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The Determinants of Volatility of the Lending Interest Rate in Kenya

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DEDICATION

I dedicate this work to my Mum and my late Father who taught me that hard work pays.

ACKNOWLEDGEMENT

I take this opportunity to thank the almighty God for giving me the strength and grace to conduct this research thesis. Special thanks to my supervisor Dr. Wang'ombe for his consistent guidance, encouragement and patience in reading, correcting and refining my work. I wish to express sincere gratitude to Dr McFie for his moral and financial support.

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ABSTRACT

This study sought to measure the volatility and identify the determinants of volatility of the lending interest rate in Kenya. Both secondary and primary data was used. Primary data was obtained from a sample of 44 financial institutions in Kenya. Secondary data was obtained from the Central bank and Kenya National Bureau of Statistics for the periods 1991 to 2012. This study was guided by the Loanable funds theory. In data analysis, the regression, descriptive statistics, F-test and GARCH models were used. The key findings from the study were: (1) The Garch reaction parameter (α) was 0.61426092 while the Garch persistence parameter (β) was 0.87405664. A high α that is associated with a low (β) produces a very high Garch volatility. This means that the lending interest rate was characterized by high volatility. Following the introduction of the CBR in 2005, volatility reduced from 84% to 22% (2) the main determinants of volatility the lending interest rate are the expected changes in inflation rate, central bank rate, growth domestic policy, treasury bills and exchange rate. The p values were less than 5% and hence significant; (3) the factors that management of financial institutions take into consideration when they are fixing the lending interest rate include, Central Bank rate of Kenya, expected changes in inflation rate, Credit worthiness of the borrower, expected changes in a country's exchange rate, economic growth measured by the GDP, the deposit rate, amount of loan, characteristics of the credit market, nature of the collateral, liquidity and solvency of the bank, level of competition, purchase of government bonds by the banks, bank's expected profits, term of the loan, demand for capital, interbank rate and current year country's budget deficit. The research study confirmed the monetary policy, loanable funds and Fisher's theory of interest rate determination. Inflation, CBR and money supply were found to be major determinants of the lending interest rate. Further research was suggested on; why the lending rate has been on an increasing trend yet volatility has reduced since the CBR introduction? How can the bank's balance sheet and regulatory requirements be made optimal so that they don't have to affect the fluctuations of the lending interest rate with great magnitude?

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LIST OF ACRONYMS

ANOVA: ANalysis Of Variance

ARCH: AutoRegressive Conditional Heteroskedasticity

CBK: Central Bank of Kenya

CBR: Central Bank Rate

CPI: Consumer Price Index

Df: Degrees of Freedom

GARCH: General AutoRegressive Conditional Heteroskedasticity

GDP: Gross Domestic Product

KNBS: Kenya National Bureau of Statistics

TB: Treasury Bills

CHAPTER ONE

INTRODUCTION

Crowder and Hoffman (1996) define interest rate as the price of money that market information reflects regarding expected change in the purchasing power of money or future inflation. According to the Liquidity premium theory, interest is defined as the cost of forgoing or parting with liquidity. From the loanable funds theory, interest rate is defined as the equilibrium rate that equates the demand for loanable funds and supply for loanable funds investment (Dewett & Navalur, 2009). Fisher (1907), defines interest as the premium commanded by present over future goods, and he attributes this premium to three concurrent causes: (i) the perspective underestimate of the future; (2) a possible relative scarcity of present goods as compared with future goods; (3) the technological productivity of wealth with passing time. Therefore, interest rate can be defined as the equilibrium premium commanded by present over future goods to compensate for the change in the purchasing power of money and other unexpected uncertainties.

Odhiambo (2009) discusses the various types of interest rates in Kenya. These include; Treasury bill rate, market interest rates (deposit and lending interest rate), and interbank lending interest rate among others. Treasury bill and Central Bank interest rates decisions are taken by the Monetary Policy Committee (MPC) of the Central Bank of Kenya. According to Central Bank (2011), the official interest rate since August 2005 is the Central Bank Rate. It is the price at which the CBK lends money overnight to commercial banks. It is then used by the commercial banks as one of the dictators the lending interest rate. This study focuses on the lending interest rate and further concentrate on the measurement of volatility and the determinants. The period under study is between 1992 and 2012. This is because the lending rate has not been stable over the years (Central Bank, 2012).

1.1 Background to the study

According to the traditional theories, interest rate is the price of savings determined by demand and supply of loanable funds. It is the rate at which savings are equal to investment assuming the existence of a capital market (Ngugi & Kabubo, 1998). The loanable fund theory argues that interest rate is determined by non-monetary factors. It assigns no role to quantity of money or level of income on savings, or to institutional factors such as commercial banks and the government. The liquidity theory, on the other hand, looks at the interest rate as the token paid for abstinence and inconveniences experienced for having to part with an asset whose liquidity is very high. It is a price that equilibrates the desire to hold wealth in the form of cash with the available quantity of cash, and not a reward of savings. Interest rate is a function of income. Its primary role is to help mobilize financial resources and ensure the efficient utilization of resources in the promotion of economic growth and development (Ngugi & Kabubo, 1998).

Kenya's market interest rates were fairly stable before 1990s due to a combination of price controls and banking controls in the country Parliamentary budget (2011). A study by Kariuki (1995) shows that in the 1960s and 1970s, interest rate policy was fairly inactive. The government administered market interest rates through a regime of fixing minimum lending interest rates for commercial banks, non financial institutions and building societies. The first interest rate review in the post independence era was undertaken in June 1974 when the minimum lending rate was increased by 1%.

Furthermore, "....it had been the official policy in Kenya since independence to follow a low interest rate policy in order to encourage investment and protect the small borrower" (Central Bank of Kenya, 1986:54).

In the 1980s a more gradual interest rate liberalization strategy was adopted following the advice of the IMF and the World Bank. Starting in 1981, a gradual liberalization strategy was pursued and nominal interest rates were reviewed regularly (Odhiambo, 2009). Major reviews were specifically undertaken in October 1982, June 1984, January 1988, April and November 1989, and April 1990 (Odhiambo, 2009). In July 1991 the interest

rates were fully liberalized (Kariuki, 1995). From 1991 to date high market interest rate volatility has been witnessed.

The act of liberalisation was not only actively advocated for by the Central Bank but also by the Bretton Wood's institutions. They have also called for tighter monetary policy in emerging markets to control high inflation economies. Analysts and economic commentators have also argued that increasing interest rates will reverse the depreciation of the Kenya shilling against major currencies by increasing portfolio flows (World Bank, 2012). In addition, high interest rates are meant to control price increases by raising the cost of money hence reducing the spending capacity of households and businesses (Mudida, 2003).

As a result of Kenya's interest rates liberalization, the lending rate has been fluctuating at an increasing rate. For example, the lending interest rate averaged 15.07 % reaching an all time high of 84.67 % in July of 1993 and a record low of 0.83 % in September of 2003. Between February and June 2011, 91 day Treasury bill (T-bill) rates rose by an unprecedented 700 basis points to reach 9%. This level of interest rates was last witnessed in May 2002. Over the same period, the Kenya Shilling depreciated by close to 10%, reaching Kshs 90 to the dollar, a level last experienced in 1993 (Central Bank of Kenya, 2012). The 2011 interest rate crisis could be attributed to high rates of inflation resulting from increases in the cost of food, transport and electricity (Kenya National Bureau of Statistics, 2011).

The determinants of interest rate have been a subject of research interest for a long time (Olweny, 2011). However, extant literature has not concluded on these determinants (Fridah, 2011). For example, in 1930, Fisher established inflation as a determinant of interest rate and found the relationship to be directly proportional. Fisher's study was later opposed by Friedman (1959) whose study in the US found out that inflation doesn't affect the demand for money and therefore disregarded it as a determinant of interest rate,

and Mundell (1963) who observed that the relationship doesn't hold in an economy with monetary assets. Government bond and budget deficit will affect interest rates only if its an interest bearing debt and if the deficit is absorbed by the public (Mundell, 1960).

Whereas Mundell (1963) found interest rates to be uninfluenced by unanticipated once for all changes in the quantity of money, wealth and savings held in form of shares, Thakor (1996) and Van (2001) in the US found regulatory capital requirements affect the lending rate by limiting the supply of credit. Real GDP and inflation were found to be determinants of the lending interest rate by Kashyap, Stein and Wilcox (1993). Better economic conditions improve the number of projects becoming profitable. This increases credit demand and hence the interest rate.

Cox, Ingersoll and Ross (1985) found market's anticipation of future events as a determinant of lending interest rate while an OECD report (1995) on 17 countries identified budget deficit, inflation rate and exchange rate depreciation as the determinants. The demand and supply of loanable funds is one of the factors affecting interest rates. However, this doesn't cover every possible interaction among the factors that affect interest rate movements but its sufficient for understanding why interest rates change over time (Madura, 2002). Baugnet and Hiradisky (2005) identified the loan amount, duration and risk to be the factors affecting the lending interest rate amongst the Belgian banks.

In addition, Weth (2002) found that bank-specific characteristics could influence banks' lending interest rate setting behavior. Banks which heavily depend upon non-insured funding adjust their interest rates more and more quickly than banks whose liabilities are less affected by market movements (Berlin & Mester, 1999). Berger and Udell (1992) sustain that banks that maintain a close tie with their customers will change their lending rates comparatively less and slowly.

Finally, Olweny (2011) found out that the variables that affect the lending interest rate are: the monetary policy, the Government fiscal policy, taxation, inflation, demand for capital, social values, political trends, interest rate on deposits, cost of liquidity, cost of holding cash, and operational costs. The monetary policy is used by the government to control the supply of money in the economy. When supply of money in the economy is low then the interest rates are expected to be high and vice versa. The volatility in money supply growth may lead to higher interest rates. Under the fiscal policy, the Government is supposed to finance all expenditure for the economy. In cases where expenditure exceeds revenue (budget deficit), the Government is forced to borrow from the local markets. This in turn affects the supply of money in the economy which in turn affects the trend of interest rates. Inflation on the other hand causes long-term interest rates to rise where investors sell-off their bonds in fear of inflation eroding their capital gains. Demand for capital influences interest rates when the demand/supply of funds is below or above the equilibrium levels. If there are fewer borrowers and the demand for funds is low then the interest rates will be low and vice versa.

According to Sill (1996), interest rate fluctuations not only affect saving and investment decisions but also have implications on how the prices of certain types of assets are determined. There is a relationship between the volatility of interest rates and the volatility of returns of assets such as options, stocks and bonds amongst others which are purchased on an interest bearing security. Consistent with Sill's research, Olweny (2011) found out that interest rates are important variables in many different areas of a country's economy. They are not only important tools in many economic models but also important risk management tools. In addition, measuring and analysing of volatility of interest rates is a crucial component of any financial market analysis (Sill, 1996). It offers insight to the Central bank in formulating and implementing the monetary policy which is usually steered by short term interest rates and by shaping market expectations.

In conclusion, prior findings haven't provided conclusive evidence on the volatility and determinants of the lending interest rate (Ngugi and Kabubo, 1998; Gambacorta, 2004, Olweny, 2011). This could be attributed to the research timing, difference in methods of measuring determinants and research location (Mojon, 2000; Weber, 2013). Therefore, the research thesis was carried out to identify the level of volatility and the determinants.

1.2 Statement of the Research Problem

Interest rates and price are important variables in the macro economy (Olweny, 2011). They are often monitored by the policymakers, especially for inflation targeting and exchange rate purposes. They are also used as a monetary policy tool to control the flow and money supply in the economy (Mishkins & Eakins, 2005).

In Kenya, interest rates have had high volatility. According to a report by the Parliamentary budget office (2012), there has been high volatility of interest rates since 1992. In the 1990s, high fluctuation of interest rates was associated with macroeconomic mismanagement and bank failures and not formal monetary policy operations in the recent years. Before the 1990's interest rates were fairly stable due to a combination of price controls and banking controls in the country (Parliamentary budget office, 2012). Does it therefore mean that macroeconomic mismanagement and inefficient banking controls have been the real and main cause of interest rate volatility? This study therefore seeks to measure the level of volatility and identify the main determinants of the lending interest rate.

The determinant of interest rate volatility has been a subject of research interest for a long time (Olweny, 2011). However, extant literature has not concluded on these determinants (Gambacorta, 2004). While some authorities find non-monetary factors to be a determinant (Ngugi and Kabubo, 1998), others find that an economy's financial structure, structural characteristics like overall regulatory environment, its exchange rate regime and inflation as a determinant (Montiel, 2012), yet others find that bank's specific

characteristic (Weth, 2002) and bank's relationship with their customers. Banks that maintain a close tie with their customers will change lending rates comparatively less and slowly (Berger and Udell, 1992). The difference in finding may be attributed to difference in methods of measuring determinants (Olweny, 2011), research timing (Weber, 2013) and research location (Mojon, 2000).

The study also seeks to find out whether the interest rates have been more stable since the introduction of Central Bank rate in August 2005. Central Bank Rate is the price at which the CBK lends money overnight to commercial banks and also serves as a signalling instrument for the monetary policy (Central Bank, 2005). The research study is also motivated by the Donde Bill that was presented in parliament in 2001 and the current push for reforms in the lending interest rate by the deputy president. These are meant to cap the lending interest rate and this means having a stable lending interest rate.

1.3 Research Objective

1.3.1 General objective

To assess the volatility of the lending interest rate in Kenya and the determinants

1.3.2 Specific Objectives

- (i) To measure the level of volatility of the lending interest rate in Kenya
- (ii) To identify the determinants of the volatility of the lending rate in Kenya
- (iii) To establish the factors that the management of financial institutions put into consideration when fixing the lending interest rate in Kenya

1.4 Research Questions

- (i) What is the level of volatility of the lending interest rate in Kenya?
- (ii) What are the determinants of volatility of the lending rate in Kenya?
- (iii) What are the factors that the financial institutions put into consideration when fixing their lending interest rates in Kenya?

1.5 Research Justification

This study will be useful to the policy makers and regulators. It will evaluate the contribution of macroeconomic variables on interest rate volatility in the context of a developing country like Kenya. It will also be of great help to policy makers like the Monetary Policy Committee within the Central Bank of Kenya (CBK) when prescribing the Central Bank Rate. The study is also of help to other researchers and academicians in that it provides a stimulus to carry out further research on the same subject matter or related topics so as to increase the already existing volume of knowledge, especially with regard to the current studies on interest rates and management of interest rate volatility crisis.

1.6 Scope of the Study

This study is based on the lending interest rate. It has been carried out in Kenya in the years 1991 to 2012. This period is preferred because its immediate after the liberalization of interest rates upto the current period. A period of 22 years is also considered sufficient for the study because this will provide adequate data points for the study and analysis.

1.7 Organization of the Research Study

This thesis, with the inclusion of chapter one, is organised into five chapters. The four chapters following this introductory chapter are set out to achieve the objectives of the study. Chapter two presents literature review. A review of the theories describing the lending interest rate volatility and determinants has been carried out. Various studies carried out on lending interest rate and its determinants have been explored. Chapter three presents the research methodology and methods employed in the study. The models used in data analysis and the conceptual framework have been explained. Chapter four focuses on data analysis and interpretation. A detailed analysis of the secondary and questionnaires data has been carried out to achieve the objectives set out in the study. Lastly, chapter five presents the discussion, conclusion, recommendation for further research and limitations of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents the literature done on the subject. It discusses volatility and the determinants of interest rates, and the theoretical framework. A developing country, Kenya has been selected and the period of study is 22 years from 1991 to 2012. The study will focus on the Lending interest rate volatility and determinants.

2.2 Determinants of the Lending interest rate volatility

The determinants of lending interest volatility have been taken to be the same as the determinants of the lending interest rate in this study. This is consistent with prior findings by Sill (1996) and was also adopted by Olweny (2011). Madura (2002) identified demand and supply of loanable funds as one of the factors affecting interest rates. However, this does not cover every possible interaction among the forces that can affect interest rate movements but it is sufficient for understanding why interest rates change over time. A Study by Baugnet and Hiradisky (2005) in Belgian shows that the average lending rates vary according to the amount, duration and the risk of the loan. According to an OECD report (1995), budget deficit, inflation rate, exchange rate depreciation are the main determinants of the lending interest rate.

According to Ottoman (1970), the determinants of the lending interest rate include the liquidity premia, budget deficit and inflation. Although liquidity preference provided a good explanation on the interest rate variation, statistic showed that a systematic element had been omitted and therefore the explanation was not satisfactory. Mundel (1963) observed that the budget deficit and public debt will always affect the lending interest rate if government borrows money from the public and if the instruments are interest bearing securities. Fisher (1930), observed the relationship between interest rates as directly proportional, that is, for a given proportion change in inflation there will be an equal change in the rate of rate of interest. However, in 1963, Mundell concluded that this

observation didn't hold and especially in an economy with monetary assets. Friedman (1959) had a different view and disregarded interest rate as one of the determinants of interest rates in the US. He observed that inflation doesn't affect the demand for money and this could be one of the reasons he disregarded it as a determinant of interest rates.

Yohe and Kanorsky (1969) began to reassess the impact of inflation on interest rates. He observed that for each percentage increase in inflation there is always an increase in interest rates by 0.66. Mundell (1963) observed that equilibrium interest rate is uninfluenced by unanticipated once for all changes in the quantity of money. Wealth and savings held in form of shares and investments doesn't affect the interest rates. The Donde Bill was presented in parliament in 2001 but the president and the Members of Parliament did not assent to it. The bill sought to address the high cost of lending by pegging maximum lending and lowest deposit rates on Treasury Bill rates and narrow the gap between the lending and deposit rate. The banks were not supposed to charge an interest higher than 4% above the rate set by the Monetary Policy Committee (MPC). The bill was rejected on the basis that it was a move against the free market economy and banks do not have a uniform lending rate from where to increase or lend (Kenya Bankers Association). There are also theories explaining the interest rate determination. The major theories include: classical or real theory interest rate determination, loanable funds theory, rational expectations theory and the Keynesian theory.

2.3 Theoretical Framework

2.3.1 Classical or Real Theory of interest rate

According to classical or real theory of interest rate, the rate of interest is determined by the equilibrium of savings and investment (Dewett & Navalur, 2009). It further seeks to explain the determination of the rate of interest by real factors like productivity and thrift, that is, productivity of capital goods and savings of goods. According to the theory, the rate of interest is a payment for saving. The rate of interest is, thus, determined by the demand for saving to invest in capital goods and the supply of savings.

2.3.1.1 Demand for savings

The demand for capital goods comes from firms which desire to invest, that is, to purchase or to make new capital goods. Capital goods are demanded because they can be used to produce consumer goods. They have revenue productivity like all other factors of production (Madura, 2007).

2.3.1.2 Supply of savings

According to the Real theory, the money which is to be used for purchasing capital goods is made available by those who save from their current income (Dewett & Navalur, 2009). By postponing consumption of a part of their current income, they release resources for productive purposes (Madura, 2002). However, people prefer the present enjoyment of goods and services to the future enjoyment of the same (Fisher, 1965). Therefore, an incentive such as interest has to be used to encourage people to save. Saving involves an element of waiting for the future enjoyment of savings.

2.3.1.3 Equilibrium between Demand and Supply

According to Fisher (1965), the rate of interest is determined by the interaction of the forces of demand for capital (or investment) and the supply of savings. The rate of interest at which the demand for capital (or demand to invest in capital goods) and the supply of savings are in equilibrium will be the rate determined in the market.

2.3.1.4 Limitations of the theory

The classical theory of interest is based on the assumption of full employment of resources. It assumes that an increase in the production of one thing must mean withdrawal of resources from the production of other things (Miltersen, 1994). Within the framework of a system of theory, built on the assumption of full employment, the notion of interest as a reward for abstaining or abstinence is highly plausible. It is the premise that resources are fully employed that lacks plausibility in the contemporary world. If at

any time in the country, unemployed resources are found on the large scale, there is no need for people to pay abstaining from consumption (Dewett & Navalur, 2009).

By assuming full employment of resources, the classical theory has neglected the changes in the income level (Dewett & Navalur, 2009). This has led to the error of viewing the rate of interest as the factor which brings equality of savings and investment. However, according to Keynes (1936), equality between savings and investment is brought about not by changes in the rate of interest but by changes in the level of income.

According to the classical theory of interest, more investment (production of capital goods) can take place only by curtailing consumption. Greater the reduction of consumption, more are the savings and therefore the investment. But a decrease in the demand for consumer goods is likely to lessen the incentive to produce capital goods and therefore, will affect investment adversely (Dewett & Navalur, 2009).

2.3.2 Loanable funds theory of interest

The loanable funds theorists believed in the time preference explanations of how interest rates arise (Madura, 2002). According to the Neo-classical theory, interest is the price paid for the use of loanable funds. Similarly to classical and Keynesian theories of interest, it is also a demand and supply theory. It views the level of interest rates in a financial markets resulting from factors that affect the supply and demand for loanable funds. The supply of loanable funds is used to describe funds provided to the financial markets by the net suppliers of funds. The demand for loanable funds is used to describe the total net demand for funds by fund users. The loanable funds framework categorises financial market participants-suppliers and demands of funds- as consumers, businesses, governments, and foreign participants. Madura (2002) summarises the factors that affect supply and demand for loanable funds, their impact on market clearing interest rates holding all other factors constant.

2.3.2.1 Limitations of the theory

The loanable funds theory is indeterminate. According to the theory, the rate of interest is determined by the intersection of the demand curve for loanable fund with the supply curve. The supply of loanable funds is composed of savings plus bank credit and dishoarding. But since the savings part of the supply curve varies with the level of income it follows that the total supply of loanable funds will also vary with income (Dewett & Navalur, 2009).

2.3.3 Rational expectations theory

According to the rational expectations theory of interest rates, interest rates are a function of investors' expectations (Kolari and Rose, 1995). The theory is based on the idea that prices of securities reflect all available and relevant information, as investors act rationally to maximise their profits, and transactions and information costs are not significant barriers to market trading.

2.3.4 The Liquidity preference theory

According to Keynes, interest is the reward for parting with liquidity for a specified period. Keynes put across the propensity to consume and save which are the ratio of consumption and savings respectively. These two affect liquidity. The desire for liquidity also arises because of three motives: the transaction motive, precautionary motive and speculative motive (Dewett and Navalur, 2009).

