

95353

**The Responsiveness of Bank Deposit Interest Rates to Policy Rate Changes in
the Kenyan Commercial Banks**

Nyangu, Moses Nzuki

**Submitted in partial fulfillment of the requirements for the Degree of Master of
Commerce at Strathmore University**

School of Management and Commerce

Strathmore University

Nairobi, Kenya

June, 2014

This thesis is available for Library use on the understanding that it is copyright material and that no quotation from the thesis may be published without proper acknowledgement.

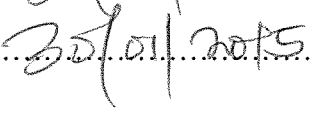
DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

© No part of this thesis may be reproduced without the permission of the author and Strathmore University.

Nyangu, Moses Nzuki

Signature.....

Date.....

Approval

The thesis of Nyangu Moses Nzuki was reviewed and approved by the following:

Dr. Freshia Mugo_Waweru

Senior lecturer, School of Management and Commerce
Strathmore University

Dr David Wang'ombe

Dean, School of Management and Commerce
Strathmore University

Professor Ruth Kiraka

Dean, School of Graduate Studies
Strathmore University



ABSTRACT

The Central Bank maintains price stability in the economy by managing the interest rate changes in the economy through monetary policy measures. It expects the interest rates to adjust in response to policy rate changes but mixed findings of interest rate adjustment have been observed despite the importance vested in the transmission process. Therefore, this study examined the responsiveness of deposit interest rates as the benchmark policy rate changed in the Kenyan commercial banks. It explained the monetary policy transmission process from the policy rate to the retail deposit interest rates. The study used various econometric tests and key among them where the granger causality test and error correction model (ECM). The granger causality test measured whether the benchmark policy rate caused the adjustment of deposit interest rates while ECM measured interest rate pass-through and the adjustment behavior.

The results strongly indicated that the benchmark policy rate (T-bill) influenced the adjustment of deposit interest rates. Using both symmetric and asymmetric ECM, incomplete pass-through was found on the deposit rates both in the short-run and long-run. Mixed results of asymmetric adjustment of deposit interest rates were established. In the entire period (1991-2013) and first period (1991-2003) deposit interest rates were observed to adjust rigidly upwards and quickly downwards supporting the collusive pricing arrangement behavior. In the second period (2004-2013), deposit interest rates adjusted quickly upwards and rigidly downwards supporting the negative customer reactions behavior. The symmetric Mean Adjustment Lag (MAL) indicated that it took between 5 and 27 months for the deposit interest rates to fully adjust as the policy rate adjusted. The deposit interest rate rigidity from the findings, implied that monetary policy was not effective and therefore not achieving its intended objectives.

TABLE OF CONTENTS

DECLARATION	i
ABSTRACT	i
LIST OF TABLES	vii
LIST OF FIGURES.....	viii
LIST OF ABBREVIATIONS.....	ix
ACKNOWLEDGEMENT	x
DEDICATION	xi
Chapter 1: INTRODUCTION.....	1
1.1 Introduction	1
1.1.1 <i>Dynamics of interest rate in Kenya</i>	3
1.2 Statement of the problem	5
1.3 General research objective	7
1.3.1 <i>Specific research objectives</i>	7
1.4 Research Questions.....	7
1.5 Scope of the study.....	8
1.6 Significance of the Research	8
Chapter 2: LITERATURE REVIEW	10
2.1 Introduction	10
2.2 The Kenyan Banking Sector.....	10
2.3 Monetary Policy Transmission Mechanism	11
2.3.1 <i>Monetary policy and interest rates in Kenya</i>	12
2.4 Theories of interest rate non-responsiveness and their implications.....	13

2.4.1	<i>Market Concentration</i>	14
2.4.2	<i>Large Customer Base</i>	14
2.4.3	<i>Consumer Inertia</i>	15
2.4.4	<i>Menu Cost</i>	15
2.4.5	<i>Kinked Demand Curve</i>	16
2.4.6	<i>Tacit Collusion</i>	16
2.4.7	<i>Summary of the theoretical literature</i>	17
2.5	Empirical Framework	18
2.5.1	<i>Price Rigidity</i>	18
2.5.2	<i>Price Asymmetry</i>	19
2.5.3	<i>Market Concentration</i>	20
2.5.4	<i>Summary of the empirical literature</i>	22
2.6	Conceptual Framework	23
2.7	Operationalization of variables	24
2.7.1	<i>Deposit interest rates</i>	24
2.7.2	<i>Money market rate</i>	24
2.8	Model specification	25
2.8.1	<i>The Cointegration and Error Correction Model</i>	25
2.9	Chapter conclusion	31
Chapter 3: RESEARCH METHODOLOGY		32
3.1	Introduction	32
3.2	The Research Design	32
3.3	Population	32

3.4	Data Collection	32
3.5	Data Analysis.....	33
3.6	Research Quality.....	34
3.7	Ethical Considerations	34
Chapter 4: PRESENTATION OF RESEARCH FINDINGS AND DISCUSSION.....		35
4.1	Introduction	35
4.2	Descriptive statistics of the deposit interest rate variables	35
4.3	The influence of benchmark policy rate to the deposit rate adjustment.....	37
4.3.1	<i>Testing for granger causality</i>	37
4.3.2	<i>Correlation analysis</i>	39
4.4	Testing for stationarity on the deposit interest rates	41
4.5	Testing for cointegration on the deposit rates.....	42
4.6	The degree of adjustment of the deposit interest rates as the benchmark policy rate changed... 44	
4.6.1	<i>Long-run pass-through analysis</i>	44
4.6.2	<i>Short-run pass-through and symmetric adjustment analysis</i>	47
4.7	The asymmetric adjustment analysis of deposit interest rates	49
4.8	Duration measurement using Symmetric and Asymmetric Mean Adjustment Lags	52
4.8.1	<i>Symmetric Mean Adjustment Lags</i>	52
4.8.2	<i>Asymmetric Mean Adjustment Lags</i>	53
4.9	Chapter conclusion.....	55
Chapter 5: SUMMARY, CONCLUSION AND RECCOMENDATIONS		56
5.1	Introduction	56

5.2	Summary of the findings	56
5.3	Conclusions	58
5.4	Policy implications and recommendations.....	59
5.5	Areas for further study and limitations of the study	60
5.6	Limitations of the study.....	60
REFERENCES		61
APPENDIX.....		67

LIST OF TABLES

Table 4.1: Descriptive statistics of the deposit interest rate categories	35
Table 4.2: Pairwise Granger causality results for all the variables under the study	38
Table 4.3: Pair-wise correlation coefficients among the deposit rates for the entire period (1991-2013)..	39
Table 4.4: Pair-wise correlation coefficients among the deposit rates for the period within 1991-2003 ...	39
Table 4.5: Pair-wise correlation coefficients among the deposit rates for the period within 2004-2013 ...	40
Table 4.6: The Unit Root Tests on level and first difference series	42
Table 4.7: Cointegration results for the deposit interest rates.....	43
Table 4.8: The long-run responsiveness of deposit interest rates.....	45
Table 4.9: Short-run responsiveness of deposit interest rates	48
Table 4.10: The asymmetric error correction results.....	50
Table 4.11: Symmetric and Asymmetric Mean Adjustment Lags	53

LIST OF FIGURES

Figure 1.1: Movement of the money market rate (91-Day T-bill) and savings deposit interest rate	4
Figure 1.2: Interest rate movement.....	5
Figure 1.3: Interest rate movement.....	5
Figure 2.4: The conceptual model for the study showing the responsiveness of deposit interest rates as the money market rate changes.....	23

LIST OF ABBREVIATIONS

ADF	Augmented Dickey Fuller
CBK	Central Bank of Kenya
CBR	Central Bank Rate
CRDW	Cointegrating Regression Durbin-Watson
CRR	Cash Reserve Ratio
ECM	Error Correction Model
EG-ADF	Engel Granger-Augmented Dickey Fuller
KPSS	Kwiatkowski, Philips, Schmidt and Shin
MAL	Mean Adjustment Lag
MPC	Monetary Policy Committee
MPTM	Monetary Policy Transmission Mechanism
OLS	Ordinal Least Square
OMO	Open Market Operations
REPO	Repurchase Rate
SSA	Sub-Saharan Africa
VAR	Vector Autoregressive

ACKNOWLEDGEMENT

First and foremost, I am sincerely grateful to the almighty God for granting me the strength, knowledge and ability to carry out this study. I also convey my special thanks to Strathmore University for sponsoring me to pursue Master of Commerce degree. I acknowledge all the guidance that my supervisor and academic mentor Dr. Waweru accorded me all through the study period. I am sincerely grateful for her tireless efforts, insightful comments and motivation. I appreciate Dr. Mboya and Dr. Omwenga for their genuine critique towards the improvement of the study. I would also like to thank the MCOM finance class of 2014 for their useful suggestions on the original draft proposal. Special thanks to Pius and Erastus for their useful comments and encouragement during the study period.

Much appreciation to my dad and mum for their moral support and constant prayers and ensuring that all was well. I owe much gratitude to the Nyambane's family for their support and care during the study period. Also, I am heartily thankful to my uncle Fred Mutiso for his valuable advice and support to undertake this programme. Special thanks to Alice Mutie and my sisters for their encouragement and motivation. I cannot pay back all what you have done to me, may you be richly rewarded. Lastly, I offer my regards and blessings to the Strathmore University fraternity for providing an enabling environment and to all of those who supported me by any means during the study period. Thank you all.

DEDICATION

This thesis is dedicated to my father Julius Nyangu, my mother Redempta Nyangu, my sisters Rose Nyambane, Pauline Mwendwa, Esther Musyoka and Elizabeth, my nephews Jeff and Lucky, my nieces Hadassah and Shirlyn, and to my best friend Alice.

Chapter 1: INTRODUCTION

1.1 Introduction

The Central Bank influences and manages the interest rates changes or shocks in response to business cycle changes or to meet specific goals of macro-economic control through monetary policy measures (Fadiran & Ezeoha, 2012). To signal the movement of interest rates, it adjusts its policy rate and the effect is then transmitted to the short-term rates, that is, Treasury bill rate, Interbank and REPO rate. Subsequently, the effect is passed from the short-term rates to the retail rates, that is, deposit and lending interest rates. This process of adjustment/responsiveness is referred to as interest rate pass-through and it is said to be complete when the movement of retail interest rates is one-on-one with the policy rate changes (Rosen, 2002 and Scholnick, 1996). Wang and Lee (2009) assert that the central bank manages the retail rates by influencing the short-term interest rates, that is, products which mature in a short period of less than a year like the 91day T-bill.

The whole process of adjustment aims at maintaining price stability in the economy and the monetary authorities aim on a complete interest rate pass-through (Fadiran & Ezeoha, 2012). Scholnick (1996) asserts that the adjustment speed of interest rates can vary depending on whether they are above or below the equilibrium level. The retail rates are expected to adjust accordingly and if they fail, it results to an incomplete market structure making the monetary policy transmission mechanism uncertain and weak thus failing to achieve the intended objective (Liu, Margaritis, & Tourani-Rad, 2009).

According to Borio (1997), most of the industrialized countries influence their short-term interest rates by use of market instruments of monetary policy and the impact is then transferred to the bank retail interest rates. Scholnick (1996) states that, the speed and symmetry at which the retail prices adjust to changes in the market conditions affect the efficiency of the economy. He refers symmetry as the uniform adjustment of interest rates either upwards or downwards to the equilibrium level when the monetary policy authority adjusts its policy rate. Any price movements away from the equilibrium setting causes misallocation of costs and hence inefficiency in the monetary policy transmission mechanism in the economy (Flannery, 1982).

Liu et al. (2009) argues that interest rate is the main instrument which the monetary authorities use to manage the aggregate demand, control inflation and ensure sustainable economic growth.

Several questions remain unresolved concerning the effectiveness of the monetary policy transmission mechanism (Wang & Lee, 2009; Wang & Thi, 2010; and Wang, 2013). Wang & Lee (2009) argues that there exists a differential adjustment rate across financial institutions and the financial markets tend to be more volatile on some of the products offered, for example the lending interest rates. Other products like the deposit interest rates are not responsive as the policy interest rate changes (Hannan & Berger, 1991 and Driscoll & Judson, 2013). The differential adjustments make monetary policy to operate with lags when commercial banks fail to adjust their administered rates as the money market rate changes. Rosen (2002) referred money market rate as the short term interest rate, that is, the 91-day Treasury bill.

When the commercial banks adjusts their retail interest rates in lags as the policy rate changes, this results to interest rate rigidity and the effect is usually an obstacle to effective monetary transmission mechanism (Loayza & Schmidt-Hebbel, 2002). According to Hannan and Berger (1991), interest rate rigidity is associated with market concentration whereby a few banks dominate the market and control the price movements through collusive behaviors. Neumark and Sharpe (1992) observed that banks in concentrated markets were rigid to increase deposit interest rates in response to rising money market interest rates and were quick to lower deposit interest rates in response to declining money market interest rates.

Deposit interest rate responsiveness has significant implications for a well-functioning monetary policy because if the commercial banks maintain a low deposit interest rate, this would discourage savings and investment in the economy (Neumark & Sharpe 1992). This is because commercial banks usually bring together savings in the form of deposits and afterwards lend it out at a certain rate in form of loans for investments. In an efficient market, equilibrium would be achieved when the rate of return on deposit accounts equals the rate of return gained on their investments after subtracting the transactions costs incurred by the bank (Neumark & Sharpe, 1992). However, according to the World Bank (2013) report, this assumption does not hold in most scenarios since most of the major banks in different countries have presented large profits

in the past insinuating that prices are not influenced by their costs only. Therefore, the determination of deposit interest rates by banks could influence the behavior of deposit holders on how much they should save on their deposit accounts and as a result, the financial stability and overall economic activities are affected in the economy.

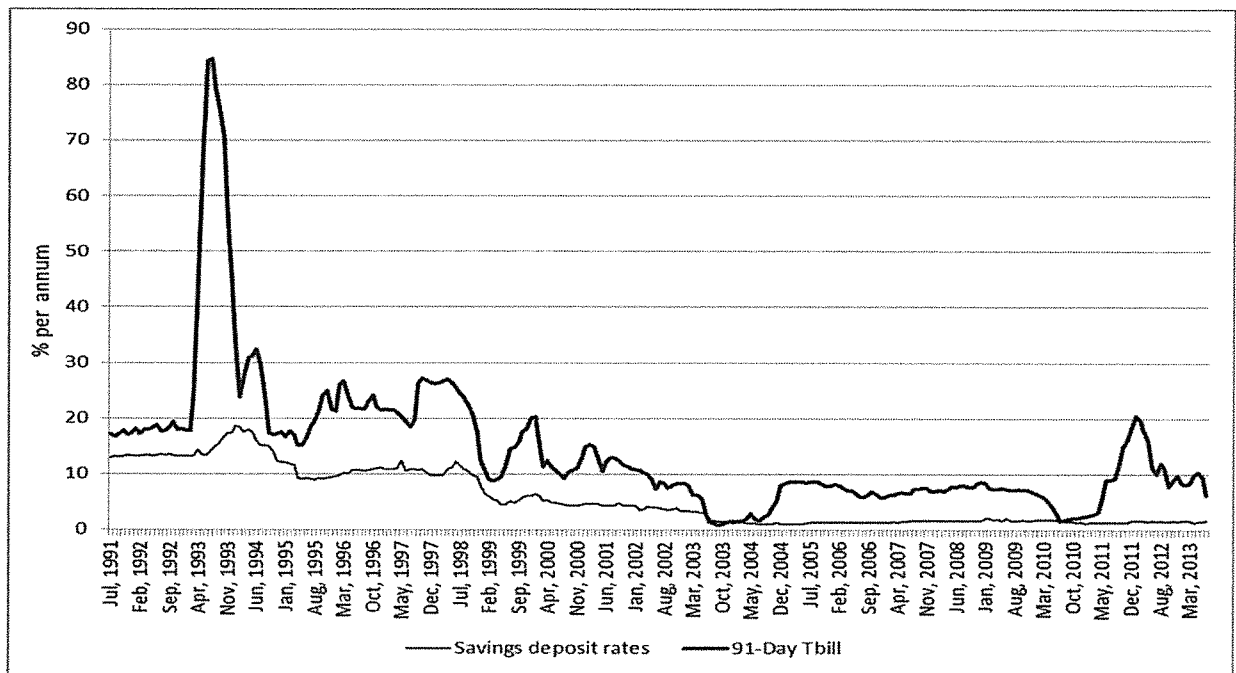
Empirical studies in the area of interest rate responsiveness indicate that there is presence of price rigidity on deposit interest rate settings by banks (Liu et al. 2009 and Fehr, Brown, & Zehnder, 2009). Driscoll & Judson (2013) defined price rigidity/sluggishness/stickiness as an incomplete pass-through in the adjustment of interest rates when the money market rate changes. Banks have been observed to be reluctant to effect price changes on deposit rates as this would lower their profits and would affect their collusion behavior especially if they dominate and control the market (Berstein & Fuentes, 2005). Hannan & Berger (1991) and Scholnick (1996) established that the price rigidity on bank deposit rate accounts can be explained by several factors including menu costs, market concentration, collusion and firm size.

