THE RELATIONSHIP BETWEEN STOCK MARKET RETURN AND MONETARY POLICY DECISIONS IN KENYA.

BY

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DECLARATION

I hereby declare that the work contained in this research project is my original work and has not been previously, in its entirety or in part, been presented at any other university for a degree requisite. All the references cited in the text have duly been acknowledged.

Signed…….. **Date……..**

MUTUKU CHARLES MUTHAMA

X50/80188/2012

This research project has been submitted for examination with our approval as the university supervisors.

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Ms SUSAN A. AYAKO

Signed ……. Date…….

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DEDICATION

I dedicate this work to my family for their understanding and support during the study period.

LIST OF ACRONYMS

ADF	Test Augmented Dickey-Fuller
CBK	Central Bank of Kenya
CRR	Cash Reserve Requirement
DCF	Discounted cash flow model
DW	Durbin Watson
EA	East African Countries
EAC	East African Community
GDP	Gross Domestic Product
HPR	Holding Period Return
IMF	International Monetary Fund
KIPPRA	Kenya Institute Of Public Policy Research And Analysis
MTM	Monetary Transmission Mechanism
NBFI	None Bank Financial Institutions
NSE	Nairobi Securities Exchange
OLS	Ordinary Least Square
OMO	Open Market Operations
PP	Phillips-Perron Test
RMP	Reserve Money Program
RR	Repurchase Rate
STD	Short Term Debt
STDEV	Standard Deviation
TB	Treasury bill Rate
US	United States
VAR	Vector Auto Regression
VECM	Vector Error Correction Model
WAN	Wide Area Network

LIST OF FIGURES AND TABLES

TABLE OF CONTENTS

ABSTRACT

This study sought to examine the relationship between stock market returns and monetary policy stance in Kenya using time series data for the period 2003 to 2013. The study employed the ordinary least square method and conducted appropriate diagnostic test to ensure validity of the findings. Estimated results showed that money supply multiplier has a positive and significant influence on stock market returns. The results revealed that treasury bills rate, cash reserve requirement and Repo rate as indicators of monetary policy do not significantly influence Kenyan stock market returns.

An important policy implication of this research paper is that government through the monetary authorities in the country (CBK) can enhance the wealth of investors in the stocks market by influencing the money supply multiplier which positively and significantly influences stock market returns. This can be achieved if the monetary policy committee focuses on the money channel of monetary policy transmission which assumes that changes in reserve money are transmitted to broad money though the money multiplier. The emphasis should be on the use of reserve money as the operating target and broad money as the intermediate target in monetary policy implementation process if the government to achieve policy goals of output and financial stability. Broad money (M2) and reserve money should be seen as important policy instruments of promoting stock market growth in the country.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study.

The role of stock markets in economic development has continued to attract the attention of many scholars and policy makers in the recent past. This is because it is widely believed by economist and finance theorist that there is a significant relationship between financial development or markets on one hand and economic growth on the other hand. According to Schumpeter (1912) a well-functioning financial system promotes economic growth by facilitating selection of productive investments that are likely to succeed in enhancing efficient allocation of scarce resources. Despite this assertion, there has been concern among finance theorist as to whether policy makers can influence the way stock markets participants' make decision regarding their investment by influencing returns on stocks.

A stock return is regarded as one of the main considerations for making investment decision in the stock market. This is because investor and in particular stock market investors expects a certain return consisting of capital gains and dividend payment which motivates their wealth maximization behavior. Therefore in the realization of this objective, it is important to recognize the role of stock returns in determining investment decisions and the significance of capital markets in economic growth. Following the 1969 James Tobin's seminal work, debate still continues on whether there is a linkage between the real economy and financial markets (money and capital markets).

James Tobin in 1969 published a seminal paper in the journal of money, credit and banking in which he explained the Q ratio approach that explains the linkage between the real economy and the financial markets. He emphasized the role of Tobin's q in influencing investment decision by firms and argued that monetary policy can change the Tobin Q which by definition was explained as the ratio of the market value of the firm assets to its replacement cost. Hence concluding that since monetary policy can influence money markets as well as capital markets then it can also change the Tobin's Q. The Q ratio being a representation of a standard for valuation of individual stocks. Tobin's (1969) conclusion

provided the basis for understanding the asset channel of monetary policy transmission. Following these findings, a growing number of researchers have generated interest in this regard and there has been a number of attempts to provide an understanding of the implications of policy changes (interest rates) on stock returns and in particular the relationship between monetary policy for instance and stock markets (Casual and Moran, 2004; Bjorn land and Lifetime, 2009; Bernanke and Kuttner, 2005).

Finance theory contends that there exist a relationship between stock prices and monetary policy variables. This is supported by various models of stock valuation such as discounted cash flow model and the Gordon growth model (1962). The Gordon growth models attempts to link the value of equity stock and interest rate or the required rate of return to the investor. On the other hand discounted cash flow (DCF) assumes that the value of equity is given by discounting the cash flow available during lifetime of the asset. The discount factor or the required rate of return in these models is in fact a monetary policy component. In view of this, it can be deduced that stock prices may change in response to changes in expected future dividends since this may be influenced by changes in expected future interest rate which is used as a discount rate for discounting future cash flows. As a result of these changes the return on stocks may change as well.

It is worth noting that monetary policy does influence stock market prices directly mainly through the interest rate channel and indirectly through its influence on the determinants of dividends and the stock return premium. This is achieved its influence on the degree of uncertainty that agents face (Ioannidis and Kontonikas, 2008). Despite this conviction the main concern and which continues to cause controversy in the minds of most economist and finance theorist is whether monetary policy decisions have significant influence on stock market returns especially in the emerging capital markets such as Kenya.

Studies conducted so far to establish the strength of linkage between monetary policy decisions and the securities markets returns or prices have largely been concentrated in the developed economies particularly in the US. For instance in some of the studies conducted, the findings have showed that the U.S. monetary policy actions have had significant impact

on international equity markets (Wongswan, 2006); (Ammer et al, 2010). In other studies such as Hamburger and Kochin (1971) the findings revealed that stock returns can be predicted through the use of past money supply data. However other related studies showed contradictory result. For example cooper (1974) and Rozeff (1974) postulated that past changes in money supply do not have predictive content for stock returns but there could exist a reverse granger causality that can move from stock returns to changes in money supply and vice versa. These findings presented a contradiction in terms of the relationship between monetary policy variables such as money supply and stock returns.

Studies conducted in emerging economies are rather scanty while the available ones show mixed results. In Kenya for example Misati et al (2010) examined the monetary policy transmission mechanism in Kenya by applying single equation methods to monthly data from 1996 to 2007. They found that financial innovations had weakened monetary policy transmission in Kenya by reducing the impact of the repo rate on output during the study period. Kagume (1990) analyzed the determinants of securities market prices in Kenya with the use of data from 1973 to 1989. Employing ordinary least square estimation technique, the results indicated that changes in money supply do not significantly affect securities prices. Ngigi (2008) analyzed the impact of fiscal and monetary policies on securities market performance in Kenya using the general to specific model specification and reduction. Values for the anticipated and unanticipated fiscal and monetary policies were obtained and used in the estimation of the securities market performance. Results showed that both anticipated monetary policy actions and unanticipated fiscal policies actions affect securities market performance negatively while unanticipated monetary policy has positive effect on securities market performance. Anticipated fiscal policy was found to have no effect on stock performance. Nganda (1985) in a study on the economic analysis of monetary relationships in Kenya for the period 1968 to 1983 concluded that increased monetization of the economy had increased demand for significantly. However his study did not show any significant effect of that phenomenon to the stock market variables.

It is clearly evident that from these limited studies, we cannot make any meaningful conclusion with regard to the link between monetary policy decisions and stock market

returns and indeed none of studies have addressed that relationship. This presents a significant gap in terms of knowledge about the relationship between monetary policy and stock market returns and in particular the effectiveness of asset channel of monetary policy transmission. It is against this background that a study is therefore necessary to try and to provide new evidence in the context of emerging market economies such as Kenya. It is also expected that the findings of this study would ignite debate among academia and policy makers on the significance of monetary policy in enhancing stocks market development. Hence this presents a great motivation for this study.

1.1.1 An overview of Nairobi Securities Exchange(NSE).

The Nairobi securities exchange previously known as the Nairobi stock exchange has grown in leaps and bounds ever since its inception in 1954 when it was first established as a voluntary association of stock brokers who were registered under the societies act. In 1954 when the NSE trading was newly formalized there were 46 listed companies. Growth of listed companies increased tremendously before independence in 1963 (Ngugi and Njiru, 2005). Since independence the NSE has witnessed significant growth in terms of listed companies alongside other infrastructural changes. To date the, the Nairobi securities exchange comprises of approximately 55 listed companies.

Historically, trading in shares and stocks started in the 1920's when the country was still a British colony. However the market was not formal as there did not exist any rules and regulations to govern stock broking activities. At this particular time, stock broking was a part time business activity conducted by accountants, auctioneers, estate agents and lawyers who were engaged in other areas of specialization. The establishment of the NSE was driven by demand and resulted largely due to the initiative of certain stockbrokers who for a number of years were engaged in securities trading on a sporadically.

Before the attainment of independence in 1963, Africans and Asians were excluded from trading in securities and securities dealings was a preserve of white colonial masters. After independence in 1963 and throughout the 1960s and 1970s decade the market activity in the

NSE remained relatively low owing to the uncertainties surrounding, the future of independent Kenya and the fact that the market was a members club which relied on the "call-over" trading system.

The period beginning 1980s was characterised by a significant transformation of the NSE after the government of Kenya realized that in order to accelerate the rate of economic growth in the country, there was need to have a stable and efficient financial system. This was followed by the implementation of financial reform package which led to transformation of NSE to a limited liability company in 1991. The 'call over' system was replaced in favor of 'open outcry' eventually. This resulted to an increase in NSE share index to a high of 5030 points in 1994.

Between 1990 and 2012, the NSE witnessed significant transformation in terms of its infrastructure, technology, and number of listed companies, market capitalization and the growth in share index. Improved technology has enabled brokers to transact business from the comfort of their offices through the WAN platform. As part of its transformation, the NSE share index has been reviewed to make it more efficient as a market barometer and NSE all share index introduced as an alternative which is now an overall indicator of the market performance.

The NSE all share index incorporates all the traded shares in any particular day and focuses more on the overall market capitalization as opposed to the price movements of select counters. To date the NSE is geared towards performing a crucial role in the growth of the Kenyan economy through the expansion of capital markets.

1.1.2 Monetary policy implementation in Kenya.

This section seeks to highlight the monetary policy implementation in Kenya in the context of the historical perspective, the instruments, targets and goals and how the three goals of monetary policy are attained. The implementation of Monetary Policy in Kenya can be analyzed in the context of the various post independence periods (Kosimbei et al, 2012) and (Kinyua, 2000). From mid 1960s to mid 1980s, monetary policy in Kenya was generally

passive and mainly focused on the protection of the country's foreign exchange reserves in addition to supporting import substitution policy (Nyamongo et al, 2009).

The period beginning mid 1980s up to mid 2008 was marked by various economic reforms including liberalization where Kenya was implementing the International Monetary Fund (IMF) supported programs in which monetary policy objective was anchored on containing inflation, economic growth and employment creation(Kosimbei et al 2012). As documented by Kosimbei et al, (2012) the liberalization saw the removal of interest rate controls and exchange rate made flexible, ushering in a new era in monetary policy where open market operations (OMO) was introduced as the main instrument of policy.