The liquidity preference theory is also an extension of the unbiased expectations theory. It is based on the idea that investors will hold long term maturities only if they are offered at a premium to compensate for the future uncertainty in a security's value, which increases with an asset's maturity (Madura, 2002). In a world of uncertainty, short term securities provide greater marketability (due to their more active secondary market) and have less price risk (due to smaller price fluctuations for a smaller change in interest

rates) than long-term securities. Consequently, investors prefer to hold short term securities because they can be converted into cash with little risk of a capital loss, that is, a fall in security below its original purchase price. According to Kolari and Rose (1995), investors must be offered liquidity premium to buy longer term securities which have a higher risk of capital losses. The difference in price or liquidity risk can be directly related to the fact that longer term securities are more sensitive to interest rate changes in the market than the short term securities. The longer the maturity of a security the greater its risk, the liquidity premium increases as maturity increases. The liquidity premium theory concludes that long term interest rates are equal to geometric averages of current and expected short-term rates plus liquidity risk premium that increase with the maturity of the security (Dewett and Navalur, 2009).

2.3.4.1 Limitations of the theory

Keynes pointed out that the rate of interest is not purely a monetary phenomenon. Real forces like productivity of capital and thriftiness or saving by the people also play an important role in the determination of interest rates (Ferris and Makhija, 1987). Keynes makes the rate of interest independent of the demand for investment funds. Actually it is not so independent. The cash-balances of the business are largely influenced by their demand for savings for capital investment. This demand for capital investment depends upon the marginal revenue productivity of capital. Therefore, the rate of interest is not determined independent of the marginal efficiency of capital. Liquidity preference is not the only factor governing the rate of interest (Dewett & Navalur, 2009). Therefore, there are other several other factors which influence the rate of interest by affecting the demand for and supply for investible funds.

Liquidity preference theory doesn't explain the existence of different rates of interest prevailing in the market at the same time. Owing to the perfect homogeneity of cash balance the rates of interest have to be uniform (Evans & Wachtel, 1989).

Keynes ignores saving or waiting as a means or source of investible funds. To part with liquidity without there being any saving is meaningless. The Keynesian theory only explains interest rate in the short run. It gives no clue to the rate of interest in the long run (Kolari & Rose, 1995).

2.4 Comparison of different theories

The basis of comparing different theories is to identify the gap created by each theory in the determinants of the lending interest rate.

2.4.1 Keynesian vs. Classical Theory

According to Dewett and Navalur (2009), the classical theory applies to a situation of full employment and constant national income, whereas the Keynesian Theory assumes equilibrium with less than full employment, where both employment and income are fluctuating.

The classical theory assumes income to be constant, saving is regarded as the fixed and the rate of interest is determined by the investment demand curve. It is the rate of interest which brings about equilibrium between saving and investment. On other hand, according to the Keynesian theory, there is a separate savings curve corresponding to each level of income and employment and the rate of interest is determined and by the intersection of the liquidity preference and money supply schedule (Ferris and Makhija, 1987). The classical theory regards the available funds as the supply factor, whereas Keynes treats them as a demand factor since they are determined by the people's liquidity preference (Dewett & Navalur, 2009).

Keynesian saving is out of income. Therefore, according to Keynes, higher rate of interest will not increase savings as is the behalf of the classical economists, because it will discourage investment and so decrease income out of which saving has to come. According to the view of the classical economists, saving automatically leads to

investment. But Keynes held quite the opposite view, viz, investment result in saving out of current income. In the classical view, investment could be increased by saving more, but according to Keynes it is investment which determines the volume of saving through the multiplier process (Fama, 1984).

2.4.2 Keynesian Vs Loanable funds Theory

Keynesian theory regards money as stock, whereas the loanable funds theory treats money as a flow. Therefore, the Keynesian Theory explains the rate of interest at any given moment when the money stock is assumed to be fixed while the loanable funds theory explains interest over a period of time when the supply of money is supposed to be fluctuating (Ferris & Makhija, 1987).

According to the Keynesian theory, it is the demand for and supply of money which determine the rate of interest, whereas according to the loanable funds theory, the rate of interest is simply the price of credit, and, as such is determined by the demand for, and the supply of, credit. Hence, the banking industry can influence the rate of interest by expanding or contracting credit. In the Keynesian theory supply of money is regarded as given (Fongemie, 2005).

Keynesian theory explains interest in a situation of less than full employment, while the loanable funds theory is valid in the long run period when full employment of human and material resources has been realised. As a result, the two theories may be regarded as complementary (Fongemie, 2005).

2.5 Term structure of interest rates

According to Madura (2002), term structure of interest rates refers to the relationship between interest rates and the term to maturity. Cox, Ingersoll and Ross (1985) describe the term structure of interest rates as a measure of the relationship among the yields on default-free securities that differ only in their term to maturity. Richard (1978) further

discusses the three theories that explain the term structure of interest rates which include: unbiased expectations theory, Liquidity premium theory and the Market segmentation theory

2.5.1 Unbiased expectations theory

According to the unbiased expectations theory of interest rates, at a given point in time the yield curve reflects the market's expectations of future short term rates (Richard, 1978).

2.5.2 Liquidity premium theory

The liquidity premium theory of term structure of interest rates is an extension of the unbiased expectations theory. It is based on the idea that investors will hold long-term maturities only if they are offered at a premium to compensate for future uncertainty in a security's value, which increases with an asset's maturity. In a world of uncertainty short term securities provide larger marketability and have less price risk than long-term maturity securities. Consequently, investors prefer to hold short term maturity securities because they can be converted into cash with little risk of capital loss, that is, a fall in the price of the security below its original purchase price. Thus, investors must be offered a liquidity premium to buy longer term securities which have a higher risk of capital losses. The difference in the price or liquidity risk is directly related to the fact that longer term securities are more sensitive to interest rate changes in the market than the short term securities. The longer the maturity of a security the greater its risk, the liquidity premium increases as maturity increases (French, 1983).

The liquidity premium theory states long-term rates are equal to geometric averages of current and expected short term rates, plus liquidity risk premiums that increase with the maturity of a security (Ferris and Makhija, 1987).

2.5.3 Market segmentation theory

It argues that borrowers and lenders have specific maturity preferences, and to get them to hold securities with maturities other than their most preferred requires higher interest rate (Modigliani, 1966). Accordingly, the market segmentation theory does not consider securities with different maturities as perfect substitutes. Rather individual investors and FIs have preferred investment horizons dictated by the nature of liability they hold. It therefore argues that the rates for different terms to maturity tend to be determined, each in its different market, by their independent demand and supply schedules. For example, banks might prefer to hold relatively short term treasury bonds because of the short term nature of their deposit liabilities, while insurance companies may prefer to hold long term treasury bonds because of the long term nature of their insurance contractual liabilities (Diller, 1969).

Accordingly, interest rates are determined by distinct supply and demand conditions within a particular market segment. The market segmentation theory assumes that investors and borrowers are generally unwilling to shift from one maturity sector to another without adequate compensation in the form of an interest rate premium. The higher the yield of securities (the lower the price), the higher the demand for them. The supply of securities decreases in the short term market and increases in the long term market, the slope of the yield curve becomes steeper (Diller, 1969).

2.6 Factors determining interest rates

Fundamentally, interest rates are determined in the market based on individuals' willingness to borrow and lend (Berk and DeMarzo, 2011). Other factors that have been put forward as the determinants of interest rates include:

2.6.1 Inflation

According to Tucker (2000), inflation refers to an increase in the general (average) price level of goods in the economy. It is measured using a Consumer Price Index (CPI). CPI

measures the changes in the average prices of consumer goods and services (Tucker, 2000). Berk and DeMarzo (2011) differentiate nominal interest rates and real interest rates. Nominal interest rates are the interest rates that are quoted by banks and other financial institutions. They indicate the rate at which money will grow if invested for a certain period while the real interest rates is the nominal interest rate less inflation. The relationship is given as follows;

$$i_n = i_r + p_e$$

where:

i_n = nominal interest rate

i_r = desired real interest rate

p_e = inflationary expectations

Fisher (1930) postulated that the nominal interest rate consists of an expected “real” rate plus an expected inflation rate. He also believed that the real and monetary sectors of the economy are independent. Thus, he hypothesized that the expected real return on interest rates is determined by real factors, such as the productivity of capital, time preference of savers, and tastes for risk, and that the expected real return on interest rates and the expected inflation rate are independent.

The Fisher effect (1930) theorizes that nominal interest rates observed in financial markets must compensate investors for (1) any reduced purchasing power on funds lent (or principal) due to inflationary pressure changes and (2) an additional premium above the expected the rate of inflation for forgoing present consumption . The nominal market interest rate will be equal to the real interest rate when market participants expect inflation to be zero. Similarly, nominal interest rates will be equal to the expected rate of inflation for forgoing the consumption;

$$\text{Expected (IP) + RIR (Real Rate of Interest) + (RIR * Expected IP)}$$

Where (RIR * Expected IP) is the inflation premium for the loss of purchasing power on the promised nominal interest

Studies, such as those of Fama (1975), Atkins (1989), (1996), have supported the Fisher hypothesis, while other studies, such as those of Mishkin (1981, 1984), Barthold and Dougan (1986), and Rose (1988), have shown contradictory evidence. Still other studies, such as those of MacDonald and Murphy (1989), Wallace and Warner (1993), and Engsted (1996), found that the empirical validity of the Fisher hypothesis varied when it was analyzed to different time periods or countries.

Kolari and Rose (1995) further describe that the higher the level of actual or expected inflation, the higher will be the level of interest rates. The intuition behind the positive relationship between interest rates and inflation rates is that an investor who buys a financial asset must earn a higher interest rate when inflation rate increases to compensate for the increased cost of forgoing consumption of real goods and services today and buying those more highly priced goods and services in the future. Inflation is measured using the Consumer (Producer) Price Index. This is defined as the increase in the price of a standardized basket of goods and services over a given period of time (Tucker, 2000).

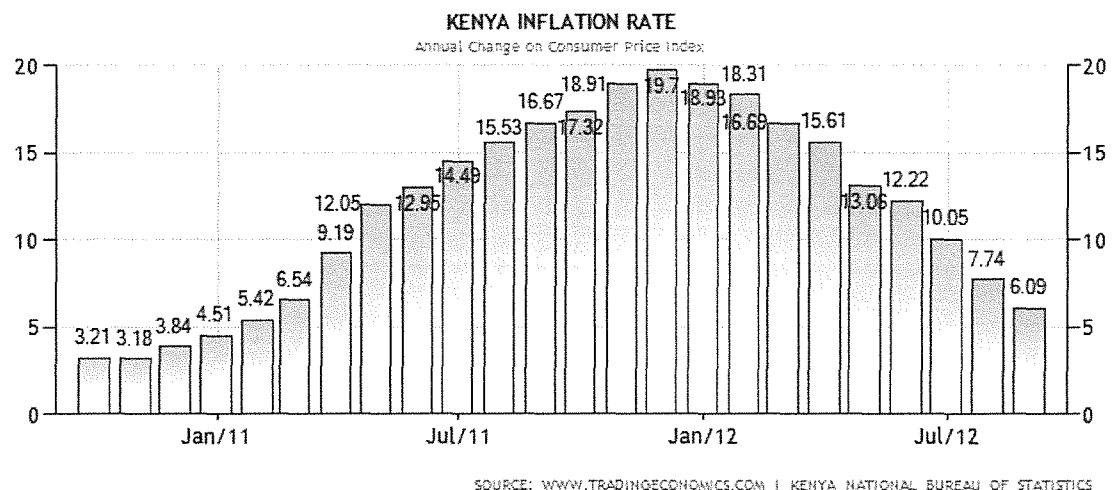
Friedman (1977) in his Nobel address claims that inflation and nominal uncertainty are positively correlated and causation runs from inflation to uncertainty about future inflation. An increase in inflation may induce an erratic policy response by the monetary authority that creates more uncertainty about future rates of inflation. Demetriadas (1988) shows the presence of asymmetric information but did not mention the direction of causality. Increased inflation uncertainty may increase unanticipated inflation. In turn, costs will be associated with the anticipated and nominal uncertainty effects on interest rates (Huizinga, 1993). Wilson (2006) studied the link between inflation, inflation uncertainty and output growth using a EGARCH-M model and found that increased inflation uncertainty increased inflation and lowered economic growth for Japan.

Wilson and Culver (1999), Grier and Perry (2000), Hayford (2000), Fountas et al. (2002) and Grier et al. (2004) found a similar negative relationship between inflation uncertainty and output growth, while, Levin and Renelt (1992), Levin and Zervos (1993) and Clark (1997) failed to find any such relationship.

2.6.1.1 Inflation Rate in Kenya

The inflation rate in Kenya was recorded at 5.4 % in September of 2012. Historically, from 2005 until 2012, Kenya Inflation Rate averaged 12.6 % reaching an all time high of 31.5 % in May of 2008 and a record low of 3.2 % in October of 2010. In Kenya measured against a standard level of purchasing power. The most well known measures of Inflation are the Consumer Price Index (CPI) which measures consumer prices, and the GDP deflator, which measures inflation in the whole of the domestic economy.

2.6.1.2 Analysis of inflation using CPI



2.6.2 Foreign flows of funds

The interest rate for a specific currency is determined by the demand for funds demonstrated in that currency and the supply of funds available in that currency. The interrelation between exchange rates and interest rates are explained by the purchasing

power parity, the international fisher relation, the real rate of return relation and the forward parity theorem (Sjolander, 2007; Staudinger, 2002; Arize et al., 2003). The exchange rates have impact on the interest rates whether in short or long run with in varying levels. The reason for that effect is the arbitrage opportunity and equilibrium theory in that if there is any arbitrage opportunity among the financial markets, the investors use that opportunity until the prices come into equilibrium.

2.6.2.1 Impact of exchange rates on interest rates

In finance, the effects of exchange rates on interest rates are modelled in alternative theories. The purchasing power parity, the international fisher relation, the interest rate parity theorem, the real rate of return relation, the forward parity theorem are the well-known approaches to model the interrelation between exchange rates and interest rates (Sjolander, 2007; Staudinger, 2002; Arize et al., 2003). The common argument in these theories is that the exchange rates have impact on the interest rates whether in short or long run with in varying levels. This is because of the arbitrage opportunity and equilibrium theory in that if there is any arbitrage opportunity among the financial markets, the investors use that opportunity until the prices come into equilibrium (Ramsey & Lampart, 1998). According to Granger causality test (1969), exchange rates affect interest rates for all the scaled time series. This means that exchange rate affects interest rates only in the short and long period but not in the middle period. The causality relationship is strong in the short run, while the effect decreases in the mid-run. However, in the long runs, the relationship is getting strong again

2.6.3 Interbank rate

Interbank rate refers to the interest rate charged on short term loans made between banks in order to manage liquidity and meet the requirements placed on them (Central Bank, 2012). Prior findings have found the interbank interest rate volatility to have more effect on the interest on loans with respect to that on deposits (Angbazo, 1997).

2.6.4 Gross Domestic Product

GDP is a measure of a country's total output over a specific period of time (Mudida, 2003). Changes in a country's economic growth are measured by the GDP constant values. According to Gambacorta (2004), the lending interest is positively influenced by the real GDP.

2.6.5 Market Capitalisation

Market capitalisation refers to the value of shares traded in the stock market over a particular period of time (Arango, 2002). Various research studies have been carried out in different research locations. For example, prior findings in Colombia by Arango (2002) found that some evidence of the nonlinear and inverse relationship between the share prices on the Bogota stock market and the interest rate. This is consistent with findings by Mahmudul and Gazi (2009) in six developed countries. They found a significant negative relationship between changes in share price and changes in interest rate.

2.6.6 Money Supply

According to Dewett & Navalur (2009), the lending interest rate is a function of money supply. Interest rates are determined by the interaction of the forces of demand and supply of money. Madura (2002), identified the demand and supply of money to be one of the factors affecting interest rates determination. This is sufficient for understanding why interest rates change over time but it doesn't cover every possible interaction among the forces that can affect interest rate movements.

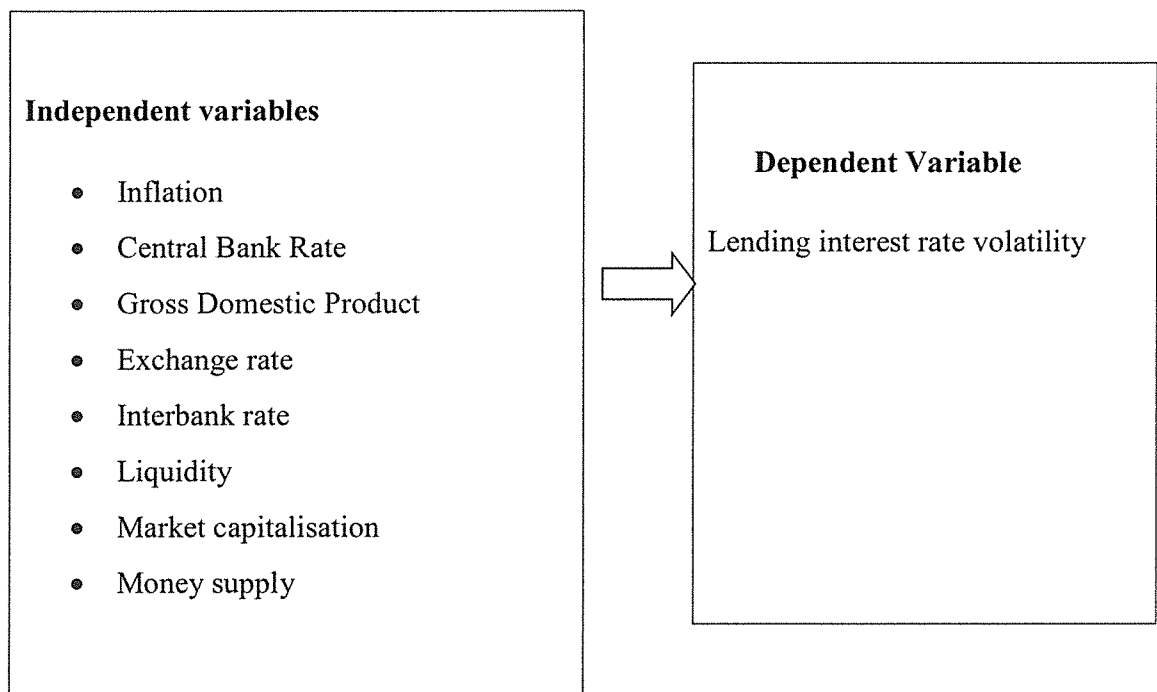
2.7 Conceptual Framework

A conceptual framework is the foundation on which the entire research thesis is based (Sekaran, 2004). It logically develops, describes and elaborates the network of association between the dependent and the independent variables.

The dependent variable lends itself to be the subject of investigation. The independent variables cause positive or negative changes in the dependent variable.

2.7.1 Relationship between dependent and independent variables

The framework for interest rate determinant and volatility analysis is largely borrowed from Coulson & Robins (1985), Domowitz & Hakkio (1985) and Engel, Hendry & Trumbull (1985) provided by Greene (2002). In all of these studies, the variables to be used were divided into dependent and independent variables. Below is the conceptual framework for the research study;



CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The initial stages of the research have been devoted to a review of empirical literature on the lending interest rate in Kenya, with emphasis on the previous studies and the existing theoretical framework. This chapter describes the overall methodology used in the study and adopts the following structure: research design, population and sample size, data collection methods, research procedures, and data analysis and presentation methods.

3.2 Research design

Yin (2009) defines research design as the logic that links the data to be collected and the conclusions to be drawn, to the initial questions of the study. It also encompasses the methodology and procedure employed to conduct the research.

This study adapted a longitudinal research strategy, which aims at describing the lending interest rate volatility and determinants between 1991 and 2012. This is because it allows the analysis of duration, permit the measurement of differences or change in a variable from one period to another, and can be used to locate the causes of a phenomena (Menard, 1991). A quantitative research design based approach will be adopted to enable the researcher collect and analyse data.

The study of the lending interest rate places more emphasis on a full contextual analysis of fewer events, conditions and their interrelations to the subject matter at hand. It explores, explains and describes a given phenomenon or situation (Robert, 2004).

3.3 Model specification

In order to test existence and causes of volatility in the lending interest rate, the variables are studied separately using the ordinary least squares (OLS) regression. OLS is considered as a simple way of detecting the determinants of the lending interest rate. The

objective is to test whether there is a statistical significant relationship between the lending interest rate (R_t) and each the dependent variables. Initially, the study will begin with a determinants model specification and then proceed to the volatility analysis. For determinants relationship testing, the following regression model is constructed:

$$R_t = y_0 + y_1 I_t + y_2 CBR_t + y_3 E_t + y_4 TB_t + y_5 MC_t + y_6 IB_t + y_7 MS_t + \varepsilon_t$$

Where R_t is the lending interest rate, I_t is the inflation rate variable, CBR is the Central Bank Rate, E_t is the exchange rate, TB is the Treasury Bill Rate, MC is the market capitalisation, IB is the interbank rate, MS is the money supply, y_1 to y_7 are the coefficients for each variable, and ε_t is the random error term. These variables have been used for this study because they are the most cited by many of the researchers such as Fisher (1930), Kashyap, Stein and Wilcox (1993), Angbazo (1997), Owoye & Onafowora (2007), Fridah (2011) and Olweny (2011) amongst others.

The model is tested for the null hypothesis

$$H_0: \mu = 0 \text{ for } \gamma_1 = \gamma_2 = \gamma_3 \dots = \gamma_n$$

against the alternative hypothesis that there is no significant relationship between the independent variables and the lending interest rate. If there is no relationship, the coefficients for the variables are not significantly different from zero meaning that the dependent variables have no effect lending interest rate. The F-test is employed for testing the hypothesis because it explains the joint significance of the independent variables to the dependent variable. The assumptions behind the linear regression model include the following: variance of the error terms must be constant, the error terms are statistically independent and are uncorrelated and the error term follow the normal distribution. To test the series for autocorrelation, the Durbin-Watson (D-W) statistic is used. When the DW-statistic is equal to the value of two there is no autocorrelation in the

residuals. When it has a value of zero, there is perfect positive autocorrelation in the residuals and a statistic of four corresponds to the case where there is perfect negative autocorrelation. The DW does not follow a standard statistical distribution but there are critical values based on number of observations and explanatory variables excluding the constant. In this case as an approximate, we don't reject the null hypothesis of no autocorrelation unless the DW is outside a 1.5-2.5 boundary.

