

Table 23: EGARCH Results (EXPECT, UNEXPECT, SARB in Variance Equation)

The Table analyses movements in South African Stock returns using an EGARCH model. The model is used to observe volatility in SA stock returns and whether the changes in volatility coincide with Federal Reserve announcement dates. The dummy variables for EXPECT AND UNEXPECT have been included as regressors in the variance equation, where EXPECT=1 the day of an expected Federal Reserve announcement and =0 otherwise; and where UNEXPECT =1 the day of an unexpected Federal Reserve announcement and =0 otherwise. The dummy variable SARB =1 on the date of a South African Reserve Bank monetary policy announcement, and 0 otherwise. For each coefficient, the values of the standard error, z-statistic, p-value and the Durbin Watson statistic are also presented

MEAN EQUATION				
Dependent Variable: *FTSE/JSE Index Return*	**No. of Observations**: *1522 (after adjustments)*	**Method**: *Least Squares ARCH (Student's t distribution)*	**Sample Range**: 09*/10/2018 to 30/10/2014*	
Independent Variables	**Coefficient**	**Standard Error**	**z-Statistic**	**P-Value**
Intercept	0.000491	0.000171	2.874168	0.0041
1 period lagged FTSE/JSE Index Return	0.003968	0.026918	0.147397	0.8828
VARIANCE EQUATION				
Intercept	-0.152930	0.030979	-4.936576	0.0000
|(1 period lagged residual)/ (√ 1 period lagged conditional variance)|	0.116202	0.020946	5.547574	0.0000
1 period lagged residual)/ (√ 1 period lagged conditional variance)	-0.094579	0.016630	-5.687206	0.0000
Log (1 period lagged conditional variance) C6	0.993863	0.002604	381.7154	0.0000
EXPECT	-0.186603	0.137241	-1.359681	0.1739
UNEXPECT	0.104849	0.150537	0.696498	0.4861
SARB	0.125551	0.122776	1.022600	0.3065
Durbin Watson Stat: 1.879522	DW Stat is almost = 2 (above 1.5 and <2) → no serial autocorrelation			
Log Likelihood	5006.455			

Table 24: Wald F-test Results EGARCH (EXPECT, UNEXPECT, SARB in Variance Equation)

Null Hypothesis	***Observed F-Statistic***	***Degrees of Freedom***	***Critical F-Statistic***	***P-value***
Coefficient of EXPECT = Coefficient of UNEXPECT	4.112889	1; 1512	2.70554 (at 10% level)	0.0427

Table 25: Results of BDS test for EGARCH (EXPECT, UNEXPECT and SARB in Variance Equation)

Null Hypothesis	**BDS Test Statistic**	**Critical Value**	**P-value**
Residuals are Independently and Identically Distributed	**Dimension 2**: 0.026244	10.17449	0.0000
	Dimension 3: 0.058663	14.32062	0.0000
	Dimension 4: 0.083612	17.14829	0.0000
	Dimension 5: 0.098321	19.35331	0.0000
	Dimension 6: 0.104428	21.31980	0.0000

Table 26: EGARCH Results (EXPECT, UNEXPECTm, SARB in Variance Equation)

The Table analyses movements in South African Stock returns using an EGARCH model. The model is used to observe volatility in SA stock returns and whether the changes in volatility coincide with Federal Reserve announcement dates. The dummy variables for EXPECT AND UNEXPECTm have been included as regressors in the variance equation, where EXPECT=1 the day of an expected Federal Reserve announcement and =0 otherwise; and where UNEXPECTm =1 the day of an unexpected Federal Reserve announcement and =0 otherwise. The dummy variable SARB =1 on the date of a South African Reserve Bank monetary policy announcement, and 0 otherwise. For each coefficient, the values of the standard error, z-statistic, p-value and the Durbin Watson statistic are also presented

MEAN EQUATION				
Dependent Variable: *FTSE/JSE Index Return*	**No. of Observations**: *1522 (after adjustments)*	**Method**: *Least Squares ARCH (Student's t distribution)*	**Sample Range**: *09/10/2018 to 30/10/2014*	
Independent Variables	**Coefficient**	**Standard Error**	**z-Statistic**	**P-Value**
Intercept	0.000495	0.000170	2.906817	0.0037
1 period lagged FTSE/JSE Index Return	0.003906	0.026929	0.145081	0.8846
VARIANCE EQUATION				
Intercept	-0.149968	0.031771	-4.720301	0.0000
|(1 period lagged residual)/ (√ 1 period lagged conditional variance)|	0.116320	0.020922	5.559759	0.0000
1 period lagged residual)/ (√ 1 period lagged conditional variance)	-0.093953	0.016613	-5.655516	0.0000

Log (1 period lagged conditional variance) C6	0.993835	0.002627	378.3362	0.0000
EXPECT	-0.257953	0.137875	-1.870918	0.0614
UNEXPECTm	-0.049488	0.149924	-0.330086	0.7413
SARB	0.134553	0.123512	1.0893886	0.2760
Durbin Watson Stat: 1.879409	DW Stat is almost = 2 (above 1.5 and <2) → no serial autocorrelation			
Log Likelihood	5006.272			

Table 27: Wald F-test Results EGARCH (EXPECT, UNEXPECTm, SARB in Variance Equation)

Null Hypothesis	***Observed F-Statistic***	***Degrees of Freedom***	***Critical F-Statistic***	***P-value***
Coefficient of EXPECT = Coefficient of UNEXPECTm	2.137496	1; 1512	2.70554 (at 10% level)	0.1439

Table 28: Details of FOMC announcements.

Source: Federal Reserve Monetary Policy Releases

Date	**Announcement type**	**Expected/ Unexpected (Simple Av. Method)**	**Expected/ Unexpected (Moving Av. Method)**
October 8, 2008	Inflationary pressures have started to moderate in a number of countries, partly reflecting a marked decline in energy and other commodity prices. Inflation expectations are diminishing and remain anchored to price stability. The recent intensification of the financial crisis has augmented the downside risks to growth and thus has diminished further the upside risks to price stability. The Federal Open Market Committee has decided to lower its target for the federal funds rate 50 basis points to 1-1/2 percent.	Unexpected	Unexpected
October 29, 2008	The Federal Open Market Committee decided today to lower its target for the federal funds rate 50 basis points to 1 percent. The pace of economic activity appears to have slowed markedly, owing importantly to a decline in consumer expenditures. Business equipment spending and industrial production have weakened in recent months, and slowing economic activity in many foreign	Expected	Expected

	economies is damping the prospects for U.S. exports. Today, the Federal Reserve, the Banco Central do Brasil, the Banco de Mexico, the Bank of Korea, and the Monetary Authority of Singapore are announcing the establishment of temporary reciprocal currency arrangements (swap lines)		
November 25, 2008	The Federal Reserve Board on Tuesday announced the creation of the Term Asset-Backed Securities Loan Facility (TALF), a facility that will help market participants meet the credit needs of households and small businesses by supporting the issuance of asset-backed securities (ABS) collateralized by student loans, auto loans, credit card loans, and loans guaranteed by the Small Business Administration (SBA). The Federal Reserve announced on Tuesday that it will initiate a program to purchase the direct obligations of housing-related government-sponsored enterprises (GSEs)--Fannie Mae, Freddie Mac, and the Federal Home Loan Banks--and mortgage-backed securities (MBS) backed by Fannie Mae, Freddie Mac, and Ginnie Mae. Purchases of up to $100 billion in GSE direct obligations and purchases of up to $500 billion in MBS to take place over several quarters.	Expected	Expected
December 16, 2008	The Federal Open Market Committee decided today to establish a target range for the federal funds rate of 0 to 1/4 percent. Since the Committee's last meeting, labour market conditions have deteriorated, and the available data indicate that consumer spending, business investment, and industrial production have declined. Financial markets remain quite strained and credit conditions tight. Overall, the outlook for economic activity has weakened further. The Federal Reserve Board established the interest rates on required reserve balances and excess balances at 1/4 percent for reserve maintenance periods beginning December 18.	Expected	Expected
January 28, 2009	The Federal Open Market Committee decided today to keep its target range for the federal funds rate at 0 to 1/4 percent. The Committee continues to anticipate that economic conditions are likely to warrant exceptionally low levels of the federal funds rate for some time. The focus of the Committee's policy is to support the functioning of financial markets and stimulate the economy through open market operations and other measures that are likely to keep the size of the Federal Reserve's balance sheet at a high level.	Unexpected	Unexpected