According to Acheampong (2005) extensive research has been conducted in the developed countries on interest rate responsiveness but little has been done on the developing economies. The study further explained that despite the financial reforms and liberalization in the developing countries, interest rates are sluggish because commercial banks charge higher margins and still they are not yet efficient. Similarly in Kenya, Misati, Nyamongo, & Kamau (2011) argued that little has been done in this area while doing their study on interest rate pass-through.

1.1.1 Dynamics of interest rate in Kenya

The monetary policy transmission mechanism was fully strengthened in July 1991 when liberalization (interest rate deregulation by the government) of interest rates took place. As a result, commercial banks became more competitive in their operations and the roles of Central Bank of Kenya (CBK) were strengthened (Olweny, 2011). Since then, deposit interest rates have not been responsive to the money market rate as shown in the figure 1.1.

Figure 1.1: Movement of the money market rate (91-Day T-bill) and savings deposit interest rate



Source: Central Bank of Kenya (2013)

The figure 1.1 above shows how the savings deposit interest rates adjusts in response to the monetary policy changes. The 91-Day T-bill was used as the benchmark for the monetary policy rate against the deposit interest rates changes. It was used because the T-bill is one of the money market rates and before the introduction of the Central Bank Rate (CBR) in 2005, it was used as the policy rate and it is closely related with CBR (CBK, 2013).

It is evident from figure 1.1 that the 91-Day T-bill influences the movement of deposit savings interest rates since any movement by T-bill is followed by the deposit rate changes though not consistently. The deposit savings rate is not responsive and has remained too low during the period (from July 1991-June 2013) despite the movements of T-bill. For instance, from July 1991 to July 1993, the T-bill shoot up by 6,753 basis points (17.14% to 84.67%) while the deposit savings rate shoot up by 125 basis points only (12.97% to 14.22%).

After 1994, the T-bill kept on fluctuating up and down but the deposit savings rate was not responsive to the changes in the T-bill and barely adjusted. Moreover, from January 1999 to May

1999, the T-bill rate reduced by 107 basis points (10.7% to 9.63%) while in contrast, the savings deposit rate reduced by 202 basis points (6.54% to 4.52%) as observed in figure 1.2 below.

Figure 1.2: Interest rate movement

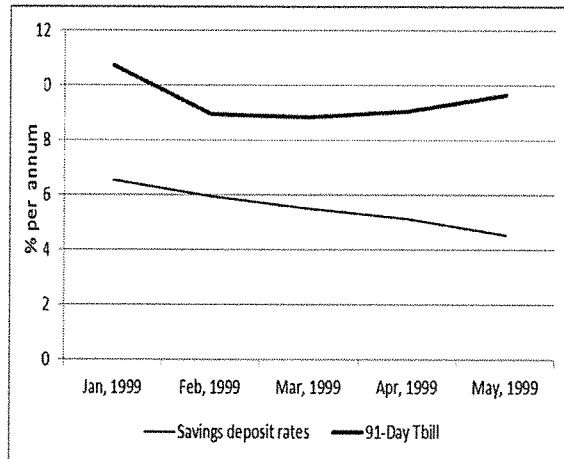
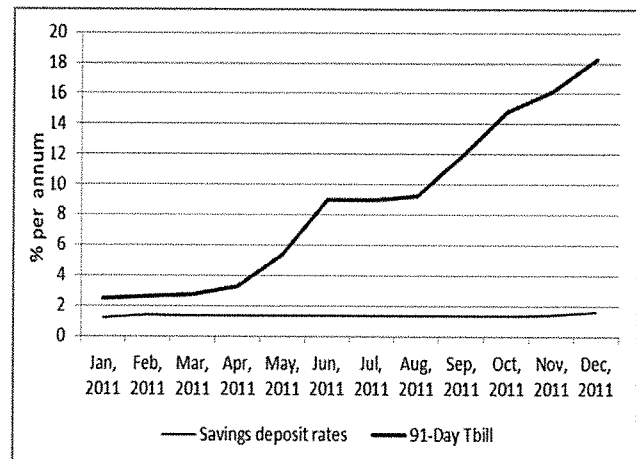


Figure 1.3: Interest rate movement



Source: Central Bank of Kenya (2013)

The trend of deposit rates not responding to monetary policy rate changes was persistent in all the periods. For example in the year 2011, the deposit rate was not responsive although there was significant weakening of the Kenyan shilling which led to the highest inflation rates ever to be experienced because of the global economic crisis. As it is observed in figure 1.3, the T-bill rate rose up by 1584 basis points (2.46% to 18.3%) compared to the savings deposit rate which barely increased by 34 basis points only (1.25% to 1.59%). Therefore, several questions arise concerning the responsiveness of deposit interest rates and monetary policy transmission mechanism because it has been responding sluggishly or even sometimes not adjusting at all.

1.2 Statement of the problem

Previous studies by Hannan and Berger (1991), Neumark and Sharpe (1992) and Scholnick (1996) established that non-responsiveness of prices existed in bank deposit interest rates. Hannan and Berger (1991) found that greater price rigidity was evident on firms that were in more concentrated markets and the deposit interest rates were more rigid upwards than downwards. Scholnick (1996), likewise established that deposit interest rates were more rigid when below the equilibrium level than when above. The non-responsiveness of deposit rates implies a greater disequilibrium in the economy because they do not move in line with policy

rate changes and also, the effects are not beneficial to the deposit account holder's hence discouraging savings in the society (Neumark & Sharpe, 1992).

Deposit rates are not responsive to policy rates in Kenya as it was observed in figure 1.1. For example in 2011 when the T-bill rate rose up by 1584 basis points (2.46% to 18.3%), the savings deposit rate increased by 34 basis points only (1.25% to 1.59%). Acheampong (2005) assert that despite the financial reforms and liberalization of developing countries, the rigidity of banks interest rates had increased and asymmetries had been observed. If asymmetries really existed, banks could benefit by decreasing the deposit interest rates more rapidly when the policy rates are adjusted downwards than upwards. Neumark and Sharpe, (1992) explained that incomplete pass-through of the money market rate changes to the deposit interest rate changes could be advantageous for the banks at the expense of the deposit account holders, especially when the money market rate was increasing.

The responsiveness of deposit interest rates was argued to be influenced by market concentration (Driscoll & Judson, 2013). Various researchers and scholars established that the relationship between the bank deposit interest rates and the market concentration was mixed and inconclusive (Hannan & Berger, 1991). Neumark and Sharpe (1992) found evidence from the US market that there was a positive relationship between market concentration and asymmetric rigidity. In contrast, Flannery (1982) found that rigidity of prices could be found both on highly and lowly concentrated markets. Similarly, Hutchison, (1995) observed that the difference between market concentration and deposit interest rates widened as the market interest rates increased.

On these premises, the study sought to examine the behavior of deposit interest rates and shed some light on how they respond to policy rate changes when below or above the equilibrium level. The study also aimed to examine the period it takes for the deposit interest rates to effect the policy rate changes. The adjustment behavior of deposit rates would also elucidate whether concentration has any effect on the responsiveness. This is because banking industry of Kenya is dominated by six large banks with a market share of 53.7% (CBK, 2013). The understanding of how deposit rates respond would explain whether monetary policy is effective or not.

1.3 General research objective

This study sought to establish how the bank deposit rates in Kenyan commercial banks responds to policy rate changes. The adjustment speed of deposit rate plays a critical role in the monetary policy transmission mechanism.

1.3.1 Specific research objectives

1. To establish whether benchmark policy rate (T-bill) changes causes the adjustment of deposit interest rates.
2. To examine the degree of adjustment (pass-through effect) of the deposit interest rates as the T-bill rate changes both in the long-run and the short-run.
3. To establish whether the rate of upward or downward adjustment speed of deposit interest rates is uniform as the T-bill rate changes.
4. To examine how long it takes for the deposit interest rates to adjust as the T-bill rate changes.

1.4 Research Questions

This study was guided by the following research questions;

1. Does change in the benchmark policy rate (T-bill) cause deposit interest rates to change?
2. What is the degree of adjustment of the deposit interest rates as the T-bill rate changes both in the long-run and short-run?
3. Does the size by which the deposit interest rates adjust vary in relation to whether the rates are adjusted upwards or downwards?
4. How long does it take for the deposit interest rates to change as the T-bill rate changes?

1.5 Scope of the study

The study covered a period of 22 years and 6 months from July 1991 to December 2013. The period was selected because interest rates in Kenya were completely liberalized in July 1991 and it was important to study the dynamics of deposit interest rates in response to forces of demand and supply. The research used monthly data obtained from the CBK and 270 observations were considered over the time period. From the sample period, three sets of periods were identified depending on the data availability of deposit interest rate categories. These sets included: the entire period 1991-2013, the first period 1991-2003, and the second period 2004-2013. With these periods, the research was able to examine the responsiveness of deposit rates as the policy rate changed.

The data employed was the actual prices of deposit interest rates containing numerous observations of both deposit rate increases and decreases. The numerous observations allowed an in-depth investigation of asymmetries in the adjustment of deposits either upwards or downwards.

1.6 Significance of the Research

The study is important to the monetary authorities, commercial banks, investors and consumers.

1.6.1 Monetary Authorities

The study highlights the policy implications to the monetary authorities and it helps the central banks in facilitating and ascertaining suitable monetary policy design and implementation and thus enhancing the effectiveness of monetary transmission mechanism. The findings from the study are useful to ensure stability in the economy is maintained and to promote economic growth and development if implemented.

1.6.2 Commercial banks

The commercial banks are in a position to understand the effects of deposit interest rate adjustments and thus, they are able to understand how they can improve their business and become more competitive without discouraging their deposit holders.

1.6.3 Investors and Consumers

The study enlightens investors and consumers in understanding the operations of deposit interest rates and how they can benefit from its adjustments. Therefore, they are in a position to make sound and solid investment decisions concerning their savings and required rate of return from their respective banks.

Chapter 2: LITERATURE REVIEW

2.1 Introduction

This chapter covers the Kenyan banking sector, the monetary policy transmission mechanism, the theoretical and empirical literature on the responsiveness of deposit interest rate. The literature review is discussed as followed: Section 2.2 describes the Kenyan banking sector. In section 2.3 of the chapter, a description of the monetary policy transmission mechanism and a brief analysis of monetary policy operation in Kenya are provided. Section 2.4 discusses the theories relating to the interest rates non-responsiveness while section 2.5 provides a detailed discussion of empirical literature reviewing different findings obtained by different authors and researchers. The chapter also develops the conceptual framework for the study in section 2.6, operationalization of the variables in section 2.7 and the model used by the study is discussed in section 2.8. Section 2.9 summarizes and concludes the chapter.

2.2 The Kenyan Banking Sector

According to the report by CBK (2013), the Kenyan banking industry is one of the broadest and most developed in Sub-Saharan Africa (SSA). At the close of December 2012, the number of banking institutions stood at 52 comprising 43 commercial banks, 1 mortgage finance company and 8 deposit taking microfinance institutions. The number of commercial banks has been rising steadily over the years but the market has been concentrated by the large banks which have a larger customer deposit base due to increased branch networks and regional expansion. There were 6 large banks in 2012 which accounted for 53.7 percent of the market share, 15 medium banks with a market share of 36.8 percent and 22 small banks with a market share of 9.5 percent (CBK, 2013). More details on financial institution are provided in Appendix 1.

The banking sector has always performed well despite the economic fluctuations in Kenya. For example, the pre-tax profit for the financial institutions increased by 20.6 percent from Ksh. 89.5 billion in December 2011 to Ksh. 107.9 billion in December 2012. The growth was mostly related with the income generated from increased loans and advances coupled with regional expansion initiatives and also investment in government securities (CBK, 2013).

2.3 Monetary Policy Transmission Mechanism

Effective monetary policy mechanism is an essential tool for an economy to run properly. The monetary authorities use interest rates as the main instrument to manage aggregate demand, curb inflation and to stimulate sustainable economic growth. Therefore, Monetary Policy Transmission Mechanism (MPTM) refers to the process that explains how adjustments in monetary policy affect the general economy (Fadiran & Ezeoha, 2012). Samba and Yan (2010) describes MPTM as the process which influences aggregate demand and general prices in the economy by influencing the investment and consumption decisions of households, firms, and financial intermediaries.

MPTM starts when the monetary policy committee adjusts the official interest rate (policy rate). The effect is then expected to pass through to the other interest rates, that is, the retail interest rates which influence the savings, investment and consumption patterns. Woodford and Walsh (2005) described three main channels of the MPTM; the interest rate channel, the exchange rate channel and the credit channel. The effectiveness of these channels largely depends on the size and speed at which they transmit the monetary impulses and also they are influenced by the prevailing economic regulation, legal, and financial structure of the economy. Since this study examines the responsiveness of deposit interest rates, it will mainly focus on the interest rate channel which is the most important channel of transmission and cannot be isolated from the other channels of MPTM (Samba and Yan, 2010 and Wang & Lee, 2009).

According to Mishkin (1995), MPTM is an important tool but if implemented wrongly it can lead to unexpected or unwanted consequences. In order for it to be successful, the monetary authorities should possess an excellent timing and monitor the effects of their policies in the economy. Bean & Nikolov, (2002) describe various ways in which interest rates influences the economy. Firstly, substitution effect may occur when firms and households react to the changes in costs of a relative alternative credit and deposit prospects. Secondly, income effect may arise when the interest rate changes affect the costs and incomes of all economic agents and thus net income is altered. Lastly, the worth of firms and households may also be affected because the value of real and financial assets is also affected.

The effectiveness and efficiency of MPTM relies on the size and speed at which the banks adjust their retail interest rates (deposit and lending interest rates) to changes in policy rates, that is, the money market rate (Liu et al., 2009). The decisions made by banks regarding deposit interest rates may influence consumption since higher deposit rates will stimulate more savings by consumers and they will reduce their current consumption in favor of higher deposit rates (Mishkin, 1995).

Studies done by Hofmann & Mizen (2004) and Liu et al. (2009) show that MPTM is typically sluggish and incomplete in the banking institutions both in the developing and developed countries. In Kenya, studies show that MPTM is usually incomplete both in the short term and the long term interest rates (Misati, Nyamongo, & Kamau, 2011 and Mahasi & Ganesh, 2013). Therefore, the knowledge of monetary policy transmission mechanism will enhance better decision making by the monetary authorities. Consequently, it will promote more investments in the economy, sustainable economic growth, full employment of resources and general price stability in the economy.

2.3.1 Monetary policy and interest rates in Kenya

The Central Bank of Kenya (CBK) formulates and implements monetary policy to achieve and sustain price stability in the economy of Kenya. The price stability objective is essential in the economy since it enhances investment, supports economic growth and creates employment. The CBK therefore formulates monetary policy to maintain inflation within the target set by the Cabinet Secretary of the National Treasury is achieved (CBK, 2013). The achievement and maintenance of a low and stable inflation leads to preferred growth in production of goods and services and ultimately employment creation.

According to Misati et al. (2011) the monetary policy objectives are achieved via the use of key tools such as; Central Bank Rate (CBR) – this rate is usually set by the Monetary Policy Committee (MPC) and it acts as the signaling rate on the other interest rates. An increase in CBR by the CBK means that other short term interest rates are expected to increase too; Open Market Operations (OMO) – refers to arrangements by the CBK in which it sales and purchases eligible securities to regulate the money supply and the credit conditions in the economy through

the use of repurchase agreements (Repos); Cash Reserve Ratio (CRR) – this is the required daily proportion of a commercial bank's deposit liability which must be deposited at CBK at no interest. Currently, it stands at 5.25 percent of the total bank domestic and foreign currency deposit liabilities; other instruments like efficient communication, licensing and supervision of financial institutions, foreign exchange market transactions, and the CBK Standing Facility, that is, the CBK Overnight Discount Window when the CBK offers loans to the commercial banks but the as the lender of last resort.