3.4 Operationalization of variables

The variables are divided into dependent and independent variables. The dependent variable is the lending interest rate, which is defined as the cost of forgoing or parting with liquidity. It is the equilibrium rate that equates the demand and supply of funds. The independent variables are the variables that cause the lending interest rate to change. These include:

3.4.1 Inflation

Inflation refers to an increase in the general (average) price level of goods in the economy. It is measured using a Consumer Price Index (CPI). CPI measures the changes in the average prices of consumer goods and services (Tucker, 2000)

$$\text{CPI} = \frac{\text{CPI in a given year} - \text{CPI in previous year}}{\text{CPI in previous year}} \times 100$$

Expected future short-term real interest rates are assumed to be stationary. According to Wallace and Warner (1993), the link between interest rates and inflation depends on how inflationary expectations are formed. If market participants form expectations of future inflation based on the time-series properties of past short-term inflation rates, the time-series properties of inflation will govern the extent to which it is transmitted to interest rates. In particular, if the one-period inflation rate has a single unit root, the innovations in it will ultimately dominate changes in expectations of future long-term inflation. A single unit root implies that expectations of inflation embodied in the current short rate will be the basis for inflation expected over all future time horizons. In this case, the null hypothesis will be accepted.

For detecting the effect of inflation on interest rate, the following regression model is constructed:

$$R_t = \gamma_0 + \gamma_1 l_{it} + \varepsilon_t$$

Where R_t is the Lending interest rate on Quarter t , l_{it} is the inflation rate, γ_0 is the intercept which measures the real rate of return day, and the coefficients from γ_1 to γ_n measures the relationship between inflation and the lending interest rate, and ε_t is the random error term.

Inflation rates used in the regression analysis were obtained from Kenya National Bureau of statistics.

3.4.2 Central Bank Rate

Central Bank Rate (CBR) is the price at which the CBK lends money overnight to commercial banks. It also serves as a signalling instrument for monetary policy (Central Bank, 2012). Quarterly Central Bank Rates were used in the regression analysis. This data was obtained from the Central Bank of Kenya database.

3.4.3 Exchange Rate

An Exchange rate is the price at which one currency trades for another (Mudida, 2003). The Central Bank of Kenya compiles indicative foreign exchange rates daily for use by the general public. These rates reflect the average buying and selling rates of the major participants in the foreign exchange market at the open of trade every day, thus providing a good indicator for any interested party on the value of the shilling on any particular day (Central Bank, 2012).

The rates provided by the central bank are only indicative and the forex dealers, that is, commercial banks and forex bureaus, may apply varying rates on their forex transactions. It is expected that competition among the dealers will lead to reasonable and competitive

margins being applied to forex transactions with customers. All forex deals are transacted on a willing buyer willing seller basis and are subject to negotiation between the forex dealers and their customers (Central Bank, 2012).

Quarterly exchange rates were used in the regression analysis. This data was obtained from the Central Bank of Kenya database.

3.4.4 Interbank rate

Interbank rate refers to the interest rate charged on short term loans made between banks (Central Bank, 2012). Data published by the CBK was used in the regression analysis.

3.4.5 Gross Domestic Product

Mudida (2003) defines gross domestic product as a measure of a country's total output in a specific period in time. GDP data was obtained from the KNBS database.

3.4.6 Market Capitalisation

Market capitalisation refers to the value of shares traded in the stock market over a particular period of time (Arango, 2002). Data used for this study was obtained from the Nairobi Securities Exchange.

3.4.7 Money Supply

Money supply refers to the amount of currency that is in circulation (Keynes, 1930). This is in form of both notes and coins. Data used for this study was M2 because it covers the currency outside banks plus private sector demand with banks (Central Bank, 2012). Liquidity is also covered under M2.

$M2 = (M1 + M0 \text{ plus private sector quasi-monetary deposits with banks})$

$M1 = M0 + \text{private sector demand deposits with banks}$

$M0 = \text{currency outside banks}$

3.5 Population, sample size and sampling design

The population under study was the lending interest rate and its variables in the Kenyan financial institutions. The lending interest rate is the rate at which interest is paid by borrowers for the use of money that they borrow from a lender (Madura, 2002). The lending interest rate has been considered amongst other interest rates because it is influenced by macroeconomic variables. Unlike the Treasury bill rate and the Central Bank Rate which are determined by the Central Bank, the lending interest rate is a factor of macroeconomic variables (Central Bank, 2012). It is therefore a fair representation of a floating interest rate in an economy because its not fixed by the policy makers.

The period of study was 22 years, that is, from 1991 to 2012. This period was considered due to data availability and provides sufficient data points for analysis. 1991 is also the immediate period after the liberalization of interest rates in Kenya. The Central Bank rate was also introduced in 2005 and is the price at which the CBK lends money overnight to commercial banks. It also serves as a signalling instrument for monetary policy (Central Bank, 2012).

According to Central Bank (2012), Kenya has 44 financial institutions, 31 are locally owned and 13 are foreign owned. A sample population of 44 banks (equivalent to the population) is intended to be taken for the study. This is a representative size of the actual population since its not too large. It also helps eliminate bias and increase objectivity to the study.

3.6 Data collection

The study is based on both primary and secondary data. Secondary data was obtained from the Central bank database, World Bank database and Kenya National Bureau of Statistics. The rationale behind the use of secondary data from various published sources is that it allowed the researcher back on the information under study and enabled the

collection of in-depth data on the population being studied. After the analysis of data the findings were presented in tables, charts, graphs and Figures. This helped establish the determinants of the lending interest rate and the volatility in the interest rates in Kenya.

Primary data was collected through the use of a questionnaire. The use of a questionnaire helped capture the qualitative factors that banks management take into consideration while fixing their lending interest rates. It also helps explain why different banks will offer different lending interest rates to different borrowers. The rationale behind the use of a questionnaire is that it allowed the researcher back on the information under study and enabled the collection of in-depth data on the population being studied. The questionnaire also establishes rapport and motivates respondents, ensure almost a 100% response rate and doubts can be clarified (Sekaran, 2004).

3.7 Data analysis and presentation methods

Regression analysis was employed and a variety of descriptive statistics and statistical tests were used to arrive at a conclusion. In addressing objective 1 of the study, Volatility was measured using the GARCH ARCH model. In addressing objective 2, a regression analysis was formulated so as to identify the determinants of the interest rate. In addressing objective 3, a questionnaire was developed to explain the factors that bank managers take into consideration when they are setting up their lending interest rate. Descriptive statistics tools such as mean, standard deviation and variance were used in data analysis. Data was then presented using tables and graphs.

For objective 1, the GARCH model was used. Volatility is explained by variance and standard deviation measures of the errors. The following model was used;

$$\sigma_t^2 = \alpha_0 + \alpha_1 \epsilon_{t-1}^2 + \dots + \alpha_q \epsilon_{t-q}^2 + \beta_1 \sigma_{t-1}^2 + \dots + \beta_p \sigma_{t-p}^2 = \alpha_0 + \sum_{i=1}^q \alpha_i \epsilon_{t-i}^2 + \sum_{i=1}^p \beta_i \sigma_{t-i}^2$$

$$\sigma_t^2 = \alpha_0 + \alpha_1 \epsilon_{t-1}^2 + \dots + \alpha_q \epsilon_{t-q}^2 + \beta_1 \sigma_{t-1}^2 + \dots + \beta_p \sigma_{t-p}^2 = \alpha_0 + \sum \alpha_i \epsilon_{t-i}^2 + \sum \beta_i \sigma_{t-i}^2$$

Error terms (ϵ_t) were obtained through the lagging process. GARCH model was then used to test the variance of the errors because we are dealing with time series data. It is a deterministic function of lagged volatility estimates and lagged squared forecast errors. This model was developed by Engel (1982) and has been adopted by several researchers including McCullough and Renfro (1999), and Olweny (2011) amongst others. Under Garch, the following parameters were tested, the Garch reaction and the Garch persistence as indicated by (α) and (β) respectively. The Garch reaction parameter (α) usually ranges between 0.05 (for a market that is relatively stable) and 1.00 (for a market that is jumpy or nervous). On the other hand, the Garch persistence parameter (β) usually ranges between 0.85 and 0.98 with lower values being associated with a high α . Garch volatilities with a relatively high α and relatively low (β) are more spiky than those with relatively low (α) and relatively high (β). A high α that is associated with a low (β) produces a very high Garch volatility. The results obtained from the data then helped explain volatility.

For objective two, the following variables were used; lending interest rate, central bank rate, inflation rate, interbank rate, market capitalisation, money supply, Treasury bill rate and exchange rate. Data collected was regressed against the dependent variable so as to identify the determinants, that is, the independent variables with a significant p-value.

$$R_t = \gamma_0 + \gamma_1 I_t + \gamma_2 CBR_t + \gamma_3 E_t + \gamma_4 TB_t + \gamma_5 MC_t + \gamma_6 IB_t + \epsilon_t$$

The independent variables data was regressed against the dependent variable data. Regression is chosen because it is the most commonly applied data analysis methodology by researchers. It also shows the relationship. It does not only show positive, negative or no relationship but also the strength of the relationship (Johnson & Kuby, 2007). The coefficient of correlation was measured to show whether there is a relationship between the dependent and the independent variables. The F-significant (p-value) was also generated to explain the joint significance of the relationship between the dependent and the independent variable.

For objective 3, a questionnaire was developed, data collected and analysed. This enabled capture the qualitative factors that financial institutions take into consideration while setting up the lending interest rate.

3.8 Chapter Summary

This chapter provides details on the type and reason of the research design adopted in the study. It further goes into defining the population and the population sample used in the study. The sampling frame, sample size and sampling technique to be adopted are defined and explained. The data collection method along with the research procedures, data analysis and presentation methods adopted are explained in this chapter.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION

4.1 Overview of the Chapter

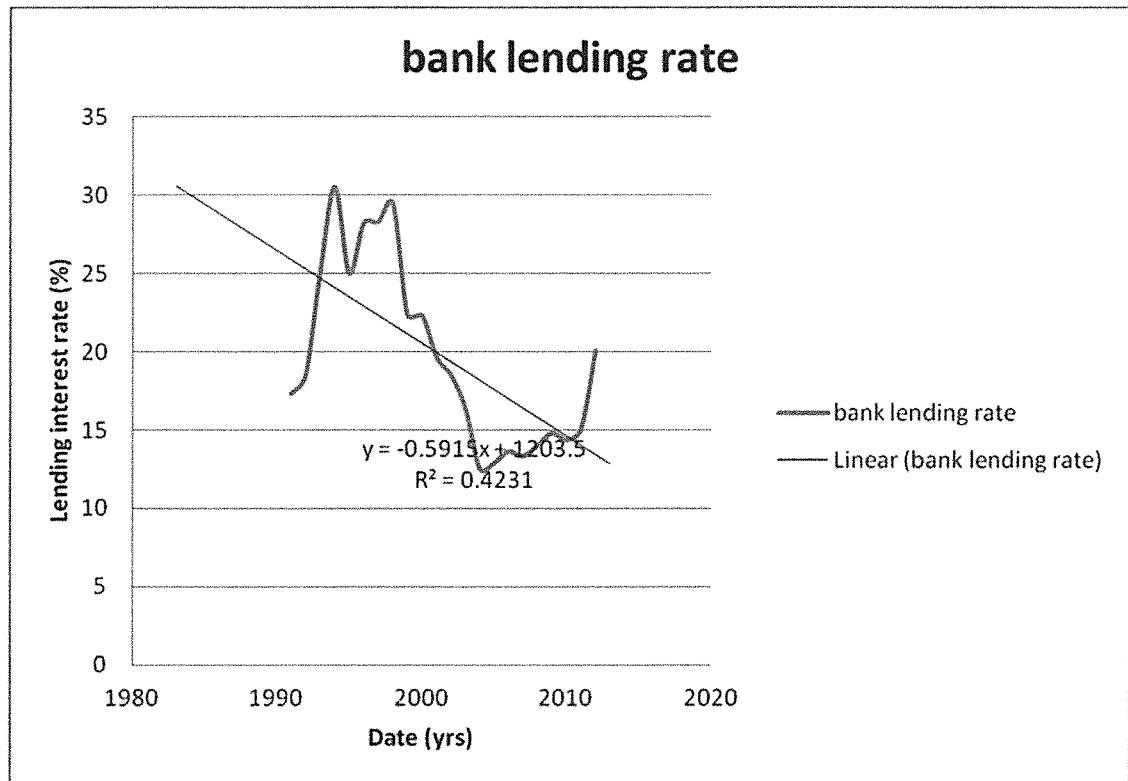
This chapter deals with the presentation, analysis, discussion and interpretation of the empirical findings of the study. It provides general information on the study of volatility and determinants of the lending interest rate in Kenya. The chapter starts with the measurement of volatility of the lending interest rate and identification of the determinants of the lending interest rate. Lastly, the study identifies the factors that the management of financial institutions put into consideration when fixing the lending interest rate in Kenya.

4.2 Trend of the lending interest rate in Kenya

In order to understand the trend of the lending interest rate in Kenya, the most recent data on the lending interest rate in Kenya was sought. Data on monthly lending interest rate and its variables was collected from the CBK and KNBS database. It covered a period of twenty two years beginning with July 1991 and ending with April 2012. The monthly averages were as presented in Appendix 4.

To establish the trend of the lending interest rate, linear regression techniques were applied to the data collected. This was done by the use of Microsoft's excel computer software version 2010. The software was used to develop the trend line and also to compute the co-efficient of determinant (R^2) which was used to draw the conclusions. The purpose of this exercise was to establish if the lending interest rate exhibited linear, exponential, logarithmic, cubic or polynomial kind of growth. To begin with, linear regression modelling was done and the results of the linear trend were as shown in Figure 4.1.

Figure 4. 1 : Linear Function for lending interest rate



As seen from Figure 4.1 the linear trend yielded a linear regression equation as:

$$Y = -0.5915x + 1203.5$$

However, the co-efficient of determinant (R^2) was 0.42 suggesting that the predictive power of the regression trend was only 42% which exhibited only a fair relationship and therefore the results needed to be interpreted with some caution. This necessitated further investigations into other predictive linear regression models. The exponential regression modelling was therefore done and was as shown in Figure 4.2.

Figure 4. 2 : Exponential Function for lending interest rate

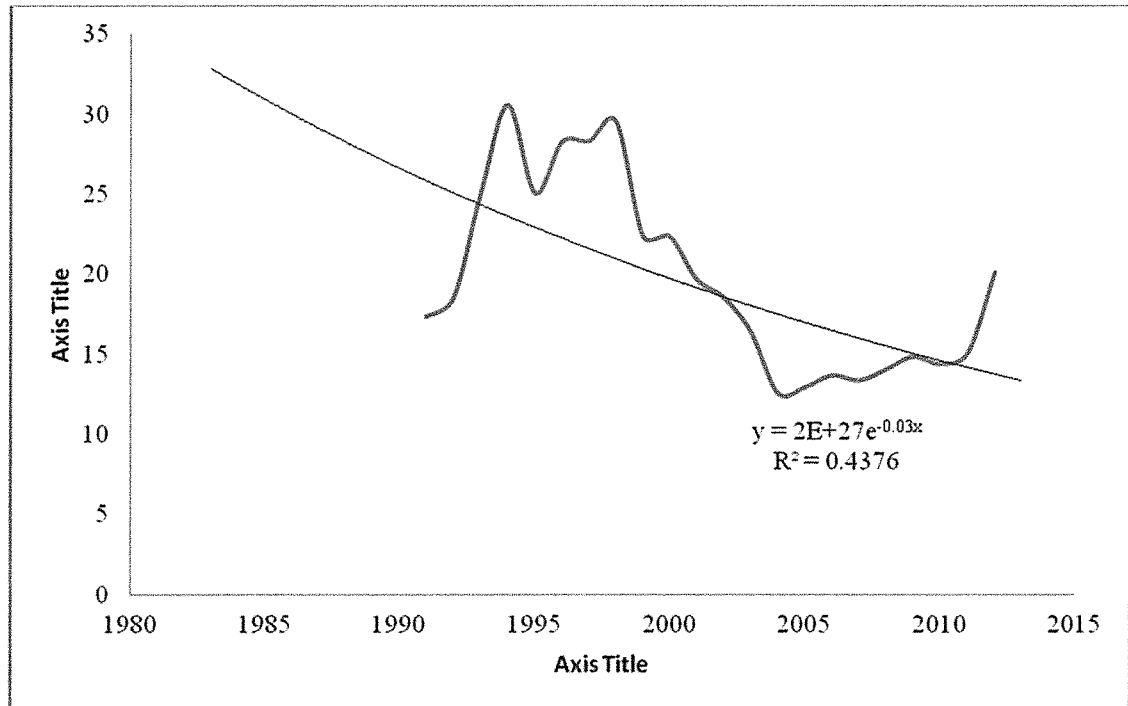
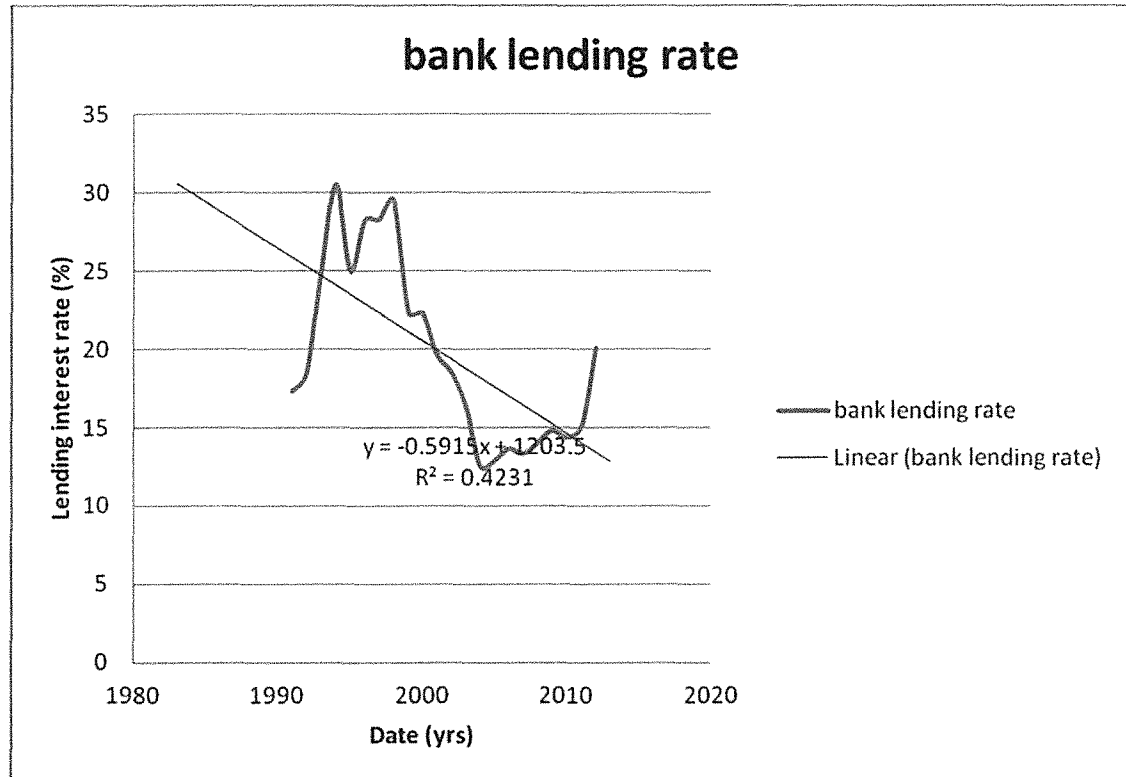


Figure 4.2 presents the exponential trend of the lending interest rate. The regression yielded the equation:

$$Y = 2E+27e^{-0.03x}$$

The co-efficient of determinant (R^2) was 0.44 suggesting that the predictive power of the regression trend was only 44% which also exhibited a fair relationship. This necessitated further investigations into other predictive regression models. The logarithmic regression function was then developed and presented as shown in Figure 4.3

Figure 4. 3: Logarithmic function for lending interest rate

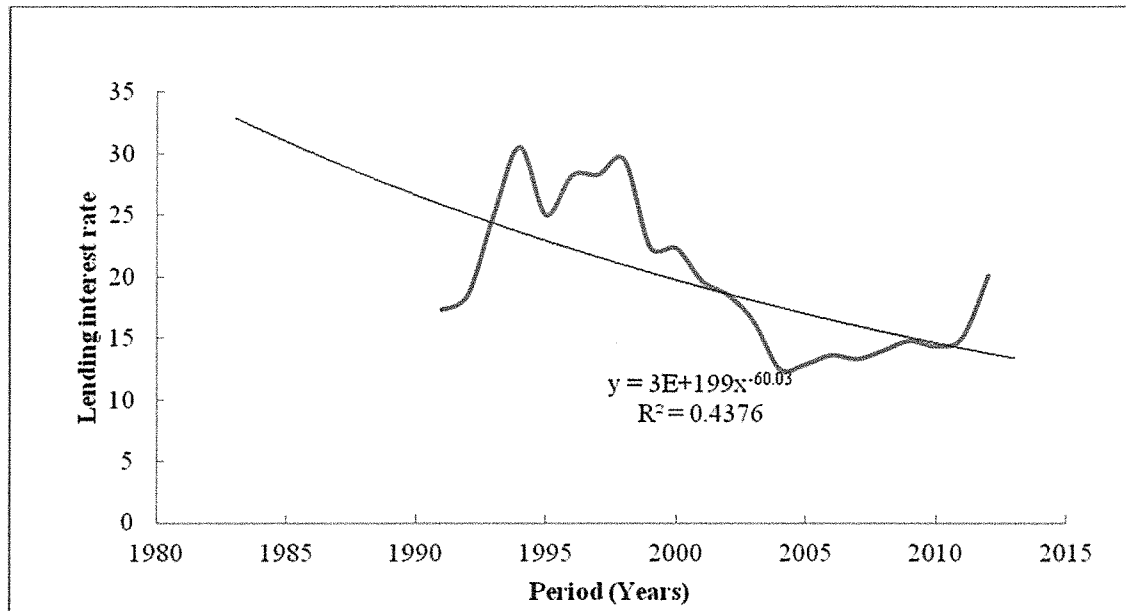


Data in Figure 4.3 presents the logarithmic trend of the lending interest rate which yielded the equation:

$$Y = -1184\ln(x) + 9017.6$$

On the other hand, R^2 yielded was 0.423 suggesting that the predictive power of the regression trend was only 42%. Again, this also exhibited a fair relationship which necessitated further investigations into other predictive regression models. The cubic regression function was then developed and presented as shown in Figure 4.4.