March 18, 2009	Information received since the Federal Open Market Committee met in January indicates that the economy continues to contract. In these circumstances, the Committee will maintain the target range for the federal funds rate at 0 to 1/4 percent and anticipates that economic conditions are likely to warrant exceptionally low levels of the federal funds rate for an extended period. To provide greater support to mortgage lending and housing markets, the Committee decided today to increase the size of the Federal Reserve's balance sheet further by purchasing up to an additional $750 billion of agency mortgage-backed securities, and to increase its purchases of agency debt this year by up to $100 billion. Moreover, to help improve conditions in private credit markets, the Committee decided to purchase up to $300 billion of longer-term Treasury securities over the next six months.	Expected	Expected
April 29, 2009	Information received since the Federal Open Market Committee met in March indicates that the economy has continued to contract, though the pace of contraction appears to be somewhat slower. The Committee will maintain the target range for the federal funds rate at 0 to 1/4 percent and the Federal Reserve will purchase a total of up to $1.25 trillion of agency mortgage-backed securities and up to $200 billion of agency debt by the end of the year. In addition, the Federal Reserve will buy up to $300 billion of Treasury securities by autumn	Unexpected	Unexpected
June 24, 2009	Information received since the Federal Open Market Committee met in April suggests that the pace of economic contraction is slowing. Conditions in financial markets have generally improved in recent months. The Committee will maintain the target range for the federal funds rate at 0 to 1/4 percent	Unexpected	Unexpected
August 12, 2009	Information received since the Federal Open Market Committee met in June suggests that economic activity is levelling out. Conditions in financial markets have improved further in recent weeks. The Committee will maintain the target range for the federal funds rate at 0 to 1/4 percent	Unexpected	Expected
September 23, 2009	Information received since Federal Open Market Committee met in August suggests that economic activity picked up following its severe downturn. Conditions in financial markets have improved further, and activity in the housing sector has increased. The Committee will maintain the target range for the federal funds rate at 0 to 1/4	Expected	Expected

November 4, 2009	Information received since the Federal Open Market Committee met in September suggests that economic activity has continued to pick up. Conditions in financial markets were roughly unchanged, on balance, over the intermeeting period. The Committee will maintain the target range for the federal funds rate at 0 to 1/4 percent. In order to promote a smooth transition in markets, the Committee will gradually slow the pace of its purchases of both agency debt and agency mortgage-backed securities and anticipates that these transactions will be executed by the end of the first quarter of 2010.	Unexpected	Unexpected
December 16, 2009	Information received since the Federal Open Market Committee met in November suggests that economic activity has continued to pick up and that the deterioration in the labour market is abating. The housing sector has shown some signs of improvement over recent months. The Committee will maintain the target range for the federal funds rate at 0 to ¼. In light of ongoing improvements in the functioning of financial markets, the Committee and the Board of Governors anticipate that most of the Federal Reserve's special liquidity facilities will expire on February 1, 2010, consistent with the Federal Reserve's announcement of June 25, 2009. These facilities include the Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility, the Commercial Paper Funding Facility, the Primary Dealer Credit Facility, and the Term Securities Lending Facility. The Federal Reserve will also be working with its central bank counterparties to close its temporary liquidity swap arrangements by February 1	Unexpected	Unexpected
January 27, 2010	Information received since the Federal Open Market Committee met in December suggests that economic activity has continued to strengthen and that the deterioration in the labour market is abating. The Committee will maintain the target range for the federal funds rate at 0 to 1/4. The Federal Reserve is in the process of winding down its Term Auction Facility: $50 billion in 28-day credit will be offered on **February 8** and $25 billion in 28-day credit will be offered at the final auction on **March 8**. The anticipated expiration dates for the Term Asset-Backed Securities Loan Facility remain set at June 30 for loans backed by new-issue commercial mortgage-backed securities and March 31 for loans backed by all other types of collateral.	Expected	Expected

March 16, 2010	Information received since the Federal Open Market Committee met in January suggests that economic activity has continued to strengthen and that the labour market is stabilizing. The Committee will maintain the target range for the federal funds rate at 0 to 1/4	Unexpected	Expected
April 28, 2010	Information received since the Federal Open Market Committee met in March suggests that economic activity has continued to strengthen and that the labour market is beginning to improve. The Committee will maintain the target range for the federal funds rate at 0 to 1/4. The Federal Reserve has closed all but one of the special liquidity facilities that it created to support markets during the crisis. The only remaining such program, the Term Asset-Backed Securities Loan Facility, is scheduled to close on June 30 for loans backed by new-issue commercial mortgage-backed securities; it closed on March 31 for loans backed by all other types of collateral.	Unexpected	Unexpected
June 23, 2010	Information received since the Federal Open Market Committee met in April suggests that the economic recovery is proceeding and that the labour market is improving gradually. Household spending is increasing but remains constrained by high unemployment, modest income growth, lower housing wealth, and tight credit. The Committee will maintain the target range for the federal funds rate at 0 to 1/4	Expected	Expected
August 10, 2010	Information received since the Federal Open Market Committee met in June indicates that the pace of recovery in output and employment has slowed in recent months. Household spending is increasing gradually, but remains constrained by high unemployment, modest income growth, lower housing wealth, and tight credit. The Committee will maintain the target range for the federal funds rate at 0 to 1/4. To help support the economic recovery in a context of price stability, the Committee will keep constant the Federal Reserve's holdings of securities at their current level by reinvesting principal payments from agency debt and agency mortgage-backed securities in longer-term Treasury securities.1 The Committee will continue to roll over the Federal Reserve's holdings of Treasury securities as they mature.	Unexpected	Unexpected
September 21, 2010	Information received since the Federal Open Market Committee met in August indicates that the pace of recovery in output and employment has slowed in recent months. The Committee will	Expected	Expected

	maintain the target range for the federal funds rate at 0 to 1/4. The Committee also will maintain its existing policy of reinvesting principal payments from its securities holdings.		
November 3, 2010	Information received since the Federal Open Market Committee met in September confirms that the pace of recovery in output and employment continues to be slow. To promote a stronger pace of economic recovery and to help ensure that inflation, over time, is at levels consistent with its mandate, the Committee decided today to expand its holdings of securities. The Committee will maintain its existing policy of reinvesting principal payments from its securities holdings. In addition, the Committee intends to purchase a further $600 billion of longer-term Treasury securities by the end of the second quarter of 2011, a pace of about $75 billion per month. The Committee will maintain the target range for the federal funds rate at 0 to 1/4 percent.	Unexpected	Unexpected
December 14, 2010	Information received since the Federal Open Market Committee met in November confirms that the economic recovery is continuing, though at a rate that has been insufficient to bring down unemployment. The Committee decided today to continue expanding its holdings of securities as announced in November.	Expected	Unexpected
January 26, 2011	Information received since the Federal Open Market Committee met in December confirms that the economic recovery is continuing, though at a rate that has been insufficient to bring about a significant improvement in labour market conditions. To promote a stronger pace of economic recovery and to help ensure that inflation, over time, is at levels consistent with its mandate, the Committee decided today to continue expanding its holdings of securities as announced in November. The Committee will maintain the target range for the federal funds rate at 0 to 1/4 percent.	Unexpected	Unexpected
March 15, 2011	Information received since the Federal Open Market Committee met in January suggests that the economic recovery is on a firmer footing, and overall conditions in the labour market appear to be improving gradually. To promote a stronger pace of economic recovery and to help ensure that inflation, over time, is at levels consistent with its mandate, the Committee decided today to continue expanding its holdings of securities as announced in November. The Committee will	Unexpected	Unexpected

	maintain the target range for the federal funds rate at 0 to 1/4 percent.		
April 27, 2011	Information received since the Federal Open Market Committee met in March indicates that the economic recovery is proceeding at a moderate pace and overall conditions in the labour market are improving gradually. To promote a stronger pace of economic recovery and to help ensure that inflation, over time, is at levels consistent with its mandate, the Committee decided today to continue expanding its holdings of securities as announced in November. The Committee will maintain the target range for the federal funds rate at 0 to ¼ percent. The Federal Reserve Board and the Federal Open Market Committee on Wednesday released the economic projections made by Federal Reserve Board members and Federal Reserve Bank presidents for the April 26-27 meeting of the Committee.	Unexpected	Unexpected
June 22, 2011	Information received since the Federal Open Market Committee met in April indicates that the economic recovery is continuing at a moderate pace, though somewhat more slowly than the Committee had expected. The Committee will complete its purchases of $600 billion of longer-term Treasury securities by the end of this month and will maintain its existing policy of reinvesting principal payments from its securities holdings. The Committee decided today to keep the target range for the federal funds rate at 0 to 1/4 percent. The Federal Reserve Board and the Federal Open Market Committee on Wednesday released the economic projections made by Federal Reserve Board members and Federal Reserve Bank presidents for the June 21-22 meeting of the Committee	Unexpected	Unexpected
August 9, 2011	Information received since the Federal Open Market Committee met in June indicates that economic growth so far this year has been considerably slower than the Committee had expected. The Committee now expects a somewhat slower pace of recovery over coming quarters than it did at the time of the previous meeting. The Committee decided today to keep the target range for the federal funds rate at 0 to 1/4 percent. The Committee currently anticipates that economic conditions are likely to warrant exceptionally low levels for the federal funds rate at least through mid-2013. The Committee also will maintain its existing policy of reinvesting principal payments from its securities holdings.	Expected	Expected

