TESTING EFFICIENCY AND SEGMENTATION OF THE INTERBANK MONEY MARKET IN KENYA

BY

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DECLARATION

I declare that this research project is my original work and that it has never been presented to any university for examination.

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Signature ……..…….. Date …….……

D63/79344/2012

This research project has been submitted for examination with my authority as the University supervisor.

Prof. Josiah Aduda

Signature …… Date ……

ACKNOWLEDGEMENT

I wish to thank my supervisor Prof. Josiah Aduda for guidance throughout the process of putting my research project together. Special thanks also to my wife for her support, as I compiled the research project. Above all I thank the most high God for the strength and ability, without him this would not have been accomplished by November 2015.

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES ..... **vi**
DEDICATION ..... **vii**
LIST OF ABBREVIATION ..... **viii**
ABSTRACT ..... **ix**
CHAPTER ONE **1**
INTRODUCTION **1**
1.1 Background of the Study 1
1.1.1 Efficiency of the Interbank Money Market 2
1.1.2 Segmentation of the Interbank Money Market 2
1.1.3 Segmentation and Efficiency of Interbank Money Market 3
1.1.4 Commercial Banks in Kenya 8
1.2 Research Problem 9
1.3 Objectives of the study 10
1.4 Value of the study 10
CHAPTER TWO 12
LITERATURE REVIEW 12
2.1 Introduction 12
2.2 Review of Theories 12
2.2.1 Financial System Network Theory 13
2.2.2 Liquidity Management Theory 14
2.3 Summary of Literature Review 19
CHAPTER THREE 21
RESEARCH METHODOLOGY 21
3.1 Introduction 21
3.2 Research Design 21
3.3 Target Population 22
3.4 Data Collection Methods 22
3.5 Data Analysis 23
3.5.1 Models for Analyzing Data 23
3.5.2 Exposure Matrix 23
3.5.3 Convergence of Interest Rates 24

CHAPTER FOUR 26
DATA ANALYSIS AND INTERPRETATION OF FINDINGS 26
4.1 Introduction 26
4.2 Determining Segmentation Nature of the market 26
4.2.1 Intensity of Lending and Borrowing Activity 27
4.2.2 Testing for efficiency in CBR rate in influencing interbank money market rate in balancing liquidity. 28
4.2.3 Testing the relationship between interbank money market rate and other key monetary policy rates. 30
4.2.4 Testing Convergence of Interest Rates in Different Market Segments 35
4.3 Interpretations of the findings 36
CHAPTER FIVE 41
SUMMARY, CONCLUSION AND RECOMENDATIONS 41
5.1 Summary 41
5.2 Conclusion 42
5.3 Recommendations for policy and practice 44
5.4 Limitations of the study 46
5.5 Suggestions for further studies 47
REFERENCES: 48

LIST OF TABLES AND FIGURES

PAGE

Table 4.1: Utilization of trading relationship ..... ….27
Table 4.2: Lender preference Index..... 28
Table 4.3: Borrower Preference Index 28
Table 4.4: Relationship between CBR and Interbank rate 29
Table4.5: Model summary of coefficient of determination predictor (CBR) 29
Table 4.6: Relationship between Interbank and policy rates..... 31
Table 4.7: Model summary of coefficient of determination predictor Liquidity 32
Table 4.8: Model summary of coefficient of determination predictor deposit..... 33
Table 4.9: Model summary of coefficient of determination predictor t/bills 34
Table 4.10: Model summary of coefficient of determination predictor, ... 34
Table 4.11: Convergence of interest rates mean test……..……..… 35
Appendix I: List of Banks and deposit taking microfinance in Kenya……...55
Appendix II: Comparison of Kenyan, UK, EU and US Interbank Market……. .. 57

DEDICATION

I dedicate this research project to my family for their, moral support, patience and always being there for me like no one else has. I appreciate you and thank God for having you in my life.

LIST OF ABBREVIATION

ALM	Asset Liability Management
BPI	Borrower Preference Index
CBK	Central Bank of Kenya
CRR	Cash Reserve Ratio
DTM's	Deposit Taking Microfinance institutions
EURIBOR	Euro Interbank Offered Rate
ILF	Intra-Day Liquidity Facility
LPI	Lender Preference Index
LIBOR	London Interbank Offered Rate

ABSTRACT

In this study, the researcher has tested efficiency and segmentation of the interbank money market in Kenya. The study has analyzed all the 44 banks that trade in the interbank money market in Kenya. The study utilizes network framework and case studies of countries with developed interbank money market namely the UK, EU and the US. In determining segmentation of the interbank money market, the research has analysed lending relationship between banks of different sizes by the intensity of the lender and borrower activity i.e. BPI and LPI.The research has analysed the rate of interest charged to different categories of banks in a particular period to test for convergence of interest rates. In testing for the efficiency of the interbank money market the research has tested the ability of the interbank money market to channel liquidity in the market, how the interbank money market responds to other policy rates in the market i.e. the CBR, CRR and the 90 days treasury bills. The researcher used data for the period January 2009 to December 2013 to analyze and make conclusions as per the objective of the research. The study finds that Kenya interbank money market is incomplete and highly segmented by large, medium and small banks. Large banks discriminate small and medium size banks in terms of credit extended and interest rates charged, which is usually higher than those charged to their peers, this limits the market to function effectively. The study has concluded that though the interbank money market is highly segmented it is relatively efficient as it's able to channel liquidity to the market and also it responds to the policy rates which are aimed at regulating the liquidity position in the market. The interbank market rate influence the pricing of other products in banks i.e. deposits and lending rates, this proves that the interbank market is performing its role of price discovery.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The interbank money market is a market in which banks extend loans to one another for a specified term; interbank loans are for maturities of one day. Overnight lending is done for only one day to enable the borrowing bank meet its liquidity requirements as well as settle its obligations (Coccoetal. 2007). Such loans are made at the interbank rate which is also known as overnight rate if the term of the loan is overnight (Coccoetal.2007).