Figure 4. 4: Cubic function for lending interest rate

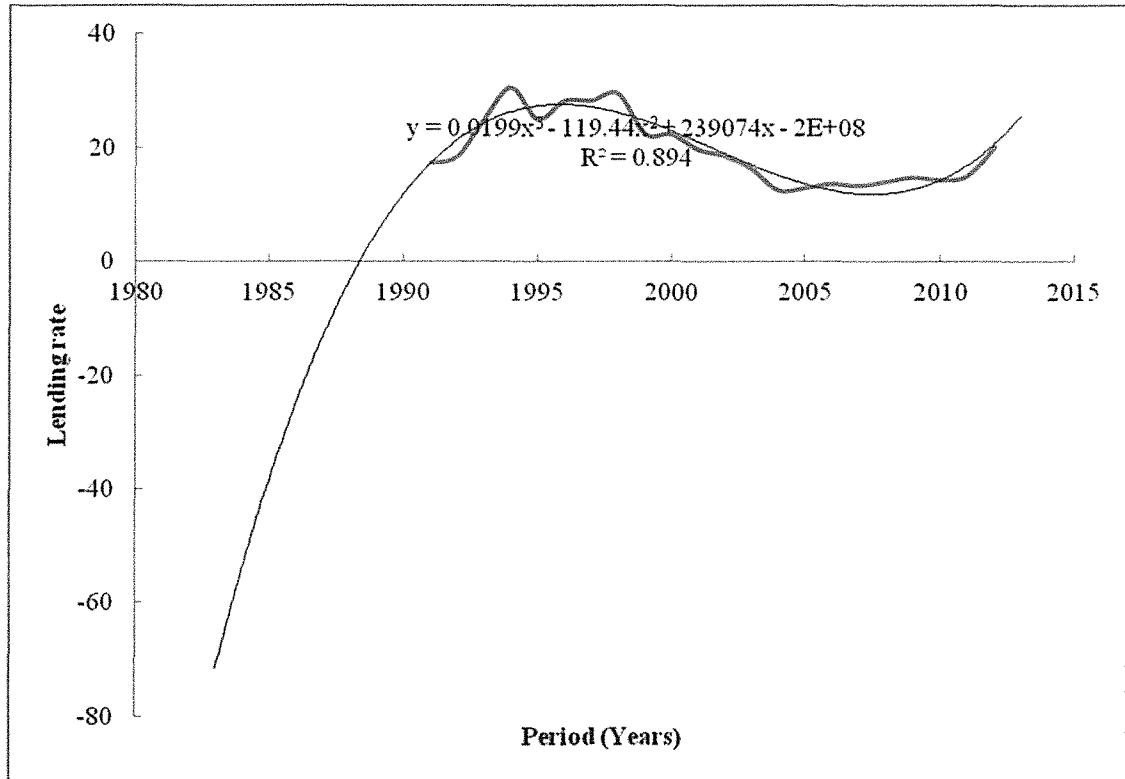


The cubic function developed as seen in Figure 4.4 was::

$$Y = 3E+199x^{-60.03}$$

On the other hand, the R^2 was 0.43 suggesting that the predictive power of the regression trend was only 43.7%. Again, this also exhibited a very weak relationship which necessitated further investigations into other predictive regression models. The polynomial regression function was then developed and presented as shown in Figure 4.5

Figure 4. 5: Polynomial function for lending interest rate



The results of the polynomial regression model were as shown in Figure 4.5. This yielded the equation: -

$$Y = 0.0199x^3 - 119.44x^2 + 239074x - 2E+08$$

The equation yielded R^2 of 0.89 suggesting that the predictive power of the regression trend was at 89%. This exhibited a stronger relationship when compared to the previous models. The polynomial linear regression function was therefore adopted as the most predictive linear growth model since it had a higher R^2 than the previous linear models. However, the value of R^2 being 0.89 suggests that the remaining 0.11 would be taken care of by the error term. Only a little caution would therefore be needed as we adopt the growth model as:-

$$Y = 0.0199x^3 - 119.44x^2 + 239074x - 2E+08$$

The polynomial trend for the lending interest rate in Kenya is consistent with prior findings by Sheefeni and Mbewe (2013), and Onanuga and Shittu (2010) Zambia and Nigeria respectively. They found out that the interest rates in Zambia and Nigeria exhibited a polynomial trend.

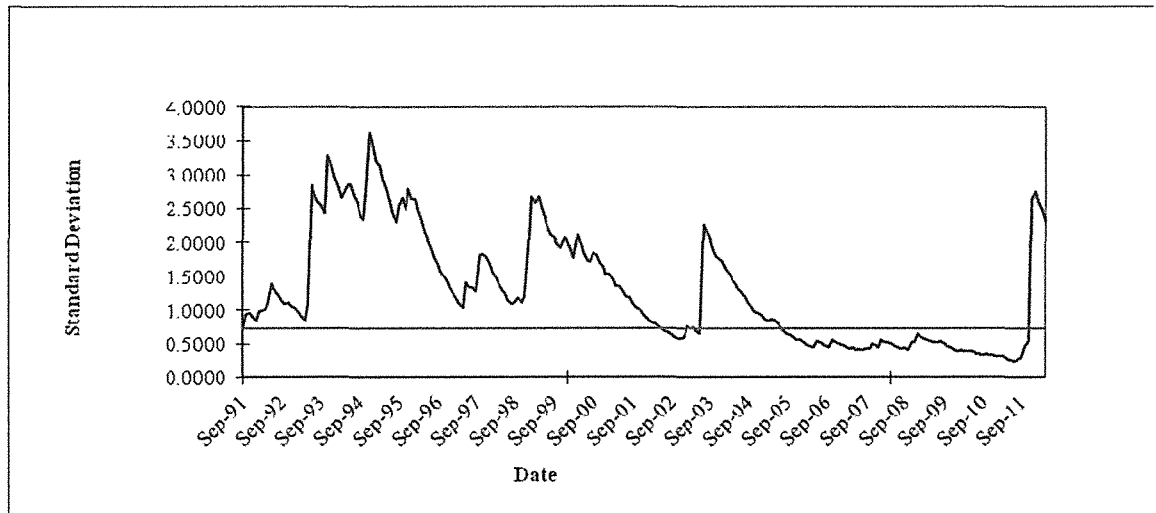
4.3 Volatility of the Lending interest rate in Kenya

To establish the volatility of the lending interest rate in Kenya the Garch modelling techniques were applied to the data set on the lending interest rates. The Garch reaction, and the Garch persistence statistics and plots were generated.

The Garch reaction parameter (α) usually ranges between 0.05 (for a market that is relatively stable) and 1.00 (for a market that is jumpy or nervous). On the other hand, the Garch persistence parameter (β) usually ranges between 0.85 and 0.98 with lower values being associated with a high α . Garch volatilities with a relatively high α and relatively low (β) are more spiky than those with relatively low (α) and relatively high (β). A high α that is associated with a low (β) produces a very high Garch volatility.

The spreadsheet workings were as summarised in Appendix 6 while the volatility graph was as shown in Figure 4.6.

Figure 4. 6 : Lending rate volatility between 1991 and 2012



From figure 4.6, the volatility is seen to be quite vigorous between 1991 and 2005. Years of low lending rates were immediately followed by years of high lending rates. A falling trend is then observed between 2006 and 2011 when suddenly the rates shoot up drastically in 2012. The α generated by the software was 0.61426092 while β was 0.87405664 (Appendix 6).

The α fell within the range of 0.05 and 1.0 at 0.61 suggesting that the Garch volatility was more than half at 61% which was considered high. On the other hand, the β fell within the range of 0.85 and 0.98 at 0.87. This suggested that the persistence was towards the lower end of the range implying that the peaks of the volatility were not very sharp.

It was therefore concluded that the period between 1991 and 2012 was generally characterised by a high volatile lending rate. From figure 4.6, the period between 1991 and 2005, volatility was very high as compared to the period between years 2006 and 2011. This called for further research and it was observed that in August 2005, the CBR was introduced by the Central Bank of Kenya (central Bank of Kenya, 2012). To confirm the finding, an F-test and Garch modelling were carried out to compare the volatility of the lending interest rate between the two regimes, that is, before the introduction of the

Central Bank Rate (1991 to 2005) and after the introduction of the Central Bank Rate (2006 to 2012).

4.3.1 F-Test (Two-Sample) for variances

The F-Test (Two-Sample) for Variances was conducted. The pre CBK intervention period was labeled α_1 while the post CBK intervention period was labeled α_2

The hypothesis for the test was set as follows:-

$$H_0 : \alpha_1 \text{ is equal to } \alpha_2$$

$$H_a : \alpha_1 \text{ is not equal to } \alpha_2$$

The statistics for the F-Test (Two-Sample) for Variances were then generated using Microsoft's excel computer software and the results were as shown in table 4.1

Table 4. 1 : F- Test Two Sample for Variances

<u>F-Test Two-Sample for Variances</u>		
	<i>Pre CBK intervention</i>	<i>Post CBK intervention</i>
Mean	21.804585	15.04147
Variance	34.420994	5.3383473
Observations	15	7
Df	14	6
F	6.4478747	
P(F<=f) one-tail	0.0152959	
F Critical one-tail	3.9559339	

The decision criteria is that if $F > F \text{ Critical one-tail}$, we reject the null hypothesis. In this case, $6.4478747 > 3.9559339$. Implying that $F > F \text{ Critical}$. Therefore, we reject the null

hypothesis. The variances of the two populations are unequal. It was therefore concluded that the mean variances under the two regimes were significantly different from one another.

4.3.2 Garch Measurements before and after CBK intervention

Figure 4. 7 : Pre CBK intervention trend

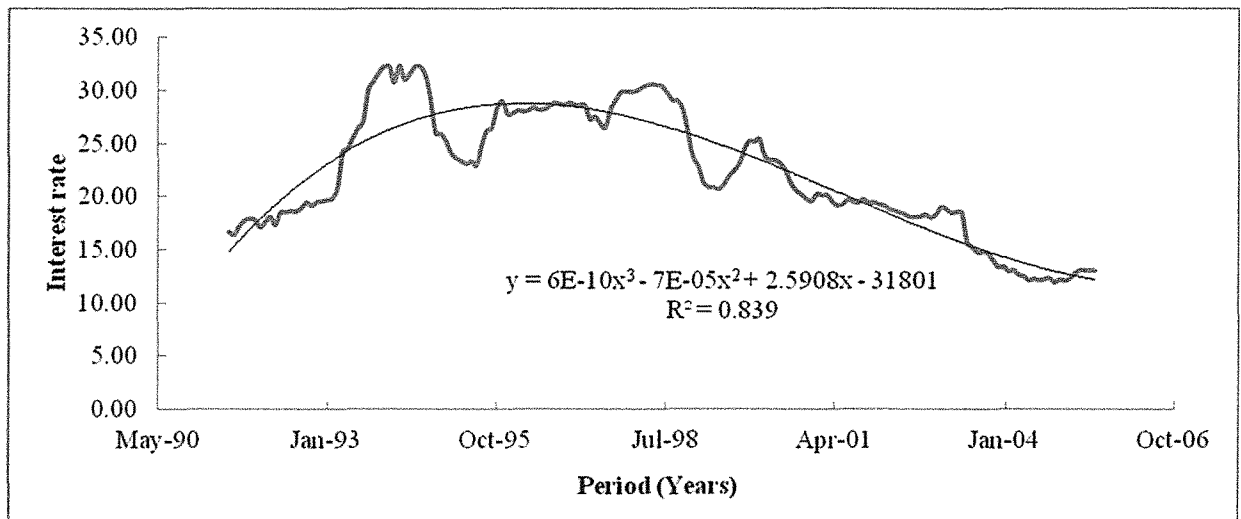
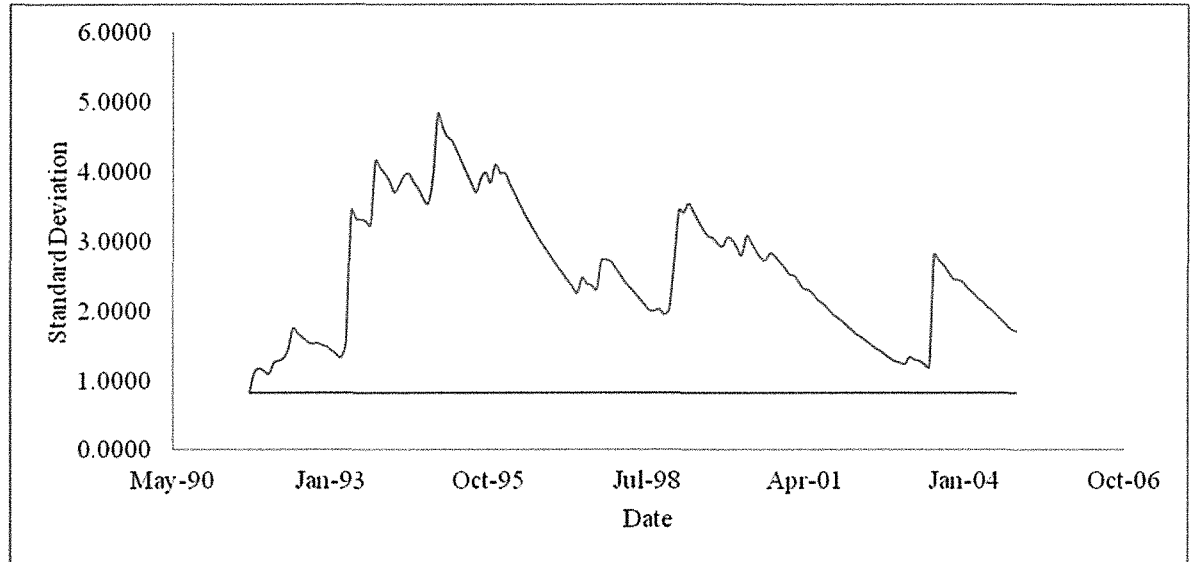


Figure 4.8 reveals a negatively sloping polynomial trend for the lending rate prior to intervention introduced by the CBK. The Garch volatility chart was as shown in Figure 4.8.

Figure 4. 8 : Lending rate volatility prior CBK interventions



As shown in Figure 4.8, the period prior to the CBK intervention was characterised by high volatility with moments of high lending rates immediately followed by moments of low lending rates. The α and β statistics generated were 0.84214261 and 0.92397036 respectively (Appendix 7). An α of 0.84214261 suggests that the volatility was high and a β of 0.92397036 suggests that the period was characterized by sharp peaks and lows.

Data in Figure 4.9 reveals a positively sloping polynomial trend for the lending rate during the post intervention introduced by the CBK. This leads to the conclusion that the Post intervention period is characterised by increasing lending rates. The Garch volatility chart is as shown in Figure 4.9.

Figure 4. 9 : Lending interest rate Post CBK intervention trend

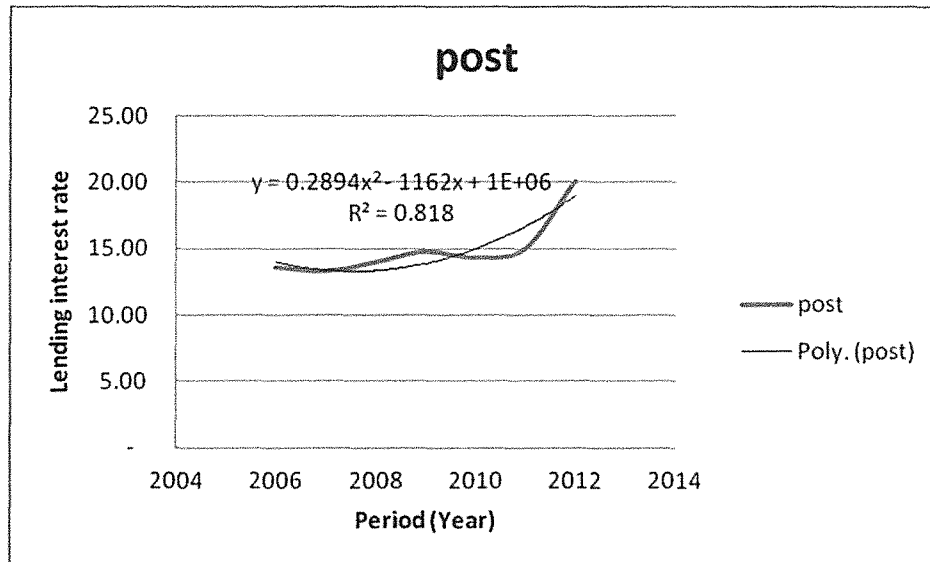
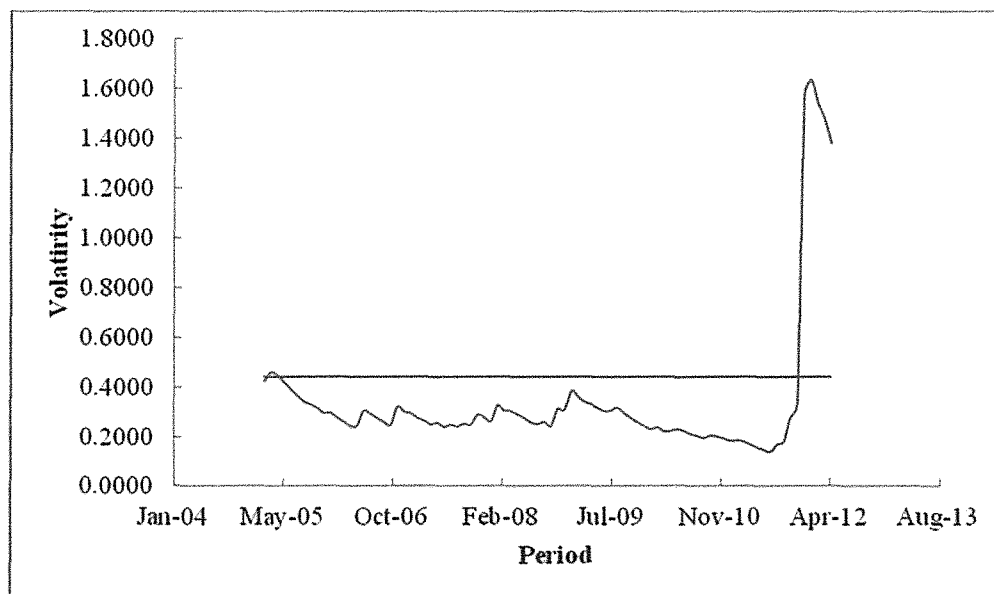


Figure 4. 10 : Garch volatility after CBK intervention



The period after the CBK intervention was characterised by a low volatility with moments of stability and low deviations. Moments of low lending rates were experienced as compared to the period prior to CBK interventions. However one sharp moment was

experienced in 2012. The α and β statistics generated were 0.2201426092 and 0.86970364 respectively (Appendix 8). An α of 0.2201426092 suggests that the volatility was quite low while a β of 0.86970364 suggests that the period was characterized by smooth peaks and lows

4.4 Analysis of the Determinants of the volatility of lending interest rate in Kenya

To identify the determinants of the volatility lending interest rate in Kenya, multiple regression techniques were applied to the data sets. The determinants of the lending interest rate were taken to be the same as the determinants of the volatility. This was borrowed from prior findings by Sill (1996) and Olweny (2011). The lending interest rate was the dependent variable while GDP values, CBR, Inflation rate, money supply, Exchange rate, market capitalisation, interbank rate and Treasury bill rate were set to be the independent variables. The correlation and regression statistics were developed and later used to draw the conclusions. To establish whether correlation existed between the variables selected for the study, a correlation table was developed. The results were as shown in Table 4.2.

Table 4. 2: Variables correlation table

	Inflation Rates	USD Exchange Rates	Mkt cap (Bn)	inter bank rate	bank lending rate	CBR	inter bank rate	T bill rates (91-day)	Constant GDP Values	Liquidity	M1	M2	M3
Inflation Rates	1												
USD Exchange Rates	-0.199	1											
Mkt cap (Bn)	-0.111	0.478	1										
inter bank rate	0.707	-0.299	-0.343	1									
bank lending rate	0.246	-0.671	-0.621	0.619	1								
CBR	0.180	0.360	0.039	0.977	0.888	1							
inter bank rate	0.707	-0.299	-0.343	1.000	0.619	0.977	1						
T bill rates (91-day)	0.727	-0.442	-0.429	0.975	0.707	0.972	0.975	1					
Constant GDP Values	-0.256	0.661	0.927	-0.429	-0.702	0.526	-0.429	-0.550	1				
Liquidity	-0.224	0.684	0.915	-0.402	-0.668	0.557	-0.402	-0.524	0.795	1			
M1	-0.177	0.650	0.914	-0.322	-0.606	0.502	-0.322	-0.441	0.783	0.987	1		
M2	-0.201	0.655	0.889	-0.298	-0.545	0.551	-0.298	-0.419	0.770	0.982	1	1	
M3	-0.171	0.633	0.893	-0.271	-0.531	0.554	-0.271	-0.391	0.767	0.979	1.000	1.000	1

From Table 4.2, both positive and negative corelationship existed between the various variables suggested for the multiple regression model. A correlation co-efficient of ± 0.5 and above is considered strong and significant. From Table 4.2, the strength of the relationship ranged between 0.1988 (weak correlation) and 1 (very strong correlation). This implied that the resulting multiple regression techniques would yield a strong co-efficient of determinant suggesting that the variables proposed could be responsible for the variations in the lending interest rate.

From the correlation table above, liquidity, M1, M2 and M3 were found to have multicollinearity. Liquidity is included in M2 and therefore was dropped. M2 is also a factor of M1. M2 was the preferred variable to be used in data analysis since it has the components of both the money supply and liquidity.

To establish the multiple regression model, Microsoft's excel computer software was then used to generate the multiple regression statistics which were used to draw the conclusions. The statistics generated were as shown in Table 4.3.

Data in Table 4.3 indicates that the R^2 was 0.8995 implying that the predictive power of the model was approximately 90%. This depicts a very strong relationship between the variables because 90% of the variations in the model could be explained by the independent variables suggested, and only 10% could be taken care of by the error term.

Again, the Multiple R was 0.948 implying that the Pearson's coefficient of correlation was 0.948 implying a very high correlation between the Dependent and the independent variables in the model. The significance F was 0.000236802 implying that the resultant P value was significant since it was less than 0.05 at 95% confidence level.