September 21, 2011	Information received since the Federal Open Market Committee met in August indicates that economic growth remains slow. To support a stronger economic recovery and to help ensure that inflation, over time, is at levels consistent with the dual mandate, the Committee decided today to extend the average maturity of its holdings of securities. The Committee intends to purchase, by the end of June 2012, $400 billion of Treasury securities with remaining maturities of 6 years to 30 years and to sell an equal amount of Treasury securities with remaining maturities of 3 years or less. This program should put downward pressure on longer-term interest rates and help make broader financial conditions more accommodative. The Committee will now reinvest principal payments from its holdings of agency debt and agency mortgage-backed securities in agency mortgage-backed securities. In addition, the Committee will maintain its existing policy of rolling over maturing Treasury securities at auction. The Committee also decided to keep the target range for the federal funds rate at 0 to 1/4 percent	Expected	Unexpected
November 2, 2011	Information received since the Federal Open Market Committee met in September indicates that economic growth strengthened somewhat in the third quarter, reflecting in part a reversal of the temporary factors that had weighed on growth earlier in the year. The Committee decided today to continue its program to extend the average maturity of its holdings of securities as announced in September. The Committee is maintaining its existing policies of reinvesting principal payments from its holdings of agency debt and agency mortgage-backed securities in agency mortgage-backed securities and of rolling over maturing Treasury securities at auction. The Committee also decided to keep the target range for the federal funds rate at 0 to 1/4 percent. The Federal Reserve Board and the Federal Open Market Committee on Wednesday released the economic projections made by Federal Reserve Board members and Federal Reserve Bank presidents for the November 1-2 meeting of the Committee	Expected	Unexpected
December 13, 2011	Information received since the Federal Open Market Committee met in November suggests that the economy has been expanding moderately, notwithstanding some apparent slowing in global growth. The Committee decided today to continue its program to extend the average maturity of its	Unexpected	Unexpected

	holdings of securities as announced in September. The Committee is maintaining its existing policies of reinvesting principal payments. The Committee also decided to keep the target range for the federal funds rate at 0 to 1/4 percent		
January 25, 2012	Information received since the Federal Open Market Committee met in December suggests that the economy has been expanding moderately, notwithstanding some slowing in global growth. The Committee expects to maintain a highly accommodative stance for monetary policy. In particular, the Committee decided today to keep the target range for the federal funds rate at 0 to 1/4 percent and currently anticipates that economic conditions are likely to warrant exceptionally low levels for the federal funds rate at least through late 2014. The Committee also decided to continue its program to extend the average maturity of its holdings of securities as announced in September. The Federal Reserve Board and the Federal Open Market Committee on Wednesday released the economic projections and the target federal funds rate projections made by Federal Reserve Board members and Federal Reserve Bank presidents for the January 24-25 meeting of the Committee. Following careful deliberations at its recent meetings, the Federal Open Market Committee (FOMC) has reached broad agreement on the following principles regarding its longer-run goals and monetary policy strategy. In setting monetary policy, the Committee seeks to mitigate deviations of inflation from its longer-run goal and deviations of employment from the Committee's assessments of its maximum level. These objectives are generally complementary. However, under circumstances in which the Committee judges that the objectives are not complementary, it follows a balanced approach in promoting them.	Expected	Expected
March 13, 2012	The economy has been expanding moderately. To support a stronger economic recovery and to help ensure that inflation, over time, is at the rate most consistent with its dual mandate, the Committee expects to maintain a highly accommodative stance for monetary policy. In particular, the Committee decided today to keep the target range for the federal funds rate at 0 to 1/4 percent. The Committee also decided to continue its program to extend the average maturity of its holdings of securities as announced in September.	Expected	Expected

April 25, 2012	Information received since the Federal Open Market Committee met in March suggests that the economy has been expanding moderately. The Committee expects to maintain a highly accommodative stance for monetary policy. The Federal Reserve Board and the Federal Open Market Committee on Wednesday released the economic projections and the target federal funds rate projections made by Federal Reserve Board members and Federal Reserve Bank presidents for the April 24-25 meeting of the Committee.	Unexpected	Unexpected
June 20, 2012	Information received since the Federal Open Market Committee met in April suggests that the economy has been expanding moderately this year. The Committee expects to maintain a highly accommodative stance for monetary policy. The Committee also decided to continue through the end of the year its program to extend the average maturity of its holdings of securities. Federal Reserve Board and Federal Open Market Committee release economic projections from the June 19-20 FOMC meeting	Expected	Expected
August 1, 2012	Information received since the Federal Open Market Committee met in June suggests that economic activity decelerated somewhat over the first half of this year. The Committee expects to maintain a highly accommodative stance for monetary policy. The Committee also decided to continue through the end of the year its program to extend the average maturity of its holdings of securities as announced in June, and it is maintaining its existing policy of reinvesting principal payments from its holdings of agency debt and agency mortgage-backed securities	Expected	Expected
September 13, 2012	Information received since the Federal Open Market Committee met in August suggests that economic activity has continued to expand at a moderate pace in recent months. The Committee agreed today to increase policy accommodation by purchasing additional agency mortgage-backed securities at a pace of $40 billion per month. The Committee also will continue through the end of the year its program to extend the average maturity of its holdings of securities as announced in June, and it is maintaining its existing policy of reinvesting principal payments from its holdings of agency debt and agency mortgage-backed securities. The Committee expects that a highly accommodative stance of monetary policy will remain appropriate for a considerable time after the economic recovery strengthens.	Expected	Expected

October 24, 2012	Information received since the Federal Open Market Committee met in September suggests that economic activity has continued to expand at a moderate pace in recent months. The Committee will continue purchasing additional agency mortgage-backed securities at a pace of $40 billion per month. The Committee also will continue through the end of the year its program to extend the average maturity of its holdings of Treasury securities. The Committee expects that a highly accommodative stance of monetary policy will remain appropriate for a considerable time after the economic recovery strengthens. The Committee currently anticipates that exceptionally low levels for the federal funds rate are likely to be warranted at least through mid-2015.	Expected	Expected
December 12, 2012	Information received since the Federal Open Market Committee met in October suggests that economic activity and employment have continued to expand at a moderate pace in recent months, apart from weather-related disruptions. The Committee will continue purchasing additional agency mortgage-backed securities at a pace of $40 billion per month. The Committee, in January, will resume rolling over maturing Treasury securities at auction. the Committee decided to keep the target range for the federal funds rate at 0 to 1/4 percent and currently anticipates that this exceptionally low range for the federal funds rate will be appropriate at least as long as the unemployment rate remains above 6-1/2 percent, inflation between one and two years ahead is projected to be no more than a half percentage point above the Committee's 2 percent longer-run goal, and longer-term inflation expectations continue to be well anchored.	Unexpected	Unexpected
January 30, 2013	Information received since the Federal Open Market Committee met in December suggests that growth in economic activity paused in recent months, in large part because of weather-related disruptions and other transitory factors. The Committee will continue purchasing additional agency mortgage-backed securities at a pace of $40 billion per month and longer-term Treasury securities at a pace of $45 billion per month. The Committee expects that a highly accommodative stance of monetary policy will remain appropriate for a considerable time after the asset purchase program ends and the economic recovery strengthens.	Unexpected	Unexpected