In Kenya, monetary policy is directed towards achieving three principle objectives. This includes, price stability, economic growth and financial stability. Price stability is cited as the main or overriding goal for monetary policy; however central banks are also in support of economic growth and financial stability (Davoodi, Dixit and Pinter, 2013). The amendment of the CBK Act in 1996 has widened the CBK scope and monetary policy objectives to include that of ensuring the stability of financial sector by targeting broad money supply (Kinyua, 2000 and KIPPRA policy brief, 2006). A further amendment of the Act in 1997, empowered the bank to support economic policy of the government, including economic growth and also maintaining a sound market based financial system. This therefore expanded the scope of monetary policy in Kenya in terms of its objectives.

In terms of the instruments of monetary policy, Davoodi et al (2013) posits that open market operations is the main instrument of monetary policy implementation in East African Community (EAC) in addition to standing facilities such as reserve requirement and foreign exchange operations. However they argued that differences have existed in the application of al Bank of Kenya Act (CAP 491), section 4 vests the sole responsibility of formulating and implementing monetary policy in the institution of the Central Bank of Kenya. According to the CBK Act, the aim of the central bank in the implementation of monetary policy is to achieving and maintaining low rate of inflation instruments of monetary policy. Reserve

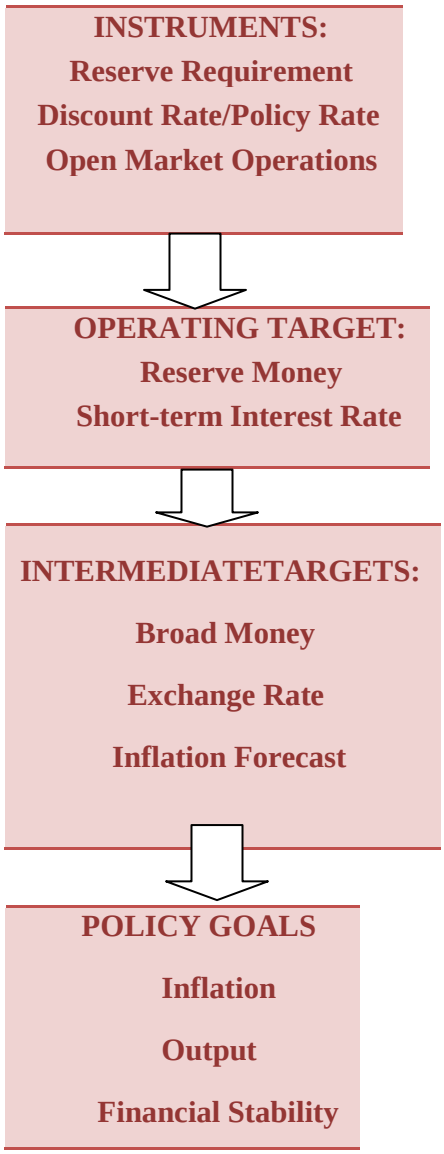
money is the operating target of monetary policy and broad money being the intermediate target (Davoodi et al, 2013).

Theoretically monetary policy affects prices including stocks prices with a lag. Hence creating the necessity to anchor monetary policy decisions on a variable. Previously the CBK has been targeting M3 as an intermediate target but the current approach following the amendment of CBK Act is a shift from targeting broad money M3 to targeting broader money aggregates such as M3X and M3XT and reserve money as an operational target (Kosimbei et al 2012) and (Nyamongo et al, 2009). As documented, in November 2011, the central bank in Kenya adopted a new monetary policy framework that gives more weight to its policy interest rate unlike other EA countries such as Uganda. According to a study by Davoodi et al, 2013, the Central Bank of Kenya (CBK) follows the IMF program as the monetary policy framework which involves the use of reserve money targeting commonly known as Reserve Money Program (RMP). This framework involves two main building blocks for monetary policy formulation. Firstly, setting a target for broad money, an intermediate target, that is not directly under the control of central bank but which would provide a signal about current prospective movements in inflation and output as the final policy goals. The second approach is one which relates the intermediate target to an operating target, that is reserve money and which is under the effective control of central bank. This has a longer policy lag than broad money since it is further away from policy goals. This target for broad money is set to be consistent with macroeconomic policy goals of economic growth and inflation and hence income velocity (Davoodi et al, 2013). The utmost concern is how monetary policy influences the real economy (output and inflation) through its effect on stock returns and mainly the stock prices.

Monetary policy affects stock returns through the asset channel of monetary transmission. Asset price channel infers that a shift in monetary policy changes asset prices, consequently the change in value of assets held by household and firms would affect their spending habits (wealth channel) or affect their credit demand for investment consumption (Tobin-q channel). Central Bank influences the money multiplier by relating reserve money as the operating target and broad money as the intermediate target, thus influencing stock returns

mainly the through wealth effects on consumption. Hence monetary policy effects are propagated to the real economy through stock prices.

Figure 1.1 Monetary policy instruments, targets and goals in Kenya



Source. Davoodi et al (2013)

1.2 Statement of the problem.

Monetary policy is the deliberate action by the government through its monetary authority in the country to influence the level of economic activity by changing level of money supply through its instruments. The instrument of monetary policy includes but not limited to bank rate, reserve requirement, repurchase rate, open market operations. As documented by Kosimbei et al (2012), Kenya has tended to rely on the choice between the use of interest rate and reserve money or combination of both as policy instruments with regard to the choice of optimal policy. However other instruments such as the open market operations have often been used. Monetary policy is and still remains one of the most important policies used by governments in the management of the economy because it is believed by monetary economist to be superior due to the ability to navigate economic shocks in an effective and efficient manner. Monetary policy influences the economy through any of its transmission mechanisms or channel. Economist and finance theorist have gained significant interest in the quest for an understanding of the manner in which monetary policy propagates through the real economy through its various channels such as the asset transmission mechanism culminating in various studies. It is admissible that most of the studies have largely been concentrated in developed economies and have been conclusive in terms of establishing that that monetary policy does affect stock market prices. (Boyle, 1990, Bernanke and Kutter, 2005). In Kenya several attempts have been made to unearth the controversy surrounding the effectiveness of monetary policy and more so the transmission to the real economy. Kagume (1991) on the determinants of securities market prices finds that specifically changes in money supply do not significantly affect security prices while Misati et al (2010) concluded that financial innovations have weakened monetary policy transmission in Kenya by reducing the impact of the repo rate on output. Ngigi (2008) posits mixed results on the effect of monetary policy and fiscal policy actions on stock market performance focusing mainly on expectations/anticipations.

As evidenced from these studies in Kenya, there is no conclusive evidence specifically on the relationship between monetary policy and stock returns in a manner that this study seeks to examine. It is on the basis of this deficiency that presents a motivation for this study. This study will provide additional evidence as well as seek to fill any existing knowledge gap. The

main concern is to determine the link between monetary policy and securities returns of companies listed at the Nairobi securities exchange as well as attempt to look into policy implications of this relationship which indeed is the main concern of an academic economist. Consistent with the research problem, this study sought to answer the following question. What is the relationship between monetary policy decisions and stock market returns in Kenya?

1.3 Objectives of the study.

The objective of this study was to investigate the relationship between monetary policy and stock market returns at the Nairobi Securities Exchange while controlling for open market operations, repurchase rate (REPO rate), cash reserve ratio requirement (CRR) and the velocity of money in circulation.

1.4 Significance of the study.

A clear understanding of the relationship between monetary policy and stock returns in the context of Kenya's macroeconomic environment is significantly important to various agents in the economy and especially monetary authorities to inform on policy. Monetary authorities would need to understand the relationship between monetary policy and stock prices so that they can understand how monetary policy influences the real economy through stock prices. This would help them to know whether they should target stock prices or use securities price volatility as indicators of the monetary policy stance, i.e. respond with policy instruments to securities price movements. Investors on the other hand need to know how monetary policy affects the performance of securities markets in order to be able to accurately measure the intrinsic value of securities and therefore make buying or selling decisions appropriately. Banks as the key implementers of monetary policy. This study would be beneficial to them in terms of giving a platform for decisions making. They would also gain insight into understanding the dynamics of monetary policy and it’s significant in affecting the key components of capital markets hence providing them with a platform for engaging the Government.

The most significant aspect of this study was mainly to contribute to the already existing knowledge regarding stock markets and monetary policy in emerging capital markets such as Kenya and also to provide new evidence with regard to asset channel of monetary transmission in emerging economies. This is simply because no study has specifically examined the link between monetary policy decision and stock market returns. Further, the study findings would also provide a platform for quality discussion and debates amongst academicians and mainly economist, policy makers, professionals and corporate leaders and also provide a basis for further research regarding stock markets in emerging markets. In addition it would assist in terms of informing policy by making appropriate policy recommendations. Lastly policy makers who were concerned about the growth of capital market would be better informed on how to deploy the monetary policy instruments as well as other economic indices to achieve desired market growth.

1.5 Scope of the Study.

The CBK can possibly can use a number of instruments to influence the direction of monetary policy in Kenya. However, this study focused on the analysis of the effectiveness of cash reserve ratio requirement, repurchase rate and Treasury bill rate as proxy for open market operation on the securities returns. It also incorporated the velocity of money in the analysis as evidenced by certain theories. It was assumed that transmission of monetary policy to the real financial sector (stock market) was perfect.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter focused on the review of both the theoretical and empirical literature on the relationship between monetary policy and the stock market return. From the theoretical perspective the study reviewed the relevant monetary policy transmission channels. On the empirical front, the study examined a detailed review of the relevant studies in the country and outside in order to justify the choice of variables and the methodology.

2.2 Theoretical Literature

Theoretically, the literature on monetary policy and securities market returns/prices focuses on models and theories that link certain monetary policy instruments with asset prices mainly securities prices. Such a review for it to be exhaustive would pay attention to the monetary policy transmission mechanism more relevantly as regards the effect of monetary policy changes to stock market prices. It is argued that stances of monetary policy can influence stock market returns via five possible channels, namely the interest rate channel, the credit channel, the wealth effect, the exchange rate channel and the money channel.

2.2.1 Equity price transmission channel.

Equity price transmission channel provides a mechanism by which monetary policy propagates its self through the real economy. There are two most important channels of monetary policy transmission involving equity prices. This involves the Tobin's Q theory of investment and wealth effects on consumption. Tobin's (1969) model is attributed to the woks of James Tobin in 1969 and the Tobin Q theory of investment in which he provides and alternative valuation of firms and argues that higher interest rate leads to lower securities valuation. Tobin's Q theory provides a framework and a mechanism by which monetary policy affects the economy through its effects on the valuation of equities. The q in the model is determined as the market value of firm divided by the replacement cost of capital. Tobin's Q is measured as the ratio of the securities market value of a firm to the replacement cost of the physical capital that is owned by that firm. That is

Tobin's Q = Market value of firm/ Replacement cost of new plant and equipment

Assuming a policy which leads to an increase in the short term nominal interest rate, the debt instrument becomes more attractive to the investors compared to equities as they bring higher returns. Therefore following a contractionary monetary policy, equilibrium in securities market is partly attained by a fall in equity prices.

When the value of *q* is high, the implication is that market price of firms is relatively high compared to the replacement cost of capital, thus it is cheap to acquire new plant and equipment capital relative to the market value of business firms. Firms can therefore issue new equity and obtain a high price for it relative to the cost of the plant and equipment being purchased. Overall investment spending in the economy will rise because all firms can acquire lot of new investment goods with only a relatively small issue of equity. The opposite is true when *q* is low and, consequently investment spending will be low. When the central bank reduces nominal interest rates, the discounted value of future profits of companies' rises and fixed income instruments become relatively less attractive. Thus, the demand for equities increases, as does their price. The q acts as a guide to investment decisions such that firms compare the market value of capital to its replacement cost in making investment decisions, this stimulates investment expenditures, and hence output.