Table 4. 3 : Multiple regression statistics results

SUMMARY OUTPUT						
<i>Regression Statistics</i>						
Multiple R	0.948407					
R Square	0.899476					
Adjusted R Square	0.837615					
Standard Error	2.379504					
Observations	22					
<i>ANOVA</i>						
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>	
Regression	7	625.8617119	89.40882	10.8411	0.000236802	
Residual	12	98.96653982	8.247212			
Total	19	724.8282518				
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	44.76352624	10.1872343	4.39408	0.000874	22.56744947	66.95960301
M2	2.47653E-05	1.16592E-05	2.124102	0.005513	-6.37885E-07	5.01685E-05
CBR	0.04233	0.01126	3.759164	0.002386	0.018003	0.066656
Constant GDP Values	-0.00012	0.46062945	-2.1587	0.005874	-1.997986762	0.009263945
Inflation Rates	-0.186458587	0.111098324	-1.67832	0.000965	-0.42852104	0.055603867
USD Exchange Rates	-0.35870316	0.131800361	-2.72156	0.018554	-0.645871476	-0.071534843
Mkt cap (Bn)	-0.010443191	0.004790991	-2.17976	0.049916	-0.020881865	-4.51791E-06
Inter bank rate	-0.222663621	0.471793981	-0.47195	0.645428	-1.250614399	0.805287158
T bill rates (91-day)	0.469082305	0.436541465	1.074542	0.042156	-0.482059838	1.420224449

To identify the variables and coefficients for the model, the respective p-values of the variables were considered at 95% confidence level where p-values that were less than 0.05 were considered significant. It was therefore concluded that the variables responsible for the variations in the lending interest rates were: Constant GDP Values, CBR, Inflation Rates, USD Exchange Rates, and Treasury bill rates.

The nature of the relationship was summarised as:-

$$Y = 0.00087 + 0.005513X_1 + 0.002386X_2 + 0.005874X_3 + 0.000965X_4 + 0.018554X_5 + 0.049916X_6 + 0.042156X_7$$

Where :-

Y = Lending interest rate,

X₁ = Money supply,

$X_2 = \text{CBR},$

$X_3 = \text{GDP},$

$X_4 = \text{Inflation Rate},$

$X_5 = \text{Exchange Rates},$

$X_6 = \text{Market capitalization}$

$X_7 = \text{Treasury bill rates}.$

4.5 Factors that the financial institutions consider when fixing the lending interest

To achieve the third objective which was to establish the factors that the management of financial institutions put into consideration when fixing the lending interest in Kenya, a questionnaire tool was developed and administered to the managers of all the 44 financial institutions in the country. Responses were received from 30 institutions giving a return rate of 68 percent. Mulusa (1990) says that 50% return rate is adequate, 60% good and 70% very good. The return rate was hence considered good to provide required information for the purpose of data analysis.

The questionnaire tool contained a number of statements based on the previous literature done in different countries and was presented in the form of a likert scale. The managers of the financial institutions were to indicate the extent to which they agreed or disagreed with the statements. They were to indicate the Level of “agreement” as either Strongly Disagree, Disagree, Indifferent, Agree or Strongly Agree Descriptive statistics were used to analyze the data where Strongly Disagree was coded as (1), Disagree (was coded as 2), Indifferent (as 3), Agree (as 4), and Strongly Agree (as 5). The results were as shown in Table 4.4.

4.6 Questionnaire analysis

Using descriptive statistics mean scores of more than 3.4 indicated that the factor had a great influence on the fixing the lending interest since the managers agreed to them. The factors with a mean of between 2.5 and 3.3 were taken to have a lesser weight since the managers were indifferent about them. The factors with less than a mean of 2.4 were taken to have very little effect on the lending rate since the managers disagreed with them.

The study therefore found out that the factors responsible for the fixation of lending rate include: Central Bank rate of Kenya, expected changes in inflation rate, credit worthiness of the borrower, expected changes in a country's exchange rate, economic growth measured by GDP, the financial institution's deposit rate, amount of loan, characteristics of the credit market, nature of the collateral, liquidity and solvency of the bank, level of competition, purchase of government bonds by the banks, bank's expected profits, nature of the loan (whether short term or long term), demand for capital, interbank rate and current year country's budget deficit.

It was also established that that the factors with little effect on the fixation of lending rate include: bank's balance sheet structure and market position, government fiscal policy, political trends, prices of bonds, demand for loanable funds, availability of deposits, supply for loanable funds and fixed costs associated with the loan. The factors with no effect on the fixation of lending rate include: social values, expected return on business investment, type of the borrower (whether commercial or individual), size of the bank, relationship between the bank and the borrower, and riskiness of the project.

Table 4. 4 : Descriptive Statistics

Interest rate determinant	N	Minimum	Maximum	Mean	Std. Deviation	Statistical Inference
Central Bank rate of Kenya	30	4	5	4.867	0.34575	Highly Significant
Expected changes in inflation rate	30	4	5	4.800	0.40684	Highly Significant
Credit worthiness of the borrower	30	3	5	4.667	0.54667	Highly Significant
Expected changes in a country's exchange rate	30	2	5	4.633	0.66868	Highly Significant
Economic growth measured by the GDP	30	3	5	4.567	0.67891	Highly Significant
The financial institution's deposit rate	30	2	5	4.500	0.82001	Significant
Amount of Loan	30	3	5	4.467	0.62881	Significant
Characteristics of the credit market	30	2	5	4.300	0.91539	Significant
Nature of the collateral	30	1	5	4.200	1.18613	Significant
Liquidity and solvency of the bank	30	1	5	4.067	1.25762	Significant
Level of competition	30	1	5	4.067	1.20153	Significant
Purchase of government bonds by the banks	30	1	5	3.933	1.55216	Significant
Bank's expected profits	30	1	5	3.867	1.45586	Significant
Nature of the loan (ie whether short term or long	30	1	5	3.767	0.97143	Significant
Demand for capital	30	1	5	3.700	1.34293	Significant
Interbank rate	30	1	5	3.633	1.35146	Significant
Current year country's budget deficit	30	1	5	3.600	1.35443	Significant
Bank's balance sheet structure and market position*	29	1	5	3.483	1.40460	Significant
Government fiscal policy	30	1	5	3.400	1.58875	Significant
Political trends*	29	1	5	3.345	1.34366	Less Significant
Prices of Bonds*	28	1	5	3.107	1.61794	Less Significant
Demand for Loanable funds	30	1	5	2.933	1.36289	Less Significant
Availability of deposits	30	1	5	2.767	1.59056	Less Significant
Supply for Loanable funds	30	1	5	2.633	1.32570	Less Significant
Fixed costs associated with the Loan	30	1	5	2.533	1.50249	Less Significant
Social values	30	1	5	2.433	1.35655	No Significance
Expected return on business investment	30	1	5	2.167	1.46413	No Significance
Type of the borrower (ie whether commercial or	30	1	5	2.100	1.32222	No Significance
Size of the bank	30	1	5	2.100	1.49366	No Significance
Relationship between the bank and the borrower	30	1	5	1.967	1.47352	No Significance

4.7 Comparison of results from secondary data and primary data

The findings for both the questionnaire analysis and secondary data analysis are consistent. The following variables were found to be the main determinants of interest rate in Kenya. They are also supported by Literature from different research locations. The use of the questionnaire was meant to confirm the findings of the secondary data. Table 4.5 presents a summary of the findings from both secondary and questionnaire data analysis.

Table 4.5 Comparison of the findings from Questionnaire and secondary data

Independent variables	Results from		
	Secondary data	Questionnaire	Inference
Central Bank Rate	Significant relationship	Significant relationship	Consistent
Inflation	Significant relationship	Significant relationship	Consistent
Gross Domestic Product	Significant relationship	Significant relationship	Consistent
Exchange Rate	Significant relationship	Significant relationship	Consistent
Interbank rate	No relationship	Significant relationship	Inconsistent
Market capitalization	Significant relationship	No relationship	Inconsistent
Treasury Bills	Significant relationship	Significant relationship	Consistent

Results of the secondary data analysis showed that the CBR, inflation, gross domestic product, exchange rate and treasury bills to be the main determinants of interest rates.

This is consistent with the questionnaire results. However, results from the questionnaire showed that the interbank rate was a determinant of the lending interest rate while the secondary data results showed that there was no relationship. In addition, the following variables were found to be determinants of the lending interest rate from the questionnaire data analysis: level of competition, purchase of government bonds by the banks, bank's balance sheet structure and market position, current year country's budget deficit, Nature of the loan (ie whether short term or long term), liquidity and solvency of the bank, characteristics of the credit market and credit worthiness of the borrower. However, the following variables were found to have no relationship with the lending interest rate: riskiness of the project, size of the bank, type of the borrower, expected return on business investment, social values and fixed costs associated with the loan.

CHAPTER FIVE

DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter deals with the discussion, conclusion, recommendations and limitations of the study. The general objective of the study was to measure the volatility and identify the determinants of volatility of the lending interest rate in Kenya.

5.2 Discussion

Three research objectives were formulated to guide the study. The first research objective was to measure the level of volatility of the lending interest rate in Kenya, the second was to identify the determinants of volatility of the lending interest rate in Kenya, while the third objective was to establish the factors that the management of financial institutions put into consideration when fixing the lending interest rate in Kenya.

Secondary data was sought from the Kenya National Bureau of Statistics and Central Bank database, while primary data was collected through the use of questionnaires. The data was cleaned, collated and analyzed using Microsoft's Excel (2010) and Statistical Package for Social Sciences (SPSS) (version 17.0) computer software. Garch and regression models were also used to analyse the data. The following were the study findings.

On the first research objective which was to measure the volatility of the lending interest rate in Kenya, the Garch reaction and Garch persistence parameters were used. The Garch reaction parameter (α) usually ranges between 0.05 (for a market that is relatively stable) and 1.00 (for a market that is jumpy or nervous). On the other hand, the Garch persistence parameter (β) usually ranges between 0.85 and 0.98 with lower values being associated with a high α . Garch volatilities with a relatively high α and relatively low (β) are more spiky than those with relatively low (α) and relatively high (β). A high α that is associated with a low (β) produces a very high Garch volatility. The α generated by the software was 0.61426092 while β was 0.87405664 concluding that the Garch volatility

was more than half at 61% which was considered high and that the persistence was towards the lower end of the range implying that the peaks of the volatility were not very sharp. The period between 1991 and 2012 was therefore generally characterised by a high volatile lending interest rate. From Figure 4.6, it was observed that the lending interest was more stable from year 2006 to 2012 as compared to the prior years. This called for a further investigation and it was found that in August 2005, the CBR was introduced and had a stabilising effect on the lending interest although at an increasing rate. Both Garch and F-statistic tests for the two periods, before and after CBR, were carried out to confirm the observation. The F-test concluded that the mean variances under the two regimes were significantly different from one another. Under the Garch test, α and β statistics generated were 0.2201426092 and 0.86970364 respectively (Appendix 8). An α of 0.2201426092 suggests that the volatility was quite low while a β of 0.86970364 suggests that the period was characterized by smooth peaks and lows. It was therefore concluded that after the introduction of the CBR volatility was reduced although the lending interest rate has been on an increasing trend.

On the second objective which was to establish determinants of volatility of the lending interest rate, regression techniques were applied. It was established that the variables responsible for the variations in the lending interest rates were: Constant GDP Values, CBR, Inflation Rates, Exchange Rates, market capitalisation and Treasury bill rates. The variables had a p value of less than 5% meaning that they were significant and therefore affected the lending interest rate. For example, the CBR had a p value of 0.002386 meaning that it was significant. This is in line with studies done by Lowe (1995) and Owoye & Onafowora (2007) in Nigeria who found out that the monetary policy practices affect the interest rates. Inflation rate had a p value of 0.000965. This was also highly significant and confirms prior research by Fridah (2011) who found inflation rates to be a major determinant of the interest rate. Its also consistent with Fisher's theory (Fisher, 1930). In addition, Muscatelli and Pinelli (2000) also conducted a research in Italy and found that expected inflation and nominal interest rates trended together in the long-run.

GDP had a p value of 0.005874. This was also significant and consistent with the findings by Gambacorta (2004). Real GDP and inflation were found to be determinants of the lending interest rate by Kashyap, Stein and Wilcox (1993). Better economic conditions improve the number of projects becoming profitable. This increases credit demand and hence the interest rate. Exchange rate and treasury bills had p values of 0.018554 and 0.042156 respectively, and were significant. Market capitalisation had a p-value of 0.049916 and was considered significant. This is consistent with prior findings by Mahmudul and Gazi (2009) in six developed countries. He found a significant negative relationship between changes in share price and changes in interest rate. Money supply was also significant (p-value= 0.005513). Availability of loanable funds is a determinant of the lending interest rate (Dewett & Navalur, 2009). Its also consist with the loanable funds theory as postulated by Knut (1907). Interbank rate had a p value of 0.622454 and was considered insignificant. This is contrary to a study done by Angbazo (1997), who found out that the interest rate on loans should be more affected by interbank interest rate volatility with respect to that on deposits.

The third objective was to establish the factors that the management of financial institutions put into consideration when fixing the lending interest rate. It was also meant to confirm the results of the secondary data analysis (objective 2). Therefore, it was established that the factors responsible for the fixation of lending rate include: Central Bank rate of Kenya, Expected changes in inflation rate, Credit worthiness of the borrower, Expected changes in a country's exchange rate, Economic growth measured by the GDP ,the financial institution's deposit rate, amount of Loan, characteristics of the credit market, nature of the collateral, liquidity and solvency of the bank, level of competition, purchase of government bonds by the banks, bank's expected profits, nature of the loan (whether short term or long term), demand for capital, Interbank rate and current year country's budget deficit. The CBR, expected changes in inflation, creditworthiness of the borrower, exchange rate and GDP were seen to have a high level of significance. The mean was 4.6. This is in line with prior findings where inflation and

GDP, CBR, creditworthiness of the borrower and exchange rates were found to be determinants of interest rates by Kashyap, Stein and Wilcox (1993) and Owoye and Onafowora (2007) respectively. The interbank rate, relationship between the bank and the borrower, bank's balance sheet structure and market position, term of the loan, amount of loan, liquidity and solvency of the bank, current year country's budget deficit, characteristics of the credit market and the level of competition were found to be significant variables in the lending interest rate determination. This is consistent with the previous studies done in different research locations. For example, Angbazo (1997) found out that the interbank interest rate volatility affects the interest rate on loans as compared to the deposits. Berger and Udell (1992) sustain that banks that maintain a close tie with their customers will change their lending rates comparatively less and slowly. Flannery (1981) found a negative relationship between the bank net asset position and the bank interest rates. In addition, Berlin and Mester (1999) claim that banks which heavily depend upon non-insured funding will adjust their deposit rates more quickly than banks whose liabilities are less affected by market movements. Baugnet and Hiradisky (2005) identified the loan amount, duration and risk to be the factors affecting the lending interest rate amongst the Belgian banks. Liquid banks are able to protect their loan portfolio against a monetary tightening policy by drawing down cash and securities. Well-capitalized banks that are perceived as less risky by the market are better able to raise uninsured funds in order to compensate the drop in deposits (Gambacorta and Mistrulli, 2004). The budget deficit was also found to affect the interest rates only when the government financed its deficit through borrowing from the local markets (Olweny, 2011). Finally, the level of competition amongst the financial institutions affect the lending interest rate and the lower the competition, the higher the spreads (Berger & Hannan, 1989).

On the other hand, the following variables were found to have no effect on the lending interest rate; social trends, riskiness of the project, size of the bank, expected return on business investment and type of the borrower. This is consistent with prior findings

carried out. For example, Gambacorta (2004), found out bank's size is not significant in the lending interest rate determination. However, prior findings in Ghana show that there is a correlation between bank size and the lending interest rate (Bosson & Jog-Kun, 2002).

5.3 Conclusion

Volatility of the lending interest rate was measured using the α and β parameters. The results generated were $\alpha = 0.61426092$ while β was 0.87405664. This concluded that the lending interest rate was volatile. However, the intervention of the CBK on the lending interest rate in 2005 could be said to have had an immediate impact because the mean lending rates under the two regimes were significantly different from one another. Prior to intervention the volatility was at 84% while the the post intervention volatility was at 22%.

The variables responsible for the variations in the lending interest rates in Kenya include; Constant GDP Values, CBR, inflation rates, exchange rates, market capitalization and Treasury bill rates. The period covered by the study could generally be summarized as having been characterised by a moderately high volatile lending rate of about 61%.

While fixing the lending interest rates, managers of financial institutions in Kenya are guided by the Central Bank of Kenya rate, anticipated changes in inflation rate, credit worthiness of the borrower, anticipated changes in a country's exchange rate, economic growth of the country, the financial institution's deposit rate, amount of loan applied, characteristics of the credit market, nature of the collateral offered, liquidity and solvency of the bank, level of competition, purchase of government bonds by the banks, bank's expected profits, term of the loan (whether short term or long term), demand for capital, interbank rate and the country's budget deficit.

This study confirms the Fisher's theory, Loanable funds and the liquidity preference as postulated by Fisher (1930), Knut (1907) and Keynes (1937). Fisher found the inflation

rate to be a major determinant of the interest rate. In this study, inflation rate has a high p-value (0.000965) meaning that its highly significant. Money supply has also been found to be a determinant of the lending interest as supported by the Loanable Funds Theory and an extension by the Liquidity preference theory. The role of the monetary policy in the lending interest rate determination has also been emphasized. Monetary policy activities are meant to control inflation and money supply amongst other macro economic variables. These in turn affects the lending interest rate.

5.4 Implications of the Study

The determinants of interest rate volatility can be broadly categorized into economic factors and financial institution's specific characteristics. The study implies that the bank specific characteristics can be controlled by having efficient operations and an optimal capital/ financial structure that is able to absorb the economic effects without adjusting the lending interest rate in a volatile manner. The economic factors are semi-controllable. By having an efficient and optimal monetary policy some variables such as inflation rate, money supply and exchange rate can be controlled and hence the lending interest rate will be less volatile.

5.5 Recommendations

Based on the study objectives and results of findings, the following recommendations were made. Firstly, the lending interest rate in Kenya has been very volatile especially before the introduction of the CBR. Therefore, the government should broaden its monetary policy, ensure that its very optimal and efficient. This will help reduce interest rate volatility since monetary policy is meant to control money supply and target inflation, and these are the major determinants of the lending interest rate. Secondly, the Donde Bill should be implemented. Although its against the free market principle of the interest rate determination by the market forces of demand and supply, it will help stabilise the lending interest rate. This is because the banks are hesitant to reduce the lending rate even when the CBR has been reduced but when the CBR is increased by a small margin the banks increase the lending interest rate at a very high margin. It will

also enhance an efficient monetary transmission and the spread between the deposit rate and the borrowing rate is small. Finally, the CBK should ensure that the financial institution's have an optimal capital structure that is able to positively handle the shocks of the monetary policy. This is because liquid banks can protect their loan portfolio against a monetary tightening by drawing cash and securities, and well capitalised banks will adjust their lending interest rates less quickly than banks whose liabilities are less affected by market movements.

5.6 Limitations of the Study

Since there is no study without limitations, this research study had the following limitations. First, it was based on primary data through the issuance of questionnaires. The response rate was only 68%. This may be considered good but not sufficient to firmly conclude on the determinants of the volatility of the lending interest rate in rate in Kenya. Finally, secondary data collected had challenges. This data may be manipulated depending on the ownership's objectives and achievement of set targets.

5.7 Suggested areas for Further Research

Based on the study expectations and the outcome of the findings, the following areas were suggested for further research. A study on the components of an optimal and efficient monetary policy that is able to target the inflation rate and money supply efficiently. This will help the lending interest rate mimick the monetary policy activities closely, and their effects in the economy can be felt more. Finally, a study on the optimal capital structure of financial institutions in response to the lending interest rate adjustments should be carried out. This is because capital structure affects the extent to which financial institutions are able to protect their loan portfolio against changes in the monetary policy or other economic changes. This will help come up with an optimal capital structure that is able to absorb the economic shocks without adjusting the lending interest rate quickly.

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APPENDICES

APPENDIX 1: SAMPLE LETTER

Githiaka Teresa Nyokabi
Strathmore University
School of Graduate Studies
P.O. BOX 59857-00200
Nairobi, Kenya
Tel : +254 725900560
Email: teresiagithiaka@yahoo.com

Dear Respondent,

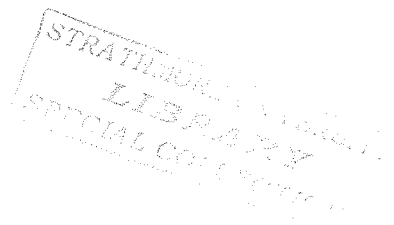
RE : REQUEST FOR PARTICIPATION IN QUESTIONNAIRE FILLING

I am a Masters of Commerce (MCOM) Second Year Student at Strathmore University. I am conducting a Research study on “*The determinants and volatility of the lending interest rate in Kenya, case for financial institutions*”. The study will assist me in completing my MCOM thesis at Strathmore University.

Your Company is among the top 44 licensed financial institutions to be included in the study since you are considered key player in the industry and hence you are better placed to provide data for the study. The information provided by respondents will be protected by the principle of confidentiality. Your participation is very imperative for the accomplishment of this study and it will be highly appreciated. Should you have any questions or concerns with regards to the questionnaire, please do not hesitate to contact me at any time through my contact provided above.

Thank you for your cooperation and time.

Yours Sincerely,
Teresa Githiaka



APPENDIX 2: QUESTIONNAIRE

This questionnaire is designed to gather information from the decision makers in financial institutions in Kenya. It is meant for academic purposes only. Fill it in a genuine manner, your responses will be analysed and be kept in a confidential manner).

DETERMINANTS OF THE LENDING INTEREST RATE IN KENYA.

1. For each of the following factors, kindly indicate your opinion on the determinants of the lending interest rates in Kenya amongst the financial institutions by ticking inside the box. On a scale of 1 – 5, (1) Strongly Agree, (2) Agree, (3) Not Sure, (4) Disagree and (5) strongly disagree, rate the following in terms of the determinants of the lending interest rates in Kenya:

	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
1. Central Bank rate of Kenya					
2. Expected changes in inflation rate					
3. Economic growth measured by the GDP (Gross Domestic Product)					
4. Riskiness of the project					
5. Expected changes in a country's exchange rate					
6. The financial institution's deposit rate					
7. Nature of the loan (ie whether short term or long term)					
8. Type of the borrower (ie whether					

commercial or individual)					
9.Credit worthiness of the borrower					
10.Demand for Loanable funds					
11.Supply for Loanable funds					
12.Bank's expected profits					
13.Amount of Loan					
14.Current year country's budget deficit					
15.Political trends					
16.Government fiscal policy					
17.Social values					
18.Demand for capital					
19.Movements in the money market interest rate					
20.Regulatory capital requirements					
21.Interbank rate					
22.Bank's balance sheet structure and market position					
23.Fixed costs associated with the Loan					
24.Size of the bank					

25.Availability of deposits					
26.Relationship between the bank and the borrower					
27.Characteristics of the credit market					
28.Level of competition					
29.Prices of Bonds					
30.Expected return on business investment					
31.Purchase of government bonds by the banks					
32.Increase in permanent income					
33.Tax treatment					
34.Liquidity and solvency of the bank					
35.Nature of the collateral					

2. Please indicate any other factor that you take into consideration while fixing the lending interest rate

.....