March 20, 2013	Information received since the Federal Open Market Committee met in January suggests a return to moderate economic growth following a pause late last year. The Committee will continue purchasing additional agency mortgage-backed securities at a pace of $40 billion per month and longer-term Treasury securities at a pace of $45 billion per month. The Committee expects that a highly accommodative stance of monetary policy will remain appropriate for a considerable time after the asset purchase program ends and the economic recovery strengthens.	Unexpected	Unexpected
May 1, 2013	Information received since the Federal Open Market Committee met in March suggests that economic activity has been expanding at a moderate pace. The Committee will continue purchasing additional agency mortgage-backed securities at a pace of $40 billion per month and longer-term Treasury securities at a pace of $45 billion per month. The Committee expects that a highly accommodative stance of monetary policy will remain appropriate for a considerable time after the asset purchase program ends and the economic recovery strengthens.	Expected	Expected
June 19, 2013	Information received since the Federal Open Market Committee met in May suggests that economic activity has been expanding at a moderate pace. The Committee will continue purchasing additional agency mortgage-backed securities at a pace of $40 billion per month and longer-term Treasury securities at a pace of $45 billion per month. The Committee expects that a highly accommodative stance of monetary policy will remain appropriate for a considerable time after the asset purchase program ends and the economic recovery strengthens.	Expected	Expected
July 31, 2013	Information received since the Federal Open Market Committee met in June suggests that economic activity expanded at a modest pace during the first half of the year. The Committee will continue purchasing additional agency mortgage-backed securities at a pace of $40 billion per month and longer-term Treasury securities at a pace of $45 billion per month. The Committee expects that a highly accommodative stance of monetary policy will remain appropriate for a considerable time after the asset purchase program ends and the economic recovery strengthens.	Unexpected	Unexpected

September 18, 2013	Information received since the Federal Open Market Committee met in July suggests that economic activity has been expanding at a moderate pace. Taking into account the extent of federal fiscal retrenchment, the Committee sees the improvement in economic activity and labour market conditions since it began its asset purchase program a year ago as consistent with growing underlying strength in the broader economy. The Committee will continue purchasing additional agency mortgage-backed securities at a pace of $40 billion per month and longer-term Treasury securities at a pace of $45 billion per month. The Committee expects that a highly accommodative stance of monetary policy will remain appropriate for a considerable time after the asset purchase program ends and the economic recovery strengthens.	Expected	Expected
October 30, 2013	Information received since the Federal Open Market Committee met in September generally suggests that economic activity has continued to expand at a moderate pace. The Committee expects that, with appropriate policy accommodation, economic growth will pick up from its recent pace and the unemployment rate will gradually decline toward levels the Committee judges consistent with its dual mandate.	Unexpected	Unexpected
December 18, 2013	Information received since the Federal Open Market Committee met in October indicates that economic activity is expanding at a moderate pace. In light of the cumulative progress toward maximum employment and the improvement in the outlook for labour market conditions, the Committee decided to modestly reduce the pace of its asset purchases. Beginning in January, the Committee will add to its holdings of agency mortgage-backed securities at a pace of $35 billion per month rather than $40 billion per month, and will add to its holdings of longer-term Treasury securities at a pace of $40 billion per month rather than $45 billion per month. If incoming information broadly supports the Committee's expectation of ongoing improvement in labour market conditions and inflation moving back toward its longer-run objective, the Committee will likely reduce the pace of asset purchases in further measured steps at future meetings. The Committee now anticipates, based on its assessment of these factors that it likely will be appropriate to maintain the current target range for the federal funds rate well past the time that	Expected	Expected

	the unemployment rate declines below 6-1/2 percent, especially if projected inflation continues to run below the Committee's 2 percent longer-run goal.		
Jan 29, 2014	Information received since the Federal Open Market Committee met in December indicates that growth in economic activity picked up in recent quarters. Inflation has been running below the Committee's longer-run objective, but longer-term inflation expectations have remained sTable. Consistent with its statutory mandate, the Committee seeks to foster maximum employment and price stability. The Committee also reaffirmed its expectation that the current exceptionally low target range for the federal funds rate of 0 to 1/4 percent will be appropriate at least as long as the unemployment rate remains above 6-1/2 percent, inflation between one and two years ahead is projected to be no more than a half percentage point above the Committee's 2 percent longer-run goal, and longer-term inflation expectations continue to be well anchored.	Expected	Expected
March 19, 2014	Information received since the Federal Open Market Committee met in January indicates that growth in economic activity slowed during the winter months, in part reflecting adverse weather conditions. Beginning in April, the Committee will add to its holdings of agency mortgage-backed securities at a pace of $25 billion per month rather than $30 billion per month, and will add to its holdings of longer-term Treasury securities at a pace of $30 billion per month rather than $35 billion per month. The Committee continues to anticipate, based on its assessment of these factors, that it likely will be appropriate to maintain the current target range for the federal funds rate for a considerable time after the asset purchase program ends, especially if projected inflation continues to run below the Committee's 2 percent longer-run goal.	Expected	Expected
April 30, 2014	Information received since the Federal Open Market Committee met in March indicates that growth in economic activity has picked up recently. To support continued progress toward maximum employment and price stability, the Committee today reaffirmed its view that a highly accommodative stance of monetary policy remains appropriate.	Expected	Expected
June 18, 2014	Information received since the Federal Open Market Committee met in April indicates that growth in economic activity has rebounded in	Unexpected	Unexpected

	recent months. In light of the cumulative progress toward maximum employment and the improvement in the outlook for labour market conditions since the inception of the current asset purchase program, the Committee decided to make a further measured reduction in the pace of its asset purchases. economic conditions may, for some time, warrant keeping the target federal funds rate below levels the Committee views as normal in the longer run.		
July 30, 2014	Information received since the Federal Open Market Committee met in June indicates that growth in economic activity rebounded in the second quarter. The Committee will closely monitor incoming information on economic and financial developments in coming months and will continue its purchases of Treasury and agency mortgage-backed securities, and employ its other policy tools as appropriate, until the outlook for the labour market has improved substantially in a context of price stability.	Unexpected	Unexpected
September 17, 2014	Information received since the Federal Open Market Committee met in July suggests that economic activity is expanding at a moderate pace. The Committee today reaffirmed its view that a highly accommodative stance of monetary policy remains appropriate.	Unexpected	Expected
October 29, 2014	Information received since the Federal Open Market Committee met in September suggests that economic activity is expanding at a moderate pace. The Committee currently anticipates that, even after employment and inflation are near mandate-consistent levels, economic conditions may, for some time, warrant keeping the target federal funds rate below levels the Committee views as normal in the longer run.	Expected	Expected

REFERENCE LIST

ADRIAN, T. and SHIN, H. S. (2009). Money, Liquidity and Monetary Policy. *American Economic Review: Papers and Proceedings*. 99 (2): 600-605.

AGENOR, P. and PEREIRA DA SILVA, L. A. (2012). Macroeconomic Stability, Financial Stability and Monetary Policy Rules. *International Finance*. 15 (2): 205-224.

ALLEN, F., MORRIS, S. and SHIN, H. S. (2006). Beauty Contests and Iterated Expectations in Asset Markets. *The Review of Financial Studies 1*. 19 (3): 719-752.

AMMER, J., VEGA, C. and WONGSWAN, J. (2010). International Transmission of US Monetary Policy Shocks: Evidence from Stock Prices. *Journal of Money, Banking and Credit.* 42 (Supplement) (6): 179-198.

ANAYA, P., HACHULA, M. and OFFERMANNS, C. J. (2017). Spillovers of U.S. Unconventional Monetary Policy to Emerging Markets: The Role of Capital Flows. *Journal of International Money and Finance*. 73 (Part B): 275-295.

ARNON, A. (2011). *David Hume and Classical Monetary Theory*. The Thomas Guggenheim Program for the History of Economic Thought Conference, December 2011. Ben Gurion University of the Negev.

ARON, J. and MUELLBAUER, J. (2001). Interest Rate Effect and Output: Evidence from a GDP Forecasting Model for South Africa. *Conference Paper*. 2nd Annual Research Conference, International Monetary Fund, 29-30th November, 2001.

ARON, J., DUCA, J. V., MUELLBAUER, J., MURATA, K. and MURPHY, A. (2011). Credit, Housing Collateral and Consumption: Evidence from Japan, the UK and the US. *Review of Income and Wealth*. 58 (3): 397-423.