The CBR remains to be the main base for monetary policy operations (Mahasi & Ganesh, 2013). The movement in the CBR, both in direction and magnitude, signals the direction of short-term interest rates particularly the interbank rate, Treasury bill rate and the Repo rate. Consequently, the long-term interest rates and the exchange rates are also affected. In Kenya, complete liberalization (interest rate deregulation by the government) of interest rates took place in July 1991, and since then interest rates have been following a steep upward ascent but the adjustment has not been at equilibrium with the market rate and asymmetries have been witnessed (Olweny, 2011). The long-term interest rates, that is, deposit rates have been observed to be too low and lending rates too high thereby discouraging domestic savings and investment (Olweny, 2011).

2.4 Theories of interest rate non-responsiveness and their implications.

Several theories have been advanced by various scholars on the possible causes of price non-responsiveness. They have explained why the deposit interest rate neither responds immediately nor adjust one-to-one with monetary policy rate changes. The extensive literature on price responsiveness has identified several theories behind the stickiness of prices. Flannery (1982), identified menu cost as one of the theory, Hannan and Berger (1991) and Neumark and Sharpe (1992) identified market concentration and large customer base, Scholnick (1996) and Stigler (1964) identified tacit collusion, Neumark and Sharpe (1992), Bernstein and Fuentes (2005), Aziakpono and Wilson(2010) and Wang, 2013) identified consumer inertia and customer deposit base. Hannan and Berger (1991) and Cottarelli and Kourelis (1994) also identified kinked demand curve as one of the theory. These theories are briefly discussed as follows:

2.4.1 Market Concentration

Market concentration is one of the most intensively examined theories behind the non-responsiveness of deposit interest rates. For example, Hannan & Berger, (1991) and Neumark & Sharpe, (1992) hypothesized that banks in more concentrated markets are more rigid because of greater control over their deposit rates and ability to adjust their rates is frequent only when it is profitable to do so. We therefore expect to have slight adjustments in the deposit interest rates in the financial institutions which have a greater market power than in those with a lower market power.

Asymmetric adjustment could also be a common feature in the financial institutions which are highly concentrated (Bernstein & Fuentes, 2005). For instance, if the money market rate is decreased, an immediate decrease in the deposit interest rates is expected because the decrease would result into reduction on transactions costs of the financial institutions. In contrast, there would be a delay in the increment of deposit interest rates if the market rate increases. Flannery (1982) established that rigidity of prices may be found both on highly and lowly concentrated markets. Similarly, Hutchison, (1995) observed that the difference between market concentration and deposit interest rates widens as market interest rates increases.

2.4.2 Large Customer Base

According to Rotemberg & Saloner, (1987) and Hannan & Berger, (1991), they hypothesized that the size of the customer base is a potential reason for interest rate non-responsiveness and that firms with a larger customer base have lower price rigidity. A firm with a larger deposit base gain more with an interest rate cut than a firm with a small deposit base because the cost of deposit accounts will have definitely gone down. Therefore, such firms with larger deposit base should always initiate any rate reductions. Blinder (1991) found that coordination failure could also cause price rigidity if small firms respond sluggishly in changing their interest rates and consequently, it results to price asymmetry.

Further, Rotemberg and Saloner (1987) established that most of the large banks are likely to set their interest rates in line with the market rates since they normally lend their money to big firms that have other alternative ways of raising funds in the market. In contrast, the clients for small

banks are normally small and medium sized enterprises, which are more depended on bank loans. Therefore, small banks would be reluctant to reduce their lending interest rates following any reductions on the market rates.

2.4.3 Consumer Inertia

Consumer inertia could be as a result of information asymmetry where the information is not up-to date (Neumark & Sharpe, 1992). It contributes to the slow adjustment of bank deposit and lending rates by banks because customers lack perfect knowledge on the movements of the market rates. Price rigidity has been related to the sensitivity of consumer response in relation interest rate changes. If consumers respond faster to interest rate change, the deposit rates will adjust more slowly downwards in response to consumer reactions (Berstein & Fuentes, 2005). For example, if depositors respond rapidly to deposit interest rate cut by withdrawing funds from a bank that decreases its deposit rates, the bank would have a substantial incentive not to change rates frequently to avoid customers' negative reaction.

According to Aziakpono & Wilson (2010) and Wang & Lee (2009), customer adverse reaction leads to rigidity of prices whereby deposit interest rates are rigid when reducing and the lending interest rates are rigid when increasing. They hypothesized that when the money markets rates reduces the deposits rates are rigid downwards and when the money market rates increases the lending rates are rigid upwards.

2.4.4 Menu Cost

If there is high cost of adjusting the interest rates, the costs could be a potential reason of encouraging price stickiness (Flannery, 1982). This could be evident if the policy rate change is perceived to be temporal and marginal. Banks may decide to stick with earlier rates rather than incurring the high cost of adjustment. If banks are uncertain about the future development of general market rates, they are likely to leave their lending rates and deposit rates unchanged (Flannery, 1982 and Liu, Margaritis, & Tourani-Rad, 2009).

Flannery, (1982), argued that consumers avoid incurring switching cost because they find it costly to keep on searching for the best interest rates in the market and changing from one bank to another. Therefore, this may result to deposit interest rate rigidity since customers are not

willing to relocate and banks may implement pricing strategies that keep track of the market rate on average even during competitive pricing periods.

2.4.5 *Kinked Demand Curve*

The kinked demand curve has also been advanced as a reason for rate non-responsiveness, under the assumption that competitors would match any deposit rate increase while they would not match any rate decrease (Hannan & Berger, 1991). These assumptions yield the standard rate stickiness implied by the kinked demand model as well as asymmetric responses to rate increases and decreases.

The movements between the deposit and lending interest rates depend on the responsiveness of interest elasticity of supply of deposits and the interest elasticity of demand for loans. If the demand for loans is interest inelastic, that is, any change in interest rate will not discourage customers from borrowing, then banks will be faster to raise lending interest rates if policy rate increases and vice versa. In contrast, if demand for loans is interest elastic, banks will be cautious when adjusting the lending rates (Cottarelli & Kourelis, 1994).

Similarly, (Hannan & Berger, 1991) argued that if the supply of deposit is interest inelastic, banks adjust their deposit rates downwards quickly to a change in the policy rate but tend to be rigid upwards. But if the deposit rate is interest elastic, they will delay in reducing deposit interest rates downwards. Consequently, they will raise it if they anticipate getting more deposits from potential customers.

2.4.6 *Tacit Collusion*

Collusion usually arises when institutions enter into formal or informal agreements to control price and quantity produced either directly or indirectly. Most of these agreements are usually illegal and they usually exploit the consumers. The agreements make consumers to pay more than required and also to get a low quantity which is not equivalent to the amount they have paid for. Collusive pricing arrangements usually reduce productive competition through deceptive ways in which they take advantage of consumers. According to Stigler (1964), although collusion behavior is not a reserve of oligopolistic competition, it may be present among oligopolistic firms which are dominated by few market participants with aggressive competition.

In that scenario, firms may decide to collude in order to increase their joint profits to achieve their objective of profit maximization.

A collusive pricing behavior arrangement in the banking industry is one of the factors explaining interest rate non-responsiveness. Banks are unwilling to effect price changes that would affect them negatively by getting low profits and also breaking down their collusive behavior arrangements. If banks increase deposit or reduce lending interest rates, they may get lower profits and thus, they enter into collusion pricing behavior to protect themselves from such a phenomenon. As a result, any other pricing arrangement rather than the collusive pricing arrangement has an extra cost to it (Neumark & Sharpe, 1992; Scholnick, 1996). Collusive pricing behavior implies rigidity in increasing the deposit rate and decreasing the lending interest rate.

On the same note, the cost of changing a price by banks may be related to negative reactions from customers. This is referred to as adverse customer reaction hypothesis, whereby banks takes note of such a phenomenon and practice downward rigidity in deposit rates and upward rigidity in lending rates so as to maintain customers (Wang & Lee, 2009; Scholnick, 1996). The whole process may make equilibrium levels of interest rates to be attained at a slow pace.

2.4.7 Summary of the theoretical literature

In summary, the theoretical literature analyzed and highlighted the operations of monetary policy transmission mechanism, the implications and theories of interest rate non-responsiveness. It presented different theories of interest rate non-responsiveness as it was established by various scholars (Stigler, 1964; Hannan, 1994; Acheampong, 2005; Rotemberg & Saloner (1987) Bernstein & Fuentes, 2005; Scholnick, 1999; Scholnick, 1996; Neumark & Sharpe, 1992; Wang & Lee, 2009; Flannery, 1982; Blinder, 1991; and Hannan & Berger, 1991). The theories included: market concentration; large customer base; tacit collusion; kinked demand curve (interest elasticity); consumer inertia and menu cost.

In general, the theories that were established contributed greatly to the understanding of interest rate non-responsiveness and asymmetrical adjustment. The next section looks at the empirical framework of various studies undertaken in different countries that supported the highlighted

theories. The understanding of these theories enables a better analysis of the effectiveness of monetary policy in the Kenyan commercial banks.

2.5 Empirical Framework

The empirical review on the responsiveness of deposit rates mainly focused on the price rigidity, price asymmetry and market concentration on bank interest rates. It discussed different authors and the results they obtained in their studies. The literature was discussed as followed;

2.5.1 Price Rigidity

Several studies have analyzed various forms of price rigidity on bank interest rates (Flannery, 1982; Rotemberg & Saloner, 1987; Hannan & Berger, 1991; Hannan, 1994; Hutchison, 1995; Scholnick, 1999; Rosen, 2003; Craig & Dinger, 2010; and Driscoll & Judson, 2013). They have discussed why bank interest rates are sluggish as money market interest rates changes and different conclusions have been made. The researchers who have looked at bank deposit interest rates have come up with different theories explaining price rigidity and asymmetric adjustment on deposit rates.

Hannan and Berger (1991) examined the behavior of deposit interest rate in the United States and found that price rigidity was greater in those firms with high market concentration. They also found that large firms exhibit less price rigidity. This is because most of the customers were large organizations which have access to other sources of finance. The study established that deposit interest rates are more rigid upwards than downwards. A study done by Scholnick (1996) in Malaysia and Singapore likewise found that deposit interest rates are more rigid when they are below their equilibrium level than when they are above. This is an implication that banks in those countries are quick when adjusting their deposit interest rates downwards and slow when adjusting their deposit interest rates upwards.

Moreover, Flannery (1982) wrote a paper on retail bank deposits as quasi-fixed factors of production. The paper found out that switching cost incurred by consumers when changing from one bank to another and menu cost incurred by banks when adjusting their rates as a result of policy rate changes contributed to price rigidity. He hypothesized that these factors (switching

cost and menu cost) explained why deposit interest rates were not adjusting accordingly with every movement of the policy rate.

Craig & Dinger (2010) in their paper on a micro-econometric investigation into bank interest rate rigidity used a micro-econometric model to explore the bank interest rate rigidity in the US_Cleveland Ohio. They covered a period of ten years and examined the asymmetric rigidity of bank deposit interest rates and loan interest rates. They found out that the retail interest movements increased with time implying that interest rates were more responsive in a longer duration. They also established that deposit interest rates adjustments were dependent on market share implying that rigidity increased with bank mergers.

A recent study done by Driscoll & Judson (2013) supported the previous studies done on deposit interest rate rigidity by (Hannan & Berger, 1991; Neumark & Sharpe, 1992; and Craig & Dinger, 2010). It hypothesized that banks are quick to lower their deposit interest rates when the money market rate declines, but are sluggish to raise it upwards when the policy rates adjust upwards. They also found that asymmetric rigidity was varying across different banks and branches and it was influenced by factors like bank size and deposit type. The study established that menu cost was key factor which influenced the deposit rate stickiness.

2.5.2 Price Asymmetry

When examining the evidence of deposit interest rates responsiveness, it is assumed that there is a perfect market and the adjustment of interest rates towards equilibrium is symmetric. That is, the adjustment speed of interest rates when they are above or below the equilibrium is the same towards the long run equilibrium. However, empirical studies have proven otherwise and presented the evidence of asymmetries in the adjustment process of deposit interest rates (Hannan & Berger, 1991; Neumark & Sharpe, 1992; Scholnick, 1996; Scholnick, 1999; Rosen, 2002; Karagiannis, Panagopoulos, & Vlamis, 2010; and Wang & Thi, 2010).

Heffernan (1997) examined how the lending and deposit interest rates of four banks and three building societies respond to changes in the base rate set by the Bank of England and found that both the deposit and lending interest rates adjust symmetrically and there is minimal evidence of asymmetry. The paper found that there is uniform adjustment between deposit interest rates and

loan rates and that there is no systematic disparity in the administered rate pricing dynamics of banks and building societies. However, Heffernan (1997) found a wide difference in the adjustment speed and size within each type of financial institutions and products.

Similarly, Neumark & Sharpe (1992) found out that stronger asymmetries in the US were evident on deposit interest rates of banks in more concentrated markets and that banks were fast in adjusting their deposit interest rates downwards when above the equilibrium price and slow in adjusting it upwards when it was below the equilibrium price. Hannan & Berger (1991) found the same results in the US that deposit interest rates are more rigid upwards than downwards.

A study done by Bernstein & Fuentes (2005) in the Chilean banking industry on market concentration and bank deposit interest rates found little evidence on the asymmetric price adjustment. They further established banks were rigid when adjusting their deposit interest rates and were quick to raise their lending interest rates when the money market rate adjusted upwards. The same findings were established by Hannan & Berger (1991) and explained the scenario to be caused by kinked supply curve. For instance, the deposit supply curve was assumed to be flatter for a rise in interest rates than for a decrease.

Another explanation of price asymmetry on deposit interest rates was due to the adjustment costs associated with price decrease or increase (Hofmann & Mizen, 2004). They argued that during high competition in the market, banks are more reluctant to adjust their deposit interest rates downwards since they fear losing their customer if they lower the interest rates. González & Fumás (2005) hypothesized that price asymmetry could be due to the bank collusion and collusive pricing behaviors among banks in the same market. This was because all the banks aimed on profit maximization and they adjusted the interest rates according to their goal.

2.5.3 Market Concentration

Several studies have examined the degree of market concentration and its impact on price rigidity and price asymmetry (Hannan & Berger, 1991; Neumark & Sharpe, 1992; Rosen, 2003; González & Fumás, 2005; Bernstein & Fuentes, 2005; and Dinger, 2011). The conclusions from these studies is that firms in more concentrated markets possess market power can influence the pricing mechanism in the market. Those firms have been observed to adjust their prices

sluggishly with changes in the market interest rates because they have a large base of customers and most likely, the customers do not frequently change banks as a result of price changes.

According to the study done by Neumark & Sharpe (1992) in the US, they found that banks which are in concentrated markets are sluggish to raise their deposit interest rates as a result of increasing market interest rates but are quick to lower them in response to decreasing market interest rates. They used panel data on consumer bank deposit interest rates and hypothesized that market concentration results to downward price rigidity and upward price flexibility since deposit interest rates have inverse relationship with price charged by banks on deposits. Hannan & Berger (1991) reached the same conclusions that greater price rigidity is exhibited on those firms in more concentrated markets and deposit interest rates are more rigid upwards.

Another study by González & Fumás (2005) found out that banks in more concentrated markets adjust their deposit interest rates sluggishly when raising it in response to rising benchmark prices (money market rate), but they are quick in lowering the interest rates in reaction to reducing benchmark prices. They used Partial Adjustment Model (PAM) to establish the relationship between the market power and bank interest rates adjustments in the Spanish banks. Bernstein & Fuentes (2005) also found out that the sluggishness in deposit interest rates increases with market concentration.

Bernstein & Fuentes (2005) examined the relationship between the market concentration and bank deposit interest rates rigidity in the Chilean banking industry. They found out that more market concentration results to more deposit interest rates rigidity. Other bank characteristics like solvency, size and loan risk also influenced the degree of price adjustment as a result of a change in the money market interest rates. The study employed Error Correction Methodology and Herfindahl Index to establish the relationship.

However, Jackson III (1997) conducted a study in Netherlands on market structure and the speed of price adjustments. He examined the speed of adjustment across the low, medium and highly concentrated markets. He found that in the highly and lowly concentrated market the adjustment speed is slower than in the medium group. He hypothesized that more concentrated markets may lead to more price rigidity and also less concentrated markets may also influence rigidity of

prices. Therefore, the issue of market concentration can be ambiguous and questions still remain on whether market concentration leads to market power on firms.

2.5.4 Summary of the empirical literature

The empirical literature emphasized on various aspects of interest rates dynamics. It considered several studies done in relation to price rigidity, price asymmetry and market concentration. Most of the scholars have explored the adjustment process of interest rates in both short run and in the long run and have presented similar conclusions but others have established different observations in different countries. For example, Jackson III (1997) study established that more concentrated markets may lead to more price rigidity and also less concentrated markets may also influence rigidity of prices. With these similar but inconclusive conclusions, it supports the fact that deposit rate responsiveness is a phenomenon which requires a thorough analysis since it affects the effectiveness of the monetary policy transmission mechanism.