3. What is the bank's lending interest rate response to policy change (eg regulatory capital requirements and CBR among others)?

Percent Measure	0-25%	26-50%	51-75%	76-100%	I don't know
Response rate					

APPENDIX 3: LIST OF FINANCIAL INSTITUTIONS IN KENYA

- | | |
|--------------------------------------|--|
| 1. ABC Bank (Kenya) | 23. Giro Commercial Bank |
| 2. Bank of Africa | 24. Guardian Bank |
| 3. Bank of Baroda | 25. Gulf African Bank |
| 4. Bank of India | 26. Habib Bank |
| 5. Barclays Bank | 27. Habib Bank AG Zurich |
| 6. CFC Stanbic Bank | 28. I&M Bank |
| 7. Chase Bank (Kenya) | 29. Imperial Bank Kenya |
| 8. Citibank | 30. Jamii Bora Bank |
| 9. Commercial Bank of Africa | 31. Kenya Commercial Bank |
| 10. Consolidated Bank of Kenya | 32. K-Rep Bank |
| 11. Cooperative Bank of Kenya | 33. Middle East Bank Kenya |
| 12. Credit Bank | 34. National Bank of Kenya |
| 13. Development Bank of Kenya | 35. NIC Bank |
| 14. Diamond Trust Bank | 36. Oriental Commercial Bank |
| 15. Dubai Bank Kenya | 37. Paramount Universal Bank |
| 16. Ecobank | 38. Prime Bank (Kenya) |
| 17. Equatorial Commercial Bank | 39. Standard Chartered Kenya |
| 18. Equity Bank | 40. Trans National Bank Kenya |
| 19. Family Bank | 41. United Bank for Africa |
| 20. Fidelity Commercial Bank Limited | 42. Victoria Commercial Bank |
| 21. Fina Bank | 43. HDFC Bank Limited |
| 22. First Community Bank | 44. Hong Kong and Shanghai Banking Corporation |

Source: Banking Supervision Annual Report 2011

Central Bank of Kenya

www.centralbank.go.ke

APPENDIX 4: MONTHLY LENDING INTEREST RATES

month	Lending
Jul-91	16.71
Aug-91	16.42
Sep-91	17.26
Oct-91	17.78
Nov-91	17.94
Dec-91	17.87
Jan-92	17.13
Feb-92	17.61
Mar-92	18.12
Apr-92	17.37
May-92	18.53
Jun-92	18.54
Jul-92	18.68
Aug-92	18.62
Sep-92	18.95
Oct-92	19.47
Nov-92	19.15
Dec-92	19.51
Jan-93	19.57
Feb-93	19.70
Mar-93	19.82
Apr-93	20.77
May-93	24.16
Jun-93	24.51
Jul-93	25.45
Aug-93	26.37
Sep-93	27.04
Oct-93	30.06
Nov-93	30.81
Dec-93	31.64
Jan-94	32.18
Feb-94	32.16
Mar-94	30.68
Apr-94	32.28
May-94	30.97
Jun-94	31.49
Jul-94	32.17
Aug-94	32.18
Sep-94	31.37
Oct-94	29.21
Nov-94	25.96
Dec-94	25.91
Jan-95	25.24

Feb-95	24.09
Mar-95	23.61
Apr-95	23.32
May-95	23.09
Jun-95	23.32
Jul-95	22.96
Aug-95	24.72
Sep-95	26.19
Oct-95	26.43
Nov-95	28.38
Dec-95	28.99
Jan-96	27.81
Feb-96	27.79
Mar-96	28.06
Apr-96	27.99
May-96	28.06
Jun-96	28.34
Jul-96	28.15
Aug-96	28.17
Sep-96	28.44
Oct-96	28.78
Nov-96	28.70
Dec-96	28.58
Jan-97	28.81
Feb-97	28.60
Mar-97	28.57
Apr-97	28.57
May-97	27.26
Jun-97	27.49
Jul-97	26.86
Aug-97	26.48
Sep-97	28.21
Oct-97	29.07
Nov-97	29.80
Dec-97	29.85
Jan-98	29.81
Feb-98	29.90
Mar-98	30.20
Apr-98	30.41
May-98	30.54
Jun-98	30.46
Jul-98	30.37
Aug-98	29.77
Sep-98	29.08

Oct-98	28.99
Nov-98	28.19
Dec-98	26.16
Jan-99	23.67
Feb-99	22.83
Mar-99	21.36
Apr-99	20.90
May-99	20.86
Jun-99	20.70
Jul-99	21.12
Aug-99	21.93
Sep-99	22.45
Oct-99	23.12
Nov-99	24.43
Dec-99	25.19
Jan-00	25.14
Feb-00	25.39
Mar-00	23.76
Apr-00	23.44
May-00	23.40
Jun-00	23.11
Jul-00	22.39
Aug-00	21.23
Sep-00	20.57
Oct-00	20.22
Nov-00	19.79
Dec-00	19.60
Jan-01	20.27
Feb-01	20.13
Mar-01	20.19
Apr-01	19.56
May-01	19.20
Jun-01	19.26
Jul-01	19.71
Aug-01	19.54
Sep-01	19.44
Oct-01	19.77
Nov-01	19.44
Dec-01	19.49
Jan-02	19.30
Feb-02	19.18
Mar-02	18.86
Apr-02	18.69
May-02	18.54

Jun-02	18.38
Jul-02	18.12
Aug-02	18.12
Sep-02	18.14
Oct-02	18.34
Nov-02	18.05
Dec-02	18.34
Jan-03	19.02
Feb-03	18.83
Mar-03	18.49
Apr-03	18.57
May-03	18.52
Jun-03	15.73
Jul-03	15.30
Aug-03	14.81
Sep-03	14.82
Oct-03	14.75
Nov-03	14.07
Dec-03	13.47
Jan-04	13.48
Feb-04	13.01
Mar-04	13.12
Apr-04	12.67
May-04	12.55
Jun-04	12.17
Jul-04	12.31
Aug-04	12.19
Sep-04	12.27
Oct-04	12.39
Nov-04	11.97
Dec-04	12.25
Jan-05	12.12
Feb-05	12.35
Mar-05	12.84
Apr-05	13.12
May-05	13.11
Jun-05	13.09
Jul-05	13.09
Aug-05	13.03
Sep-05	12.83
Oct-05	12.97
Nov-05	12.93
Dec-05	13.16
Jan-06	13.20

Feb-06	13.27
Mar-06	13.33
Apr-06	13.51
May-06	13.95
Jun-06	13.79
Jul-06	13.72
Aug-06	13.64
Sep-06	13.54
Oct-06	14.01
Nov-06	13.93
Dec-06	13.74
Jan-07	13.78
Feb-07	13.64
Mar-07	13.56
Apr-07	13.33
May-07	13.38
Jun-07	13.14
Jul-07	13.29
Aug-07	13.04

Sep-07	12.87
Oct-07	13.24
Nov-07	13.39
Dec-07	13.32
Jan-08	13.78
Feb-08	13.84
Mar-08	14.06
Apr-08	13.91
May-08	14.01
Jun-08	14.06
Jul-08	13.90
Aug-08	13.66
Sep-08	13.66
Oct-08	14.12
Nov-08	14.33
Dec-08	14.87
Jan-09	14.78
Feb-09	14.67
Mar-09	14.87

Apr-09	14.71
May-09	14.85
Jun-09	15.09
Jul-09	14.79
Aug-09	14.76
Sep-09	14.74
Oct-09	14.78
Nov-09	14.85
Dec-09	14.76
Jan-10	14.98
Feb-10	14.98
Mar-10	14.80
Apr-10	14.58
May-10	14.46
Jun-10	14.39
Jul-10	14.29
Aug-10	14.18
Sep-10	13.98
Oct-10	13.85

Nov-10	13.95
Dec-10	13.87
Jan-11	14.03
Feb-11	13.92
Mar-11	13.92
Apr-11	13.92
May-11	13.88
Jun-11	13.91
Jul-11	14.14
Aug-11	14.32
Sep-11	14.79
Oct-11	15.21
Nov-11	18.51
Dec-11	20.04
Jan-12	19.54
Feb-12	20.28
Mar-12	20.34
Apr-12	20.22

APPENDIX 5: VARIOUS VARIABLES

Year	Constant GDP Values	Money Supply (M2)	CPI	Inflation Rates	USD Exchange Rates	Mkt cap (Bn)	inter bank rate	T bill rates (91-day)	bank lending rate
1991	816,943	112,281	255.9	19.6	28.07	12.71	19.43	17.18	17.33
1992	814,492	124,828	325.8	27.3	36.22	23.00	24.74	18.15	18.47
1993	821,008	162,726	475.8	46.0	68.16	72.00	44.67	55.70	24.99
1994	857,954	192,584	612.8	28.8	44.84	136.83	15.92	25.20	30.55
1995	887,982	238,366	622.4	1.6	55.94	107.20	13.08	18.98	25.03
1996	918,174	277,811	678.5	9.0	55.02	98.68	15.05	23.00	28.24
1997	920,928	284,510	754.5	11.2	62.63	114.31	17.17	22.49	28.30
1998	952,240	295,513	804.6	6.6	61.91	128.94	20.28	23.32	29.49
1999	972,237	297,872	850.8	5.8	70.30	106.74	10.18	13.29	22.38
2000	977,098	308,735	935.5	10.0	76.20	101.42	8.51	12.07	22.34
2001	1,021,067	338,244	989.4	5.8	78.80	86.40	10.63	12.73	19.67
2002	1,025,584	381,017	1008.8	2.0	77.10	83.30	8.73	8.94	18.50
2003	1,055,658	419,837	1107.8	9.8	76.10	180.65	3.26	3.73	16.36
2004	1,109,338	474,883	1236.6	11.6	77.30	274.40	2.69	2.96	12.53
2005	1,172,784	553,907	1364.0	10.3	72.40	420.76	7.97	8.44	12.89
2006	1,244,445	666,875	1568.8	14.5	69.40	623.20	6.71	6.81	13.63
2007	1,332,801	766,471	1635.6	4.3	62.68	743.90	6.97	6.80	13.33
2008	1,352,793	898,099	1882.6	15.1	75.00	1,230.70	7.11	7.70	14.02
2009	1,389,318	1,100,299	2081.0	10.5	75.80	821.80	4.15	7.38	14.80
2010	1,469,898	1,253,958	2166.0	4.1	79.26	1,167.00	1.79	3.60	14.36
2011	1,534,574	1,469,037	2469.2	14.0	89.06	868.00	9.62	8.73	15.05
2012	1,605,164	124,828	2701.3	9.4	84.65	1,049.00	18.95	17.05	20.10

APPENDIX 6: GARCH VOLATILITY MODEL

GARCH(1,1) Analysis								
Unconditional Variance		0.51567917						
α		0.61426092						
β		0.87405664						
Date	Rate	Residual	Squared	Lagged	Conditional	Log	Conditional	Unconditional
			Residual	Squared	Variance	Likelihood	Standard	Standard
				Change		Function	Deviation	Deviation
							time weighted	no time weight
Jul-91	16.71							
Aug-91	16.42	-0.29	0.0841		0.5157			
Sep-91	17.26	0.84	0.7056	0.0841	0.5024	-1.2770	0.7088	0.7181
Oct-91	17.78	0.52	0.2704	0.7056	0.8725	-1.0057	0.9341	0.7181
Nov-91	17.94	0.16	0.0256	0.2704	0.9288	-0.8958	0.9637	0.7181
Dec-91	17.87	-0.07	0.0049	0.0256	0.8275	-0.8272	0.9097	0.7181
Jan-92	17.13	-0.74	0.5476	0.0049	0.7263	-1.1360	0.8522	0.7181
Feb-92	17.61	0.48	0.2304	0.5476	0.9712	-1.0229	0.9855	0.7181
Mar-92	18.12	0.51	0.2601	0.2304	0.9904	-1.0454	0.9952	0.7181
Apr-92	17.37	-0.75	0.5625	0.2601	1.0255	-1.2058	1.0126	0.7181
May-92	18.53	1.16	1.3456	0.5625	1.2418	-1.5690	1.1144	0.7181
Jun-92	18.54	0.01	0.0001	1.3456	1.9120	-1.2430	1.3827	0.7181
Jul-92	18.68	0.14	0.0196	0.0001	1.6712	-1.1816	1.2928	0.7181
Aug-92	18.62	-0.06	0.0036	0.0196	1.4728	-1.1137	1.2136	0.7181
Sep-92	18.95	0.33	0.1089	0.0036	1.2895	-1.0883	1.1356	0.7181
Oct-92	19.47	0.52	0.2704	0.1089	1.1940	-1.1208	1.0927	0.7181
Nov-92	19.15	-0.32	0.1024	0.2704	1.2097	-1.0565	1.0999	0.7181
Dec-92	19.51	0.36	0.1296	0.1024	1.1203	-1.0336	1.0584	0.7181
Jan-93	19.57	0.06	0.0036	0.1296	1.0588	-0.9492	1.0290	0.7181
Feb-93	19.70	0.13	0.0169	0.0036	0.9277	-0.8905	0.9632	0.7181
Mar-93	19.82	0.12	0.0144	0.0169	0.8212	-0.8292	0.9062	0.7181
Apr-93	20.77	0.95	0.9025	0.0144	0.7266	-1.3803	0.8524	0.7181
May-93	24.16	3.39	11.4921	0.9025	1.1895	-5.8363	1.0906	0.7181
Jun-93	24.51	0.35	0.1225	11.4921	8.0988	-1.9724	2.8458	0.7181
Jul-93	25.45	0.94	0.8836	0.1225	7.1541	-1.9645	2.6747	0.7181
Aug-93	26.37	0.92	0.8464	0.8836	6.7959	-1.9394	2.6069	0.7181
Sep-93	27.04	0.67	0.4489	0.8464	6.4599	-1.8865	2.5416	0.7181
Oct-93	30.06	3.02	9.1204	0.4489	5.9220	-2.5783	2.4335	0.7181
Nov-93	30.81	0.75	0.5625	9.1204	10.7785	-2.1338	3.2831	0.7181
Dec-93	31.64	0.83	0.6889	0.5625	9.7666	-2.0937	3.1251	0.7181

Jan-94	32.18	0.54	0.2916	0.6889	8.9597	-2.0316	2.9933	0.7181
Feb-94	32.16	-0.02	0.0004	0.2916	8.0104	-1.9593	2.8303	0.7181
Mar-94	30.68	-1.48	2.1904	0.0004	7.0018	-2.0484	2.6461	0.7181
Apr-94	32.28	1.6	2.5600	2.1904	7.4654	-2.0955	2.7323	0.7181
May-94	30.97	-1.31	1.7161	2.5600	8.0977	-2.0707	2.8457	0.7181
Jun-94	31.49	0.52	0.2704	1.7161	8.1320	-1.9835	2.8517	0.7181
Jul-94	32.17	0.68	0.4624	0.2704	7.2739	-1.9429	2.6970	0.7181
Aug-94	32.18	0.01	0.0001	0.4624	6.6419	-1.8656	2.5772	0.7181
Sep-94	31.37	-0.81	0.6561	0.0001	5.8054	-1.8548	2.4094	0.7181
Oct-94	29.21	-2.16	4.6656	0.6561	5.4773	-2.1951	2.3404	0.7181
Nov-94	25.96	-3.25	10.5625	4.6656	7.6534	-2.6266	2.7665	0.7181
Dec-94	25.91	-0.05	0.0025	10.5625	13.1776	-2.2083	3.6301	0.7181
Jan-95	25.24	-0.67	0.4489	0.0025	11.5195	-2.1604	3.3940	0.7181
Feb-95	24.09	-1.15	1.3225	0.4489	10.3445	-2.1511	3.2163	0.7181
Mar-95	23.61	-0.48	0.2304	1.3225	9.8540	-2.0746	3.1391	0.7181
Apr-95	23.32	-0.29	0.0841	0.2304	8.7545	-2.0085	2.9588	0.7181
May-95	23.09	-0.23	0.0529	0.0841	7.7036	-1.9432	2.7755	0.7181
Jun-95	23.32	0.23	0.0529	0.0529	6.7659	-1.8788	2.6011	0.7181
Jul-95	22.96	-0.36	0.1296	0.0529	5.9463	-1.8212	2.4385	0.7181
Aug-95	24.72	1.76	3.0976	0.1296	5.2770	-2.0441	2.2972	0.7181
Sep-95	26.19	1.47	2.1609	3.0976	6.5151	-2.0218	2.5525	0.7181
Oct-95	26.43	0.24	0.0576	2.1609	7.0219	-1.8976	2.6499	0.7181
Nov-95	28.38	1.95	3.8025	0.0576	6.1730	-2.1370	2.4845	0.7181
Dec-95	28.99	0.61	0.3721	3.8025	7.7312	-1.9656	2.7805	0.7181
Jan-96	27.81	-1.18	1.3924	0.3721	6.9861	-1.9906	2.6431	0.7181
Feb-96	27.79	-0.02	0.0004	1.3924	6.9616	-1.8892	2.6385	0.7181
Mar-96	28.06	0.27	0.0729	0.0004	6.0850	-1.8278	2.4668	0.7181
Apr-96	27.99	-0.07	0.0049	0.0729	5.3635	-1.7592	2.3159	0.7181
May-96	28.06	0.07	0.0049	0.0049	4.6910	-1.6923	2.1659	0.7181
Jun-96	28.34	0.28	0.0784	0.0049	4.1032	-1.6344	2.0256	0.7181
Jul-96	28.15	-0.19	0.0361	0.0784	3.6346	-1.5692	1.9065	0.7181
Aug-96	28.17	0.02	0.0004	0.0361	3.1990	-1.5004	1.7886	0.7181
Sep-96	28.44	0.27	0.0729	0.0004	2.7964	-1.4461	1.6722	0.7181
Oct-96	28.78	0.34	0.1156	0.0729	2.4890	-1.3981	1.5776	0.7181
Nov-96	28.70	-0.08	0.0064	0.1156	2.2465	-1.3251	1.4988	0.7181
Dec-96	28.58	-0.12	0.0144	0.0064	1.9675	-1.2610	1.4027	0.7181
Jan-97	28.81	0.23	0.0529	0.0144	1.7286	-1.2079	1.3148	0.7181
Feb-97	28.60	-0.21	0.0441	0.0529	1.5434	-1.1502	1.2423	0.7181
Mar-97	28.57	-0.03	0.0009	0.0441	1.3761	-1.0789	1.1731	0.7181
Apr-97	28.57	0	0.0000	0.0009	1.2033	-1.0115	1.0970	0.7181
May-97	27.26	-1.31	1.7161	0.0000	1.0518	-1.7600	1.0256	0.7181
Jun-97	27.49	0.23	0.0529	1.7161	1.9735	-1.2722	1.4048	0.7181
Jul-97	26.86	-0.63	0.3969	0.0529	1.7574	-1.3138	1.3257	0.7181
Aug-97	26.48	-0.38	0.1444	0.3969	1.7799	-1.2478	1.3341	0.7181
Sep-97	28.21	1.73	2.9929	0.1444	1.6444	-2.0776	1.2823	0.7181

Oct-97	29.07	0.86	0.7396	2.9929	3.2757	-1.6251	1.8099	0.7181
Nov-97	29.80	0.73	0.5329	0.7396	3.3175	-1.5989	1.8214	0.7181
Dec-97	29.85	0.05	0.0025	0.5329	3.2270	-1.5051	1.7964	0.7181
Jan-98	29.81	-0.04	0.0016	0.0025	2.8221	-1.4380	1.6799	0.7181
Feb-98	29.90	0.09	0.0081	0.0016	2.4677	-1.3722	1.5709	0.7181
Mar-98	30.20	0.3	0.0900	0.0081	2.1619	-1.3252	1.4703	0.7181
Apr-98	30.41	0.21	0.0441	0.0900	1.9449	-1.2629	1.3946	0.7181
May-98	30.54	0.13	0.0169	0.0441	1.7270	-1.1970	1.3142	0.7181
Jun-98	30.46	-0.08	0.0064	0.0169	1.5199	-1.1304	1.2329	0.7181
Jul-98	30.37	-0.09	0.0081	0.0064	1.3324	-1.0655	1.1543	0.7181
Aug-98	29.77	-0.6	0.3600	0.0081	1.1696	-1.1512	1.0815	0.7181
Sep-98	29.08	-0.69	0.4761	0.3600	1.2434	-1.2193	1.1151	0.7181
Oct-98	28.99	-0.09	0.0081	0.4761	1.3793	-1.0827	1.1744	0.7181
Nov-98	28.19	-0.8	0.6400	0.0081	1.2106	-1.2788	1.1003	0.7181
Dec-98	26.16	-2.03	4.1209	0.6400	1.4512	-2.5249	1.2047	0.7181
Jan-99	23.67	-2.49	6.2001	4.1209	3.7998	-2.4023	1.9493	0.7181
Feb-99	22.83	-0.84	0.7056	6.2001	7.1297	-1.9506	2.6701	0.7181
Mar-99	21.36	-1.47	2.1609	0.7056	6.6652	-2.0295	2.5817	0.7181
Apr-99	20.90	-0.46	0.2116	2.1609	7.1531	-1.9175	2.6745	0.7181
May-99	20.86	-0.04	0.0016	0.2116	6.3822	-1.8458	2.5263	0.7181
Jun-99	20.70	-0.16	0.0256	0.0016	5.5794	-1.7808	2.3621	0.7181
Jul-99	21.12	0.42	0.1764	0.0256	4.8924	-1.7308	2.2119	0.7181
Aug-99	21.93	0.81	0.6561	0.1764	4.3846	-1.7328	2.0939	0.7181
Sep-99	22.45	0.52	0.2704	0.6561	4.2354	-1.6726	2.0580	0.7181
Oct-99	23.12	0.67	0.4489	0.2704	3.8681	-1.6533	1.9668	0.7181
Nov-99	24.43	1.31	1.7161	0.4489	3.6567	-1.8019	1.9122	0.7181
Dec-99	25.19	0.76	0.5776	1.7161	4.2503	-1.7104	2.0616	0.7181
Jan-00	25.14	-0.05	0.0025	0.5776	4.0698	-1.6210	2.0174	0.7181
Feb-00	25.39	0.25	0.0625	0.0025	3.5588	-1.5624	1.8865	0.7181
Mar-00	23.76	-1.63	2.6569	0.0625	3.1490	-1.9143	1.7745	0.7181
Apr-00	23.44	-0.32	0.1024	2.6569	4.3844	-1.6696	2.0939	0.7181
May-00	23.40	-0.04	0.0016	0.1024	3.8951	-1.5990	1.9736	0.7181
Jun-00	23.11	-0.2904637	0.0844	0.0016	3.4055	-1.5440	1.8454	0.7181
Jul-00	22.39	-0.7190756	0.5171	0.0844	3.0285	-1.5583	1.7402	0.7181
Aug-00	21.23	-1.1587166	1.3426	0.5171	2.9647	-1.6888	1.7218	0.7181
Sep-00	20.57	-0.6635156	0.4403	1.3426	3.4160	-1.5976	1.8482	0.7181
Oct-00	20.22	-0.3440057	0.1183	0.4403	3.2562	-1.5274	1.8045	0.7181
Nov-00	19.79	-0.4348511	0.1891	0.1183	2.9188	-1.4869	1.7085	0.7181
Dec-00	19.60	-0.1874603	0.0351	0.1891	2.6674	-1.4161	1.6332	0.7181
Jan-01	20.27	0.6680886	0.4463	0.0351	2.3530	-1.4416	1.5340	0.7181
Feb-01	20.13	-0.1405578	0.0198	0.4463	2.3309	-1.3463	1.5267	0.7181
Mar-01	20.19	0.0613054	0.0038	0.0198	2.0494	-1.2786	1.4316	0.7181
Apr-01	19.56	-0.6315032	0.3988	0.0038	1.7936	-1.3222	1.3393	0.7181
May-01	19.20	-0.3631854	0.1319	0.3988	1.8127	-1.2527	1.3464	0.7181
Jun-01	19.26	0.0663643	0.0044	0.1319	1.6654	-1.1753	1.2905	0.7181