On the other hand, the wealth effect on consumption provides an alternative channel for which monetary policy transmission through equity prices occurs. This is attributed to the works of Ando and Modigliani (1963) in the analysis of consumption behavior through the life cycle theory of consumption. According to this theory, wealth as wells as income is considered as a key determinants of consumer spending. Wealth and income are part of individual's lifetime resources which influences consumer spending. Lifetime resources consist of human capital, real capital, and financial wealth. A major component of financial wealth is common/equity securities. When equity securities prices rise, the value of financial wealth increases, thus increasing the lifetime resources of consumers, and consumption expenditure should rise and hence output.

2.2.2 Money Channel

This channel is perhaps the oldest one that effectively assumes changes in reserve money are transmitted to broad money via the money multiplier implying that banks are in the business of creating inside money. But this argument also assumes a role for individuals holding components of broad money, currency in circulation, and various forms of deposits (Davoodi et al, 2013). The money view of monetary policy assumes aggregate demand moves in line with money balances used to finance transactions and affect the split of nominal GDP between real GDP and the price level. It is this idea that forms the basis for broad money representing the intermediate target in many central bankers' money-focused monetary policies (Mishkin, 1998).

2.2.3 Interest rate transmission channel.

Interest rate channel represents the traditional Keynesian view of monetary policy transmission mechanism through which interest rates affects the real economy (Davoodi et al, 2013). Accordingly a change in interest rates either an increase or a decrease affects the value of the firm's future cash flow hence the value of the firm. An increase in interest rate lowers the present value of the firm's future net cash flow which eventually leads to a decline in the cost of capital thus lowering the firm's value as measured in terms of equity prices. The standard IS-LM model provides the basis for the analysis of the interest channel of the monetary policy transmission mechanism. According to this model, an expansionary monetary policy (increase in money supply) has the effect of shifting the LM curve to the right thus causing the real interest rate to fall. Firms finding that their real cost of borrowing over all horizons has decreased are encouraged to borrow hence increasing their investment expenditures. Similarly, households facing lower real borrowing cost scale up on their purchases of homes, automobiles and other durable goods. Hence a policy induced decrease in short-term nominal interest rate leads to a decrease in long term nominal interest rate as investors attempt to arbitrage on interest rate differentials. A fall in real interest rate decreases the cost of capital and thus stimulates investment. This eventually results to an increase in aggregate demand and real output (Davoodi et al, 2013).

2.2.4 The asset price transmission channels.

Monetary policy though the asset price channel is propagated to real economy though asset such as stock, housing as well as land. Monetary theory traditionally maintains the view that monetary tightening, attained through an increase in discount rate of financial assets such as securities may lead to a fall in asset prices which eventually affects the real economy. There are two main mechanisms through which monetary policy is propagated by changes in equity prices (Mishkin, 1995). Firstly, the Tobin's q theory holds the view that when equities are cheaper relative to the replacement cost of capital, the firms are not motivated to issue new shares of equity stock to purchase investment goods hence leading to a decline in investment stock (Davoodi et al, 2013). The second relates to wealth effect of equity prices on consumption related to permanent income hypothesis. A rise in stock prices increases the stock returns of individual shareholders through capital gains and divided payment. This further increases the financial wealth of equity holders hence increasing the lifetime resources of households as well as demand for consumption and output.

2.2.5 Credit transmission channel.

This is an indirect monetary policy transmission channel, related to interest rate adjustments, is the credit channel. (Davoodi et al, 2013). This channel suggests that the central bank can influence the level of investment taking place in a country by altering interest rates. In this regard, it is understood that the level of corporate investment will affect the market value of firms. This argument is predicated upon the fact that the market value of firms is affected by the present value of its future cash flows,. In this sense, higher corporate investment activity should lead to higher future cash flows, thus increasing the firm's market value.

2.2.6 The balance sheet transmission channel.

Bernanke and Gertler (1995), provides a broader view of the credit channel, in context of balance sheet channel where financial markets imperfections also play a key role. They emphasize that, in the presence of financial market imperfections, a firms cost of credit, whether from banks or other external source, rises when the strength of its balance sheet deteriorates. A direct effect of monetary policy on the firm's balance sheet comes about when an increase in interest rate works to increase the payments that the firm must make to

service its floating rate debt. An indirect effect arises, too when the same increase in interest works to reduce the capitalized value of the firms long lived assets. Hence a policy induced increase in the short term interest rate not only acts immediately to depress spending through the traditional interest rate channel. It also acts possibly with a lag to raise each firms cost of capital through the balance sheet channel, deepening and extending the initial decline in output and employment

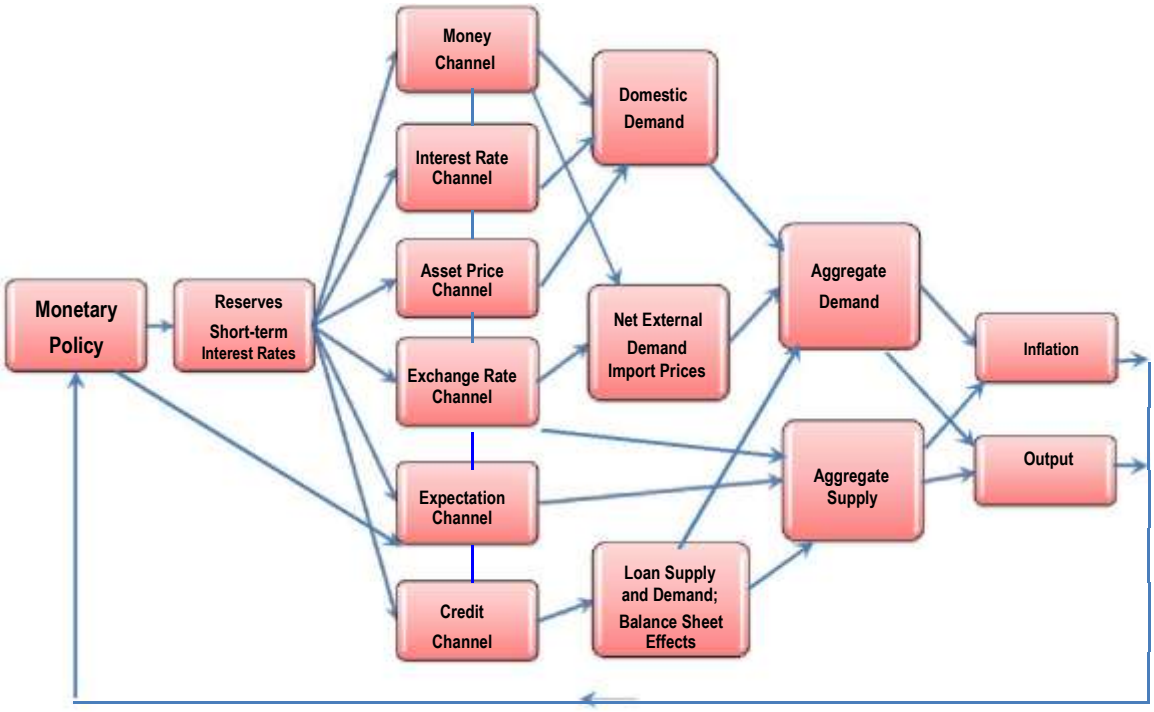
2.2.7 Exchange rate transmission channel.

In open economies, additional effects of policy induced increase in the short term interest rate come about through the exchange rate channel. When the domestic nominal interest rates rises above its foreign counterpart, equilibrium in the foreign exchange market requires that the domestic currency gradually depreciate at a rate that, again, serves to equate the risk adjusted returns on various debt instrument, in this case debt instruments denominated in each of the two currencies. This is the condition of uncovered interest parity. Both in the traditional Keynesian model and in the new Keynesian model, this expected future depreciation requires an initial appreciation of the domestic currency that, when prices are slow to adjust, makes domestically produced goods more expensive than foreign produced goods. Net exports fall; domestic output and employment fall as well. (Davoodi et al, 2013).

2.2.8 Expectation Channel

Davoodi et al, (2013) provides a review of the expectations channel in their analysis of monetary policy transmission mechanism in East Africa. They argue that modern monetary policy analysis is based on forward-looking and rational economic agents; hence the expectation channel is central in the working of all channels of MTM. In practice, this channel is mainly operational in developed economies with well-functioning and deep financial markets. For example, expectations of future changes in the policy rate can immediately affect medium and long-term interest rates. Monetary policy can guide economic agents' expectations of future inflation and thus influence price developments. Similarly, changes in the monetary policy stance can influence expectations about the future course of real economic activities by affecting inflationary expectations and the ex ante real rate and guiding the future course of economic activities.

Figure 2.1 Monetary policy transmission channels



Source. Davoodi et al (2013)

Figure 2.1 provides a summary of the framework within which monetary policy is propagated through its policy variables mainly changes in interest rate to real economy. This study focused on the asset price channel of monetary policy transmission where policy changes is expected to positively affect stock returns and eventually propagated to the real economy through the wealth effects. In this framework changes in interest rates influences the stock prices and eventually the stock returns. This eventually affects the wealth of stock holders and hence the aggregate demand in the economy and propagated to the real economy through its effect on real output.

2.4 Empirical Literature

Empirically; the relationship between monetary policy and securities returns has been a topic of intense research by both monetary and financial economists for the last two decades. Most of the studies have been concentrated in developed markets while few have been done in emerging markets such as Kenya.

2.4.1 Empirical studies outside Kenya.

Most of the studies in this area have largely been concentrated in developed markets as noted earlier perhaps due to the developed nature of these market as well as availability of data. In these studies monetary policy shocks were identified and their effect on the securities prices or returns investigated. Some of these studies are discussed below.

In one of the most recent and related study, Yoshino et al (2014), have studied the response of stock markets to monetary policy (An Asian Stock Market perspective) a case of Tehran stock market. They estimated the response of Asian stock market prices to exogenous monetary policy shocks employing the VECM. The results indicated that stock prices increase persistently in response to exogenous monetary policy easing. Further they conclude that there is an endogenous response of the stock prices to monetary policy as evidenced by variance deposition results

More relevantly in Africa, Nemaorani (2012) estimated single equation models by regressing real and nominal securities returns on changes in short-term interest rate using Botswana monthly data for the period 2001-2011. He found a positive and statistically significant relationship between interest rate changes and securities returns. These results were counter-intuitive and his explanation for result was that the dominant players in the domestic securities market are the commercial banks, who are also the main beneficiaries of interest rate increases through their exclusive participation in the Bank of Botswana Certificates. In another study of Botswana securities market. Naceur et al (2009), examined the effectiveness of monetary policy on securities markets for Middle East and North Africa countries, monetary policy in Jordan was found to have significant impact on securities prices. Similarly, in North African countries such as morocco and Tunisia, monetary policy also is effective in securities market price. In Saudi Arabia and Oman, tight monetary policy significantly decreases securities prices. The findings produced mixed result.

Ioannidis and Kontonikas (2008) investigated the effect of the monetary policy on securities returns in thirteen OECD countries over the period 1972-2002. They regressed the securities market variable on the monetary policy variable and found that securities returns decrease when money supply decreases. Their findings indicate that monetary policy shifts have significant negative impact on both nominal and inflation-adjusted securities returns. This relationship was significantly different from zero at the 5 percent level in 10 out of 13 countries. However, the strengths of the links differed from one country to another possibly because of their inherent structural differences.

Bernanke and Kuttner (2005) examined the reaction of equity prices following a change in federal rate. Using Campbell and Ammer model to assess the relationship between behavior of stock prices in response to change of interest rate the results were a 0.25 percent reduction on interest rate increased securities price indices by 1 percent.

In terms of methodology, Sellin (2001) noted that most of the studies have relied on vector autoregressive model particularly in the last decades in studying the relationship between monetary policy and securities market

Patelis (1997) Using a simple two-equation system where one equation represented the monetary policy and the other equation representing the securities returns investigated whether observed changes in US securities returns could be attributed to shifts in the monetary policy stance. The findings showed that monetary policy variables are significant predictors of future stock returns.