Even though a number of studies have been done in the developed countries, very few studies have been done in the emerging and developing countries particularly in the African countries. Some of the studies done in Africa include Acheampong (2005) study which focused on bank interest rate channel of monetary policy transmission in Ghana, Aziakpono & Wilson (2010) which studied on interest rate pass-through and monetary policy regime in South Africa, Fadiran & Ezeoha (2012) study which examined the South African market volatility, asymmetry and interest rate pass-through transmission mechanism, Ngugi (2001) studied interest rate spread in Kenya, Olweny (2011) studied modeling volatility of short term interest rates in Kenya and recent studies done by Mahasi & Ganesh (2013) and Misati et al. (2011) on interest rate pass-through in Kenya.

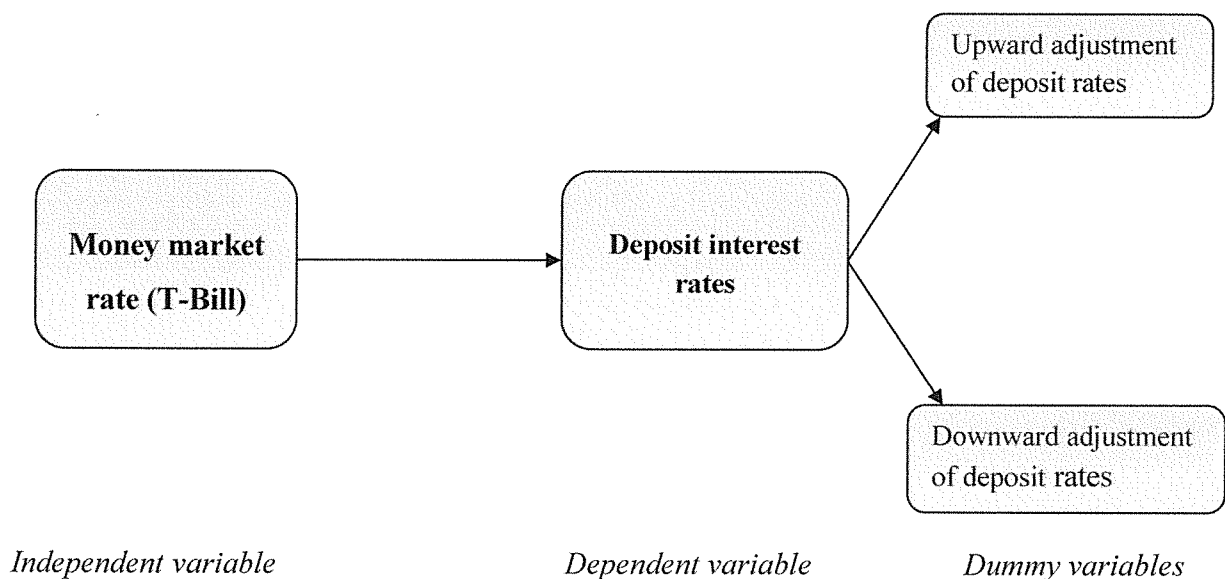
Therefore, from the previous studies that have been done in Kenya, little has been done on deposit interest rate responsiveness if any in Kenya. This research sought to fill this gap by studying the responsiveness of deposit interest rate in Kenya. It enables better understanding of the monetary policy transmission mechanism in Kenya, specifically through the interest rate channel. This is because for an economy to run smoothly, the size and speed of adjustment of deposit interest rates in response to monetary policy is important. A quick and complete pass-

through of deposit interest rates ensures efficiency in the economy. In addition, asymmetric behavior of bank deposit interest rates in an expansionary or contractionary monetary policy measures could have different effects on output and prices and therefore impacting savings and investments from deposit account holders. The knowledge of symmetric and asymmetric adjustments in terms of size and speed is therefore crucial for the effectiveness of MPTM.

2.6 Conceptual Framework

The basic framework adopted in this study was developed after reviewing several prior researches done by Hannan & Berger (1991); Neumark & Sharpe (1992); and Scholnick (1996). The framework enabled the examination of deposit interest rates as the money market rate changed. This study examined the pass-through effects both in the short run and long run by establishing how long it takes for the deposit rates to adjust. It also distinguished between the symmetric and asymmetric adjustments of deposit rates on how they responded when below or above the equilibrium as the money market rate changed. The conceptual framework identified the deposit interest rate as the dependent variable. The 91 Treasury bill rate was the independent variable since it was closely related with the CBR.

Figure 2.4: The conceptual model for the study showing the responsiveness of deposit interest rates as the money market rate changes



Source: Author 2014

2.7 Operationalization of variables

2.7.1 *Deposit interest rates*

The deposit interest rates included the different categories of deposit accounts from the Kenyan commercial banks. The categories for the entire period 1991-2013 were: savings deposit interest rate and average deposit interest rate. The categories for the first period 1991-2003 were: 3-6 months deposit interest rate, 6-9 months deposit interest rate, 9-12 months deposit interest rate, savings deposit interest rate and average deposit interest rate. The categories for the second period 2004-2013 were: 0-3 months deposit interest rate, over_3 months deposit rate, savings deposit interest rate and average deposit interest rate. The deposit rates consisted of weighted average deposit interest rates from each category and provided generalization across all the Kenyan commercial banks. The deposit interest rates were obtained from the CBK databases and consisted of monthly observations.

Dummy variables to capture the upward adjustment of deposit interest rates and the downward adjustment of deposit interest rates were incorporated in the study. They measured the adjustment speed of deposit interest rates when it was below or above the equilibrium level using the Asymmetric ECM as it was used by Scholnick (1996). With uniform adjustment speed (symmetric adjustment), the two variables should produce the same results while with non-uniform adjustment, the two variables should produce different results and the adjustment is referred to as asymmetric adjustment.

2.7.2 *Money market rate*

Different studies have used different rates as a proxy for the money market rate. Bernstein and Fuentes (2005) used the interbank rate; Acheampong (2005) used the T-bill rate; Chong, Liu, & Shrestha (2006) used the interbank rate; Driscoll and Judson (2013) used the policy rate. The money market rate selected in this study was the 91-day Treasury bill rate.

The 91-day T-bill was used as the independent variable together with the lagged variables of Treasury bill rate. The T-bill was selected because of several reasons: Firstly, the T-bill rate is closely related with policy rate (CBR) because any change in policy rate causes the T-bill to

change in the same direction and therefore it was not necessary to include both rates in the model. Secondly, it was more appropriate to use it because commercial banks can invest the deposit amounts on T-bill rate and earn returns. Thirdly, the maturity of the 90-day T-bill was same with the 0-3month deposit interest rate which was used in our analysis as one of the dependent variables. Lastly, the 90-day T-bill rate data was available for the whole period of study and before the introduction of CBR in 2005 it was used as the policy rate. The 90-day T-bill rate data was collected from the CBK statistical bulletins and consisted of monthly observations.

2.8 Model specification

2.8.1 The Cointegration and Error Correction Model

The Error Correction Model (ECM) is a commonly used technique which examines the price adjustment of different variables over a period of time. Sargan (1964) was the first to start using the Error Correction Methodology (ECM) when establishing the wage and price adjustment in the UK. It was further used by Engle & Granger (1987) and made it more popular when estimating Cointegration regression using Ordinal Least Square (OLS). ECM is used to correct disequilibrium in the equation whereby the error term obtained from the OLS regression is lagged once to obtain the error correction term. The Cointegration regression is used for measuring the long-run relationships while the ECM measures the short-run relationship between the variables. Neumark and Sharpe (1992) noted that in the long run, relationship between variables was relatively stable while in the short run, the relationship was relatively volatile and this could result to disequilibrium in the short run.

With the use of ECM, it was possible to test the different adjustments of interest rates when they were below or above their equilibrium level. Further, the error correction model was able to examine and establish the pass through effect, that is, how long it could take for the deposit interest rates to adjust to equilibrium as a result of a policy rate change (T-bill). Engel and Granger (1987) explain that that ECM is estimated by using a two-step procedure. The first step is to obtain the linear regression function of the long-run relationship between the variables and the residuals obtained from the model are then saved. In this study, the relationship between

deposit interest rate and the policy rate set by the CBK was obtained. Secondly, the residuals saved were then incorporated in the ECM model and they formed the error correction term.

2.8.1.1 Unit root and Cointegration Tests

It is usually important to conduct unit root and cointegration test on the time series data before the estimation of the error correction model. This is because the variables can be estimated more reliably and efficiently if the time series is cointegrated. A time series data is believed to be stationary if it has a constant mean, constant variance and constant auto-covariance for each given lag period. A stationary time series is usually cointegrated. However, most of the time series data especially the financial variables are usually non-stationary but move together over time period to establish a long-term linear relationship which thus makes them to become cointegrated. For instance, if two variables are cointegrated, (e.g. the deposit interest rates and T-bill rate) it means they have a long-term equilibrium relationship between them, and even though they may deviate in the short run, their association would return in the long run. If there is no cointegration between variables, it means the series would move apart without any sequence in the long run.

Before the estimation of the ECM model, the time series data was tested for unit root problem to ensure whether the variables were cointegrated, that is, to determine whether long-term equilibrium relationship existed. The aim of the unit root test was to establish whether all the variables were integrated and to which order, that is, order $I(0)$, order $I(1)$ or higher orders. The unit root test helps to avoid the estimation of a spurious or nonsense OLS regression while developing the model. The financial time series properties and behavior are greatly influenced by the stationarity of the variables, if the series is stationary, the chance of getting a spurious regression model is minimized but if the series is non-stationary, it can lead to a spurious regression model. The unit root test therefore helps to determine whether the data is stationary or non-stationary.

Several statistical methods have been developed to measure unit root or stationarity. This study used two methods, namely: the Augmented Dickey Fuller (ADF) unit root test and the Kwiatkowski, Philips, Schmidt, Shin (KPSS) stationarity tests. To examine the stationarity of the

interest rates series, the ADF tests the null hypothesis that the series have a unit root against the alternative of stationarity while KPSS tests the null hypothesis of stationarity against the alternative of non-stationarity. The null and alternative hypotheses under each testing approach are as follows:

ADF	KPSS
H ₀ : series contains a unit root	H ₀ : series is stationary
H ₁ : series is stationary	H ₁ : series is non-stationary

The ADF test has been the commonly used method in many empirical studies but it has been criticized for its poor size (suffers from small sample problem because it assumes the sample is large) and power properties. Therefore the use of another test like KPSS which does not suffer from small sample problems confirmed whether the results of ADF were reliable. Once the order of integration was established, the next step was to test for cointegration.

Various statistical techniques have been applied by other empirical studies in this field while testing for cointegration between interest rate series data. This study used four approaches to test for cointegration on interest rate series (deposit interest rates and T-bill rate). These techniques were: Engle-Granger Augmented Dickey Fuller (EG-ADF) test, Johansen (1988) Maximum Likelihood technique, the Cointegrating Regression Durbin-Watson (CRDW) technique and the Error Correction based technique. To test for cointegration a hypothesis of null hypothesis of no cointegration and alternate hypothesis of cointegration between variables was developed. The Johansen technique is considered superior since it can be applied on multiple cointegrating vectors and it searches for cointegrating relationships in a vector autoregressive (VAR) model indicating the cointegrated vectors identified.

2.8.1.2 The linear regression model

To examine the long-term relationship between the policy rate (T-bill) and the deposit interest rates, the following regression model was established:

$$DR_t = \alpha_0 + \alpha_1 Tbill_t + \varepsilon_t \quad (1)$$

The equation (1) above represented the relationship between the bank deposit interest rate (retail rate) and the Treasury bill rate which was assumed to be the policy rate. DR_t represents the different endogenously determined deposit interest rate categories; $Tbill_t$ denotes the corresponding exogenously determined T-bill rate; ε_t is the long run stochastic error term; α_0 and α_1 are the model parameters. According to Rousseas, (1985), parameter α_0 is the intercept coefficient and it measures the constant mark-up or mark-down on the deposit interest rates while α_1 is the slope coefficient and it measures the degree of pass-through in the long run. When there is complete pass-through the $\alpha_1 = 1$, incomplete pass-through the $\alpha_1 < 1$ and when there is an over pass-through $\alpha_1 > 1$.

2.8.1.3 The error correction model

The ECM was used to examine the short-term dynamics of the changes in the deposit interest rates in response to the changes in the CBR (T-bill). The same methodology was applied by Scholnick (1996); Liu et al. (2009) and Fadiran & Ezeoha (2012). Because most of the time series data is usually non-stationary in nature and move together over time to establish a long-term equilibrium relationship, Engle and Granger (1987) Cointegration and error correction test were applied to remove any spurious nonsense regression results. This is usually done by use of a unit root test which is applied on the on the residuals ε_t . Therefore if the interest rate series (DR_t and $Tbill_t$) are integrated of order one $I(1)$, their linear combination according to econometric theory will be stationary and it will produce a residual that is integrated of order zero $I(0)$ denoting that the interest rate series have a long-term equilibrium relationship and hence they are cointegrated.

The relationship between the variables DR_t and $Tbill_t$ can be examined using ECM if the series are cointegrated. The following ECM model equation (2) was established by using a combination of the first difference and the lagged levels of cointegrated variables as followed:

$$\Delta DR_t = \alpha_0 + \beta_1 \Delta Tbill_t + \beta_2 (DR_{t-1} - \alpha_0 - \alpha_1 Tbill_{t-1}) + \mu_t \quad (2)$$

The above equation is referred to as error correction model or an equilibrium correction model. Δ denotes the first difference; β_1 measures the short-term relationship between the changes in DR_t and changes in $Tbill_t$; the component $(DR_{t-1} - \alpha_0 - \alpha_1 Tbill_{t-1})$ is the error correction term (ε_{t-1}) which represents the degree of disequilibrium at time $(t-1)$, and is the residual of long-term relationship between changes in $Tbill_t$ and DR_t given by equation (1); β_2 is the coefficient of the error correction term and it measures the adjustment speed of the error correction term back to the equilibrium level. μ_t , hence denotes the disturbance error term.

2.8.1.4 Symmetric and Asymmetric Error Correction Framework

After obtaining the ECM model, the adjustment speed of the deposit interest rates back to equilibrium level as the policy rate (T-bill) changes was then be established. The short-term adjustment was obtained by running equation (1) in its first difference as shown below:

$$\Delta DR_t = \alpha_0 + \alpha_1 \Delta Tbill_t + \varepsilon_t \quad (3)$$

Given that the interest rates series were integrated of order I(1), the short-term adjustment was obtained regardless of whether the variables were integrated or not because differencing the series made it stationary and hence no spurious regression results could be obtained.

2.8.1.5 Symmetric Mean Adjustment Lags (MAL)

The symmetric MALs measures the period it takes the adjustment lag back to equilibrium, when above or below their equilibrium level. If monthly time series data is used, the symmetric MAL show how many months it takes the deposit interest rates to fully adjust to changes made on policy rate (T-bill rate). Studies done by Scholnick (1996); Liu et al. (2009) and Fadiran & Ezeoha, (2012), demonstrated that the MAL can be computed from equation (2) as followed:

$$MAL = (1 - \beta_1) / \beta_2 \quad (4)$$

When the MAL is high, it shows that the adjustment speed of deposit interest rates is very slow/rigid and when the MAL is low, it signifies a lower rigidity, that is, the adjustment speed of deposit interest rates is fast. The above model assumes that the adjustment of deposit interest

rates is uniform (symmetric) when it is above or below the equilibrium level. This is usually considered as a challenge when there is asymmetric adjustment.

2.8.1.6 Asymmetric Mean Adjustment Lags (MAL)

Due to the limitation of symmetric MALs, asymmetric MALs were incorporated to factor the possibilities of asymmetric adjustments in the deposit interest rates when they were either below or above the equilibrium level. Scholnick (1996) suggested that dummy variables (ECM^+ and ECM^-) should be included in the ECM model cointegrating equation to factor in the asymmetric effects. The dummies were in two series as shown:

$$ECM^+ = ECM, \quad \text{if } ECM > \mu$$

$$ECM^+ = 0, \quad \text{if } ECM < \mu$$

and

$$ECM^- = ECM, \quad \text{if } ECM < \mu$$

$$ECM^- = 0, \quad \text{if } ECM > \mu$$

Scholnick (1996) explained that μ refers to the mean and should be equal to zero because it is the residual series obtained from the cointegrating equation. When the residual is above the mean, it shows that the deposit interest rates are above their equilibrium level and they are expected to fall down back to equilibrium. Conversely, when the residual is below, the deposits interest rates are below are their equilibrium level and they are expected to rise back to equilibrium.