Jul-01	19.71	0.4436908	0.1969	0.0044	1.4584	-1.1751		1.2076	0.7181
Aug-01	19.54	-0.1619507	0.0262	0.1969	1.3956	-1.0950		1.1814	0.7181
Sep-01	19.44	-0.1015924	0.0103	0.0262	1.2360	-1.0291		1.1118	0.7181
Oct-01	19.77	0.3270969	0.1070	0.0103	1.0867	-1.0097		1.0424	0.7181
Nov-01	19.44	-0.3330425	0.1109	0.1070	1.0155	-0.9813		1.0077	0.7181
Dec-01	19.49	0.0529852	0.0028	0.1109	0.9558	-0.8978		0.9776	0.7181
Jan-02	19.30	-0.19226	0.0370	0.0028	0.8371	-0.8521		0.9149	0.7181
Feb-02	19.18	-0.1157415	0.0134	0.0370	0.7544	-0.7869		0.8686	0.7181
Mar-02	18.86	-0.317739	0.1010	0.0134	0.6676	-0.7925		0.8171	0.7181
Apr-02	18.69	-0.1726026	0.0298	0.1010	0.6456	-0.7232		0.8035	0.7181
May-02	18.54	-0.1510629	0.0228	0.0298	0.5826	-0.6684		0.7633	0.7181
Jun-02	18.38	-0.1625428	0.0264	0.0228	0.5232	-0.6203		0.7233	0.7181
Jul-02	18.12	-0.2564207	0.0658	0.0264	0.4736	-0.6146		0.6882	0.7181
Aug-02	18.12	-0.0048407	0.0000	0.0658	0.4543	-0.5245		0.6740	0.7181
Sep-02	18.14	0.0282624	0.0008	0.0000	0.3971	-0.4582		0.6302	0.7181
Oct-02	18.34	0.1931785	0.0373	0.0008	0.3476	-0.4442		0.5896	0.7181
Nov-02	18.05	-0.2920527	0.0853	0.0373	0.3267	-0.4902		0.5716	0.7181
Dec-02	18.34	0.2954038	0.0873	0.0853	0.3380	-0.5057		0.5814	0.7181
Jan-03	19.02	0.6741796	0.4545	0.0873	0.3490	-1.0438		0.5908	0.7181
Feb-03	18.83	-0.1832849	0.0336	0.4545	0.5843	-0.6790		0.7644	0.7181
Mar-03	18.49	-0.3440305	0.1184	0.0336	0.5313	-0.7141		0.7289	0.7181
Apr-03	18.57	0.0850516	0.0072	0.1184	0.5371	-0.6149		0.7329	0.7181
May-03	18.52	-0.0507599	0.0026	0.0072	0.4739	-0.5483		0.6884	0.7181
Jun-03	15.73	-2.7941324	7.8072	0.0026	0.4158	-9.8681		0.6448	0.7181
Jul-03	15.30	-0.4254734	0.1810	7.8072	5.1591	-1.7569		2.2714	0.7181
Aug-03	14.81	-0.4966383	0.2466	0.1810	4.6205	-1.7109		2.1495	0.7181
Sep-03	14.82	0.0144064	0.0002	0.2466	4.1901	-1.6353		2.0470	0.7181
Oct-03	14.75	-0.0672631	0.0045	0.0002	3.6625	-1.5686		1.9138	0.7181
Nov-03	14.07	-0.68558	0.4700	0.0045	3.2040	-1.5745		1.7900	0.7181
Dec-03	13.47	-0.5973896	0.3569	0.4700	3.0892	-1.5407		1.7576	0.7181
Jan-04	13.48	0.0076693	0.0001	0.3569	2.9194	-1.4546		1.7086	0.7181
Feb-04	13.01	-0.4655168	0.2167	0.0001	2.5517	-1.4298		1.5974	0.7181
Mar-04	13.12	0.1060846	0.0113	0.2167	2.3635	-1.3514		1.5374	0.7181
Apr-04	12.67	-0.4464123	0.1993	0.0113	2.0727	-1.3314		1.4397	0.7181
May-04	12.55	-0.1224872	0.0150	0.1993	1.9341	-1.2526		1.3907	0.7181
Jun-04	12.17	-0.3762436	0.1416	0.0150	1.6997	-1.2258		1.3037	0.7181
Jul-04	12.31	0.135132	0.0183	0.1416	1.5726	-1.1511		1.2540	0.7181
Aug-04	12.19	-0.1138494	0.0130	0.0183	1.3858	-1.0867		1.1772	0.7181
Sep-04	12.27	0.0741585	0.0055	0.0130	1.2192	-1.0203		1.1042	0.7181
Oct-04	12.39	0.1190727	0.0142	0.0055	1.0691	-0.9590		1.0339	0.7181
Nov-04	11.97	-0.4169718	0.1739	0.0142	0.9431	-0.9818		0.9711	0.7181
Dec-04	12.25	0.2790861	0.0779	0.1739	0.9311	-0.9251		0.9650	0.7181
Jan-05	12.12	-0.1302315	0.0170	0.0779	0.8617	-0.8544		0.9283	0.7181
Feb-05	12.35	0.2277818	0.0519	0.0170	0.7636	-0.8181		0.8739	0.7181
Mar-05	12.84	0.4965841	0.2466	0.0519	0.6993	-0.9164		0.8363	0.7181

Apr-05	13.12	0.2806881	0.0788	0.2466	0.7627	-0.8352	0.8733	0.7181
May-05	13.11	-0.0178765	0.0003	0.0788	0.7151	-0.7515	0.8456	0.7181
Jun-05	13.09	-0.0181133	0.0003	0.0003	0.6252	-0.6844	0.7907	0.7181
Jul-05	13.09	0.0058229	0.0000	0.0003	0.5467	-0.6170	0.7394	0.7181
Aug-05	13.03	-0.0678929	0.0046	0.0000	0.4778	-0.5545	0.6913	0.7181
Sep-05	12.83	-0.2008862	0.0404	0.0046	0.4205	-0.5338	0.6485	0.7181
Oct-05	12.97	0.1429605	0.0204	0.0404	0.3923	-0.4772	0.6264	0.7181
Nov-05	12.93	-0.0382503	0.0015	0.0204	0.3555	-0.4039	0.5962	0.7181
Dec-05	13.16	0.2301374	0.0530	0.0015	0.3116	-0.4209	0.5582	0.7181
Jan-06	13.20	0.0353382	0.0012	0.0530	0.3049	-0.3271	0.5522	0.7181
Feb-06	13.27	0.0703446	0.0049	0.0012	0.2673	-0.2685	0.5170	0.7181
Mar-06	13.33	0.0614247	0.0038	0.0049	0.2367	-0.2063	0.4865	0.7181
Apr-06	13.51	0.185063	0.0342	0.0038	0.2092	-0.2185	0.4574	0.7181
May-06	13.95	0.4330989	0.1876	0.0342	0.2039	-0.5838	0.4515	0.7181
Jun-06	13.79	-0.152598	0.0233	0.1876	0.2934	-0.3455	0.5417	0.7181
Jul-06	13.72	-0.0781835	0.0061	0.0233	0.2708	-0.2770	0.5204	0.7181
Aug-06	13.64	-0.0765069	0.0059	0.0061	0.2404	-0.2184	0.4903	0.7181
Sep-06	13.54	-0.1036599	0.0107	0.0059	0.2137	-0.1726	0.4623	0.7181
Oct-06	14.01	0.4743134	0.2250	0.0107	0.1934	-0.6791	0.4398	0.7181
Nov-06	13.93	-0.0810521	0.0066	0.2250	0.3073	-0.3396	0.5543	0.7181
Dec-06	13.74	-0.1881792	0.0354	0.0066	0.2726	-0.3340	0.5221	0.7181
Jan-07	13.78	0.0403876	0.0016	0.0354	0.2600	-0.2486	0.5099	0.7181
Feb-07	13.64	-0.1425673	0.0203	0.0016	0.2283	-0.2249	0.4778	0.7181
Mar-07	13.56	-0.0808841	0.0065	0.0203	0.2120	-0.1588	0.4605	0.7181
Apr-07	13.33	-0.2260985	0.0511	0.0065	0.1893	-0.2218	0.4351	0.7181
May-07	13.38	0.0456017	0.0021	0.0511	0.1969	-0.1117	0.4437	0.7181
Jun-07	13.14	-0.232121	0.0539	0.0021	0.1734	-0.1982	0.4164	0.7181
Jul-07	13.29	0.1413208	0.0200	0.0539	0.1846	-0.1284	0.4297	0.7181
Aug-07	13.04	-0.2447979	0.0599	0.0200	0.1737	-0.2162	0.4167	0.7181
Sep-07	12.87	-0.1704148	0.0290	0.0599	0.1886	-0.1619	0.4343	0.7181
Oct-07	13.24	0.3657603	0.1338	0.0290	0.1827	-0.4351	0.4274	0.7181
Nov-07	13.39	0.1544282	0.0238	0.1338	0.2419	-0.2586	0.4918	0.7181
Dec-07	13.32	-0.0684461	0.0047	0.0238	0.2261	-0.1858	0.4755	0.7181
Jan-08	13.78	0.458562	0.2103	0.0047	0.2005	-0.6399	0.4477	0.7181
Feb-08	13.84	0.0581437	0.0034	0.2103	0.3044	-0.3298	0.5517	0.7181
Mar-08	14.06	0.2229047	0.0497	0.0034	0.2681	-0.3535	0.5178	0.7181
Apr-08	13.91	-0.151055	0.0228	0.0497	0.2649	-0.2978	0.5147	0.7181
May-08	14.01	0.1012698	0.0103	0.0228	0.2455	-0.2377	0.4955	0.7181
Jun-08	14.06	0.0429243	0.0018	0.0103	0.2209	-0.1681	0.4700	0.7181
Jul-08	13.90	-0.1537239	0.0236	0.0018	0.1942	-0.1604	0.4407	0.7181
Aug-08	13.66	-0.2402506	0.0577	0.0236	0.1843	-0.2299	0.4293	0.7181
Sep-08	13.66	0.0012556	0.0000	0.0577	0.1965	-0.1055	0.4433	0.7181
Oct-08	14.12	0.456754	0.2086	0.0000	0.1718	-0.6454	0.4145	0.7181
Nov-08	14.33	0.2071447	0.0429	0.2086	0.2783	-0.3565	0.5276	0.7181
Dec-08	14.87	0.5464875	0.2986	0.0429	0.2696	-0.8174	0.5193	0.7181

Jan-09	14.78	-0.0895138	0.0080	0.2986	0.4191	-0.4937	0.6474	0.7181
Feb-09	14.67	-0.1157207	0.0134	0.0080	0.3713	-0.4415	0.6093	0.7181
Mar-09	14.87	0.2041397	0.0417	0.0134	0.3327	-0.4314	0.5768	0.7181
Apr-09	14.71	-0.1616179	0.0261	0.0417	0.3164	-0.3849	0.5625	0.7181
May-09	14.85	0.14	0.0196	0.0261	0.2926	-0.3380	0.5409	0.7181
Jun-09	15.09	0.24	0.0576	0.0196	0.2678	-0.3677	0.5175	0.7181
Jul-09	14.79	-0.3	0.0900	0.0576	0.2695	-0.4303	0.5191	0.7181
Aug-09	14.76	-0.03	0.0009	0.0900	0.2908	-0.3030	0.5393	0.7181
Sep-09	14.74	-0.0225765	0.0005	0.0009	0.2547	-0.2362	0.5047	0.7181
Oct-09	14.78	0.0462467	0.0021	0.0005	0.2230	-0.1734	0.4722	0.7181
Nov-09	14.85	0.0676222	0.0046	0.0021	0.1962	-0.1163	0.4430	0.7181
Dec-09	14.76	-0.0907413	0.0082	0.0046	0.1743	-0.0691	0.4175	0.7181
Jan-10	14.98	0.2157252	0.0465	0.0082	0.1574	-0.1423	0.3968	0.7181
Feb-10	14.98	-0.0005295	0.0000	0.0465	0.1662	-0.0216	0.4077	0.7181
Mar-10	14.80	-0.1782595	0.0318	0.0000	0.1453	-0.0637	0.3811	0.7181
Apr-10	14.58	-0.2174872	0.0473	0.0318	0.1465	-0.1200	0.3827	0.7181
May-10	14.46	-0.12	0.0144	0.0473	0.1571	-0.0393	0.3964	0.7181
Jun-10	14.39	-0.07	0.0049	0.0144	0.1462	0.0258	0.3823	0.7181
Jul-10	14.29	-0.1033891	0.0107	0.0049	0.1308	0.0574	0.3616	0.7181
Aug-10	14.18	-0.1095216	0.0120	0.0107	0.1209	0.0880	0.3477	0.7181
Sep-10	13.98	-0.2015615	0.0406	0.0120	0.1130	-0.0086	0.3362	0.7181
Oct-10	13.85	-0.1250812	0.0156	0.0406	0.1237	0.0626	0.3518	0.7181
Nov-10	13.95	0.0985446	0.0097	0.0156	0.1178	0.1093	0.3432	0.7181
Dec-10	13.87	-0.0771529	0.0060	0.0097	0.1089	0.1623	0.3300	0.7181
Jan-11	14.03	0.156273	0.0244	0.0060	0.0989	0.1146	0.3144	0.7181
Feb-11	13.92	-0.1060709	0.0113	0.0244	0.1014	0.1699	0.3184	0.7181
Mar-11	13.92	-0.00513	0.0000	0.0113	0.0956	0.2550	0.3091	0.7181
Apr-11	13.92	0.0071283	0.0001	0.0000	0.0835	0.3220	0.2890	0.7181
May-11	13.88	-0.0465927	0.0022	0.0001	0.0731	0.3745	0.2703	0.7181
Jun-11	13.91	0.0293758	0.0009	0.0022	0.0652	0.4397	0.2553	0.7181
Jul-11	14.14	0.2317924	0.0537	0.0009	0.0575	0.0418	0.2398	0.7181
Aug-11	14.32	0.1839464	0.0338	0.0537	0.0833	0.1207	0.2886	0.7181
Sep-11	14.79	0.4677924	0.2188	0.0338	0.0936	-0.9037	0.3059	0.7181
Oct-11	15.21	0.4222334	0.1783	0.2188	0.2162	-0.5655	0.4650	0.7181
						-		
Nov-11	18.51	3.3016728	10.9010	0.1783	0.2985	18.5743	0.5463	0.7181
Dec-11	20.04	1.5295466	2.3395	10.9010	6.9570	-2.0570	2.6376	0.7181
Jan-12	19.54	-0.4993422	0.2493	2.3395	7.5179	-1.9442	2.7419	0.7181
Feb-12	20.28	0.7344137	0.5394	0.2493	6.7242	-1.9119	2.5931	0.7181
Mar-12	20.34	0.0609891	0.0037	0.5394	6.2087	-1.8322	2.4917	0.7181
Apr-12	20.22	-0.118173	0.0140	0.0037	5.4290	-1.7661	2.3300	0.7181

APPENDIX 7: PRE INTERVENTION GARCH MODEL

GARCH(1,1) Analysis								
Unconditional Variance			0.68959755					
α			0.84214261					
β			0.92397036					
Date	Rate	Residual	Squared	Lagged	Conditional	Log	Conditional	Unconditional
			Residual	Squared	Variance	Likelihood	Standard	Standard
				Change		Function	Deviation	Deviation
							time weighted	no time weight
Jul-91	16.71							
Aug-91	16.42	-0.29	0.0841		0.6896			
Sep-91	17.26	0.84	0.7056	0.0841	0.7080	-1.2446	0.8414	0.8304
Oct-91	17.78	0.52	0.2704	0.7056	1.2484	-1.1382	1.1173	0.8304
Nov-91	17.94	0.16	0.0256	0.2704	1.3812	-1.0897	1.1752	0.8304
Dec-91	17.87	-0.07	0.0049	0.0256	1.2977	-1.0511	1.1392	0.8304
Jan-92	17.13	-0.74	0.5476	0.0049	1.2032	-1.2390	1.0969	0.8304
Feb-92	17.61	0.48	0.2304	0.5476	1.5729	-1.2186	1.2541	0.8304
Mar-92	18.12	0.51	0.2601	0.2304	1.6473	-1.2475	1.2835	0.8304
Apr-92	17.37	-0.75	0.5625	0.2601	1.7411	-1.3577	1.3195	0.8304
May-92	18.53	1.16	1.3456	0.5625	2.0825	-1.6088	1.4431	0.8304
Jun-92	18.54	0.01	0.0001	1.3456	3.0573	-1.4777	1.7485	0.8304
Jul-92	18.68	0.14	0.0196	0.0001	2.8250	-1.4417	1.6808	0.8304
Aug-92	18.62	-0.06	0.0036	0.0196	2.6267	-1.4025	1.6207	0.8304
Sep-92	18.95	0.33	0.1089	0.0036	2.4300	-1.3853	1.5589	0.8304
Oct-92	19.47	0.52	0.2704	0.1089	2.3370	-1.4012	1.5287	0.8304
Nov-92	19.15	-0.32	0.1024	0.2704	2.3870	-1.3754	1.5450	0.8304
Dec-92	19.51	0.36	0.1296	0.1024	2.2918	-1.3619	1.5139	0.8304
Jan-93	19.57	0.06	0.0036	0.1296	2.2267	-1.3200	1.4922	0.8304
Feb-93	19.70	0.13	0.0169	0.0036	2.0604	-1.2845	1.4354	0.8304
Mar-93	19.82	0.12	0.0144	0.0169	1.9180	-1.2483	1.3849	0.8304
Apr-93	20.77	0.95	0.9025	0.0144	1.7843	-1.4614	1.3358	0.8304
May-93	24.16	3.39	11.4921	0.9025	2.4087	-3.7440	1.5520	0.8304
Jun-93	24.51	0.35	0.1225	11.4921	11.9035	-2.1625	3.4502	0.8304
Jul-93	25.45	0.94	0.8836	0.1225	11.1017	-2.1623	3.3319	0.8304
Aug-93	26.37	0.92	0.8464	0.8836	11.0018	-2.1564	3.3169	0.8304
Sep-93	27.04	0.67	0.4489	0.8464	10.8781	-2.1329	3.2982	0.8304
Oct-93	30.06	3.02	9.1204	0.4489	10.4291	-2.5285	3.2294	0.8304
Nov-93	30.81	0.75	0.5625	9.1204	17.3168	-2.3610	4.1614	0.8304
Dec-93	31.64	0.83	0.6889	0.5625	16.4740	-2.3407	4.0588	0.8304
Jan-94	32.18	0.54	0.2916	0.6889	15.8016	-2.3082	3.9751	0.8304