Boyle (1990) postulated that interest rates increases the opportunity cost of holding money and therefore its velocity. This in turn adversely affects the nominal price of securities, he further argued that high nominal interest rate induce substitution effects from securities to bonds, thereby driving securities prices down. In line with this argument Friedman (1998) had in an earlier study asserted that portfolio substitution effects cause the positive relationship between money velocity and deflated securities prices. He further observed that a fall in securities prices reflects a substitution from securities to sale assets due to changes in interest rates.

2.4.2 Empirical studies in Kenya.

The empirical studies in Kenya have mainly been confined to investigating the nature of monetary policy transmission mechanism.

Kosimbei et al (2012), studied the choice of an optimal monetary policy in Kenya which involved the choice between the use of interest rate and reserve money or combination of both as policy instruments. Using data for the period 1994 to 2000 and by employing an error correction model. Their finding indicates that the use of interest rate as a policy instruments resulted in minimal losses compared to reserve money instruments. A combination of both instruments lead to minimal losses from equilibrium output as opposed to use of instruments independently.

Misati et al (2010). Studied the role of financial innovation in the effectiveness of monetary policy in Kenya by applying single equation methods to monthly data for 1996 to 2007. They showed that financial innovations, proxied by ratio of M2 to M1 and bank assets to GDP, have weakened monetary policy transmission in Kenya by reducing the impact of the repo rate on output.

More relevantly in Kenya, Ngigi (2008) analyzed the impact of fiscal and monetary policies on securities market performance in Kenya using the general to specific model specification and deduction. Values for the anticipated and unanticipated fiscal and monetary policies were obtained and used in the estimation of the securities market performance. Results showed that both anticipated monetary policy actions and unanticipated fiscal policies actions affect securities market performance negatively while unanticipated monetary policy has positive effect on securities market performance. Anticipated fiscal policy was found to have no effect on market performance.

Rotich et al (2008), on the monetary policy reaction function for Kenya, reviewed the conduct of monetary policy and the CBK rule based behavior. Applying the modified backward and forward policy rules in order to test how the CBK reacts to changes in expected inflation, GDP growth rate, and exchange rates made significant observations. The findings indicate that for the period following liberalization (1997-2006), the CBK in its

conduct of monetary policy relied on monetary aggregates as main policy targets. It was found that a rise in the annual inflation rate by 1% compelled the CBK to lower growth of broad money (M3) by 4.2%. The coefficient of inflation was also found to be consistent with Taylor's non-accommodative policy. Evidence also indicated that CBK strictly followed a rule to target inflation while reaction to exchange rate was statistically significant

Kagume (1990) used data spanning from 1973 to 1989 to analyze the determinants of securities market prices in Kenya. He expressed securities prices as being influenced by the level of quasi money, real incomes, expected returns from securities and changes in money supply. Using ordinary least square estimation procedure, the results of his regression indicated that changes in money supply do not significantly affect securities prices. He further concluded that domestic credit going to the public sector was negatively correlated to securities prices whereas that to the private sector is positively related to securities prices. Net foreign assets were found to be negatively correlated to securities prices as was inflation. Inflation was found to have no effect.

In another study, Nganda (1985), in a study on the economic analysis of monetary relationships in Kenya 1968-1983, using a simple model within the quantity theory tradition to analyses the relationship between money supply, output, and prices over the period 1968-1983. His findings indicated that increased monetization of the economy increased demand for money faster than the growth in income. Money multiplier was found to increase during the study period however with much fluctuation. He further found a strong relationship running from real output to real money balances as well as money balances to real output and interest rate as having significant influence on prices.

2.5 Overview of literature review.

The objective of this study was mainly to determine the relationship between monetary policy and securities returns in Kenya. The literature review has dealt on both theoretical as well as empirical evidence. Theoretically monetary policy affects real economy through its transmission channels such as asset price channels by influencing short term interest rates which eventually increases or decreases stock prices.

Evidence of the recent empirical literature analysis shows conclusive evidence of the existence a relationship between monetary policy and securities/equity prices but the strength of relationship depends on structural and institutional features of an economy. (Boyle, 1990; Bernanke and Kuttner, 2005)

However, most of the studies in this area were conducted for developed economies and to a lesser extent, emerging market economies. However in most of the studies the findings indicate that securities prices are influenced by short term interest rates. In terms of methodology, the VAR approach was noted as having has been commonly used (Sellin, 2001).

Studies conducted in Kenya, on monetary policy in relation to securities exchange market have not been exhaustive and not addressed the link between monetary policy and securities returns. For example, Misati et al (2010) applying single equation methods to monthly data finds that financial innovations had weak monetary policy transmission in Kenya while Ngigi (2008) using general to specific model specification concludes that monetary policy and fiscal policy actions affect securities market performance. Rotich et al (2008) finds that CBK has had a tendency to follow a rule targeting inflation. Kagume (1990), on the determinants of securities market prices concludes that changes in money supply do not significantly affect security prices. In all these studies we find methodological differences which this study seeks to deal with by applying the most conveniently used OLS regression analysis to determine the relationship between monetary policy and stock returns while controlling for open market operations, cash reserve ratio requirement and velocity of money in circulation.

CHAPTER THREE

METHODOLOGY

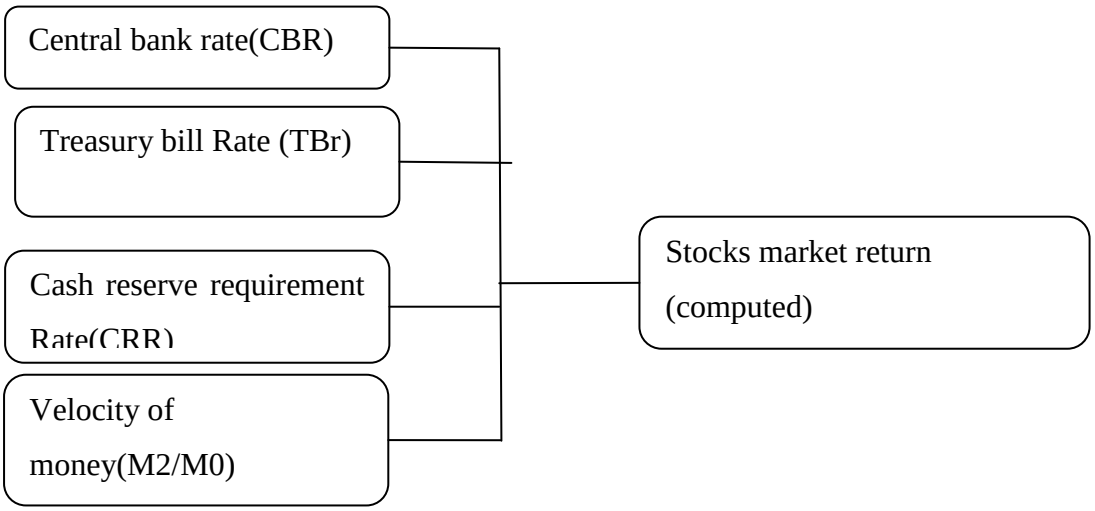
3.1 Introduction

This chapter detailed the research methodology employed in carrying out the study. It provided a description of the entire methodological approach to the research problem and the attainment of the research objectives. This involved the estimation of empirical models of the relationship between monetary policy and returns on securities including the operational definition of the variables, followed by formal diagnostic techniques for the time series properties of the data.

3.2 Conceptual Framework

In this study, the dependent variable was the stock returns and the independent variables were monetary policy variables mainly repurchase rate, reserve ratio requirement, Treasury bill rate used as a proxy for the open market operation and the velocity of money. This is shown by the following conceptual framework.

Figure 3.2 Conceptual Framework



Independent variables **Dependent variable**

3.3 Empirical model.

The approach used to analyze the relationship between monetary policy and stock returns of listed companies in Kenya is the ordinary least square regression model (OLS) which is an adaptation of that used by Nemorani (2012) in a related study. The stock returns is expressed

as dependent on open market operations(OMO), cash reserve requirement(CRR), Repurchase rate(RR) and velocity of money(MM) as measured by the ratio of M2 to M0.

Stock market Returns = f (OMO, RR, CRR, MM) simply stated

$$Rs_t = \beta_{0+} \beta_1 TBr_t + \beta_2 CRR_t + \beta_3 RR_t + \beta_4 MM_t + \varepsilon_t$$

This function was log-lineated to facilitate use if ratios and assist in stationarity and multicollinearity of the output.

The function becomes as follows:

$$\ln Rs_t = \ln\beta_{0+} \ln\beta_1 TBr_t + \ln\beta_2 CRR_t + \ln\beta_3 RR_t + \ln\beta_4 MM_t + \varepsilon_t$$

Where;

Rs_t is the stock returns, as computed by arithmetic mean of quarterly holding period returns for the listed companies at the NSE using the NSE20 share index.

TBr_t, is the 91 day Treasury bill auction rate used as a proxy for open market operations. The interest rates are already in % so were log transformed. It is used as to capture the movement of prices of domestic securities listed on NSE which eventually determines securities returns.

CRR_t is the cash reserve requirement ratio also measured in percentage and therefore was log transformed.

RR_t is the REPO (Repurchase) rate is the rate at which the central bank lends short-term money to the banks against securities. It is also measured in percentage and therefore was log transformed.

MM_t is a measure of velocity of money in the economy as measured by the ratio of M2/M0 which is the actual or empirical money multiplier.

β_s are the unknown parameters (constants of regression).

ε_t is the error term or white noise which captures omitted but relevant variables. It is assumed stochastic. The justification for the choice of the variables of the study was based on the underlying theoretical and empirical framework as well as previous studies.

Final estimation model being represented by $R_t = \beta_0 + X_t\beta_t + \varepsilon_t$

Where

R_t represents the stock returns

α,β_t are the set of parameters

X_t are the set of monetary policy variables regressed against stock market returns

ε_t is the error term which captures the set of omitted variables and simultaneity problem.

3.4 Definition and measurement of variables.

3.4.1 Dependent Variable.

Stock Returns (Rs). In this study, stock returns were computed as holding period returns for each quarter using the NSE 20Share index and used as dependent variable as it is assumed to be dependent on the monetary policy actions. The market quarterly security return which is the holding period return of securities was computed using data from the NSE. The stock market return was derived from NSE 20 share index and computed using the following equation which was adopted from

the simple holding period return equation for individual security where HPR = Ending price of a share - Beginning price + Cash dividend/ Beginning price for firms that declare cash dividends but since not all firms declare dividends then this is usually ignored in empirical studies. Hence upon modification, the final equation is

Stock market returns (Rs) = NSE 20_t - NSE 20_{t-1} divided by NSE 20_{t-1}

Taking natural log

Stock returns (Rs) = ln (NSE 20_t - NSE 20_{t-1}) Less lnNSE 20_{t-1}

Where

NSE 20_t is the NSE 20 share index at the end of quarter t

NSE 20_{t-1} is the NSE 20 share index at the beginning of the quarter t-1

This index is used to avoid the use of monthly or quarterly stock prices in computing stock returns since ordinarily data on stock prices is high frequency and it may not be appropriate to use in computing stock returns while data for the explanatory variables is not high frequency.

3.4.2 Independent variables.

The independent variables are basically the instrument monetary policy in Kenya as explained by Kinyua (2000)

Open market operations (OMO): This study used the 91-day Treasury bill auction rate as a measure for the open market operations consisted with other studies (Nyamute 1998) and as a monetary policy stance consistent with Kosimbei et al (2012). According to Kinyua (2000), the CBK engages in repurchase and reverse repurchase agreements which are conducted under the OMO in order to mop up excess liquidity or even inject money into the banking system and it is therefore an important policy instrument. OMO operations are conducted and restricted to commercial banks which are the main participating institutions where

transactions are two way process. It was expected that TB rate will positively influence the stock returns consistent with findings of Patelis (1997) in which he concluded that changes in monetary variables positively affected stock returns.