ARTMANN, S., FINTER, P. and KEMPF, A. (2012). Determinants of Expected Stock Returns: Large Sample Evidence from the German Market. *Journal of Business Finance and Accounting*. 39 (5) and (6): 758-784.

BAI, Y. and GREEN, C. J. (2011). Determinants of Cross-sectional Stock Return Variations in Emerging Markets. *Empirical Economic*. 41 (2011): 81-102.

BAKER, M. and WURGLER, J. (2007). Investor Sentiment in the Stock Market. *Journal of Economic Perspectives*. 21 (2): 129-152.

BAKER, M., WURGLER, J. and YAUN, Y. (2012). Global, Local and Contagious Investor Sentiment. *Journal of Financial Economics*. 104 (2012): 272-287.

BARBERIS, N., SHLEIFER, A. and VISHNY, R. (1998). A Model of Investor Sentiment. *Journal of Financial Economics*. 49 (1998): 307-343.

BARBERIS, N., GREENWOOD, R., JIN, L. and SHLEIFER, A. (2015). X-CAPM: An extrapolative capital asset pricing model. *Journal of Financial Economics*. 115 (1): 1-24.

BASCI, E., OZEL, O. and SARIKAYA, C. (2008). The monetary transmission mechanism in Turkey: new developments. *BIS Papers No. 35*. Basle: Bank of International Settlements.

BASISTHA, A. and KUROV, A. (2008). Macroeconomic Cycles and the Stock Market's Reaction to Monetary Policy. *Journal of Banking and Finance*. 32 (2008): 2606-2616.

BERNANKE, B. S. and BLINDER, A. S. (1988). Credit, Money and Aggregate Demand. *The American Economic Review*. 78 (2): 435-439.

BERNANKE, B. S. and BLINDER, A. S. (1992). The Federal Funds Rate and the Channels of Monetary Transmission. *The American Economic Review*. 82 (4): 901-921.

BERNANKE, B. S. and GERTLER, M. (1995). Inside the Black Box: The Credit Channel of Monetary Policy Transmission. *Journal of Economic Perspectives*. 9 (4): 27-48.

BERNANKE, B. S., GERTLER, M. and GILCHRIST, S. (1996). The Financial Accelerator and the Flight to Quality. *The Review of Economics and Statistics*. 78 (1): 1-15.

BERNANKE, B. S., GERTLER, M., WATSON, M., SIMS, C. A. and FRIEDMAN, B. M. (1997). Systematic Monetary Policy and the Effects of Oil Price Shocks. *Brookings Papers on Economic Activity*. 1997 (1): 91-157.

BERNANKE, B. S. and WOODFORD, M. (1997). Inflation Forecasts and Monetary Policy. *Working Paper 6157*. Cambridge: National Bureau of Economic Research

BHATTACHARYA, R., PATNAIK, I. and SHAH, A. (2011). Monetary Policy Transmission in an Emerging Market Setting. *Working Paper 2011-5*. Washington D.C.: International Monetary Fund.

BHUYAN, R., ROBBANI, M. G., TALUKDAR, B. and JAIN, A. (2016). Information transmission and dynamics of stock price movements: An empirical analysis of BRICS and US stock markets. *International Review of Economics & Finance*. 46 (November 2016): 180-195.

BLACK, L. K. and ROSEN, R. J. (2007). How the Credit Channel Works: Differentiating the Bank Lending Channel and the Balance Sheet Channel. *Working Paper 2007-13*. Chicago: Federal Reserve Bank of Chicago.

BLACKSTONE, B. and ADAM, N. (2015). Eurozone Credit Squeeze Ending, But Confidence Shaken by Greece. [Online] Available: http://www.wsj.com/articles/eurozone-credit-squeeze-ending-but-confidence-shaken-by-greece-1430310018 [Accessed 27 August 2014].

BOAMAH, N. A., LOUDON, G. and WATTS, E. J. (2017). Structural Breaks in the Relative Importance of Country and Industry Factors in African Stock Returns. *The Quarterly Review of Economics and Finance*. 63 (February 2017): 79-88.

BODURTHA, J. N., CHO, D. C. and SENBET, L. W. (1989). Economic forces and the stock market: An international perspective. *The Global Finance Journal*. 1 (1): 21-46.

BOORMAN, J. (2009). The Impact of the Financial Crisis on Emerging Market Economies: The Transmission Mechanism, Policy Response and Lessons. *Global Meeting of the Emerging Markets Forum Discussion Draft*. Emerging Markets Forum.

BOUAKEZ, H., ESSID, B. and NORMANDIN, M. (2013). Stock returns and monetary policy: Are there any ties? *Journal of Macroeconomics*. 36 (2013): 33-50.

BOWMAN, D., LONDONO, J. M. and SAPRIZA, H. (2015). U.S. Unconventional Monetary Policy and Transmission to Emerging Market Economies. *Journal of International Money and Finance*. 55 (July): 27-59.

BROADDUS, A., and COOK, T. (1983). The Relationship Between and the Federal Funds the Discount Rate Under the Federal Reserve's Post-October 6, 1979 Operating Procedure. *Economic Review*. January/February 1983.

BRÓZDA, D. (2016). Transmission Mechanism of the Federal Reserve System's Monetary Policy in the Conditions of Zero Bound on Nominal Interest Rates. *Equilibrium. Quarterly Journal of Economics and Economic Policy*. 11(4): 751-767.

BUCH, C. M., BUSSIÈRE, M., GOLDBERG, L. and HILLS, R. (2018). The International Transmission of Monetary Policy. *Federal Reserve Bank of New York Staff Report No. 845*. New York: Federal Reserve Bank of New York.

CAMPBELL, J. Y. (1998). Asset Prices, Consumption and the Business Cycle. *Working Paper 6485*. Cambridge: National Bureau of Economic Research.

CASSOLA, N. and MORANA, C. (2004). Monetary Policy and the Stock Market in the Euro Area. *Journal of Policy Modelling*. 26 (2004): 387-399.

CERCIONI, M., FERRERO, G. and SECCHI, A. (2011). Unconventional Monetary Policy in Theory and Practice. *Questioni di Economia e Finanza Occasional Papers No. 102*. Rome: Bank of Italy.

CHEN, N., ROLL, R. and ROSS, S. A. (1986). Economic forces and the stock market. *The Journal of Business*. 59 (3): 383-403.

CHEN, Q., FILARDO, A., HE, D. and ZHU, F. (2016). Financial Crisis, US Unconventional Monetary Policy and International Spillovers. *Journal of International Money and Finance.* 67 (October): 62-81.

CLARIDA, R., GALI, J., and GERTLER, M. (2000). Monetary Policy Rules and Macroeconomic Stability: Evidence and Some Theory. *Quarterly Journal of Economics*. 115 (1): 147–180.

CONSTÂNCIO, V. (2017). The Future of Monetary Policy Frameworks. *European Central Bank Lecture*. Instituto Superior de Economia e Gestão. Lisbon: European Central Bank.

CRONJE, J. (2017). *Economists' Surprised Reaction at SARB Rates Decision*. [Online]. Fin24. Available: https://www.fin24.com/Economy/economists-surprised-reaction-at-sarb-rates-decision-20170922 [Accessed 26 July 2018].

D'AMICO, S., ENGLISH, W., LOPEZ-SALIDO, D. and NELSON, E. (2012). The Federal Reserve's Large Scale Asset Purchase Programmes: Rationale and Effects. *The Economic Journal*. 122 (November): F415-F445.

DASGUPTA, R. and CHATTAPADHYAY, S. (2014). Stock Market Driven Factors in Investors' Sentiment: A Review of the Stylised Facts. *European Journal of Business and Management*. 6 (17): 208-217.

DE BONDT, G. J. (2008). Determinants of Stock Prices: New International Evidence. *The Journal of Portfolio Management*. 2008 (Spring): 81-92.

DE GREGORIO, J. (2012). Commodity Prices, Monetary Policy and Inflation. *IMF Economic Review*. 60 (4): 600-633.

DEMIRGÜÇ-KUNT, A., HORVÁTH, B. L. and HUIZINGA, H. (2017). Foreign Banks and International Transmission of Monetary Policy: Evidence from the Syndicated Loan Market. *Policy Research Working Paper No. 7937*. Washington DC: World Bank.