Once the residual errors had been separated into two series, the asymmetric MAL was computed using the following asymmetric ECM model:

$$\Delta DR_t = \alpha_0 + \delta_1 \Delta Tbill_t + \delta_2 ECM_{t-1}^+ + \delta_3 ECM_{t-1}^- + \eta_t \quad (5)$$

The coefficient δ_2 denotes the adjustment speed of the ECM when the deposit interest rates are above their equilibrium levels and the coefficient δ_3 denotes the adjustment speed of the ECM when the deposit interest rates are below their equilibrium levels.

The asymmetric MALs were obtained from the above equation (5) as shown below:

$$MAL^+ = (1 - \delta_1) / \delta_2 \quad (6)$$

Or

$$MAL^- = (1 - \delta_1) / \delta_3 \quad (7)$$

The mean adjustment lags of time series data is usually measured by the asymmetric MAL. The above equations (6) and (7) measured the asymmetric adjustment in the bank deposit interest rates when they were either above or below the equilibrium values. MAL^+ denotes the mean adjustment lag when the bank deposit interest rates are above their equilibrium values and MAL^- denotes the mean adjustment lag when the bank deposit interest rates are below their equilibrium values. If the two asymmetric MALs (MAL^+ and MAL^-) are different, then the adjustment speed of deposit interest rates is different (not symmetric).

To confirm the presence of asymmetric adjustment, a Wald test with $\chi^2(1)$ was performed to establish whether δ_2 was statistically different from δ_3 . If the null hypothesis of equality test is accepted, then there is no asymmetry, otherwise there is asymmetry.

2.9 Chapter conclusion

This chapter of the literature review explored the effectiveness of monetary policy transmission mechanism and briefly discussed on the monetary policy and interest rates in Kenya. Theoretical review and implications of deposit interest rate was then discussed. The theoretical review was then followed by the empirical review of studies done in different countries in relation to the price rigidity, price asymmetry and market concentration. Lastly conceptual framework was developed, the variables were discussed and the model to be used was specified.

Chapter 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter gives a description of the research methodology employed in achieving the objectives of this study. The chapter is organized into four broad sections: Section 3.2 covers the research design, Section 3.3 discusses the target population, and Section 3.4 describes the data collection procedures and the source of the data, and lastly, section 3.5 provides details for the data analysis.

3.2 The Research Design

The study employed both descriptive and exploratory research design since it was addressing the prevailing situation on the responsiveness of deposit interest rates as the benchmark policy rate changed. The design enabled the study to focus on the relationship between the policy rate and the deposit interest rates adjustment (Saunders, Lewis, & Thornhill, 2007). The relative adjustment of deposit rates either upwards or downwards to the equilibrium level was also achieved.

3.3 Population

The unit of analysis was the Central Bank of Kenya (CBK) where the aggregate monthly deposit interest rate series and money market rate (T-bill) were obtained. The aggregate deposit interest rate series consisted of all the commercial bank's deposit rates in Kenya. A sample period of 22 years and 6 months from July 1991 to December 2013 was selected generating 270 observations for the study. From the sample period, three sets of periods were identified depending on the data availability. These sets included: the entire period 1991-2013, the first period 1991-2003, and the second period 2004-2013.

3.4 Data Collection

Secondary data was used and included the 91-day Treasury bill rate and the different categories of deposit interest rate series for the Kenyan Commercial Banks. The deposit interest rate series

was an aggregate data factoring in all the commercial bank's deposit rates in Kenya. Monthly data for a period of 22 years and 6 months from July 1991 to December 2013 were collected. The period was therefore long enough to examine the responsiveness of deposit interest rates (Rosen, 2002). The data was collected from the CBK statistical bulletins through document review method.

The data was categorized in to three sets of periods depending on the availability of data from each period and the periods would indicate whether there has been an improvement on the responsiveness of deposit interest rates. The categories for the entire period 1991-2013 were: savings deposit interest rate and average deposit interest rate. The categories for the first period 1991-2003 were: 3-6 months deposit interest rate, 6-9 months deposit interest rate, 9-12 months deposit interest rate, savings deposit interest rate and average deposit interest rate. The categories for the second period 2004-2013 were: 0-3 months deposit interest rate, over_3 months deposit rate, savings deposit interest rate and average deposit interest rate.

3.5 Data Analysis

The quantitative data was analyzed using various time series techniques and descriptive statistics focusing on mean, standard deviation, skewness, kurtosis and Jarque-Bera statistics were firstly obtained. Data analysis section acted as a walkthrough guide on how the various analyses in this study were carried out in the following chapter. Granger causality test and pair-wise correlation analysis were used to establish whether benchmark policy rate (T-bill) caused the deposit rates to adjust.

The study employed the Error Correction Methodology (ECM) as used by Scholnick (1996) and Bernstein & Fuentes (2005) to measure the deposit interest rate pass-through. To examine the asymmetric adjustment, it was advanced to asymmetric ECM model developed by Granger & Lee (1989) and also used by (Scholnick, 1996). The procedure of Granger & Lee (1989) used a dummy variable technique to measure the speed of adjustment of retail interest rates either upwards or downwards to the equilibrium price. Therefore the study was in a position to address the choice of an operational structure for monetary policy in Kenya by systematically relating the behavior of money market and deposit rates adjustment.

3.6 Research Quality

Research quality in terms of validity and reliability was ensured in this study. Validity measures the extent of the data collection instruments effectiveness and whether the research findings can be generalized on what they purport (Saunders et al., 2007). Internal validity was ensured by explaining only how the effects of independent variable affected the dependent variable in this study. In addition, external validity was also ensured since the deposit rates data was composed of aggregate monthly deposit interest rates categories from all the commercial banks in Kenya and findings could be generalized across all the banks.

According to Saunders et al. (2007), reliability measures the consistency of the research findings such that if a similar methodology is used, the same results would be obtained. The data used in this study was obtained from a reliable source (CBK databases), and a similar study can be conducted by anyone because the data is accessible. Therefore, reliability is not a problem with this study.

3.7 Ethical Considerations

All the issues pertaining with ethical considerations were sufficiently taken care of all through the study period. The documents reviewed to obtain the data were publicly available since they were from an open database. Any relevant materials used in this study were duly acknowledged to avoid issues of plagiarism. The research findings obtained in this study are the actual results from the model outputs and they have not been in been altered in any way to suit the researcher's opinion.

Chapter 4: PRESENTATION OF RESEARCH FINDINGS AND DISCUSSION

4.1 Introduction

In this chapter, the results of data analysis and research findings are presented and discussed as described by the detailed model specification. The presentations are organized based in the order of specific study objectives as followed: section 4.2 presents the descriptive statistics of the deposit interest rate variables. Section 4.3 analyses the Granger causality test results and the correlation coefficient among the variables. Section 4.4 presents the findings of unit root tests for stationarity while section 4.5 covers the cointegration analysis. Section 4.6, presents the long-run pass-through, the short-run pass-through and symmetric error correction results while section 4.7 presents asymmetric error correction results. In section 4.8, the symmetric and asymmetric mean adjustment lags results are presented. Lastly, section 4.9 presents the chapter conclusions.

4.2 Descriptive statistics of the deposit interest rate variables

The sampling period covered July 1991 to December 2013. Three different sets were carried out for the analysis. They comprised of the entire period (1991-2013), the period within 1991-2003, and the period within 2004- 2013. Various aspects were observed to understand the nature of the deposit interest rate variables. Table 4.1 provides a descriptive statistics the deposit interest rate categories for each period.

Table 4.1: Descriptive statistics of the deposit interest rate categories

			Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Probability
1991-2013	Benchmark Rate	91-Day Tbill	14.24	10.12	84.67	0.83	12.59	3.09	15.78	2267.10	0.00
	Deposit Rates	Savings	8.53	6.44	23.43	1.96	5.14	0.86	2.72	34.05	0.00
		Av. Deposit Rates	5.69	3.63	18.62	0.96	5.01	0.81	2.26	36.01	0.00
1991-2003	Benchmark Rate	91-Day Tbill	19.70	17.67	84.67	0.83	14.43	2.65	11.53	630.13	0.00
	Deposit Rates	3-6 Months	12.35	13.93	25.87	3.38	5.45	0.19	2.26	4.27	0.12
		6-9 Months	11.76	13.37	28.78	3.41	5.27	0.39	2.75	4.27	0.12
		9-12 Months	11.71	13.68	26.22	3.92	5.15	0.29	2.57	3.24	0.20
		Savings	11.56	13.40	23.43	3.07	5.01	0.13	2.31	3.37	0.19
		Av. Deposit Rates	9.05	9.76	18.62	1.38	4.45	0.08	1.91	7.55	0.02
2004-2013	Benchmark Rate	91-Day Tbill	7.41	7.35	20.56	1.57	3.57	1.06	5.70	58.84	0.00
	Deposit Rates	0-3months	5.93	5.25	13.70	2.02	2.55	1.16	4.15	33.67	0.00
		Over-3months	6.77	6.47	11.82	2.62	1.83	0.39	2.96	3.07	0.22
		Savings	4.75	4.39	9.04	1.96	1.50	0.78	3.42	13.19	0.00
		Av. Deposit Rates	1.50	1.54	2.13	0.96	0.24	-0.09	3.00	0.15	0.93

From the entire period 1991-2013, the mean of savings deposit rates offered a higher deposit rate than the average deposit rate. This could be due to the fact the savings deposit rate was not comprised by many categories of deposit rates like the average deposit interest rate. The benchmark rate (91-day T-bill) recorded the highest rate in the period and conversely, it also recorded the lowest rate. By observing the standard deviation, savings rate was more volatile hence more risky than the average deposit rate and also, it had a higher rate of skewness. The kurtosis and Jarque-Bera statistics rejected the normality hypothesis because all the rates were significant.

Within the period 1991-2003, the mean of deposit rates presented a negative relationship with maturity indicating a downward sloping yield curve. Therefore, the 3-6month deposit rate presented the highest interest rate while the average deposit rate presented the lowest interest rate implying that the time deposits were more sensitive to interest rate changes. Interestingly, the deposit rate risk from the standard deviation was negatively related with the maturity implying that the deposit rates with longer maturity had a lower risk. The 6-9 Months deposit rates were observed to have the highest rate with an exception of the benchmark rate (T-bill). The 6-9 Months deposit rates also had the highest skewness than the other deposit rate categories. The kurtosis and Jarque-Bera statistics failed to reject the normality hypothesis at 10% except the 91-Day T-bill and the average deposit rates which were significant. It therefore meant that the deposit rates were normally distributed.

The period within 2004-2013, the mean of deposit rates had a negative relationship with maturity indicating a downward sloping yield curve with an exception of over-3months deposit rate. Likewise, the deposit rate risk from the standard deviation was negatively related with the maturity. The 0-3 Months deposit rate category had the highest rate and skewness. This could be as a result of competition from commercial banks to gain access to more deposit base. The kurtosis and Jarque-Bera statistics rejected the normality hypothesis because all the rates were significant except over 3months deposit rate and average deposit rate.

From the descriptive analysis in table 4.1, it was concluded that the deposit interest rates presented interesting characteristics. For instance, it was observed that the deposit interest rates

had been reducing over the time period from the mean analysis. Most of the deposit rate categories were not normally distributed as it was observed in the Jarque-Bera analysis. Therefore, a further analysis on the responsiveness of deposit interest rates was carried out to establish their behavior.

4.3 The influence of benchmark policy rate to the deposit rate adjustment

The first objective was to determine whether the benchmark policy rate (T-bill) influenced the adjustment of deposit interest rates. The objective was analyzed by computing the granger causality test and the pair-wise correlation analysis as presented in section 4.3.1 and 4.3.2.

4.3.1 Testing for granger causality

In order to determine the responsiveness of deposit interest rates as the benchmark 91_day T-bill rate changes, Granger causality test was carried out to establish whether the T-bill rate changes influenced the adjustment of deposit interest rates. The granger causality test measured whether the independent variable (91_day T-bill) causes the dependent variable (deposit rate) to adjust. It also measured whether the dependent variable has any influence on the independent variable. Table 4.2 presents the granger causality test results for all the periods under study.

For the entire period (1991-2013), the granger causality test results were presented in table 4.2. As anticipated, the changes in 91_day T-bill caused all the deposit interest rate categories to adjust and this implies that the benchmark policy rate influences the adjustment of deposit rates. It can further be deduced that a strong relationship exist between the independent variable and the dependent variable.

The granger causality test results for the period within 1991-2003 indicated that the changes in 91_day T-bill caused all the deposit interest rate categories to adjust. The null hypothesis of no granger causality by the benchmark rate (T-bill) was strongly rejected at 1% significance level as presented in table 4.2.

Table 4.2 also presents the pair-wise granger causality results on whether the 91_day T-bill had been influencing the adjustment of deposit rates for the period within 2004-2013. The results

indicated that the changes in the T-bill caused the deposit interest rates to adjust but not vice versa.

Table 4.2: Pairwise Granger causality results for all the variables under the study

1991-2013			
Null Hypothesis:	Obs	F-Statistic	Probability
91-DAY TBILL does not Granger Cause SAVINGS		15.4638	0.0000
SAVINGS does not Granger Cause 91-DAY TBILL	268	12.0076	0.0000
91-DAY TBILL does not Granger Cause DEPOSIT_RATES	268	44.0809	0.0000
DEPOSIT_RATES does not Granger Cause 91-DAY TBILL		11.5533	0.0000
1991-2003			
91-DAY TBILL does not Granger Cause 3-6_MONTHS	148	19.4281	0.0000
3-6_MONTHS does not Granger Cause 91-DAY TBILL		4.5054	0.0127
91-DAY TBILL does not Granger Cause 6-9 MONTHS	148	12.9378	0.0000
6-9 MONTHS does not Granger Cause 91-DAY TBILL		7.7704	0.0006
91-DAY TBILL does not Granger Cause 9-12 MONTHS	148	24.0619	0.0000
9-12 MONTHS does not Granger Cause 91-DAY TBILL		5.8403	0.0037
91-DAY TBILL does not Granger Cause SAVINGS	148	8.7348	0.0003
SAVINGS does not Granger Cause 91-DAY TBILL		5.8611	0.0036
91-DAY TBILL does not Granger Cause DEPOSIT_RATES	148	22.4264	0.0000
DEPOSIT_RATES does not Granger Cause 91-DAY TBILL		5.6467	0.0044
2004-2013			
91-DAY TBILL does not Granger Cause 0-3MONTHS		22.6868	0.0000
0-3MONTHS does not Granger Cause 91-DAY TBILL	118	0.2069	0.8134
91-DAY TBILL does not Granger Cause OVER_3MONTHS		30.5283	0.0000
OVER_3MONTHS does not Granger Cause 91-DAY TBILL	118	0.8291	0.4391
91-DAY TBILL does not Granger Cause SAVINGS		3.4969	0.0336
SAVINGS does not Granger Cause 91-DAY TBILL	118	0.8273	0.4398
91-DAY TBILL does not Granger Cause DEPOSIT_RATES		39.4311	0.0000
DEPOSIT_RATES does not Granger Cause 91-DAY TBILL	118	1.6315	0.2002

4.3.2 Correlation analysis

Pair-wise correlation coefficients was carried out between the various deposit rates and the benchmark 91_day T-bill rate. Table 4.3 shows the correlation between the deposit rates and the T-bill for the entire period under study (1991-2013). High correlation was observed between the variables, that is, the savings rate had a correlation of 0.73 while average deposit rates had a correlation 0.81 with the benchmark policy rate.

Table 4.3: Pair-wise correlation coefficients among the deposit rates for the entire period (1991-2013)

	91-Day Tbill	Savings	Av. Deposit Rates
91-Day Tbill	1.0000		
Savings	0.7304	1.0000	
Av. Deposit Rates	0.8099	0.9470	1.0000

Table 4.4 analyzes the pair-wise correlation coefficients between the deposit rates and the benchmark T-bill for the period within 1991-2003. High correlation was observed between the different categories of deposit rates and the benchmark T-bill. The average deposit rate had the highest correlation of 0.75 with the benchmark 91_day T-bill. The reason could be majority of the deposit rate categories had a high correlation especially the deposit interest rates categories with close maturing dates. The correlation coefficients of the savings rate indicated an increasing trend with maturity because savings rate covers a period of more than one year and hence, the longer the maturity, the better the results.