Cash reserve requirement/ratio. A cash reserve requirement is a ratio a bank must maintain between deposits and reserves. The ratio is determined as the average amount of deposits and liabilities of a bank (or a NBFI) with the CBK over a 15-day period ending in the middle and at the end of every month to the amount of domestic currency deposits held with the bank residents and nonresident on the last working day of the penultimate month through the middle of each month and the last day of the previous month thereafter (Kinyua, 2000). For many years cash reserve requirement has been used occasionally by the CBK for expansionary and contractionally monetary policy as documented by Kinyua (2000). This ratio must be fulfilled twice a month by Kenya banks. Previous studies conducted in Kenya have justified the use of reserve money/requirement as a monetary policy instrument. Therefore this study was not an exception and hence adopted similar approach justifying its relevance as policy instrument. It was expected that this variable would influence stock returns positively as evidenced by the works of Kosimbei et al (2012).

REPO (Repurchase) rate. Whenever the banks have any shortage of funds, they can borrow it from the central bank. REPO (Repurchase) rate is the rate at which the central bank lends short-term money to the banks against securities. A reduction in the repo rate will help banks to get money at a cheaper rate. When the repo rate increases borrowing from the central bank becomes more expensive. It is more applicable when there is a liquidity crunch in the market or even when there is surplus liquidity in the market. This study used historical repo rates available from central bank report. Misati et al (2010) examined the monetary policy transmission mechanism in Kenya by applying single equation methods to monthly data from 1996 to 2007. The results indicated that financial innovations had weakened monetary policy transmission in Kenya by reducing the impact of the repo rate on output during the study period. Hence, this study incorporated REPO rate as a monetary policy variable and it was expected to have positive effect on stock returns.

Money supply/multiplier (M2/M0). M2 is a broad classification of money and represents money and "close substitutes" for money. It is a broader classification of money than M1 (currency in circulation plus demand deposit such as checking accounts). It consists of M1 plus savings accounts and time deposits with short term maturity. In economic theory, M2 is used when looking to quantify the amount of money in circulation and trying to explain different economic monetary conditions. The ratio of a pair of M2/M0, in particular is known as money multiplier and it measures the velocity of money. Previous studies have not been keen on the relevance of money supply as a monetary policy stance. However Nganda (1998) in his study used money multiplier and showed that it increased during the study period but with much fluctuation. Misati et al (2010) studied the role of financial innovation in the effectiveness of monetary policy in Kenya using monthly data for 1996 to 2007 and showed that financial innovations proxied by ratio of M2 to M1 and bank assets to GDP had weakened monetary policy transmission in Kenya by reducing the impact of the repo rate on output. Therefore to the best of our knowledge, it is prudent to use this ratio in this study which will be computed using CBK annual reports. According to Kagume (1990), changes in money supply do not significantly affect securities prices

Table 3.1 Summary of variables and measurement

Variable	Notation	Measurement	Predicted sign	Source of data
Dependent variable				
Stock Market Returns	Rs	Stock market returns computed as holding period returns for each quarter using the NSE20Share index.	Unpredicted	NSE
Independent variables				
Open Market Operations	TBr	This study used the 91-day Treasury bill auction rate as a measure for the open market operations as a policy instrument	Positive	CBK annual reports
Cash Reserve Requirement/Ratio.	CRR	The ratio is computed as the average amount of deposits and liabilities of a bank(or a NBFI) with the CBK over a 15-day period ending in the middle and at the end of every month to the amount of domestic currency deposits held with the bank residents and nonresident in a month.	Negative	CBK annual reports
REPO(Repurchase) rate	RR	REPO rate is the rate at which the central bank lends short-term money to the banks against securities. A reduction in the repo rate will help banks to get money at a cheaper rate.	Positive	CBK annual reports
Money Supply/Multiplier	MM	The ratio of a pair of M2/M0, in particular is known as money multiplier and it measures the velocity of money in circulation.	Positive or Negative	CBK annual reports

3.5 Population of the Study

The population of interest in this study consisted of all the 63 firms listed at the Nairobi securities exchange. The sample period was from Q1; 2003 to Q1; 2013. The sample period consisted of quarterly periods of 11 years which translated into 41 quarterly periods. This period was considered sufficient enough to monitor the variation in variables and also it's more recent. Similar and related studies that have adopted similar sampling period include Misati et al (2010).

3.6 Sampling and Sample Size

This study used the NSE20share index in computation of stock returns since in most of the studies cited this index has been used as a proxy for market stock prices (Nyamute, 1998). Therefore the sample size will consists of 20 firms used in computation of the index mainly in the industrial and allied, banking, agricultural, commercial and allied as well as service sector and which have traded consistently during the study period.

3.7 Estimation and testing

To study the relationship between the stock market returns and the monetary policy as the independent variables. Monetary policy variables were regressed against stock returns using the ordinary least squares (OLS) technique. Empirical analysis maintains that there exists a long run relationship between the variables under consideration (Nemorani, 2012). The empirical relationship can be established using the following estimation model

$R_{t=} \beta_0 + X_t\beta_t + \varepsilon_t$

Where R_t is stock returns, α and β are the parameters to be estimated and X_t represents a set of monetary policy variables in time *t*, and ε_t is the error term with mean zero measuring the effects of omitted variables. Nonetheless, most time series data have unit roots (are non-stationary). Regression of none stationary time series data yields spurious results. With this understanding, the t-statistic and F-test based on this estimation procedure becomes inconclusive. Hence this requires one to undertake the following estimation test.

3.7.1 Stationarity Test

To test for stationarity or order of integration of each series of variables, the augmented Dickey-Fuller (ADF) Test was conducted. There was a need to make non-stationary time series data stationary in order to come up with meaningful results before regression is done. If results showed existence of unit roots, then they would be made stationary by differencing.

3.7.2 Cointegration Test

This test is done in case of non-stationarity of the series in order to determine long-run relationships. In theory, cointegration exist when there is really a long run relationships linking the variables together and therefore it is a very powerful tool of detecting the existence of economic structures (Asteriou and Hall, 2007). In order to test the long run association between stock market returns and monetary policy, the study adopted the cointegration test of Johansen (1988) and Johansen and Juselius (1990) Maximum Likelihood estimator. The main purpose was to establish the existence of long run association between the variables.

3.8 Post- estimation test

OLS estimation technique can only hold if its assumptions are not violated. In this study, the following tests were conducted.

3.8.1 Autocorrelation test.

Autocorrelation refers to a situation where the error term is correlated to the preceding error term. Autocorrelation is most likely to occur in time series framework such as in this study. Due to the presence of autocorrelation the OLS estimators will still be unbiased and consistent but they will be inefficient. Secondly the estimated variances of the regression coefficient will be biased and inconsistent thus the hypothesis testing will no longer be valid. To detect the presence of autocorrelation, this study employed Durbin-Watson test which is the most commonly used method for serial correlation and Breusch- Godfrey LM test for serial correlation to confirm.

3.8.2 Multicollinearity test.

Multicollinearity is a common characteristic of most time series data. It exists if there are exact linear relationships among sample values of the explanatory variables (Asteriou and

Hall, 2007). In other words if there is a high correlation between any two independent variables then Multicollinearity arises. Presence of Multicollinearity leads to inflation of the variance of the parameter estimates which may cause incorrect magnitude of the estimates of the coefficients and also the signs. This implies that a significant variable may become insignificant by increasing its standard error term (high p values) while in reality it is not. To detect the presence of Multicollinearity where we have more than two independent variables this study will used auxiliary regressions.

3.8.3 Test of Heteroskedasticity.

Existence of heteroskedasticity violates one of the critical assumptions of OLS of homoskedasticity. However it is quite common in regression analysis to have this assumption violated (Asteriou and Hall, 2007). Existence of heteroskedasticity violates the minimum variance property and therefore making the estimators of the OLS method inefficient consequently affecting hypothesis testing. To test for heteroskedasticity this study will use the white's test developed by White (1980). According to Asteriou and Hall (2007) this test is more superior over other test in that it does not assume any prior knowledge of heteroskedasticity and secondly it does not depend on normality assumption like the Breusch-Pagan test.

3.8.4 Normality test

Normality test is essential in time series analysis to establish if the residuals are normally distributed. A normal distribution test was conducted using Jarque – Bera statistic.

3.9 Data and data sources.

This study will use secondary quarterly data covering the sample period, Q1; 2003 to Q1; 2013. The monetary policy data consisting of The 91 day Treasury bill rate, REPO rate and the reserve requirement (Reserve ratio) was obtained from the CBK Annual reports for the periods 2003 to 2013. The study also used the NSE 20 share index to compute stock returns for the study period. The data for NSE 20 share index was purchased from NSE and used in computation of stock returns.

CHAPTER FOUR

EMPIRICAL RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents empirical findings. This includes summary statistics, correlation analysis, stationarity test and cointegration test, regression analysis and post estimation tests.

4.2 Descriptive Statistics

Table 4.1 gives the summary statistics of the main variables that have been included in the model including: minimum, maximum, mean, standard deviation, skewness, kurtosis and Jarque-Bera test for normality. Mean is used to locate the centre of the relative frequency distribution. Additionally, standard deviation gives the spread or dispersion in a series, whereas skewness is a measure of negative or positive symmetry of a distribution of a series around its mean, and kurtosis is the peakedness of the distribution.

Table 4.1: Descriptive Statistics table

Statistics	Market Returns	Money Supply Multiplier	Repo	T Bill	Cash Reserve Requirement
Mean	0.000573	8.488310	5.251138	6.936667	5.662602
Median	0.000782	7.986455	6.300000	7.100000	6.000000
Maximum	0.003947	10.62792	16.68000	19.35333	10.00000
Minimum	-0.003495	6.919226	0.000000	1.183333	4.500000
Std. Dev.	0.001946	1.176173	3.926634	3.668878	1.051446
Skewness	-0.306815	0.333321	0.348795	0.997902	2.065745
Kurtosis	2.451986	1.533323	3.113948	5.449646	9.468279
Jarque-Bera	1.156306	4.434070	0.853510	17.05599	100.6342
Probability	0.560934	0.108932	0.652624	0.000198	0.000000
Sum	0.023504	348.0207	215.2967	284.4033	232.1667
Sum Sq. Dev.	0.000151	55.33529	616.7383	538.4268	44.22154
Observations	41	41	41	41	41

Analysis of skewness shows that with exception of market returns, the rest of the variables distributions were asymmetrical to the left of its mean. Additionally, cash reserve requirement was highly peaked compared to other repressors' followed by Treasury Bill. Repo was nearly symmetrical about its mean given skewness of 0.3487 and kurtosis of 3.113. Jarque-Bera is a test statistic for testing whether the series is normally distributed. It measures the difference of the skewness and kurtosis of the series with those from the normal distribution using the null hypothesis of a normal distribution. A small probability value leads

to the rejection of the null hypothesis of a normal distribution. Jarque-Bera test for normality produced significance of: market returns ($p = 0.560$), money supply multiplier ($p = 0.108$), repo ($p = 0.652$) and T bill ($p < 0.001$) and cash reserve requirement ($p < 0.001$). It can be deduced that only Treasury bill and cash reserve requirement are not normally distributed since their p-value (probability) are less than 0.05 for a 95% confidence level (Jarque and Bera, 1980).