DICKENS, E. (2011). Keynes' Theory of Monetary Policy: An Essay in Historical Reconstruction. *Contributions to Political Economy*. 30 (2011): 1-11.

DURAN, M., OZCAN, G., OZLU, P. and UNALMIS, D. (2012). Measuring the Impact of Monetary Policy on Asset Prices in Turkey. *Economic Letters*. 114 (2012): 29-31.

EGGERTSSON, G. B. and WOODFORD, M. (2003). The Zero Bound on Interest Rates and Optimal Monetary Policy. Brookings Papers on Economic Activity. 2003 (1): 139-233.

EISNER, G., MARTIN, A. and SØVIK, Y. (2016). *Standard Elements of a Monetary Policy Implementation Framework*. [Online]. Liberty Street Economics – Federal Reserve Bank of New York. http://libertystreeteconomics.newyorkfed.org/2016/02/standard-elements-of-a-monetary-policy-implementation-framework.html [Accessed 14 February 2018].

El Baltaji, D. and Wallace, P. (2017). Rand Surges as Investors Raise Stakes on Ramaphosa to Lead ANC. Bloomberg. [Online] Available: https://www.bloomberg.com/news/articles/2017-12-17/south-africa-s-rand-reaches-3-month-high-as-anc-prepares-to-vote [Accessed 14 February 2018].

ENGELBERG, J. and PARSONS, C. A. (2011). The Causal Impact of Media in Financial Markets. *The Journal of Finance*. 66 (1): 67–97.

ERHMANN, M. and FRATZSCHER, M. (2009). Global Financial Transmission of Monetary Policy Shocks. *Oxford Bulleting of Economics and Statistics*. 71 (6): 739-759.

FANG, L. and PERESS, J. (2009). Media Coverage and the Cross-Section of Stock Returns. *The Journal of Finance*. 64 (5): 2023-2052.

FEDERAL RESERVE BANK (2014). *Monetary Policy*. [Online]. Federal Reserve Bank. Available: http://www.federalreserve.gov/monetarypolicy/ [Accessed 12 October 2014].

FEDERAL RESERVE BANK (2018). *Monetary Policy*. [Online]. Federal Reserve Bank. Available: https://www.federalreserve.gov/monetarypolicy/openmarket.htm [Accessed 13 February 2018].

FEDERAL RESERVE BANK OF ATLANTA (2018). *Taylor Rule Utility*. [Online]. Federal Reserve Bank of Atlanta. Available: https://www.frbatlanta.org/cqer/research/taylor-rule.aspx?panel=1 [Accessed 13 February 2018].

FEDERAL RESERVE BANK OF ST. LOUIS (2018). *Effective Federal Funds Rate*. [Online]. Federal Reserve Bank of St. Louis. Available: https://fred.stlouisfed.org/series/FEDFUNDS [Accessed 14 February 2018].

FISCHER, E. (2017). *U.S. Monetary Expectations and Emerging Market Debt Flows*. [Online]. Federal Reserve Bank of San Francisco. Available: https://ericfischerphd.com/wp-content/uploads/2017/11/EFischer_JMP.pdf [Accessed 14 February 2018].

FISHER, E. A. (2013). Monetary Policy and Capital Based Macroeconomics: An Empirical for the United States (1963-2012). *The Quarterly Journal of Austrian Economics*. 16 (1): 45-74.

FRIEDMAN, M. (1982). Monetary Policy: Theory and Practice. *Journal of Money, Credit and Banking*. 14 (1): 98-118.

FUHRER, J. and MOORE G. (1992). Monetary policy rules and the indicator properties of asset prices. *Journal of Monetary Economics*. 29 (1): 303-336.

FUKUDA, Y., KIMURA, Y., SUDO, N. and UGAI, H. (2013). Cross-country Transmission Effect of the US Monetary Shock Under Global Integration. *Working Paper No. 13-E-16*. Tokyo: Bank of Japan.

GANG, Y. (2008). The Monetary Policy Transmission Mechanism in China. *BIS Papers No. 35*. Basle: Bank of International Settlements.

GALI, J. (2007). Constant interest rate projections without the curse of indeterminacy. *Economics Working Papers 1057*. Barcelona: Department of Economics and Business, Universitat Pompeu Fabra. Revised February 2008.

GERTLER, M. and GILCHRIST, S. (1994). Monetary Policy, Business Cycles and the Behaviour of Small Manufacturing Firms. *The Quarterly Journal of Economics*. 109 (2): 309-340.

GERTLER, M. and KARADI, P. (2011). A Model of Unconventional Monetary Policy. *Journal of Monetary Economics*. 58 (2011): 17-34.

GHOSSOUB, E. A. and REID, R. R. (2013). The Stock Market, Monetary Policy and Economic Development. *Southern Economic Journal*. 79 (3): 639-658.

GILBERT, E. and KARAHALIOS, K. (2010). *Widespread Worry and the Stock Market*. Fourth International AAAI Conference on Weblogs and Social Media, May 2010. Washington DC.

GILES, D. (2013). *Information Criteria Unveiled*. [Online]. Econometrics Beat: Dave Giles' Blog. Available: http://davegiles.blogspot.com/2013/07/information-criteria-unveiled.html [Accessed 13 September 2017].

GIOVANNI, J. and SHAMBAUGH, J. C. (2008). The Impact of Foreign Interest Rates on the Economy: The Role of the Exchange Rate Regime*. Journal of International Economics*. 74 (2008): 341-361.

GREINER, B. (2014). Stock Market Drivers -- Where Are We? *Forbes*. [Online] Available: http://www.forbes.com/sites/billgreiner/2014/07/07/stock-market-drivers-where-are-we/ [Accessed 9 October 2014].

GUPTA, R., JURGILAS, M. and KABUNDI, A. (2010). The Effect of Monetary Policy on Real House Price Growth in South Africa: A Factor-Augmented Vector Autoregression (FAVAR) Approach. *Economic Modelling*. 27 (2010): 315-323.

HAUSMAN, J. and WONGSWAN, J. (2011). Global asset prices and FOMC announcements. *Journal of International Money and Finance*. 30 (2011): 547-571.

HAFNER, C. M. and LAUWERS, A. R. (2017). An augmented Taylor rule for the Federal Reserve's response to asset prices. *International Journal of Computational Economics and Econometrics.* 7 (1/2): 115-151.

HARMSE, C. (2018). OPINION: JSE takes a pounding on US rates move. Business Report. [Online] Available: https://www.iol.co.za/business-report/opinion/opinion-jse-takes-a-pounding-on-us-rates-move-13105050 [Accessed 9 February 2018]

HEIMONEN, K., JUNTTILA, J. and KÄRKKÄINEN, S. (2017). Stock market and exchange rate information in the Taylor rule: Evidence from OECD countries. *International Review of Economics & Finance*. 51 (September 2017): 1-18.

HOGG, A. (2015). Foreign Shareholders Now Control Almost Half the JSE's Top 40 Companies. [Online] Available: http://www.fin24.com/BizNews/foreign-shareholders-now-control-almost-half-the-jses-top-40-companies-20151203 [Accessed 7 January 2017].

HOMMES, C. H., SONNEMANS, J., TUINSTRA, J. and van de VELDEN, H. (2004). Coordination of Expectations in Asset Pricing Experiments. *CeNDEF working paper 04 – 02*. Amsterdam: CeNDEF, Department of Economics, University of Amsterdam.

HONG KONG MONETARY AUTHORITY (2008). The housing market channel of the monetary transmission mechanism in Hong Kong. *BIS Papers No. 35*. Basle: Bank of International Settlements.

HORELL, T. (2014). *2014 Global Investor Sentiment: Confidence Returning to a Competitive Marketplace*. London: Colliers International.

HUMPHREY, T. M. (1974). The Quantity Theory of Money: Its Historical Evolution and Role in Policy Debates. *Economic Review May/June*. Richmond: Federal Reserve Bank of Richmond.

IOANNIDIS, C. and KONTONIKAS, A. (2007). The Impact of Monetary Policy on Stock Prices. *Journal of Policy Modelling*. 30 (2008): 33-53.

JEFFERIS, K. R. and OKEAHALAM, C. C., 2000. The Impact of Economic Fundamentals on stock markets in Southern Africa. *Development South Africa*. 17 (1): 24-51.