Table 4.4: Pair-wise correlation coefficients among the deposit rates for the period within 1991-2003

	91-Day Tbill	3-6 Months	6-9 Months	9-12 Months	Savings	Av. Deposit Rates
91-Day Tbill	1.0000					
3-6 Months	0.7279	1.0000				
6-9 Months	0.7035	0.9635	1.0000			
9-12 Months	0.7446	0.9825	0.9677	1.0000		
Savings	0.6467	0.9002	0.9014	0.9295	1.0000	
Av. Deposit Rates	0.7471	0.9918	0.9667	0.9900	0.9362	1.0000

The pair-wise correlation coefficient for the remaining period within 2004-2013 was presented by table 4.5. The deposit interest rates and the benchmark 91_day T-bill are highly correlated with each other except with the average deposit interest rates. This is because the average deposit interest rate is composed of aggregate weighted average of all the different categories of deposit interest rates. The 0-3months deposit rate had the highest correlation of 0.78 with the benchmark 91_day T-bill. This could be because of the close maturing dates between the benchmark T-bill and the 3-6 month deposit rate. Interestingly, the correlation of average deposit interest rates with the policy rate had been decreasing over time. In the period between 1991-2003 (table 4.4), the correlation coefficient was 0.75 while in the period between 2004-2013 (table 4.5), the correlation was 0.21. This is a clear indication that the responsiveness of deposit rates has been declining and hence deposit rates are not adjusting one on one with the policy rates.

Table 4.5: Pair-wise correlation coefficients among the deposit rates for the period within 2004-2013

	91-Day Tbill	0-3months	Over-3months	Savings	Av. Deposit Rates
91-Day Tbill	1.0000				
0-3months	0.7837	1.0000			
Over-3months	0.6504	0.9377	1.0000		
Savings	0.7235	0.9762	0.9759	1.0000	
Av. Deposit Rates	0.2104	0.3978	0.5529	0.5049	1.0000

In summary, findings of the study from the granger causality test strongly indicated that the benchmark policy rate influenced the adjustment of deposit interest rate at 1% significance level. The results were also confirmed by pair-wise correlation analysis which indicate that a strong positive relationship exist between the deposit interest rates and the benchmark policy rate (T-bill). The same method was carried out by Liu et al. (2009) establishing whether the benchmark market rate influences the adjustment of retail rates in Singapore and came up with the same conclusions. Various studies which have been undertaken in this field to establish the relationship of policy rate and retail interest rates have confirmed that policy rate influences the adjustment of retail rates (Acheampong, 2005; Berstein & Fuentes, 2005; and Driscoll & Judson, 2013).

The first objective which aimed at determining whether benchmark policy rate (T-bill) influenced the adjustment of deposit interest rates was achieved by running the granger causality test. The results were statistically significant meaning that the benchmark policy rate influenced the adjustment of deposit rates. The same results were confirmed by pair-wise correlation analysis which shows that a strong relationship exists between the independent variable and the dependent variables. The findings therefore indicate that monetary policy stance is effective to some extent but the test could not establish by how much.

4.4 Testing for stationarity on the deposit interest rates

Before the measurement of the other objectives, the data was firstly passed through various tests (unit root and cointegration tests) to ensure that it could give out reliable estimates for the analysis. The unit root tests were conducted to determine whether the variables were stationary and in which order of integration. Both the Augmented Dickey Fuller (ADF) unit root test and the Kwiatkowski, Philips, Schmidt, Shin (KPSS) stationarity tests were selected to determine the stationarity and the level of integration. The null hypothesis of the ADF test was that the series had a unit root against the alternative of stationarity while the null hypothesis of KPSS test was stationarity against the alternative of non-stationarity. KPSS was used to test for reliability because ADF is criticized for its low power to detect unit root. Robustness check of the results was conducted at level and first difference series. The results of stationarity tests are summarized in table 4.10. The results from both ADF and KPSS tests indicate that most of the series (for all the periods under study) in the level were unit root non-stationary at 5% level of significance. At the first difference, all the series were stationary on both tests (ADF and KPSS), that is, all the individual series were in order $I(1)$.

Table 4.6: The Unit Root Tests on level and first difference series

	ADF				KPSS	
	Level		First difference		Level	1st Diff
	t-Statistic	Prob.*	t-Statistic	Prob.*		
1991-2013						
91-Day Tbill	-3.04	0.03	-8.37	0.00	1.15	0.02
Savings	-1.50	0.53	-6.81	0.00	1.86	0.10
Av. Deposit Rates	-1.82	0.37	-7.21	0.00	1.53	0.07
1991-2003						
91-Day Tbill	-2.88	0.05	-6.62	0.00	0.71	0.05
3-6 Months	-1.80	0.38	-5.47	0.00	0.96	0.10
6-9 Months	-1.23	0.66	-18.48	0.00	1.02	0.07
9-12 Months	-0.67	0.85	-10.77	0.00	1.05	0.09
Savings	0.00	0.96	-10.38	0.00	1.31	0.09
Av. Deposit Rates	-1.35	0.60	-5.07	0.00	1.06	0.10
2004-2013						
91-Day Tbill	-2.56	0.10	-3.50	0.01	0.31	0.05
0-3months	-2.59	0.10	-3.55	0.01	0.71	0.04
Over-3months	-2.69	0.08	-5.14	0.00	0.79	0.05
Savings	-1.90	0.33	-15.22	0.00	0.55	0.08
Av. Deposit Rates	-2.79	0.06	-3.26	0.02	0.77	0.04
Notes:						
Augmented Dickey-Fuller (ADF) test		Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test				
Test critical values:	1% level	-3.45	Asymptotic critical values*:		1% level	0.74
	5% level	-2.87			5% level	0.46
	10% level	-2.57			10% level	0.35

4.5 Testing for cointegration on the deposit rates

In order to test for cointegration on whether a long-run relationship exists between the dependent and independent variables, four techniques were used as it was specified in section 2.8. The test that were used are Engle-Granger Augmented Dickey Fuller (EG-ADF) test, Johansen (1988) Maximum Likelihood technique, the Cointegrating Regression Durbin-Watson (CRDW) technique and the Error Correction based technique. These various approaches were used to improve the reliability of the test results. The error correction based technique was used to confirm whether cointegration was present because it can generate more powerful results than EG-ADF test and CRDW test. The results of cointegration test are summarized in table 4.7

indicating that there was long-run relationship between deposit interest rates and the benchmark 91_day T-bill.

Table 4.7: Cointegration results for the deposit interest rates

	Johansen cointegration tests				EG-ADF		CRDW	ECM tests		
	Trace Statistic	Prob.**	Max- Eigen	Prob.**	t-Statistic	Prob.*	t-Statistic	Coefficient	t-Statistic	Prob.
1991-2013										
Savings	40.582	0.000	38.348	0.000	-5.056	0.000	1.901	-0.069	-5.056	0.000
Av. Deposit Rates	29.672	0.000	26.961	0.000	-5.482	0.000	1.908	-0.095	-5.482	0.000
1991-2003										
3-6 Months	13.684	0.092	11.891	0.115	-3.624	0.006	1.981	-0.083	-3.624	0.000
6-9 Months	22.639	0.004	21.670	0.003	-3.587	0.007	2.188	-0.160	-3.587	0.001
9-12 Months	17.974	0.021	17.088	0.017	-5.348	0.000	2.003	-0.146	-5.348	0.000
Savings	23.166	0.003	22.478	0.002	-3.318	0.016	1.993	-0.064	-3.318	0.001
Av. Deposit Rates	15.486	0.050	14.631	0.044	-3.758	0.004	1.894	-0.087	-3.758	0.000
2004-2013										
0-3months	24.937	0.001	20.597	0.004	-2.610	0.094	1.939	-0.091	-2.610	0.010
Over-3months	28.268	0.000	22.824	0.002	-1.927	0.319	1.894	-0.069	-1.927	0.056
Savings	20.488	0.008	15.553	0.031	-1.960	0.304	1.975	-0.270	-3.073	0.003
Av. Deposit Rates	28.047	0.000	23.817	0.001	-2.013	0.281	1.956	-0.073	-2.013	0.046
Notes:										
Johansen coint	Trace Statistic		Max-Eigen Statistic		CRDW Critical values					
5% Critical value	15.495		14.265		1% level		0.511			
EG-ADF					5% level		0.386			
Critical values:	1991-2013	1991-2003	2004-2014		10% level		0.322			
1% level	-3.455	-3.475	-3.487		EG-ADF: Engle-Granger Augmented Dickey Fuller test					
5% level	-2.872	-2.881	-2.886		CRDW: Cointegrating Regression Durbin-Watson test					
10% level	-2.572	-2.577	-2.580		ECM: Error Correction Model technique					

The Johansen cointegration technique clearly shows that the deposit interest rates from all the periods, that is, the entire period (1991-2013), the first period (1991-2003) and the second period (2004-2013) were cointegrated with the benchmark T-bill rate. The null hypothesis of no cointegration was rejected in all the periods at 5% significance level except in the first period where the 3-6 Month and average deposit rates were rejected at 10% significance level. In order to test for robustness, other methods were used and they concluded that the deposit interest rates were cointegrated and therefore having a long-run relationship with the benchmark T-bill rate.

With the EG-ADF test, cointegration was established for most of the variables except in the second period (2004-2013) where the over-3month, savings and average deposits test failed to reject the null hypothesis of no cointegration. The CRDW test rejected the null hypothesis of no

cointegration at 1% on the all deposit rates. The ECM test confirmed that the deposit rates were cointegrated at 5% significance level except the second period (2004-2013) over-3month deposit rate which rejected null hypothesis of no cointegration at 10% significance level.

4.6 The degree of adjustment of the deposit interest rates as the benchmark policy rate changed

The second objective measured the degree of the deposit interest rates adjustment as policy rate adjusted. The objective sought to establish the long-run and short-run relationship of deposit interest rates with benchmark policy rate. It was achieved by running the cointegration and ECM model. Section 4.6.1 presents the long-run pass-through analysis while section 4.6.2 presents the short-run pass-through and the symmetric adjustment analysis.

4.6.1 Long-run pass-through analysis

Having established that a long-run cointegration relationship exists between the deposit interest rates and the benchmark T-bill, a long-run pass-through was conducted to establish the responsiveness of deposit interest rates. This section achieved the determination of the long-run adjustment of the deposit interest rates. The results are presented in Table 4.8 showing the estimated coefficients of the long-run relationship obtained by running equation 1.

Table 4.8: The long-run responsiveness of deposit interest rates

$$DR_t = \alpha_0 + \alpha_1 Tbill_t + \varepsilon_t$$

	Intercept (Markup)			Slope (Degree of pass-through)			R-squared
	Coefficient	t-Statistic	Prob.	Coefficient	t-Statistic	Prob.	
1991-2013							
Savings	3.82	13.76	0.00	0.33	22.61	0.00	0.66
Av. Deposit Rates	1.55	4.93	0.00	0.29	17.50	0.00	0.53
1991-2003							
3-6 Months	6.94	13.37	0.00	0.27	12.91	0.00	0.53
6-9 Months	6.70	12.89	0.00	0.26	12.04	0.00	0.49
9-12 Months	6.47	13.54	0.00	0.27	13.57	0.00	0.55
Savings	5.12	10.87	0.00	0.20	10.32	0.00	0.42
Av. Deposit Rates	6.45	13.94	0.00	0.26	13.67	0.00	0.56
2004-2013							
0-3months	1.79	5.34	0.00	0.56	13.71	0.00	0.61
Over-3months	4.30	14.60	0.00	0.33	9.30	0.00	0.42
Savings	1.40	28.33	0.00	0.01	2.34	0.02	0.04
Av. Deposit Rates	2.49	11.35	0.00	0.30	11.38	0.00	0.52

The intercept coefficient of equation 1 measures the constant mark-up, that is, the degree of fixed cost, whereas the slope coefficient measures the degree of pass-through in the long-run, that is, the degree of variable cost. The constant mark-up was significant at 1% level for all the periods under study. The first period 1991-2003, presented the highest mark-up compared to the second period 2004-2013 and entire period 1991-2013. The savings and average deposit rates in the second period 2004-2013 had a lower mark-up than those in the first period 1991-2003. The presence of a low mark-up in the second period 2004-2013 indicated the improvement of monetary policy transmission mechanism since commercial banks were passing through costs to the respective variables and maintaining lower fixed costs than the other periods.

While considering the degree of pass-through from benchmark T-bill to the deposit rates, it can be observed that the pass-through was incomplete because the coefficients are less than 1. It implies that there is no one-to-one adjustment of deposit rates as the benchmark rate changes. Considering the deposit rates in the entire period (1991-2013), the savings rate had a higher pass-

through (33%) than the average deposit rate (29%). The reason for the lower pass-through on the average deposit rates was probably that it is composed of different categories of fixed deposit rates. In addition, it could be as a result of consumer inertia whereby they are not aware of the categories of fixed deposit rates in the market and hence banks are reluctant to adjust the rates.

In the first period (1991-2003), there was incomplete pass-through ranging from 20% to 27%. The results imply that little change is transmitted to the deposit rates categories as the benchmark rate changes. The reasons attributing to the slow adjustment could be due to large customer base by banks whereby they do not compete for deposits since they have enough to transact on.

The analysis for the second period 2004-2013, the long-run pass-through coefficients were statistically significant but very slow. The results indicated that an incomplete pass-through is evident on the deposit rates. In this period the 0-3month deposit rate category presented the highest long-run pass-through of 56% while in contrast, the same period also had the lowest deposit rate category, that is, the savings rate with a long-run pass-through of 1%. The reason for high pass-through on the 0-3month deposit rate could be due to the transactionary motive of customers whereby they keep money for short term goals and they are able to find the banks with most competitive rate.

In summary on the long-run adjustment of deposit rates, incomplete pass-through was evident and very weak. It implies that monetary policy impulses are not passed to the deposit rates effectively. That was confirmed by the R-squared which showed a weak relationship between the deposit rates and the benchmark rate. Interestingly, the entire period 1991-2013 had the highest R-squared on the savings deposit rate of 66%, while in contrast the same savings deposit rate in the second period 2004-2013 had the lowest R-squared of 4%. This implies that longer duration of analysis is reliable to give better estimates of results.

The findings of the study corroborated those of Fadiran and Ezeoha (2012) who did a study in the South African market and found that incomplete long-run pass-through existed in the retail interest rates. Their study supported that monetary policy mechanism was not very effective and in this study the same conclusion was reached. However, the study contrasted Ozdemir, 2009

who did a study in the Turkish market and found that complete long-run pass-through existed on the retail rates.

4.6.2 Short-run pass-through and symmetric adjustment analysis.

The error correction model (ECM) was used to measure the short-run responsiveness of deposit interest rates. The results of the short-run analysis (Equation 2) are presented in table 4.9 and the beta 1 (β_1) coefficient were measuring the pass-through effect from the benchmark 91_day T-bill. All the β_1 were statistically insignificant and this means that the deposit rates do not adjust one-on-one with the benchmark rate in the short run. The beta 2 (β_2) coefficients were measuring the symmetric adjustment speed of deposit rates. All the β_2 coefficients were negative as it was expected and they were all statistically significant at 1% with a very slow response rate.

In the entire period 1991-2013, the short-run pass-through was incomplete and the savings rate had a lower pass-through than the average deposit rate, that is, 0.09% and 3.52% respectively. The first period 1991-2003 pass-through rate ranged from 0.01% to 3.90% which was a very slow response. The 3-6 and 6-9 months deposit rates were the highest with 3.9% followed by the average deposit rate 3.05% while savings deposit had the lowest pass-through rate of 0.01%. Considering the second period 2004-2013, it had the highest pass-through rate of 13.37% from the 0-3 months deposit rate. Interestingly, the savings rate seems not to be responding with the benchmark rate changes and it had a negative percentage (-0.81%). Comparing the period (2004-2013) with the other periods, it seemed to be more responsive even though the pass-through was still low. The results clearly indicated that the monetary policy stance was not effective in the short run.