4.3 Correlation Analysis

The explanatory variable fails to have a good p-value if there is presence of multicollinearity. Correlation analysis was therefore performed to investigate whether there is existence of perfect or exact linear relationship among some or all explanatory variables of the regression model. Asteriou and Hall (2007) asserts that most researchers appear to consider multicollinearity a serious problem in OLS if the correlation coefficient between two repressors is above 0.9 which is the threshold beyond which problems are likely to occur which is not the case in our model. The results of correlation analysis are shown in a correlation matrix. From table 4.2, we do not find any serious multicollinearity problem.

Table 4.2: Correlation Matrix

Variable	Stock Market Returns	Money Supply Multiplier	Repo	T Bill	Cash Reserve Requirement
Market Returns	1				
Money Supply Multiplier	-0.1419	1			
Repo	0.0534	0.0355	1		
T Bill	-0.0849	0.3287	0.7348	1	
Cash Reserve Requirement	0.2877	-0.6936	0.2352	-0.0676	1

From the Table 4.2, it can be deduced that there was a positive correlation between stock market returns and Repo (0.0534) and cash reserve requirement (0.2877). However, negative correlations were established between stock market returns and money supply multiplier (-0.1419) as well as T bill (-0.0849). We find that a very low correlation exists between the independent variables and the stock market returns which is the dependent variable. However, we find that there is high positive correlation between repo rate and T-bill rate. This is explained by the fact that as interest rates the two variables move in the same direction.

The result also shows that stock market returns is negatively correlated with treasury bills rate and money multiplier. The expansionary monetary policy such as an increase in money supply increases investor participation in the stock markets that is likely to reflect low stock prices and hence lowering stocks returns. Similarly, a high T-bill rate implies that speculative investor will divert their investment form stock markets to investment in government securities such as treasury bills that have a high-risk free return. On the other hand we find that stock market return is positively correlated with cash reserve requirement ratio which is monetary policy instrument used by commercial banks. The positive relationship implies that increase in cash reserve requirement ratio indicates that it can be used as an instrument for enhancing stock market growth. Treasury bills rate is highly positively correlated with REPO rate but low positive correlation with cash reserve requirement ratio. However, it is highly negatively correlated with money supply multiplier. The negative correlation is an expected scenario since it is used by the government through the OMO to mop up excess liquidity from the economy. The REPO rate and the money multiplier have a low positive correlation. REPO rate is the rate at which the central bank lends short-term money to the banks against securities. A reduction in the repo rate will help banks to get money at a cheaper rate. Hence increasing rate makes money expensive for banks to borrow from central banks and this explains the nature of the relationship. Money supply and cash reserve requirement have a negative correlation which is explained by the fact that cash ratio is basically used as a monetary policy instrument mainly in checking the excess money supply. Where the government wants to reduce excess money supply then it increases the cash reserve requirement thus limiting the banks in terms of lending ability hence lowering money supply. Therefore this correlation relationship is consistent with the operations of monetary policy transmission process and does not adversely influence the manner in which hypothesis will be tested and the results of the findings.

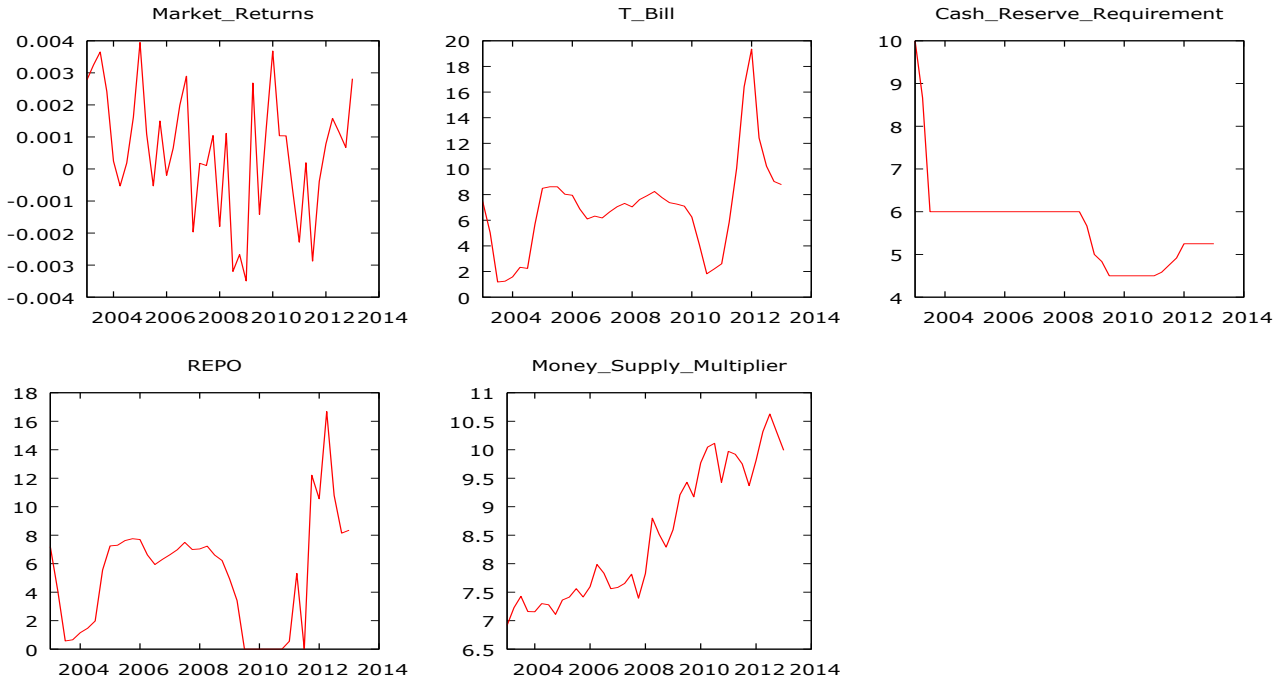
4.4 Trend analysis of the variables

Figure 4.1 shows the relationship in trends of the growth and changes in the respective variables. In the early 2000s and up to mid-2000s, the stock market returns (Rs_t,) was near constant and below the monetary policy indicators of TBr_t, CRR_t, RR_t and MM_t. during the study period. Stock market return rate shows minimal fluctuations compared to the monetary policy indicators. From Q1; 2009 the REPO rate and Treasury bill rate showed significant fluctuations increasing after Q2; 2012. We can attribute this to macroeconomic changes

following the political instability of 2007. The REPO grows with the growth of T Bills and this is a clear indication of the intertwined relationship between the two since the government executes the REPO command when there is need for inflationary or money supply control, which also depends in the amount of bills in the market. It was expected that TB rate would positively influence the stock returns consistent with previous studies' findings that changes in monetary variables positively affects stock returns.

The rate of return in the market which is seen to vary from quarter to the next depending on among other factors, the monetary policy stance and is between -0.003% and 0.004% from 2003 to the first quarter of 2013. The slump in 2008 and 2009 is attributable to the political crises which as literature presupposes, affects the market in two ways: first is the general lack of investor confidence and drive for volatile markets, and two the way the expansionary monetary policy drag in resuscitating the situation.

Figure 4.1: Graphical representation of the variables (2003-2013).



A close examinations of the trend in the variables at levels shown in figure 4.2 reveals that the variables exhibit a long run trend while in figure 4.1 we notice that the variables have an intercept at levels. We therefore conduct a stationarity test at levels with intercept and at first difference with trend and intercept.

Figure 4.2: Long Run Variables trends at levels (2003-2013).

4.5 Stationarity Test

A basic assumption of the linear regression model is that variables have a constant mean, variance and covariance (stationary). We conduct a stationarity test using ADF at level with intercept and at first difference with trend and intercept. The aim of applying the test is to determine the order of integration of the variables. The results for all the variables are shown in table 4.3 first at their level with intercept and trend and then at first difference with trend and intercept.

Table 4.3: ADF Unit root test for the sample period 2003-2013.

	At Level with Intercept and Trend		**At First Difference with Trend and Intercept**		**Order of Integration**
Variables	**ADF**	**Critical values**	**ADF**	**Critical values**	
Market Returns	-3.156 (0.0935)	-4.242 at 1% -3.540 at 5%	-9.940 (0.0000)	-4.251 at 1% -3.544 at 5%	I(1)
T Bill	-2.315 (0.4252)	-4.242 at 1% -3.540 at 5%	-3.7559 (0.0189)	-4.251 at 1% -3.544 at 5%	I(1)
Cash Reserve Requirement	-2.663 (0.0000)	-4.242 at 1% -3.540 at 5%	-4.4883 (0.0049)	-4.251 at 1% -3.544 at 5%	I(1)
REPO	-2.550 (0.3036)	-4.242 at 1% -3.540 at 5%	-8.6090 (0.0000)	-4.251 at 1% -3.544 at 5%	I(1)
Money Supply Multiplier	-2.892 (0.1649)	-4.242 at 1% -3.540 at 5%	-6.235 (0.0000)	-4.251 at 1% -3.544 at 5%	I(1)

The results in table 4.4 indicate that each of the series is non stationary when the variables are defined in levels. But first differencing the series removes the non stationarity component in all cases and the null hypothesis of non stationarity is clearly rejected at the 5% significance level suggesting that all the variables are integrated of order on as was expected. This implies that the residuals are stationary and therefore the residuals were used as the error correction term and an error correction model was adopted.

4.6 Cointegration Test

Cointegration test **provides** evidence for the long-run relationships between the variables. The study used the Johansen test for cointegration to establish the long run relationship procedure involving Eigen value and trace test. The result of the co-integration test are presented in Table 4.5

Table 4.4 Cointegration test analysis

Unrestricted constant

Log-likelihood = 232.036 (including constant term: 124.197)

Rank	Eigen value	Trace test	p-value	Lmax test	p-value
0	0.71263	103.82	[0.0000]	47.385	[0.0003]
1	0.52819	56.439	[0.0055]	28.545	[0.0341]
2	0.46214	27.894	[0.0830]	23.566	[0.0200]
3	0.073178	4.3280	[0.8703]	2.8878	[0.9436]
4	0.037192	1.4402	[0.2301]	1.4402	[0.2301]

The co-integration result using Johansen Rank Test for the effect of monetary policy on the stock market returns reveal existence of co-integrating between variables in the model and common trend characteristics. Hence there is a long-run stability relation between monetary policy variables and stock market returns. Consequently the study went further to conduct an estimation to determine the extent of the relationship between monetary policy variables and stock market returns. The evidence of cointegration rules out the possibility of obtaining spurious results by regressing non stationary variables at level (Hall and Henry, 1989). Lack of cointegration suggests that such variables have no long run relationship, in principal they can wander arbitrary far away from each other and Vector Auto regressions (VAR) model

would be suitable for such short run relationship (Dickey and Fuller, 1981). In this study we find evidence of long run relationship hence we conduct a VECM.

4.7 Empirical results and discusion.

Table 4.5. Impact of monetary policy variables on stock market returns

Variable	Coefficient	Std. Error	t-Statistic	Prob.
T Bill	-7.09E-06	0.000123	-0.057674	0.9543
Cash Reserve Requirement	0.000297	0.000615	0.482548	0.6325
Repo	0.000142	0.000119	1.196482	0.2398
Money Supply Multiplier	0.002498	0.000759	3.291004	0.0023
C	-0.017705	0.006486	-2.729721	0.0100
@Trend	-0.000267	8.72E-05	-3.068426	0.0042
R-squared	0.223219	Mean dependent var		0.000518
Adjusted R-squared	0.108986	S.D. dependent var		0.001938
S.E. of regression	0.001829	Sum squared resid		0.000114
Durbin-Watson stat	1.745378	Long-run variance		2.73E-06

Table 4.5 shows that T bill, cash reserve requirement and Repo rate reveals insignificant effect on stock market returns. We can therfore conclude that This reveals that T bill, cash reserve requirement and Repo as indicators of monetary policy do not significantly influence Kenyan stock market returns especially in the short run. However, money supply multiplier significantly influence stock market returns positively. These findings are inconsistent with Patelis (1997) who investigated whether observed changes in US securities returns could be attributed to shifts in the monetary policy stance. The findings showed that monetary policy variables are significant predictors of future stock returns. However the difference in findings can be attributed to differences in methodology and also differences in the nature of the two economies. We also find evidence of inconsistency in Kenya where Kagume (1990) conclude that changes in money supply in Kenya do not significantly affect securities prices and therefore the returns. Howerver the findings of this study are cosistent with Ioannidis and Kontonikas (2008) who finds that monetary policy shifts have significant negative impact securities returns.