JENSEN, D. W. and TSAI, C. (2010). Monetary Policy and Stock Returns: Financing Constraints and Asymmetries in Bull and Bear Markets. *Journal of Empirical Finance*. 17 (2010): 981-990.

JO, G. (2010). The Transmission of Japanese Financial Shocks: Evidence from International Bank Claims on East Asian Economies. *Emerging Markets Finance & Trade*. 46 (5): 4–17.

JOHNSON, H. G. (1962). Monetary Theory and Policy. *The American Economic Review.* 52 (3): 335-384

JONES, G. (2014). Reserve Bank warns that tapering poses risk to SA financial stability. *Business Day*. [Online] Available: http://www.bdlive.co.za/economy/2014/04/24/reserve-bank-warns-that-tapering-poses-risk-to-sa-financial-stability (Accessed 24 April 2015).

JONES, H. and MARTINEZ, J. V. (2013). How Institutional Investors Form and Ignore Their Own Expectations. University of Oxford. [Online] Available: http://cefup.fep.up.pt/uploads/fin%20seminars/2013/Howard%20Jones_26.09.2013.pdf (Accessed 15 February 2018).

JORDA, O. (2005). Can Monetary Policy Influence Long-Term Interest Rates? *Federal Reserve Bank of San Francisco Economic Letter*. 2005 (09): 1-4.

JUNKIN, K. (2011). *Macroeconomic determinants of stock market behaviour in South Africa.* Unpublished Master's Thesis. Grahamstown: Dept of Economics, Rhodes University.

KABUNDI, A. (2009). Synchronisation between South Africa and the US: A structural dynamic factor analysis. *South African Journal of Economics*. 77 (1): 1-27.

KABUNDI, A. and NGWENYA, N. (2011). Assessing Monetary Policy in South Africa in a Data Rich Environment. *South African Journal of Economics*. 79 (1): 91-107.

KAHNEMAN, D. and TVERSKY, A. (1979). Prospect Theory: An Analysis of Decision Under Risk. *Econometrica*. 47 (2): 263-291.

KASAI, N. and GUPTA, R. (2010). Financial Liberalisation and the Effect of Monetary Policy on House Prices in South Africa. *The IUP Journal of Monetary Economics*. 3 (4): 59-74.

KASHYAP, A. K. and STEIN, J. C. (1994). Monetary Policy and Bank Lending. In: MANKIW, N. G. *Monetary Policy*. Chicago: University of Chicago Press.

KIM, S. (2001). International Transmission of US Monetary Policy Shocks: Evidence from VARs. *Journal of Monetary Economics*. 48 (2001): 339-372.

KIM, S. and YANG, D. Y. (2009). International Monetary Transmission and Exchange Rate Regimes: Floaters vs. Non-Floaters in East Asia. *Working Paper No. 181*. Tokyo: Asian Development Bank Institute.

KUANG, O. S. (2008). The monetary transmission mechanism in Malaysia: current developments and issues. *BIS Papers No. 35*. Basle: Bank of International Settlements.

KUMAR, N. and BARUA, A. (2013). The impact of fed tapering on emerging economies: Struggling with the ebb. *Global Economic Outlook 4th Quarter 2013*. Westlake, Texas: Deloitte University Press.

KUROV, A. (2010). Investor Sentiment and the Stock Market's Reaction to Monetary Policy. *Journal of Banking and Finance*. 34 (2010): 139-149.

LABONTE, M. (2018). Monetary Policy and the Federal Reserve: Current Policy and Conditions. *Congressional Research Service Report*. 7-5700.

LAEVEN, L. and TONG, H. (2010). U.S. monetary shocks and global stock prices. *IMF Working Paper 278*. Washington, D.C: IMF.

LANDRY, A. E. (2005). The Mundell-Fleming-Dornbusch Model in a New Bottle. *Unpublished Paper*. Boston: Boston University.

LERNER, J. S. and KELTER, D. (2001). Fear, Anger and Risk. *Journal of Personality and Social Psychology*. 81 (1): 146-159.

LERNER, J. S., SMALL, D. A. and LOEWENSTEIN, G. (2004). Heart Strings and Purse Strings – Carryover Effects of Emotions on Economic Decisions. *American Psychological Society*. 15 (5): 337-341.

LI, Y.D., ÏŞCAN, T.B. and XU, K. (2010). The impact of monetary policy shocks on stock prices: Evidence from Canada and the United States. *Journal of International Money and Finance*. 29 (2010): 876-896.

LUCKE, B. (2004). Real Interest Rates and Productivity Shocks. *Emerging Markets Finance &Trade*. 40 (6): 82–94.

MACDONALD, G., MULLINEUX, A. and SENSARMA, R. (2011). Asymmetric Effects of Interest Rate Changes: The Role of the Consumption-Wealth Channel. *Applied Economics*. 43 (2011): 1991-2001.

MACKOWIAK, B. (2007). External Shocks, US Monetary Policy and Macroeconomic Fluctuations in Emerging Markets. *Journal of Monetary Economics*. 54 (2007): 2512-2520.

MASERUMULE, T. and ALAGIDEDE, P. (2017). Impact of Macroeconomic Announcements on Foreign Exchange Volatility: Evidence from South Africa. *South African Journal of Economics*. 85 (3): 405-429.

MATALONI, L.S. (2010). *U.S. Economy at a Glance: Perspective from the BEA Accounts.* [Online] Available: http://www.bea.gov/newsreleases/national/gdp/2010/gdp1q10_3rd.htm [Accessed 28 September 2014].

MAY, C., FARRELL, G. and ROSSOUW J. (2017). Do Monetary Policy Announcements Affect Foreign Exchange Returns and Volatility? Some Evidence from High-Frequency Intraday South African Data. *ERSA working paper 672*. Cape Town: Economic Research Southern Africa.

MENSI, W., HAMMOUDEH, S., REBOREDO, J. C. and NGUYEN, D. K. (2014). Do Global Factors Impact BRICS Stock Markets? A Quantile Regression Approach. *Emerging Markets Review*. 19 (June 2014): 1-17.

MERRIN, R. P., HOFFMANN, A. O. I. and PERRINGS, J. M. E. (2014). Latent Affective Decision Drivers and Observable Investor Sentiment Price Outcomes. *Working Paper MFRL-01*. Maastricht: Maastricht University School of Business and Economics.

MISHKIN, F. S. (2001). The Transmission Mechanism and the Role of Asset Prices in Monetary Policy. *NBER Working Paper No. 8617*. Cambridge: National Bureau of Economic Research.

MISHKIN, F. S. (2009). Globalisation, Macroeconomic Performance and Monetary Policy. *Journal of Money, Credit and Banking*. 41 (Supplement) (1): 187-196.

MISHRA, P., MORIYAMA, K., N'DIAYE, P. and NGUYEN, L. (2014). Impact of Fed Tapering Announcements on Emerging Markets. *IMF Working Paper WP/14/109*. Washington D.C.: International Monetary Fund.

MOHANTY, M. S. and TURNER, P. (2008). Monetary Policy Transmission in Emerging Market Economies: What is New? *BIS Papers No. 35*. Basle: Bank of International Settlements

MONTORIOL-GARRIGA, J. (2016). Bank globalisation and the international transmission of monetary policy. Caixa Bank. [Online] Available: http://www.caixabankresearch.com/en/bank-globalisation-and-international-transmission-monetary-policy (Accessed: 10 January 2018).

MUKHERJEE, S. and BHATTACHARYA, R. (2011). Inflation Targeting and Monetary Policy in Emerging Market Economies. *Working Paper 2011-229*. Washington D.C.: International Monetary Fund.

NCUBE, M., NDOU, E. and GUMATA, N. (2012). How are the US financial shocks transmitted in South Africa? Structural VAR evidence. *Working Paper Series No. 157*. Tunis: African Development Bank.

NDOU, M. and NCUBE, E. (2011). Monetary Policy Transmission, House Prices and Consumer Spending in South Africa: An SVAR Approach. *Working Paper No. 133*. Tunis: African Development Bank.

NIEHANS, J. (1987). Classical Monetary Theory, New and Old. *Journal of Money, Credit and Banking*. 19 (4): 409-424.

NIKKINEN, J., OMRAN, M., SAHLSTROM, P. and AIJO, J. (2006). Global Stock Market Reactions to Scheduled US Macroeconomic News Announcements. *Global Finance Journal*. 17 (2006): 92-104.