Table 4.9: Short-run responsiveness of deposit interest rates

$$\Delta DR_t = \alpha_0 + \beta_1 \Delta Tbill_t + \beta_2 (DR_{t-1} - \alpha_0 - \alpha_1 Tbill_{t-1}) + \mu_t$$

	Beta_1 (Degree of Pass-through)			Beta_2 (Adjustment speed)			R-squared
	Coefficient	t-Statistic	Prob.	Coefficient	t-Statistic	Prob.	
1991-2013							
Savings	0.0009	0.1095	0.9129	-0.0362	-5.1037	0.0000	0.0793
Av. Deposit Rates	0.0352	3.4056	0.9002	-0.0882	-8.5669	0.0000	0.2523
1991-2003							
3-6 Months	0.0390	2.2919	0.4877	-0.0877	-4.8999	0.0000	0.1787
6-9 Months	0.0089	0.2365	0.8134	-0.1872	-4.7410	0.0000	0.1346
9-12 Months	0.0390	2.2852	0.1892	-0.0694	-3.7211	0.0000	0.2625
Savings	0.0001	0.0123	0.9902	-0.0365	-2.7971	0.0058	0.0311
Av. Deposit Rates	0.0305	2.2422	0.4555	-0.0844	-5.2701	0.0000	0.1887
2004-2013							
0-3months	0.1337	4.1646	0.7099	-0.1428	-6.1781	0.0000	0.3729
Over-3months	0.0329	0.9268	0.3559	-0.1376	-4.7149	0.0000	0.1869
Savings	-0.0081	-0.9013	0.3693	-0.1430	-3.2769	0.0014	0.0852
Av. Deposit Rates	0.0721	2.6867	0.4260	-0.1436	-4.8742	0.0000	0.2633

The symmetric adjustment speed in the entire period (1991-2013) seemed to be very slow both in the two deposit rate categories, that is, the savings rate with 3.62% and average deposit rate with 8.82%. In the first period 1991-2003, the 6-9 months deposit rate had the highest adjustment of 18.72% while the savings rate had the lowest adjustment speed of 3.65%. The second period 2004-2013 had the highest adjustment speed on average. The over average deposit rate was the highest with 14.36% followed closely by the savings rate with 14.30% and 0-3 months deposit rate with 14.28% while over-3 months deposit rate had the lowest adjustment speed of 13.76%. Generally, the second period seemed to be adjusting faster than the other periods and this could be as a result of increased number of commercial banks in the economy which have brought in competition and also increased level of customer awareness.

In summary, from the pass-through analysis, the savings deposit rate was very rigid and not responsive to the signals send by the benchmark rate (T-bill). The evidence proves that the monetary policy operations were not effective both in the short-run and also in the long-run as established in section 4.6.1. The results were also confirmed by the R-squared values which

showed that a weak relationship existed between the deposit interest rates and the benchmark policy rate (91_day T-bill) since all the values were below 0.50.

Similar results have been obtained by various researchers from different countries and no single research has been found having a complete short-run pass-through (Scholnick, 1996; Acheampong, 2005; Rosen, 2003; Bernstein & Fuentes, 2005; Aziakpono & Wilson, 2010; Misati et al., 2011 and Fadiran & Ezeoha, 2012). Comparing the results of this study with the study done by Fadiran and Ezeoha (2012) in South Africa, the pass-through rate was lower. It implied that monetary policy measures in the country were not effective and indeed they were worse than those of the other developing countries like Ghana (Acheampong, 2005).

According to Misati et al. (2011), in a perfect market which is efficient, the benchmark policy rates and retail rates should move together. In other words, there should be complete pass-through of retail interest rates once the benchmark policy rate adjusts such that pass-through coefficients are equal to one or very close to one. From the findings of this study, the pass-through coefficients are incomplete and very low indeed both in the short-run and in the long-run. Market concentration, consumer inertia and large customer base hypothesis could be influencing the responsiveness of deposit rates to a larger extent as stipulated by Hannan and Berger, (1991); Neumark and Sharpe, (1992) and Blinder, (1991). This is because the Kenyan banking sector is dominated by few large banks and customers lack all the available information in the market hence information asymmetry.

4.7 The asymmetric adjustment analysis of deposit interest rates

The third objective was to establish whether the adjustment of deposit interest rates was the same when above or below the equilibrium level. To achieve the objective, asymmetric error correction model was computed. This is because the retail interest rates usually follow a mean-reverting process to achieve a long-run equilibrium. It means that the interest rates adjust downwards when they are above the equilibrium level and adjust upwards when they are below the equilibrium level. The short-term adjustment speed of deposit interest rates is not always the same when they are above or below the equilibrium level. Therefore, asymmetric error correction model was computed in order to obtain the ECM coefficients of the deposit interest

rates when above or below the equilibrium level. The results were presented in table 4.10 where the asymmetric ECM (Equation 5) was represented by positive ECM^+ (δ_2) when above and negative ECM^- (δ_3) when below the equilibrium level.

Table 4.10: The asymmetric error correction results

$$\Delta DR_t = \alpha_0 + \delta_1 \Delta Tbill_t + \delta_2 ECM_{t-1}^+ + \delta_3 ECM_{t-1}^- + \eta_t$$

	Delta_1		Delta_2 (ECM^+)		Delta_3 (ECM^-)		Wald Test	
1991-2013	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	F-Statistic	P_Value
Savings	0.0009	0.1095	-0.1536	-3.6773	0.0183	0.5942	6.9377	0.0012
Av. Deposit Rates	0.0352	3.4056	-0.1805	-3.2874	0.0742	1.7022	6.8501	0.0013
1991-2003								
3-6 Months	0.0390	2.2919	-0.2216	-2.2941	0.1039	1.0274	3.1578	0.0454
6-9 Months	0.0089	0.2365	-0.2115	-0.9629	0.1154	0.5088	0.5926	0.5542
9-12 Months	0.0390	2.2852	0.1920	1.7121	-0.2647	-2.6475	4.9714	0.0082
Savings	0.0001	0.0123	-0.1627	-0.0013	0.0038	0.0612	3.2929	0.0399
Av. Deposit Rates	0.0305	2.2422	-0.1959	-2.5432	0.0874	1.0547	3.7877	0.0249
2004-2013								
0-3months	0.1337	4.1646	-0.0925	-1.4769	0.1309	2.5220	4.1955	0.0174
Over-3months	0.0329	0.9268	-0.1278	-2.0711	0.1549	2.8186	5.9350	0.0035
Savings	-0.0081	-0.9013	-0.0170	-1.1803	0.0258	1.6955	2.0870	0.1287
Av. Deposit Rates	0.0721	2.6867	-0.0563	-1.1594	0.0832	1.9592	2.5212	0.0848

For the entire period 1991-2013, the deposit rates (savings and average deposit rates) were adjusting downwards at a faster rate than upwards. The savings rate adjusted downwards by 15.36% compared to the upward adjustment of 1.83%. The average deposit rate adjusted downwards by 18.05% and adjusted upwards by 7.42%. The Wald test is statistically significant in both deposit rates confirming that there is asymmetric adjustment.

In the first period 1991-2003, the deposit rates were adjusting faster downwards than upwards with an exception of 9-12 months deposit rate. The downward adjustment depicted a negative sloping yield curve with maturity meaning that the deposit rates with longer maturities had the slowest adjustment. The 9-12 deposit rate adjusted upwards faster (26.47%) than downwards (19.20%). The reason could have been as a result of negative customer reaction hypothesis

whereby, banks perceived to incur high cost if they adjusted the rate downwards faster. The Wald test in the first period for all the deposit rate categories was statistically significant meaning that there was an asymmetric adjustment with an exception of 6-9 month deposit interest rate which had symmetric adjustment.

The second period 2004-2013 presented contrasting results which were different compared to the other periods. The deposit interest rates were adjusting downwards slowly than upwards. The possible reason of the higher adjustment upwards could be due to the increased competition in the banking industry in the recent years making banks to become more competitive. Another reason could be due to negative customer reactions if they are able switch from one bank to another in search of favorable terms. All the deposit rates adjustment in that period was asymmetric as presented by the Wald test except the savings rate which adjusted symmetrically.

The study established that asymmetric adjustment existed in most of the deposit interest rates series. In the entire period 1991-2013 and the first period 1991-2003, the deposit interest rates were found to be rigid and a high upward rigidity than downwards rigidity was observed. The results were supported by the tacit collusion behavior which is usually brought about by the imperfect competition among the commercial banks. The commercial banks are able to exploit the deposit customers by being quick to adjust the deposit rate downwards when they are above the equilibrium level than when they are below. The findings were consistent with previous related studies (Hannan & Berger, 1991; Neumark & Sharpe, 1992; Scholnick, 1999; Berstein & Fuentes, 2005; and Liu et al., 2009)

In the second period 2004-2013, asymmetric adjustment was observed except on the savings deposit interest rate. In contrast with the other periods, deposit interest rates was observed to adjust faster upwards than downwards. The results agreed with the customer reaction hypothesis where banks are reluctant to adjust the deposit rates downwards fearing the negative actions of deposit holders to switch to other banks which offer competitive rates. The findings were similar to other previous studies in different countries which found the same conclusions (Hannan & Berger, 1991; Scholnick, 1996; and Liu et al., 2009)

4.8 Duration measurement using Symmetric and Asymmetric Mean Adjustment Lags

The forth objective which measured how long it took for the deposit interest rates to adjust was analyzed and discussed in this section. The ECM coefficients measures the pass-through effect, that is, how much deposit interest rates adjusts back to equilibrium in each month but they do not present how long it takes for the deposits rates to have a complete adjustment. To determine the duration taken for a change in benchmark policy rate (T-bill) to be fully passed through to deposit interest rates categories, the Mean Adjustment Lags (MAL) were computed. The MAL measures the time taken for the adjustment and a high MAL value implies a high rigidity or slow adjustment speed while a low MAL implies less rigidity or high adjustment speed in response to the benchmark policy rate (T-bill rate).

The computation of MALs presents the efficiency level monetary policy effectiveness. The speed of adjustment helps in the improvement of monetary policy mechanism to the policy makers. Therefore, to understand how long it takes for deposit interest to reflect the changes of benchmark policy rate is very critical in the economy. The symmetric and asymmetric MALs results are presented in table 4.11.

4.8.1 Symmetric Mean Adjustment Lags

The symmetric MAL for the entire period 1991-2013 in table 4.11 presented savings deposit rate having a higher MAL than the average deposit interest rate. It meant that the savings rate had a slower adjustment rate of 27.57 months compared with average deposit rate which took 10.93 months for it to completely adjust. In the second period 1991-2003, the symmetric MAL was also highest in the saving deposit rate and lowest in the 6-9 month deposit rate. The short-term maturity deposit rates seemed to have the lowest MALs in that period except the average deposit rate which was an aggregate of all the deposit rates. In the second period 2004-2013, the symmetric MAL was almost the same. The second period had the lowest MAL on average and this meant that deposit rates were responding faster to reflect the benchmark policy rate changes. That could have been as a result of increased competition in the recent years and increased customer awareness whereby, they find the banks with the most favorable rates. The second

period therefore produced better results compared to the other periods under study. It can be deduced that monetary policy transmission mechanism is becoming more efficient and effective.

Table 4.11: Symmetric and Asymmetric Mean Adjustment Lags

	Symmetric Model	Asymmetric Model	
1991-2013	MAL (Months)	MAL+ (Months)	MAL- (Months)
Savings	27.57	6.51	54.50
Av. Deposit Rates	10.93	5.35	13.01
1991-2003			
3-6 Months	10.96	4.34	9.25
6-9 Months	5.29	4.69	8.59
9-12 Months	13.84	5.00	3.63
Savings	27.38	6.14	262.29
Av. Deposit Rates	11.49	4.95	11.10
2004-2013			
0-3months	6.07	9.37	6.62
Over-3months	7.03	7.57	6.24
Savings	7.05	59.40	39.07
Av. Deposit Rates	6.46	16.49	11.15

4.8.2 Asymmetric Mean Adjustment Lags

From table 4.11, the entire period 1991-2013 indicate that both deposit rates, that is, savings rate and average deposit rates adjusted quickly downwards and were very rigid upwards. This asymmetric adjustment was also affirmed by Wald test in table 4.10. The savings rate took 6.51 months to adjust downwards compared with upward adjustment which took 54.50 months. The average deposit rates took 5.35 months to adjust downwards compared with upward adjustment of 13.01 months. The adjustment behavior was supported by the tacit collusion pricing arrangement and it was a clear indication that monetary policy mechanism was not efficient especially when the rates were being adjusted upwards. In addition, menu cost and lack of competition could have also influenced the asymmetric adjustment.

In the first period 1991-2003, the deposit rates were still rigid upwards and quick to adjust rates downwards except the 9-12 month deposit rate category. The savings deposit rate was very rigid

and it took 262.29 months for it to adjust upwards insinuating that it was not responsive to the policy rate changes. The asymmetric adjustment of deposit rates were also confirmed by Wald test in table 4.10 and found to be significant in all the deposit rates except 6-9 month deposit rate category. The adjustment behavior of deposit rates in the first period was also consistent with the tacit collusion behavior.

In the second period 2004-2013, interesting results were produced in contrast with the other periods under study. The deposit rate was rigid downwards than upwards. Once again, the savings deposit rate produced the most extreme results of rigidity whereby it took 59.40 months for it to adjust downwards and 39.07 for it to adjust upwards. This behavior of asymmetric adjustment is supported by negative customer reaction hypothesis. In addition, the adjustment could be as a result of increased competition in the banking industry.

In summary, the section established that the deposit interest rates were rigid and it took on average between 5 months and 27 months for them to completely adjust. The results indicate that monetary policy is ineffective and hence the interest rate channel is also not effective. The entire period 1991-2013 and the first period 1991-2003 indicate a more upward rigidity than downwards while the second period 2004-2013 indicate a more downward rigidity than upwards. The findings are consistent with the tacit collusion behaviors brought about by imperfect competition and negative customer reaction hypothesis.

The findings were similar to studies done by previous researchers. A study Hannan and Berger (1991) in the US found out that deposit interest rates were more rigid when below the equilibrium level and were quick to adjust downwards when above the equilibrium level. Similar findings were observed by Scholnick (1996) while conducting the study in Malaysia and Singapore. A study by Neumark & Sharpe (1992) established that the rigidity of deposit interest rates was influenced by market concentration. They found that those markets that were highly concentrated the deposit rates were more rigid than less concentrated markets. A study by Bernstein & Fuentes (2005) in Chilean market confirmed the results of Neumark & Sharpe (1992) by establishing that larger rigidity was associated with market concentration. From the findings of this research, the high rigidity could also be associated with the market concentration

because Kenyan banking industry is dominated by six large banks which control a market share of 53.7% (CBK, 2013).

4.9 Chapter conclusion

The study used the various econometric tests and key among them where the granger causality test and error correction model (ECM). The granger causality test measured whether the benchmark policy rate influenced the adjustment of deposit interest rates. The results strongly indicated that the benchmark policy rate (T-bill) influenced the adjustment of deposit interest rates. Using both symmetric ECM and asymmetric ECM, incomplete pass-through was found on the deposit rates both in the short-run and long-run. Mixed results of asymmetric adjustment of deposit interest rates were established. In the entire period (1991-2013) and first period (1991-2003), deposit interest rates was observed to adjust rigidly upwards and quickly downwards supporting the collusive pricing arrangement behavior. In the second period (2004-2013), deposit interest rates adjusted quickly upwards and rigidly downwards supporting the negative customer reactions behavior.

Chapter 5: SUMMARY, CONCLUSION AND RECCOMENDATIONS

5.1 Introduction

The chapter presents the summary, conclusion and recommendations that emanated from the study. This chapter summarizes the findings of the study based on the research objectives in section 5.2. The chapter also covers the research conclusions in section 5.3. Section 5.4 describes the policy implications and recommendations while section 5.5 discusses the areas for further studies in relation to the study. Lastly, section 5.6 presents the limitations encountered while carrying out the research.

5.2 Summary of the findings

The main objective of the study was to establish the responsiveness of bank deposit interest rates as the benchmark policy rate adjusted. The study covered a sample period of 22 years and 6 months and the three sets of periods were obtained to carry out the analysis. The periods were the entire period 1991-2013, the first period 1991-2003 and the second period 2004-2013. The periods were identified to allow the examination of different deposit interest rate categories.

The first objective was to determine whether benchmark policy rate changes influenced the adjustment of deposit interest rates. In order to analyze the objective, granger causality test was carried out. The results strongly indicated that the benchmark policy rate influenced the adjustment of deposit interest rate at 1% significance level. The results were also confirmed by pair-wise correlation analyses which indicated a strong positive association existed between the deposit interest rates and the benchmark policy rate. The same method was carried out by Liu, Margaritis, and Tourani-Rad (2009) to find out whether the benchmark market rate influenced the adjustment of retail rates in Singapore and the findings were similar.

Unit root and cointegration test were conducted before the estimation of ECM model. The unit root tests were conducted to measure whether the data was stationary or not. Both ADF and KPSS stationarity tests were conducted and found that the data was stationary at first difference, that is, all the deposit interest rate series were of order $I(1)$. After confirming the order of integration of the variables, cointegration test were conducted to ensure that a long-run

equilibrium relationship existed between the deposit rates and the benchmark policy rate. The results from all the methods indicated that the deposit rates were cointegrated with benchmark policy rate meaning that the chances of getting a spurious regression model were minimized.