Feb-94	32.16	-0.02	0.0004	0.2916	14.8458	-2.2678		3.8530	0.8304
Mar-94	30.68	-1.48	2.1904	0.0004	13.7174	-2.3081		3.7037	0.8304
Apr-94	32.28	1.6	2.5600	2.1904	14.5191	-2.3448		3.8104	0.8304
May-94	30.97	-1.31	1.7161	2.5600	15.5711	-2.3468		3.9460	0.8304
Jun-94	31.49	0.52	0.2704	1.7161	15.8325	-2.3085		3.9790	0.8304
Jul-94	32.17	0.68	0.4624	0.2704	14.8564	-2.2837		3.8544	0.8304
Aug-94	32.18	0.01	0.0001	0.4624	14.1163	-2.2426		3.7572	0.8304
Sep-94	31.37	-0.81	0.6561	0.0001	13.0431	-2.2282		3.6115	0.8304
Oct-94	29.21	-2.16	4.6656	0.6561	12.6040	-2.3710		3.5502	0.8304
Nov-94	25.96	-3.25	10.5625	4.6656	15.5748	-2.6309		3.9465	0.8304
Dec-94	25.91	-0.05	0.0025	10.5625	23.2858	-2.4929		4.8255	0.8304
Jan-95	25.24	-0.67	0.4489	0.0025	21.5175	-2.4638		4.6387	0.8304
Feb-95	24.09	-1.15	1.3225	0.4489	20.2596	-2.4559		4.5011	0.8304
Mar-95	23.61	-0.48	0.2304	1.3225	19.8330	-2.4184		4.4534	0.8304
Apr-95	23.32	-0.29	0.0841	0.2304	18.5191	-2.3806		4.3034	0.8304
May-95	23.09	-0.23	0.0529	0.0841	17.1820	-2.3424		4.1451	0.8304
Jun-95	23.32	0.23	0.0529	0.0529	15.9202	-2.3044		3.9900	0.8304
Jul-95	22.96	-0.36	0.1296	0.0529	14.7543	-2.2691		3.8411	0.8304
Aug-95	24.72	1.76	3.0976	0.1296	13.7417	-2.3419		3.7070	0.8304
Sep-95	26.19	1.47	2.1609	3.0976	15.3056	-2.3536		3.9122	0.8304
Oct-95	26.43	0.24	0.0576	2.1609	15.9617	-2.3058		3.9952	0.8304
Nov-95	28.38	1.95	3.8025	0.0576	14.7966	-2.3946		3.8466	0.8304
Dec-95	28.99	0.61	0.3721	3.8025	16.8739	-2.3428		4.1078	0.8304
Jan-96	27.81	-1.18	1.3924	0.3721	15.9043	-2.3460		3.9880	0.8304
Feb-96	27.79	-0.02	0.0004	1.3924	15.8677	-2.3011		3.9834	0.8304
Mar-96	28.06	0.27	0.0729	0.0004	14.6617	-2.2640		3.8291	0.8304
Apr-96	27.99	-0.07	0.0049	0.0729	13.6083	-2.2245		3.6889	0.8304
May-96	28.06	0.07	0.0049	0.0049	12.5778	-2.1851		3.5465	0.8304
Jun-96	28.34	0.28	0.0784	0.0049	11.6257	-2.1489		3.4096	0.8304
Jul-96	28.15	-0.19	0.0361	0.0784	10.8078	-2.1107		3.2875	0.8304
Aug-96	28.17	0.02	0.0004	0.0361	10.0165	-2.0711		3.1649	0.8304
Sep-96	28.44	0.27	0.0729	0.0004	9.2553	-2.0355		3.0423	0.8304
Oct-96	28.78	0.34	0.1156	0.0729	8.6130	-2.0023		2.9348	0.8304
Nov-96	28.70	-0.08	0.0064	0.1156	8.0555	-1.9625		2.8382	0.8304
Dec-96	28.58	-0.12	0.0144	0.0064	7.4485	-1.9239		2.7292	0.8304
Jan-97	28.81	0.23	0.0529	0.0144	6.8943	-1.8881		2.6257	0.8304
Feb-97	28.60	-0.21	0.0441	0.0529	6.4147	-1.8517		2.5327	0.8304
Mar-97	28.57	-0.03	0.0009	0.0441	5.9641	-1.8119		2.4422	0.8304
Apr-97	28.57	0	0.0000	0.0009	5.5114	-1.7723		2.3476	0.8304
May-97	27.26	-1.31	1.7161	0.0000	5.0924	-1.9013		2.2566	0.8304
Jun-97	27.49	0.23	0.0529	1.7161	6.1504	-1.8315		2.4800	0.8304
Jul-97	26.86	-0.63	0.3969	0.0529	5.7274	-1.8262		2.3932	0.8304
Aug-97	26.48	-0.38	0.1444	0.3969	5.6262	-1.7955		2.3720	0.8304
Sep-97	28.21	1.73	2.9929	0.1444	5.3200	-2.0360		2.3065	0.8304
Oct-97	29.07	0.86	0.7396	2.9929	7.4360	-1.9718		2.7269	0.8304

Nov-97	29.80	0.73	0.5329	0.7396	7.4935	-1.9615		2.7374	0.8304
Dec-97	29.85	0.05	0.0025	0.5329	7.3725	-1.9180		2.7152	0.8304
Jan-98	29.81	-0.04	0.0016	0.0025	6.8141	-1.8786		2.6104	0.8304
Feb-98	29.90	0.09	0.0081	0.0016	6.2974	-1.8396		2.5095	0.8304
Mar-98	30.20	0.3	0.0900	0.0081	5.8254	-1.8078		2.4136	0.8304
Apr-98	30.41	0.21	0.0441	0.0900	5.4583	-1.7715		2.3363	0.8304
May-98	30.54	0.13	0.0169	0.0441	5.0805	-1.7333		2.2540	0.8304
Jun-98	30.46	-0.08	0.0064	0.0169	4.7084	-1.6943		2.1699	0.8304
Jul-98	30.37	-0.09	0.0081	0.0064	4.3559	-1.6556		2.0871	0.8304
Aug-98	29.77	-0.6	0.3600	0.0081	4.0315	-1.6607		2.0079	0.8304
Sep-98	29.08	-0.69	0.4761	0.3600	4.0282	-1.6747		2.0070	0.8304
Oct-98	28.99	-0.09	0.0081	0.4761	4.1229	-1.6282		2.0305	0.8304
Nov-98	28.19	-0.8	0.6400	0.0081	3.8162	-1.6724		1.9535	0.8304
Dec-98	26.16	-2.03	4.1209	0.6400	4.0651	-2.1270		2.0162	0.8304
Jan-99	23.67	-2.49	6.2001	4.1209	7.2264	-2.3368		2.6882	0.8304
Feb-99	22.83	-0.84	0.7056	6.2001	11.8983	-2.1868		3.4494	0.8304
Mar-99	21.36	-1.47	2.1609	0.7056	11.5879	-2.2372		3.4041	0.8304
Apr-99	20.90	-0.46	0.2116	2.1609	12.5267	-2.1913		3.5393	0.8304
May-99	20.86	-0.04	0.0016	0.2116	11.7525	-2.1510		3.4282	0.8304
Jun-99	20.70	-0.16	0.0256	0.0016	10.8603	-2.1127		3.2955	0.8304
Jul-99	21.12	0.42	0.1764	0.0256	10.0562	-2.0818		3.1711	0.8304
Aug-99	21.93	0.81	0.6561	0.1764	9.4402	-2.0762		3.0725	0.8304
Sep-99	22.45	0.52	0.2704	0.6561	9.2750	-2.0472		3.0455	0.8304
Oct-99	23.12	0.67	0.4489	0.2704	8.7975	-2.0317		2.9661	0.8304
Nov-99	24.43	1.31	1.7161	0.4489	8.5067	-2.0902		2.9166	0.8304
Dec-99	25.19	0.76	0.5776	1.7161	9.3051	-2.0653		3.0504	0.8304
Jan-00	25.14	-0.05	0.0025	0.5776	9.0841	-2.0223		3.0140	0.8304
Feb-00	25.39	0.25	0.0625	0.0025	8.3955	-1.9865		2.8975	0.8304
Mar-00	23.76	-1.63	2.6569	0.0625	7.8099	-2.1167		2.7946	0.8304
Apr-00	23.44	-0.32	0.1024	2.6569	9.4536	-2.0476		3.0747	0.8304
May-00	23.40	-0.04	0.0016	0.1024	8.8211	-2.0076		2.9700	0.8304
Jun-00	23.11	-0.2904637	0.0844	0.0016	8.1517	-1.9732		2.8551	0.8304
Jul-00	22.39	-0.7190756	0.5171	0.0844	7.6030	-1.9672		2.7574	0.8304
Aug-00	21.23	-1.1587166	1.3426	0.5171	7.4604	-2.0137		2.7314	0.8304
Sep-00	20.57	-0.6635156	0.4403	1.3426	8.0239	-1.9876		2.8326	0.8304
Oct-00	20.22	-0.3440057	0.1183	0.4403	7.7846	-1.9526		2.7901	0.8304
Nov-00	19.79	-0.4348511	0.1891	0.1183	7.2924	-1.9253		2.7004	0.8304
Dec-00	19.60	-0.1874603	0.0351	0.1891	6.8972	-1.8870		2.6263	0.8304
Jan-01	20.27	0.6680886	0.4463	0.0351	6.4024	-1.8821		2.5303	0.8304
Feb-01	20.13	-0.1405578	0.0198	0.4463	6.2915	-1.8401		2.5083	0.8304
Mar-01	20.19	0.0613054	0.0038	0.0198	5.8298	-1.8008		2.4145	0.8304
Apr-01	19.56	-0.6315032	0.3988	0.0038	5.3898	-1.7982		2.3216	0.8304
May-01	19.20	-0.3631854	0.1319	0.3988	5.3158	-1.7667		2.3056	0.8304
Jun-01	19.26	0.0663643	0.0044	0.1319	5.0228	-1.7264		2.2411	0.8304
Jul-01	19.71	0.4436908	0.1969	0.0044	4.6446	-1.7080		2.1551	0.8304

Aug-01	19.54	-0.1619507	0.0262	0.1969	4.4573	-1.6691		2.1112	0.8304
Sep-01	19.44	-0.1015924	0.0103	0.0262	4.1405	-1.6306		2.0348	0.8304
Oct-01	19.77	0.3270969	0.1070	0.0103	3.8344	-1.6049		1.9582	0.8304
Nov-01	19.44	-0.3330425	0.1109	0.1070	3.6329	-1.5792		1.9060	0.8304
Dec-01	19.49	0.0529852	0.0028	0.1109	3.4501	-1.5386		1.8575	0.8304
Jan-02	19.30	-0.19226	0.0370	0.0028	3.1902	-1.5048		1.7861	0.8304
Feb-02	19.18	-0.1157415	0.0134	0.0370	2.9788	-1.4669		1.7259	0.8304
Mar-02	18.86	-0.317739	0.1010	0.0134	2.7636	-1.4455		1.6624	0.8304
Apr-02	18.69	-0.1726026	0.0298	0.1010	2.6385	-1.4097		1.6243	0.8304
May-02	18.54	-0.1510629	0.0228	0.0298	2.4630	-1.3743		1.5694	0.8304
Jun-02	18.38	-0.1625428	0.0264	0.0228	2.2949	-1.3401		1.5149	0.8304
Jul-02	18.12	-0.2564207	0.0658	0.0264	2.1427	-1.3153		1.4638	0.8304
Aug-02	18.12	-0.0048407	0.0000	0.0658	2.0352	-1.2742		1.4266	0.8304
Sep-02	18.14	0.0282624	0.0008	0.0000	1.8805	-1.2349		1.3713	0.8304
Oct-02	18.34	0.1931785	0.0373	0.0008	1.7382	-1.2061		1.3184	0.8304
Nov-02	18.05	-0.2920527	0.0853	0.0373	1.6375	-1.1916		1.2796	0.8304
Dec-02	18.34	0.2954038	0.0873	0.0853	1.5848	-1.1767		1.2589	0.8304
Jan-03	19.02	0.6741796	0.4545	0.0873	1.5378	-1.2819		1.2401	0.8304
Feb-03	18.83	-0.1832849	0.0336	0.4545	1.8037	-1.2232		1.3430	0.8304
Mar-03	18.49	-0.3440305	0.1184	0.0336	1.6948	-1.2176		1.3019	0.8304
Apr-03	18.57	0.0850516	0.0072	0.1184	1.6656	-1.1762		1.2906	0.8304
May-03	18.52	-0.0507599	0.0026	0.0072	1.5451	-1.1373		1.2430	0.8304
Jun-03	15.73	-2.7941324	7.8072	0.0026	1.4298	-3.8279		1.1957	0.8304
Jul-03	15.30	-0.4254734	0.1810	7.8072	7.8958	-1.9636		2.8100	0.8304
Aug-03	14.81	-0.4966383	0.2466	0.1810	7.4480	-1.9395		2.7291	0.8304
Sep-03	14.82	0.0144064	0.0002	0.2466	7.0894	-1.8983		2.6626	0.8304
Oct-03	14.75	-0.0672631	0.0045	0.0002	6.5506	-1.8591		2.5594	0.8304
Nov-03	14.07	-0.68558	0.4700	0.0045	6.0564	-1.8583		2.4610	0.8304
Dec-03	13.47	-0.5973896	0.3569	0.4700	5.9917	-1.8439		2.4478	0.8304
Jan-04	13.48	0.0076693	0.0001	0.3569	5.8367	-1.8010		2.4159	0.8304
Feb-04	13.01	-0.4655168	0.2167	0.0001	5.3930	-1.7816		2.3223	0.8304
Mar-04	13.12	0.1060846	0.0113	0.2167	5.1655	-1.7410		2.2728	0.8304
Apr-04	12.67	-0.4464123	0.1993	0.0113	4.7822	-1.7222		2.1868	0.8304
May-04	12.55	-0.1224872	0.0150	0.1993	4.5865	-1.6821		2.1416	0.8304
Jun-04	12.17	-0.3762436	0.1416	0.0150	4.2504	-1.6591		2.0617	0.8304
Jul-04	12.31	0.135132	0.0183	0.1416	4.0465	-1.6201		2.0116	0.8304
Aug-04	12.19	-0.1138494	0.0130	0.0183	3.7542	-1.5821		1.9376	0.8304
Sep-04	12.27	0.0741585	0.0055	0.0130	3.4797	-1.5432		1.8654	0.8304
Oct-04	12.39	0.1190727	0.0142	0.0055	3.2198	-1.5058		1.7944	0.8304
Nov-04	11.97	-0.4169718	0.1739	0.0142	2.9869	-1.4952		1.7283	0.8304
Dec-04	12.25	0.2790861	0.0779	0.1739	2.9062	-1.4658		1.7048	0.8304

APPENDIX 8: POST INTERVENTION GARCH MODEL

				Post intervention				
GARCH(1,1) Analysis								
Unconditional Variance		α 0.19427145 β 0.22014261 0.86970364						
Date	Rate	Residual	Square d	Lagged	Condition al	Log	Conditional	Unconditiona l
			Residua l	Squared	Variance	Likelihoo d	Standard	Standard
				Change		Function	Deviation	Deviation
							time weighted	no weight
Jan-05	12.12							
Feb-05	12.35	0.2277818	0.0519		0.1943			
Mar-05	12.84	0.4965841	0.2466	0.0519	0.1804	-0.7461	0.4247	0.4408
Apr-05	13.12	0.2806881	0.0788	0.2466	0.2112	-0.3279	0.4595	0.4408
May-05	13.11	0.0178765	0.0003	0.0788	0.2010	-0.1175	0.4483	0.4408
Jun-05	13.09	0.0181133	0.0003	0.0003	0.1749	-0.0481	0.4182	0.4408
Jul-05	13.09	0.0058229	0.0000	0.0003	0.1522	0.0223	0.3901	0.4408
Aug-05	13.03	0.0678929	0.0046	0.0000	0.1324	0.0748	0.3638	0.4408
Sep-05	12.83	0.2008862	0.0404	0.0046	0.1161	-0.0162	0.3408	0.4408
Oct-05	12.97	0.1429605	0.0204	0.0404	0.1099	0.0922	0.3315	0.4408
Nov-05	12.93	0.0382503	0.0015	0.0204	0.1001	0.2247	0.3163	0.4408
Dec-05	13.16	0.2301374	0.0530	0.0015	0.0874	-0.0032	0.2956	0.4408
Jan-06	13.20	0.0353382	0.0012	0.0530	0.0876	0.2912	0.2960	0.4408
Feb-06	13.27	0.0703446	0.0049	0.0012	0.0765	0.3339	0.2766	0.4408
Mar-06	13.33	0.0614247	0.0038	0.0049	0.0676	0.4000	0.2601	0.4408
Apr-06	13.51	0.185063	0.0342	0.0038	0.0596	0.2036	0.2442	0.4408
May-06	13.95	0.4330989	0.1876	0.0342	0.0594	-1.0857	0.2438	0.4408
Jun-06	13.79	-0.152598	0.0233	0.1876	0.0930	0.1435	0.3049	0.4408
Jul-06	13.72	0.0781835	0.0061	0.0233	0.0860	0.2723	0.2932	0.4408
Aug-06	13.64	0.0765069	0.0059	0.0061	0.0761	0.3302	0.2759	0.4408
Sep-06	13.54	-	0.0107	0.0059	0.0675	0.3492	0.2598	0.4408

		0.1036599							
Oct-06	14.01	0.4743134	0.2250	0.0107	0.0611	-1.3627		0.2471	0.4408
Nov-06	13.93	-	0.0066	0.2250	0.1027	0.1873		0.3204	0.4408
Dec-06	13.74	-	0.0354	0.0066	0.0907	0.0859		0.3012	0.4408
Jan-07	13.78	0.0403876	0.0016	0.0354	0.0867	0.2943		0.2945	0.4408
Feb-07	13.64	-	0.0203	0.0016	0.0758	0.2370		0.2753	0.4408
Mar-07	13.56	-	0.0065	0.0203	0.0704	0.3615		0.2653	0.4408
Apr-07	13.33	-	0.0511	0.0065	0.0627	0.0582		0.2503	0.4408
May-07	13.38	0.0456017	0.0021	0.0511	0.0657	0.4262		0.2564	0.4408
Jun-07	13.14	-0.232121	0.0539	0.0021	0.0576	0.0404		0.2401	0.4408
Jul-07	13.29	0.1413208	0.0200	0.0539	0.0620	0.3103		0.2490	0.4408
Aug-07	13.04	-	0.0599	0.0200	0.0583	-0.0118		0.2415	0.4408
Sep-07	12.87	-	0.0290	0.0599	0.0639	0.2290		0.2528	0.4408
Oct-07	13.24	0.3657603	0.1338	0.0290	0.0620	-0.6076		0.2490	0.4408
Nov-07	13.39	0.1544282	0.0238	0.1338	0.0834	0.1803		0.2887	0.4408
Dec-07	13.32	-	0.0047	0.0238	0.0778	0.3280		0.2788	0.4408
Jan-08	13.78	0.458562	0.2103	0.0047	0.0687	-1.1110		0.2620	0.4408
Feb-08	13.84	0.0581437	0.0034	0.2103	0.1060	0.1872		0.3256	0.4408
Mar-08	14.06	0.2229047	0.0497	0.0034	0.0929	0.0016		0.3049	0.4408
Apr-08	13.91	-0.151055	0.0228	0.0497	0.0918	0.1510		0.3029	0.4408
May-08	14.01	0.1012698	0.0103	0.0228	0.0848	0.2541		0.2913	0.4408
Jun-08	14.06	0.0429243	0.0018	0.0103	0.0761	0.3571		0.2758	0.4408
Jul-08	13.90	-	0.0236	0.0018	0.0666	0.2584		0.2580	0.4408
Aug-08	13.66	-	0.0577	0.0236	0.0631	0.0052		0.2512	0.4408
Sep-08	13.66	0.0012556	0.0000	0.0577	0.0676	0.4283		0.2600	0.4408
Oct-08	14.12	0.456754	0.2086	0.0000	0.0588	-1.2766		0.2424	0.4408
Nov-08	14.33	0.2071447	0.0429	0.2086	0.0970	0.0263		0.3115	0.4408
Dec-08	14.87	0.5464875	0.2986	0.0429	0.0939	-1.3270		0.3064	0.4408
Jan-09	14.78	-	0.0080	0.2986	0.1474	0.0113		0.3839	0.4408
Feb-09	14.67	-	0.0134	0.0080	0.1299	0.0499		0.3605	0.4408
Mar-09	14.87	0.2041397	0.0417	0.0134	0.1160	-0.0214		0.3405	0.4408
Apr-09	14.71	-	0.0261	0.0417	0.1100	0.0659		0.3317	0.4408
May-09	14.85	0.14	0.0196	0.0261	0.1014	0.1286		0.3185	0.4408
Jun-09	15.09	0.24	0.0576	0.0196	0.0925	-0.0401		0.3042	0.4408
Jul-09	14.79	-0.3	0.0900	0.0576	0.0932	-0.2153		0.3052	0.4408

Aug-09	14.76	-0.03	0.0009	0.0900	0.1009	0.2237		0.3176	0.4408
Sep-09	14.74	-	0.0005	0.0009	0.0879	0.2939		0.2965	0.4408
Oct-09	14.78	0.0462467	0.0021	0.0005	0.0766	0.3518		0.2767	0.4408
Nov-09	14.85	0.0676222	0.0046	0.0021	0.0671	0.3980		0.2590	0.4408
Dec-09	14.76	-	0.0082	0.0046	0.0593	0.4239		0.2436	0.4408
Jan-10	14.98	0.2157252	0.0465	0.0082	0.0534	0.1103		0.2311	0.4408
Feb-10	14.98	-	0.0000	0.0465	0.0567	0.5159		0.2381	0.4408
Mar-10	14.80	-	0.0318	0.0000	0.0493	0.2636		0.2221	0.4408
Apr-10	14.58	-	0.0473	0.0318	0.0499	0.1060		0.2234	0.4408
May-10	14.46	-0.12	0.0144	0.0473	0.0538	0.4084		0.2320	0.4408
Jun-10	14.39	-0.07	0.0049	0.0144	0.0500	0.5301		0.2236	0.4408
Jul-10	14.29	-	0.0107	0.0049	0.0445	0.5167		0.2111	0.4408
Aug-10	14.18	-	0.0120	0.0107	0.0411	0.5310		0.2027	0.4408
Sep-10	13.98	-	0.0406	0.0120	0.0384	0.1819		0.1959	0.4408
Oct-10	13.85	-	0.0156	0.0406	0.0423	0.4773		0.2058	0.4408
Nov-10	13.95	0.0985446	0.0097	0.0156	0.0403	0.5666		0.2007	0.4408
Dec-10	13.87	-	0.0060	0.0097	0.0372	0.6472		0.1928	0.4408
Jan-11	14.03	0.156273	0.0244	0.0060	0.0336	0.4141		0.1834	0.4408
Feb-11	13.92	-	0.0113	0.0244	0.0346	0.6001		0.1861	0.4408
Mar-11	13.92	-0.00513	0.0000	0.0113	0.0326	0.7924		0.1806	0.4408
Apr-11	13.92	0.0071283	0.0001	0.0000	0.0284	0.8615		0.1684	0.4408
May-11	13.88	-	0.0022	0.0001	0.0247	0.8879		0.1571	0.4408
Jun-11	13.91	0.0293758	0.0009	0.0022	0.0219	0.9709		0.1481	0.4408
Jul-11	14.14	0.2317924	0.0537	0.0009	0.0193	-0.3378		0.1389	0.4408
Aug-11	14.32	0.1839464	0.0338	0.0537	0.0286	0.2667		0.1691	0.4408
Sep-11	14.79	0.4677924	0.2188	0.0338	0.0323	-2.5876		0.1798	0.4408
Oct-11	15.21	0.4222334	0.1783	0.2188	0.0763	-0.8007		0.2762	0.4408
Nov-11	18.51	3.3016728	10.901 0	0.1783	0.1056	51.4078		0.3250	0.4408
Dec-11	20.04	1.5295466	2.3395 0	10.901 0	2.4916	-1.8449		1.5785	0.4408
Jan-12	19.54	-	0.2493	2.3395	2.6820	-1.4587		1.6377	0.4408
Feb-12	20.28	0.7344137	0.5394	0.2493	2.3875	-1.4670		1.5451	0.4408
Mar-12	20.34	0.0609891	0.0037	0.5394	2.1951	-1.3129		1.4816	0.4408
Apr-12	20.22	-0.118173	0.0140	0.0037	1.9099	-1.2461		1.3820	0.4408