OBSTFELD, M. and ROGOFF, K. (1995). Exchange Rate Dynamics Redux. *Journal of Political Economy*. 103 (3): 624-660.

ONO, S. (2018). Spillovers of US Conventional and Unconventional Monetary Policies to Russian Financial Markets. *International Journal of Economics and Finance*. 10 (2): 14-19.

ORR, A., EDEY, M. and KENNEDY, M. (1995). Real Long-Term Interest Rates: The Evidence from Pooled Time Series. *OECD Economic Studies*. 1995111 (25): 75-107.

OSAMWONYI, I. O. and EVBAYIRO-OSAGIE, E. I. (2012). The Relationship Between Macroeconomic Variables and Stock Market Index in Nigeria. *J Economics*. 3 (1): 55-63.

PERETI, V., GUPTA, R. and INGLETI-LOTZ, R. (2012). Do House Prices Impact Consumption and Interest Rate in South Africa? Evidence from Time-Varying Vector Autoregressive Model. *Working Paper 2012-16*. Pretoria: University of Pretoria.

RIGOBON, R. and SACK, B. (2004). The impact of monetary policy on asset prices. *Journal of Monetary Economics*. 51(8): 1553-1575.

REY, H. (2016). International Channels of Transmission of Monetary Policy and the Mundellian Trilemma. *IMF Economic Review*. 64 (1): 6–35.

REYNOLDS, G. C. (2017). *Whatever the Rule, Investors See Taylor Turning Fed Hawkish*. Bloomberg. [Online] Available: https://www.bloomberg.com/news/articles/2017-10-17/whatever-the-rule-investors-see-taylor-turning-fed-hawkish [Accessed 15 February 2018].

ROCHON, L. and ROSSI, S. (2007). Central Banking and Post-Keynesian Economics. *Review of Political Economy*. 19 (4): 539-554.

ROLEY, V. V. and SELLON, G. H. (1995). Monetary Policy Actions and Long-Term Interest Rates. *Federal Reserve Bank of Kansas City Economic Review*. 1995 (Fourth Quarter): 73-89.

SANTAMARAYA, A. and KAMAIAH, B. (2011). An Empirical Analysis of Monetary Transmission in India in the Post-Reform Period: Relevance of the Banking Channel. *The IUP Journal of Applied Economics*. X (4): 5-22.

SARB (2014). *Monetary Policy*. South African Reserve Bank. [Online] Available: https://www.resbank.co.za/MonetaryPolicy/Pages/MonetaryPolicy-Home.aspx [Accessed 12 October 2014].

SARB (2016). *The South African Reserve Bank's system of accommodation*. South African Reserve Bank. [Online] Available: https://www.resbank.co.za/Lists/News%20and%20Publications/Attachments/5001/Fact%20sheet%209.pdf [Accessed 13 February 2018].

SCHMELING, M. (2009). Investor Sentiment and Stock Returns: Some International Evidence. *Journal of Empirical Finance*. 16 (2009): 394-408.

SHAWTARI F. A., SALEM, M. A., HUSSAIN, H. I., HAWARIYUNI, W. and THABET, O. A. (2016). Long Run Relationship between Macroeconomic Indicators and Stock Price: The Case of South Africa. *Journal of Internet Banking and Commerce*. 21 (S2-007): 1-16.

SHADAB, H. B. (2009). *Mercatus on Policy: Hedge Funds and the Financial Crisis*. [Online] Available: https://www.mercatus.org/system/files/RSP_MOP34_Hedge_Funds_and_the_Financial_Crisis.pdf [Accessed 30 July 2018].

SIDAOUI, J. J. and RAMOS-FRANCIA, M. (2008). The monetary transmission mechanism in Mexico: recent developments. *BIS Papers No. 35*. Basle: Bank of International Settlements.

SIMS, C. A. (2007). Monetary Policy Models. *Working Paper No. 155*. Princeton: The Griswold Centre for Economic Policy Studies.

SINGH, T., MEHTA, S. and VARSHA, M. S. (2010). Macroeconomic Factors and Stock Returns: Evidence from Taiwan. *Journal of Economics and International Finance*. 2 (4): 217-227.

SJOLIN, S. and VLASTELICA, R. (2017). Stock market edges to new round of records as investors await Fed. Market Watch. [Online] Available: https://www.marketwatch.com/story/us-stocks-aim-for-fresh-records-as-fed-meeting-steals-focus-2017-09-19 (Accessed 16 February 2018).

SMETS, F. (2007). Financial Asset Prices and Monetary Policy: Theory and Evidence. *Working Paper No. 47*. Basle: Bank of International Settlements.

SUZUKI, T. (2008). International Credit Channel of Monetary Policy: An Empirical Note. *Australian Economic Papers*. December (1): 396-407.

SVENSSON, L. E. O. and VAN WIJNBERGEN, S. (1987). Excess Capacity, Monopolistic Competition and International Transmission of Monetary Disturbances. *Working Paper No. 2262*. Cambridge: National Bureau of Economic Research.

TAKÁTS, E. and VELA, A. (2014). International Monetary Policy Transmission. *BIS Papers No. 78*. Basle: Bank of International Settlements.

TAYLOR, J. B. (1995). The Monetary Transmission Mechanism: An Empirical Framework. *Journal of Economic Perspectives*. 9 (4): 11-26.

TETLOCK, P. C. (2007). Giving Content to Investor Sentiment: The Role of Media in the Stock Market. *The Journal of Finance*. 62 (3): 1139-1168.

TOBIN, J. (1998). Monetary Policy: Recent Theory and Practice. *Discussion Paper No 1187*. New Haven: Cowles Foundation for Research in Economics at Yale University.

TREVEDI, P. and BEHERA, S. R. (2012). Macroeconomic Fundamentals and Determinants of Equity Prices: An Empirical Analysis for India. *The IUP Journal of Applied Finance*. 18 (3): 5-30.

UNITED STATES TRADE REPRESENTATIVE (2014). U.S.-South Africa trade facts. *Office of the United States Trade Representative*. [Online] Available: http://www.ustr.gov/countries-regions/africa/southern-africa/south-africa [Accessed 18 April 2014].

VALENTE, G. (2009). International Interest Rates and US Monetary Policy Announcements: Evidence from Hong Kong and Singapore. *Journal of International Money and Finance*. 28 (2009): 920-940.

VAN ROOYEN, D. (2014a). JSE suffers from election blues. *Fin24*. [Online] Available: http://www.fin24.com/Markets/Equities/JSE-suffers-from-election-blues-20140506 [Accessed 6 May 2015].

VAN ROOYEN, D. (2014b). JSE investors eye data, Nkandla report. *Fin24*. [Online] Available: http://www.fin24.com/Markets/Equities/JSE-investors-eye-data-Nkandla-report-20140319 [Accessed 19 March 2015].

VAN ROOYEN, D. (2014c). JSE hovers in record territory. *Fin24*. [Online] Available: http://www.fin24.com/Markets/Equities/JSE-hovers-in-record-territory-20140424 [Accessed 24 April 2015].

WANG, S. and MAYES, D.G. (2012). Monetary policy announcements and stock reactions: An international comparison. *North American Journal of Economics and Finance*. 23 (2012): 145-164.

WAUD, R. N. (1970). Public Interpretation of Federal Reserve discount rate changes: Evidence on the "Announcement Effect". *Econometrica*. 38 (2): 231-250.

WILLIAMSON, S. D. (2016). Interest Rate Control Is More Complicated Than You Thought. *The Regional Economist* - St. Louis Federal Reserve. [Online] Available: https://www.stlouisfed.org/~/media/Publications/Regional-Economist/2016/April/interest_rates.pdf [Accessed 13 February 2018].

WILSON, Z. (2016). What Are Bond Yields Telling Us: Safe Haven or Health Hazard? *Old Mutual Investment Group*. [Online] Available: http://ww2.oldmutual.co.za/docs/default-source/macrosolutions/Perspectives-Newsletter/2016/macrosolutions-newsletter-retail-may-2016.pdf?sfvrsn=2 [Accessed 18 July 2018].

WONGSWAN, J. (2009). The Response of Global Equity Indexes to U.S. Monetary Policy Announcements. *Journal of International Money and Finance*. 28 (2): 344 – 365.

ZIMMERMANN, G. (2003). Optimal Monetary Policy: A New Keynesian View. *The Quarterly Journal of Austrian Economics*. 6 (4) (Winter 2003): 61–72.