4.7.1 Error correction model results

The results of error correction model are show in table 4.6. From the results of error a negative error correction term as expected. The error correction term represents the speed of adjustment towards equilibrium.

Table 4.6: Vector error correction model results

Variable	Coefficient	Std. Error	t-ratio	p-value
const	-0.00328046	0.00747444	-0.4389	0.66369
T Bill	0.000159481	0.000201754	0.7905	0.43507
Cash Reserve Requirement	-0.000340432	0.000880379	-0.3867	0.70155
REPO	6.08837e-05	0.000151796	2.4011	0.016910**
Money Supply Multiplier	0.00068281	0.00116136	2.5879	0.015607**
EC1	-0.0234257	0.056196	-2.4169	0.016795**

Mean dependent var	-0.000011	S.D. dependent var	0.002353
Sum squared resid	0.000159	S.E. of regression	0.002226
R-squared	0.246721	Adjusted R-squared	0.105481
rho	-0.056699	Durbin-Watson	2.065544

We fit a lagged error correction term to the short run model as an explanatory variable to establish the speed of adjustment towards equilibrium for every period. The residual is taken as valid error correction term hence the model results into error correction model. The coefficient of the residual is taken as the speed of adjustment or the amount of disequilibrium transmitted in each period to stock market returns by the monetary policy variables. The ECM model is in differenced form to ensure stationarity of variables. Table 4.6 shows short-run regression results. The results showed that the coefficient of the error correction term is –0.0234257 which is less than one and significant at 5%. The significance implies that whenever there are deviations in the stock market returns from an equilibrium path the model corrects at the rate of 2.3% annually. The negative coefficients of ECM give validity that the dependent variable and the explanatory variables have a long run equilibrium relationship.

4.8: Post estimation results

The results of post estimation test revealed no evidence of serial autocorrelation as evidenced by the Durbin Watson (DW) test statistic of 1.7453 as shown in table 4.5. The rule of the thumb is that when DW is very close to 2 then we do not have serial correlation. The Jarque-Bera test statistic for normal distribution shown that Treasury bill and cash reserve requirement are not normally distributed as shown in table 4.1 while the other variables exhibit normality. Correlation analysis conducted to check for multicollinearity of independent variables and the results indicate that no evidence of severe multicollinearity since none of the correlation coefficient exceeded 0.9 which is the threshold for problematic collinearity as revealed in table 4.2.

CHAPTER FIVE

SUMMARY, CONCLUSION AND POLICY RECOMMENDATIONS

5.1 Introduction

This chapter consists of the summary of findings, conclusion, recommendation and suggestions for further research.

5.2 Summary of the key findings.

This study sought to determine the relationship between stock market returns and monetary policy decisions using stock market returns as the dependent variable and monetary policy variables as the independent variable such as the treasury bills rate, cash reserve requirement, the REPO rate and the money multiplier. Time series for the period during 2003-2013 was obtained from the NSE and CBK reports. The estimated results indicated that monetary policy variables explains 24.67% of the variations as evidenced by the R^2 while the rest 75.33% is explained by other factors not captured in the model such as anticipations. The estimated results show that Treasury bills, cash reserve requirement and Repo rate have no significant effect on stock market returns. Treasury bills show a negative effect but not statistically significant at 5% while for cash reserve requirement and repo rate the effect is positive though not statistically significant at 5%. However, money supply multiplier significantly influence stock market returns positively.

5.3 Conclusion

The analysis established a strong negative contemporaneous response of stock markets to monetary policies. It is suggested that stock market returns are generally non responsive to cash reserve requirement, money treasury bil rate and Repo. We can therefore conclude that the only significant monetary policy variable that would influence stock market returns is money supply multiplier

5.4 Policy recommendations

The study established that money supply multiplier significantly influences stock market returns. Therefore investors should use the study findings in making informed decisions on their stock market portfolio given that monetary policy environment influences stock market

returns. An important policy implication of this research paper is that government through the monetary authorities (CBK) can enhance the wealth of investors in the stock market by influencing money supply multiplier which positively and significantly influences stock market returns. This can be achieved if the monetary policy committees focus on the money channel of monetary policy transmission which assumes that changes in reserve money are transmitted to broad money through the money multiplier.

5.5 Limitations of the study

In attaining its objectives, the study was stock market returns between 2003 and 2013. This is a period of relative transparency as opposed to autocracy that was exercised in prior periods when monetary policy was restrictive especially in the periods before 1993 before liberalization of the financial sector. Thus, the study's findings cannot be generalized to such periods as the sample is not representative of the same. Moreover, the implications of the study's findings for monetary policy formulation are profound, since it establishes that central banks can affect stock market valuations by altering its monetary policies. However, the study did not cover factors outside the monetary policies such as GDP and unemployment rate which might have effect on stock market returns. The study did not answer the perennial question of how quickly monetary policy should respond to stock prices, this can be done only within a structural model. We rather took a step backwards and showed that the underlying assumption, that stock market valuations are affected by monetary policies changes, is robust to close empirical inspection.

5.6 Areas for further research

The study suggests that future research can look at the exact timing of the stock market return reaction to monetary policies. This would help the CBK make an even more profound monetary policy that would have effective effect on stock market performance. Given this information, it is up to the monetary authority to calibrate the appropriate policy response to potential stock price misalignments. Large fluctuations in stock prices were experienced during the late 1990s, early 2000 and 2007 during the economic meltdown. Hence there is need future studies look at this prior period. This research has uncovered very little about how one can use monetary policy information to profit in the stock market. The quarterly estimations show little effect of anticipated or unanticipated policy on stock returns, hence need for further research. In addition future research can consider shorter periods.

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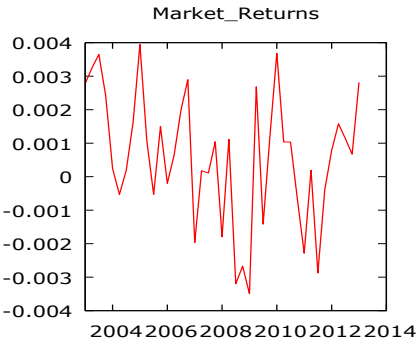
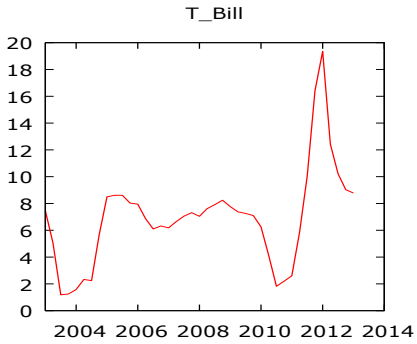
APPENDICES

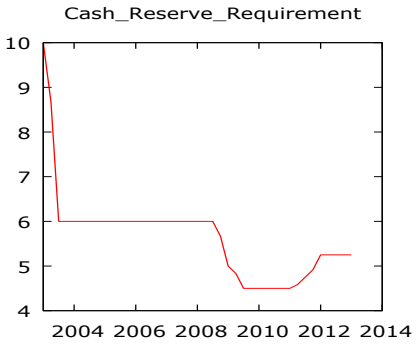
Appendix I: Descriptive Data

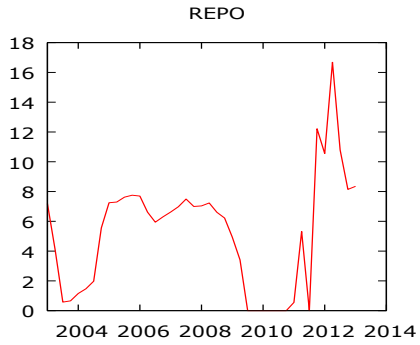
Quarter	Market Returns	Money Supply Multiplier	Repo	T Bill	Cash Reserve Requirement
2003Q1	0.002778	6.919226	7.190000	7.463333	10.00000
2003Q2	0.003248	7.227705	4.093333	5.030000	8.666667
2003Q3	0.003651	7.428051	0.576667	1.183333	6.000000
2003Q4	0.002417	7.159878	0.660000	1.246667	6.000000
2004Q1	0.000244	7.156505	1.153333	1.580000	6.000000
2004Q2	-0.000530	7.299274	1.470000	2.330000	6.000000
2004Q3	0.000189	7.279105	1.976667	2.243333	6.000000
2004Q4	0.001619	7.110978	5.560000	5.683333	6.000000
2005Q1	0.003947	7.362238	7.246667	8.493333	6.000000
2005Q2	0.001093	7.413120	7.293333	8.613333	6.000000
2005Q3	-0.000527	7.561634	7.623333	8.610000	6.000000
2005Q4	0.001499	7.415887	7.753333	8.033333	6.000000
2006Q1	-0.000197	7.595903	7.696667	7.950000	6.000000
2006Q2	0.000653	7.986455	6.616667	6.876667	6.000000
2006Q3	0.001993	7.833039	5.943333	6.100000	6.000000
2006Q4	0.002895	7.560829	6.300000	6.323333	6.000000
2007Q1	-0.001965	7.583756	6.626667	6.180000	6.000000
2007Q2	0.000178	7.653394	6.980000	6.650000	6.000000
2007Q3	0.000107	7.815528	7.496667	7.056667	6.000000
2007Q4	0.001043	7.395160	6.996667	7.313333	6.000000
2008Q1	-0.001796	7.826549	7.036667	7.043333	6.000000
2008Q2	0.001113	8.799898	7.233333	7.613333	6.000000
2008Q3	-0.003198	8.513233	6.606667	7.913333	6.000000
2008Q4	-0.002670	8.290608	6.220000	8.243333	5.666667
2009Q1	-0.003495	8.596439	4.933333	7.773333	5.000000
2009Q2	0.002683	9.209056	3.410000	7.373333	4.833333
2009Q3	-0.001415	9.429735	0.000000	7.260000	4.500000
2009Q4	0.001222	9.172737	0.000000	7.100000	4.500000
2010Q1	0.003682	9.770160	0.000000	6.250000	4.500000
2010Q2	0.001036	10.04634	0.000000	4.120000	4.500000
2010Q3	0.001034	10.11319	0.000000	1.823333	4.500000
2010Q4	-0.000667	9.427410	0.000000	2.203333	4.500000
2011Q1	-0.002284	9.971518	0.553333	2.606667	4.500000
2011Q2	0.000194	9.920294	5.316667	5.853333	4.583333
2011Q3	-0.002874	9.751445	0.000000	10.05000	4.750000
2011Q4	-0.000387	9.369803	12.21333	16.41333	4.916667
2012Q1	0.000782	9.812906	10.55333	19.35333	5.250000
2012Q2	0.001578	10.31704	16.68000	12.42667	5.250000
2012Q3	0.001139	10.62792	10.79333	10.21667	5.250000
2012Q4	0.000672	10.30668	8.143333	9.026667	5.250000
2013Q1	0.002817	9.990087	8.350000	8.780000	5.250000

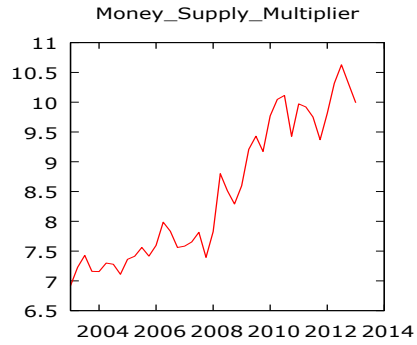
Appendix II: Time Series Plots at levels