The second objective sought to establish the degree of adjustment of the deposit interest rates as the benchmark policy rate changed. The study found out that incomplete pass-through was evident both in the short-run and long-run. The study found out that deposit interest rates were more rigid in the short-run than in the long-run. The second period 2004-2013 generally had a higher pass-through rate than the other periods. The results were consistent with other related studies in different countries which have established incomplete pass-through of retail rates in the short-run (Scholnick, 1996; Acheampong, 2005; Bernstein & Fuentes, 2005; Wang & Thi, 2010; Aziakpono & Wilson, 2010; Fadiran & Ezeoha, 2012). However, in the long-run different studies have established mixed findings where some have obtained complete, incomplete or over pass-through. In south Africa for instance, Aziakpono and Wilson (2010) obtained incomplete and over pass-through results while Fadiran and Ezeoha (2012) obtained incomplete pass-through although the results were close to one. On this study, incomplete pass-through was established in the long-run.

The third objective was to examine whether the rate of upward or downward adjustment of deposit interest rates was the same as the benchmark rate changed. Symmetric and asymmetric results presented indicated that deposit interest rates exhibited asymmetric adjustment, that is, non-uniformity while adjusting from either above or below the equilibrium level as the policy rate changed. In the entire period (1991-2013) and first period (1991-2003), deposit interest rates were observed to adjust rigidly upwards and quickly downwards. The adjustment was supported by tacit collusive pricing behavior. Similar findings were established by Hannan and Berger (1991), Neumark and Sharpe (1992), Bernstein and Fuentes (2005) and Wang and Lee (2009) who found high upward rigidity of deposit interest rates than downwards. In the second period (2004-2013), the deposit interest rates were observed to adjust upwards faster than downwards. The behavior was supported by negative customer reactions as it was advocated by (Liu et al., 2009 and Aziakpono & Wilson, 2010).

The forth objective sought to establish how long it took for the deposit interest rates to adjust as the benchmark policy rate changed. The objective aimed at finding out the exact number of months the deposit interest rates took to completely adjust as the benchmark policy rate adjusted. Using the symmetric MALs, the study found out that it took between 5 months to 27 months for the deposit interest rates to completely adjust. This implies that deposit interest rate categories are not very responsive to the benchmark policy rate changes. Most of the studies have also indicated that it takes a longer period for the interest rates to adjust completely though it varies from one country to another depending on the level of economic development (Acheampong, 2005; Craig & Dinger, 2010; Driscoll & Judson, 2013). An ideal duration is determined by the level of efficiency on monetary policy transmission mechanism.

5.3 Conclusions

From the research findings, the pass-through analyses on Kenyan retail deposit interest rates are incomplete both in the short-run and in the long-run. A high incomplete pass-through was observed in the short-run than in the long-run with the savings deposit interest rate being the most unresponsive rate. Asymmetric adjustment was also observed in the deposit interest rates. From the entire period (1991-2013) and first period (1991-2003), deposit interest rates were adjusting rigidly and a high upward rigidity than downward was observed. In the second period (2004-2013), deposit rates were rigidly adjusting and a higher downward rigidity than upward was observed.

While comparing all the periods, the second period (2004-2013) produced better results of interest rate pass-through than the other periods. This is good indication that the responsiveness of deposit interest rates has improved in the recent years meaning that the monetary policy effectiveness has also improved. Monetary policy effectiveness is very important since it impacts the economic performance in the country through stimulating savings and investments. MPTM helps the policymakers, investors and commercial banks in coming up with better decisions during expansionary and contractionary cycles.

The study concurred with Acheampong (2005), who argued that despite the liberalization of prices and financial reforms in the developing economies, commercial banks interest rates have

remained rigid as the banks enjoy higher margins. This evidence implies that monetary policy has not been efficient and effective in the developing countries. The established incomplete pass-through and asymmetric adjustment could therefore be explained by the fact that Kenya is a developing economy.

5.4 Policy implications and recommendations

This study provides a guideline to monetary policy makers on the prevailing condition of monetary policy effectiveness. This will help the policy makers in coming up with appropriate measures to determine the size and speed of monetary policy transmission mechanism. The interest rate channel of monetary policy transmission mechanism is questionable because from the findings it was observed that monetary policy was not effective. Therefore, an appropriate action should be taken to improve the MPTM effectiveness. The policy makers should adopt hybrid measures like inflation-targeting system to ensure price stability in the economy and avoid overreliance on the interest rate channel.

The study also provides knowledge to commercial banks, potential investors and customers on the right investment and savings alternatives. For instance, customers are able to understand the way banks behave by taking advantage on them and thus enjoying higher profit margins. The commercial banks are in a position to understand the trends of deposit interest rates and can make the right decisions depending on the degree of market competition and customer awareness.

The results of MPTM could be improved by encouraging more banks to join the banking industry in order to increase the competition. This is because the incomplete pass-through and asymmetric upward rigidity of deposit interest rates is supported by the collusive pricing behavior which means that few dominating banks control the market. According to CBK (2013), 53.7% of the deposit base is controlled by only 6 banks out of 43 banks in the economy. This could mean that if the banks collude, they might be controlling the market through dictating the prices of deposits since they will be having excess liquidity and hence become more unresponsive to the benchmark policy rate. Therefore, attracting more banks in the industry will lead to intense competition for deposits and banks will become more competitive thus reducing the high net interest margin benefits which they are currently enjoying. The monetary authorities

should adopt policies that encourage competition even beyond the banking sector like the non-banking financial institutions.

Monetary policy effectiveness is also influenced by the financial stability in the economy. Therefore, the policy makers should stimulate the development of financial reforms and policies that promote the development of financial markets in the Kenyan Economy. This is because most of the developed economies like US and the Euro area which have a high pass-through are financially stable and possess an effective monetary policy mechanism. Enactment of such measures would enhance the speed of adjustment and the desired complete pass-through would be achieved.

5.5 Areas for further study and limitations of the study

An area for further study could be to establish the link between the market concentration and the adjustment of deposit interest rates. This would explain whether market concentration bears any influence on the adjustment of deposit interest rates. In addition, both deposit rates and lending rates could be measured to ascertain their adjustments in response to other influencing factors mentioned in the literature review. It would also be interesting to carry out the research using a different methodology and establish whether the same results will be obtained.

5.6 Limitations of the study

The limitation of the study was lack of consistent categories of deposit interest rates series for the whole period 1991-2013. However, the study was divided into two periods (1991-2003 and 2004-2013) depending on the availability of data in terms of deposit interest rate categories. Analysis was also done for the entire period based on the categories of deposit interest rates series that were available for the whole period.

REFERENCES

- Acheampong, K. (2005). Bank interest rate channel of monetary policy transmission in Ghana. *Working Paper*, 6, 8.
- Aziakpono, M. J., & Wilson, M. K. (2010). Interest Rate Pass-Through and Monetary Policy Regimes in South Africa 12. Retrieved from <http://www.csae.ox.ac.uk/conferences/2010-edia/papers/487-Aziakpono.pdf>
- Bean, C., & Nikolov, K. (2002). Financial Frictions and the Monetary Transmission Mechanism: Theory, Evidence and Policy Implications. *ECB Working Paper*, (113). Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=356761
- Berstein, S., & Fuentes, R. (2005). Concentration and price rigidity: Evidence for the deposit market in Chile. *Documentos de Trabajo (Banco Central de Chile)*, (311), 1–28.
- Blinder, A. S. (1991). *Why are Prices Sticky? Preliminary Results from an Interview Study* (Working Paper No. 3646). National Bureau of Economic Research. Retrieved from <http://www.nber.org/papers/w3646>
- CBK. (2013a). Bank Supervision Annual Report. Central Bank of Kenya, Nairobi. Retrieved from <http://www.centralbank.go.ke/index.php/bank-supervision-reports>
- CBK. (2013b). Monetary Policy Reports. Central bank of Kenya, Nairobi. Retrieved from <http://www.centralbank.go.ke/index.php/monetary-policy/monetary-policy-reports-2>
- Chong, B. S., Liu, M.-H., & Shrestha, K. (2006). Monetary transmission via the administered interest rates channel. *Journal of Banking & Finance*, 30(5), 1467–1484.
- Cottarelli, C., & Kourelis, A. (1994). Financial Structure, Bank Lending Rates, and the Transmission Mechanism of Monetary Policy. *Staff Papers - International Monetary Fund*, 41(4), 587–623. doi:10.2307/3867521
- Craig, B. R., & Dinger, V. (2010). A microeconomic investigation into bank interest rate rigidity. *Working Papers of the Federal Reserve Bank of Cleveland*, 10(1). Retrieved

from

http://www.clevelandfed.org/research/workpaper/2010/wp1001.pdf?WT.oss=Retail%20Sales&WT.oss_r=609

- Dinger, V. (2011). Bank mergers and deposit interest rate rigidity. *Working Papers of the Federal Reserve Bank of Cleveland*, 10(31). Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1971315
- Driscoll, J., & Judson, R. (2013). *Sticky deposit rates: Data and implications for models of price adjustment*. Working Paper, Federal Reserve Board.
- Engle, R. F., & Granger, C. W. J. (1987). Co-Integration and Error Correction: Representation, Estimation, and Testing. *Econometrica*, 55(2), 251–276. doi:10.2307/1913236
- Fadiran, G. O., & Ezeoha, A. (2012). SOUTH AFRICAN MARKET VOLATILITY, ASYMMETRY AND RETAIL INTEREST RATES PASS-THROUGH. *South African Journal of Economics*, 80(2), 157–180.
- Fehr, E., Brown, M., & Zehnder, C. (2009). On reputation: A microfoundation of contract enforcement and price rigidity*. *The Economic Journal*, 119(536), 333–353.
- Flannery, M. J. (1982). Retail Bank Deposits as Quasi-Fixed Factors of Production. *The American Economic Review*, 72(3), 527–536. doi:10.2307/1831553
- Goldstein, M. (1996). *Banking crises in emerging economies: origins and policy options*. Basle: Bank for International Settlements, Monetary and Economic Dept.
- González, R. L., & Fumás, V. S. (2005). Market power and bank interest rate adjustments. *Banco de España*. Retrieved from <http://www.ivie.es/downloads/2005/02/01/ponencia01.pdf>
- Granger, C. W. J., & Lee, T. H. (1989). Investigation of Production, Sales and Inventory Relationships Using Multicointegration and Non-Symmetric Error Correction Models. *Journal of Applied Econometrics*, 4, S145–S159.

- Hannan, T. H. (1994). Asymmetric price rigidity and the responsiveness of customers to price changes: The case of deposit interest rates. *Journal of Financial Services Research*, 8(4), 257–267.
- Hannan, T. H., & Berger, A. N. (1991). The rigidity of prices: Evidence from the banking industry. *The American Economic Review*, 81(4), 938–945.
- Heffernan, S. A. (1997). Modelling British Interest Rate Adjustment: An Error Correction Approach. *Economica*, 64(254), 211–231.
- Hofmann, B., & Mizen, P. (2004). Interest Rate Pass-Through and Monetary Transmission: Evidence from Individual Financial Institutions' Retail Rates. *Economica*, 71(281), 99–123.
- Hutchison, D. (1995). Retail Bank Deposit Pricing_An Intertemporal Asset Pricing Approach.pdf. *Ohio State University Press*, 27(1), 217–231.
- Jackson III, W. E. (1997). Market Structure and the Speed of Price Adjustments: Evidence Of Non-Monotonicity. *Review of Industrial Organization*, 12(1), 37–57. doi:10.1023/A:1007700703448
- Johansen, S. (1988). Statistical analysis of cointegrating vectors. *Journal of Economic Dynamics and Control*, 12, 231–54.
- Karagiannis, S., Panagopoulos, Y., & Vlamis, P. (2010). Symmetric or asymmetric interest rate adjustments? Evidence from Greece, Bulgaria and Slovenia. Retrieved from <http://eprints.lse.ac.uk/29168/>
- Liu, M.-H., Margaritis, D., & Tourani-Rad, A. (2009a). Monetary policy and interest rate rigidity in China. *Applied Financial Economics*, 19(8), 647–657. doi:10.1080/09603100801998576
- Liu, M.-H., Margaritis, D., & Tourani-Rad, A. (2009b). Monetary policy and interest rate rigidity in China. *Applied Financial Economics*, 19(8), 647–657.

- Loayza, N., & Schmidt-Hebbel, K. (2002). Monetary policy functions and transmission mechanisms: an overview. *Monetary Policy: Rules and Transmission Mechanisms*. Retrieved from http://www.bcentral.cl/Estudios/banca-central/pdf/v4/001_020Gallego.pdf
- Mahasi, J., & Ganesh, P. (2013). Two Stage Interest Rate Pass Through In Kenya.pdf. *Journal of Emerging Trends in Economics and Management Sciences*, 4(1), 54–61.
- Misati, R. N., Nyamongo, E. M., & Kamau, A. W. (2011). Interest rate pass-through in Kenya. *International Journal of Development Issues*, 10(2), 170–182. doi:10.1108/14468951111149104
- Mishkin, F. S. (1995). " Symposium on the Monetary Transmission Mechanism. *The Journal of Economic Perspectives*, 9(4), 3–10.
- Neumark, D., & Sharpe, S. A. (1992). Market structure and the nature of price rigidity: evidence from the market for consumer deposits. *The Quarterly Journal of Economics*, 107(2), 657–680.
- Ngugi, R. (2001). *An empirical analysis of interest rate spread in Kenya* (Vol. 106). African Economic Research Consortium. Retrieved from <http://www.aercafrica.org/DOCUMENTS/rp106.pdf>
- Olweny, T. (2011). Modelling Volatility of Short-term Interest Rates in Kenya. *International Journal of Business and Social Science*, 2(7). Retrieved from http://www.ijbssnet.com/journals/Vol._2_No._7%3B_Special_Issue_April_2011/31.pdf
- Ozdemir, B. . (2009). Retail bank interest rate pass-through: The Turkish experience. *International Research Journal of Finance and Economics*, (28), 7–15.
- Rosen, R. (2003). Banking Market Conditions And Deposit Interest Rates. *Federal Reserve Bank of Chicago*.

- Rosen, R. J. (2002). What goes up must come down? Asymmetries and persistence in bank deposit rates. *Journal of Financial Services Research*, 21(3), 173–193.
- Rotemberg, J. J., & Saloner, G. (1987). The Relative Rigidity of Monopoly Pricing. *The American Economic Review*, 77(5), 917–926. doi:10.2307/1810217
- Rousseas, S. (1985). A Markup Theory of Bank Loan Rates. *Journal of Post Keynesian Economics*, 8(1), 135–144.
- Samba, M. C., & Yan, Y. (2010). Interest rate pass-through in the Central African Economic and Monetary Community (CAEMC) area: Evidence from an ADRL analysis. *International Journal of Business and Management*, 5(1), P31. doi:10.5539/ijbm.v5n1P31
- Sargan, J. D. (1964). Wages and Prices in the UK: A Study in Econometric Methodology. *Econometric Analysis for National Economic Planning*, London, Butterworths, 25–54.
- Saunders, M., Lewis, P., & Thornhill, A. (2007). *Research Methods for Business Students* (4th ed.). Pearson Education Limited, London.
- Scholnick, B. (1996). Asymmetric adjustment of commercial bank interest rates: evidence from Malaysia and Singapore. *Journal of International Money and Finance*, 15(3), 485–496.
- Scholnick, B. (1999). Interest rate asymmetries in long-term loan and deposit markets. *Journal of Financial Services Research*, 16(1), 5–26.
- Stigler, G. J. (1964). A Theory of Oligopoly. *Journal of Political Economy*, 72(1), 44–61. doi:10.2307/1828791
- Wang, K. M. (2013). Interest rate pass-through and illiquidity shocks in the US. *Journal of Economic Policy Reform*, 16(2), 198–217. doi:10.1080/17487870.2013.770261
- Wang, K.-M., & Lee, Y.-M. (2009). Market volatility and retail interest rate pass-through. *Economic Modelling*, 26(6), 1270–1282. doi:10.1016/j.econmod.2009.06.002

- Wang, K.-M., & Thi, T.-B. (2010). Asymmetric Pass-Through and Risk of Interest Rate _ An Empirical Exploration of Taiwan and Hong Kong. *Applied Economics*, 42(5).
- Woodford, M., & Walsh, C. E. (2005). INTEREST AND PRICES: FOUNDATIONS OF A THEORY OF MONETARY POLICY. *Macroeconomic Dynamics*, 9(3), 462–468.
- World Bank. (2013). *Financial Development and Structure Dataset*. Retrieved from <http://econ.worldbank.org>

APPENDIX

Appendix 1

Banks Market Share Analysis (Ksh. M)					
	Weighted Market Size	No. of Institutions	Total Net Assets	Customer Deposits	Capital & Reserves
Large	53.70%	6	1,233,577	880,119	202,852
Medium	36.80%	15	875,566	656,451	126,639
Small	9.50%	22	221,192	171,264	32,691
Total	100.00%	43	2,330,335	1,707,834	362,182