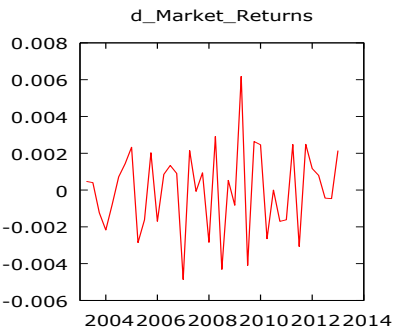


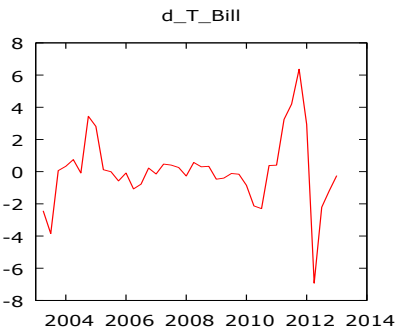


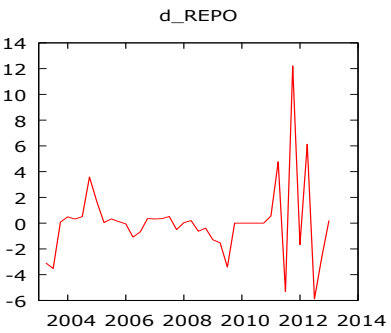


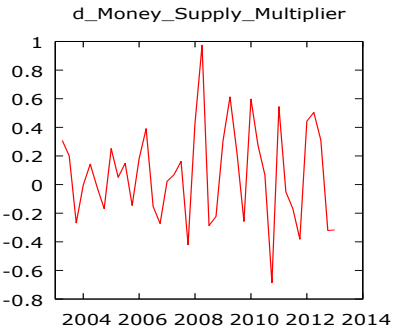


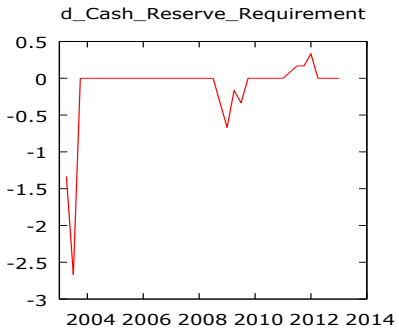
Time Series Plots at First Difference











Appendix III: Unit Root Test

tsset obsevation, quarterly

time variable: obsevation, 2003q2 to 2013q2

delta: 1 quarter

1. dfuller rr, trend lags(1)

Augmented Dickey-Fuller test for unit root Number of obs = 40

	---------- Interpolated Dickey-Fuller ---------		
Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(t) -3.156	-4.242	-3.540	-3.206

MacKinnon approximate p-value for Z(t) = 0.0935

2. dfuller tb, trend lags(0)

Dickey-Fuller test for unit root Number of obs = 40

	---------- Interpolated Dickey-Fuller ---------		
Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(t) -2.315	-4.242	-3.540	-3.204

MacKinnon approximate p-value for Z(t) = 0.4258

3. dfuller crr, trend lags(0)

Dickey-Fuller test for unit root Number of obs = 40

	---------- Interpolated Dickey-Fuller ---------		
Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(t) -5.663	-4.242	-3.540	-3.204

MacKinnon approximate p-value for Z(t) = 0.0000

4. dfuller rp, trend lags(0)

Dickey-Fuller test for unit root Number of obs = 40

---------- Interpolated Dickey-Fuller ---------

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-2.550	-4.242	-3.540	-3.204

MacKinnon approximate p-value for Z(t) = 0.3036

5. dfuller mm, trend lags(0)

Dickey-Fuller test for unit root Number of obs = 40

---------- Interpolated Dickey-Fuller ---------

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-2.892	-4.242	-3.540	-3.204

MacKinnon approximate p-value for Z(t) = 0.1649

6. dfuller d_t_bill, trend lags(0)

Dickey-Fuller test for unit root Number of obs = 39

---------- Interpolated Dickey-Fuller ---------

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-3.756	-4.251	-3.544	-3.206

MacKinnon approximate p-value for Z(t) = 0.0189

7. dfuller d_repo, trend lags(0)

Dickey-Fuller test for unit root Number of obs = 39

---------- Interpolated Dickey-Fuller ---------

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value

Z(t)	-8.609	-4.251	-3.544	-3.206

MacKinnon approximate p-value for Z(t) = 0.0000

8. dfuller d_money_supply_multiplier, trend lags(0)

Dickey-Fuller test for unit root — Number of obs = 39

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
		---------- Interpolated Dickey-Fuller ---------		
Z(t)	-6.235	-4.251	-3.544	-3.206

MacKinnon approximate p-value for Z(t) = 0.0000

9. dfuller d_market_returns, trend lags(0)

Dickey-Fuller test for unit root — Number of obs = 39

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
		---------- Interpolated Dickey-Fuller ---------		
Z(t)	-9.940	-4.251	-3.544	-3.206

MacKinnon approximate p-value for Z(t) = 0.0000

Appendix VI: Cointegration Test

Sample (adjusted): 2003Q3 2013Q1

Included observations: 39 after adjustments

Trend assumption: Linear deterministic trend

Series: MARKET_RETURNS T_BILL CASH_RESERVE_REQUIREMENT REPO MONEY_SUPPLY_MULTIPLIER

Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.870477	133.2203	69.81889	0.0000

At most 1 *	0.513196	53.50841	47.85613	0.0134
At most 2	0.371245	25.43255	29.79707	0.1466
At most 3	0.139603	7.336006	15.49471	0.5389
At most 4	0.037038	1.471893	3.841466	0.2250

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.870477	79.71188	33.87687	0.0000
At most 1 *	0.513196	28.07586	27.58434	0.0433
At most 2	0.371245	18.09655	21.13162	0.1263
At most 3	0.139603	5.864113	14.26460	0.6307
At most 4	0.037038	1.471893	3.841466	0.2250

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

MARKET_RETURNS	T_BILL	CASH_RESERVE_REQUIREMENT	REPO	MONEY_SUPPLY_MULTIPLIER
-157.6718	0.211805	2.518741	-0.354366	0.884924
200.8118	0.524920	-0.496836	-0.280945	-0.796720
-728.2125	0.179097	-0.036102	-0.154151	-0.410543
-3.655248	-0.151593	0.123557	0.375978	0.551205
29.14575	0.074650	0.369665	-0.157920	0.993435

Unrestricted Adjustment Coefficients (alpha):

D(MARKET_ RETURNS)	0.000149	0.000242	0.001086	0.000153	0.000150
D(T_BILL)	-0.513201	-1.086524	0.198626	-0.254984	0.085597
D(CASH_RESERVE_REQUIREMENT)	-0.347020	0.021331	-0.012778	-0.019378	0.020902
D(REPO)	-0.040722	0.428706	0.081242	-0.587133	0.234418
D(MONEY_SUPPLY_MULTIPLIER)	0.015020	0.120180	0.097402	-0.024435	-0.042334

1 CointegratingEquation(s): Log likelihood 43.56750

Normalized cointegrating coefficients (standard error in parentheses)

MARKET_RETURNS	T_BILL	CASH_RESERVE_REQUIREMENT	REPO	MONEY_SUPPLY_MULTIPLIER
1.000000	-0.001343	-0.015975	0.002247	-0.005612
	(0.00027)	(0.00109)	(0.00027)	(0.00073)

Adjustment coefficients (standard error in parentheses)

D(MARKET_RETURNS)	-0.023426
	(0.05620)
D(T_BILL)	80.91734
	(49.1490)
D(CASH_RESERVE_REQUIREMENT)	54.71524
	(5.11905)

D(REPO)	6.420727
	(57.9936)
D(MONEY_S	
UPPLY_MU	
LTIPLIER)	-2.368303
	(9.09164)

2 CointegratingLog
Equation(s): likelihood 57.60543

Normalized cointegrating coefficients (standard error in parentheses)

MARKET_RETURNS	T_BILL	CASH_RESERVE_REQUIREMENT	REPO	MONEY_SUPPLY_MULTIPLIER
1.000000	0.000000	-0.011392	0.001010	-0.005054
		(0.00102)	(0.00014)	(0.00066)
0.000000	1.000000	3.411514	-0.921468	0.415672
		(0.60643)	(0.08465)	(0.39264)

Adjustment coefficients (standard error in parentheses)

D(MARKET_		
RETURNS)	0.025168	0.000158
	(0.09034)	(0.00020)
D(T_BILL)	-137.2695	-0.679037
	(62.6828)	(0.13897)
D(CASH_RE		
SERVE_REQ		
UIREMENT)	58.99877	-0.062303
	(8.23309)	(0.01825)
D(REPO)	92.50985	0.216411
	(91.8930)	(0.20373)
D(MONEY_S		
UPPLY_MU	21.76532	0.066266

LTIPLIER)

	(13.6862)	(0.03034)

3 CointegratingLog
Equation(s): likelihood 66.65371

Normalized cointegrating coefficients (standard error in parentheses)

MARKET_RETURNS	T_BILL	CASH_RESERVE_REQUIREMENT	REPO	MONEY_SUPPLY_MULTIPLIER
1.000000	0.000000	0.000000	5.92E-05	0.000252
			(8.7E-05)	(0.00028)
0.000000	1.000000	0.000000	-0.636831	-1.173368
			(0.08590)	(0.27971)
0.000000	0.000000	1.000000	-0.083434	0.465787
			(0.01188)	(0.03867)

Adjustment coefficients (standard error in parentheses)

D(MARKET_RETURNS)	-0.765381	0.000353	0.000215
	(0.22940)	(0.00018)	(0.00076)
D(T_BILL)	-281.9112	-0.643464	-0.759967
	(187.507)	(0.14426)	(0.62388)
D(CASH_RESERVE_REQUIREMENT)	68.30388	-0.064592	-0.884190
	(24.8229)	(0.01910)	(0.08259)
D(REPO)	33.34812	0.230961	-0.318498
	(277.519)	(0.21351)	(0.92337)
D(MONEY_SUPPLY_MULTIPLIER)	-49.16398	0.083711	-0.025394
	(39.1738)	(0.03014)	(0.13034)

4 CointegratingLog 69.58576

Equation(s): likelihood

Normalized cointegrating coefficients (standard error in parentheses)

MARKET_RETURNS	T_BILL	CASH_RESERVE_REQUIREMENT	REPO	MONEY_SUPPLY_MULTIPLIER
1.000000	0.000000	0.000000	0.000000	0.000187
				(0.00030)
0.000000	1.000000	0.000000	0.000000	-0.477816
				(0.98150)
0.000000	0.000000	1.000000	0.000000	0.556914
				(0.12286)
0.000000	0.000000	0.000000	1.000000	1.092207
				(1.43086)

Adjustment coefficients (standard error in parentheses)

D(MARKET_RETURNS)	-0.765938	0.000330	0.000234	-0.000231
	(0.22845)	(0.00018)	(0.00076)	(0.00018)
D(T_BILL)	-280.9792	-0.604810	-0.791472	0.360628
	(184.255)	(0.14631)	(0.61376)	(0.14517)
D(CASH_RESERVE_REQUIREMENT)	68.37471	-0.061654	-0.886584	0.111663
	(24.6820)	(0.01960)	(0.08222)	(0.01945)
D(REPO)	35.49423	0.319966	-0.391042	-0.339285
	(265.714)	(0.21099)	(0.88510)	(0.20934)
D(MONEY_SUPPLY_MULTIPLIER)	-49.07466	0.087415	-0.028413	-0.063288
	(39.0322)	(0.03099)	(0.13002)	(0.03075)