The interbank market plays at least three critical roles in any modern financial system. First, a well-functioning interbank market effectively channels liquidity from institutions with surplus funds to those in need, thus allowing for more efficient financial intermediation (Lucia Gibilaro 2012). Finally, the interbank market rate should provide an effective price-discovery in the money market as a whole. This requires a credible benchmark rate, which is computed from trades of majority of the participants in the market. Temporary imbalances may arise from time to time, but the market should restore equilibrium and close undesirable gap, without intervention of the central bank rate. Consequently, interbank rates can be used as effective guide for loans, savings, mortgages, futures, options and swaps. (Bruche and Suarez, 2010).

With an efficient interbank market, banks hit by liquidity shocks would have an incentive to borrow from those with surplus liquidity in order to meet liquidity obligations that fall due. This will enable them not to prematurely liquidate interest-earning assets. Moreover, with an interbank market in place, banks will ex-ante put aside less liquidity to cushion themselves from shocks and thus invest more in profitable lending transactions. The redistribution of

funds between banks is necessary to cope with the expected and unexpected liquidity needs, risk sharing safety net purposes since banks are heterogeneous and specialize in different activities.

1.1.1 Efficiency of the Interbank Money Market

The efficiency of the interbank market is assessed on the basis of its ability to perform three critical functions. First, it should effectively channel liquidity from institutions with surplus funds to those in need, thus allowing for more efficient financial intermediation. In effect, when there is an effective interbank market, banks should not hold substantial liquidity to cushion themselves against liquidity shocks. Second, the interbank market should be a good conduit for the interest rate channel of the monetary policy transmission. In effect, when the CBR is changed, the interbank market rates should respond in tandem. Finally, the interbank market should provide an effective yield curve which can be used as a basis for pricing of the loans.

1.1.2 Segmentation of the Interbank Money Market

The interbank money market is segmented in various ways i.e. by products that are offered in the market and the operational structure in which banks can be able to trade with each other. The Kenyan interbank market, don't allow banks to trade with each other freely yet they are regulated in the same way by one regulator i.e. Central Bank of Kenya, instead banks are required to open credit lines with their peers, a process which is done on the credit profiling process, this is the first proof of the market being segmented because big banks don't lend to small banks as they view them as very risky because of the size of their assets (Allen and Gale, 1990, Allen and Saunders, 1992). Again some banks always shy off from banks which don't have good reputation or their profitability is low. Small banks are left with the option to

only borrow funds from their peers but big banks borrow from small banks (Ho and Saunders, 1985). In Kenya 2 banks don't participate in the interbank money market because they offer sharia compliant products and the interbank money market don't have sharia compliant products, because of this only 41 out of 44 banks trade in the market this is the second evidence of the market being highly segmented as far as products are concerned. The interbank money market should allow free trade of all the banks which are licensed and regulated by the central bank of Kenya.

1.1.3 Segmentation and Efficiency of Interbank Money Market

The efficiency of the interbank market in supporting commercial banks liquidity management process depends largely on the exact patterns of financial linkages among the participating banks (Cabral etal. 2002). Theoretically there are four possible segmentation structures of the interbank market; complete market structure where each bank lends to all other banks in the industry, incomplete market structure where some banks lend to selected banks, disconnected structure where no lending takes place among banks and multi-money center where one or some banks lend to each other and connect to small banks which are not connected among themselves (Vander Vennet, 2002).Kenya's interbank market reflects some of these segmentation characteristics. The type of market structure affects the speed at which the market resolves liquidity distribution issues and achieves stability. The faster this happens the highly efficient the market is considered to be (D'Souza and Lai, 2006).

Literature on segmentation of interbank markets suggests that the ability of banks to borrow in the interbank market is principally affected by their reputation. Market reputation in turn depends on such factors as bank size and ownership (Cajueiroand Tabak, 2008). Large banks usually tend to be net borrowers while smaller banks tend to be net lenders in the market, with

the interbank market utilized as one source of funds for banks wishing to engage in "window dressing" of their balance sheets. A small bank wishing to borrow in the interbank market faces the problem of convincing potential lenders that it has a good credit record. This information asymmetry between a small borrowing financial institution and a prospective counter party is part of the theoretical justification for the "large bank-small bank dichotomy"(Ho and Saunders, 1985).

Anecdotal evidence shows that the ability of the interbank market in Kenya to withstand liquidity shocks has been hampered by segmentation of the market. For instance the Safaricom IPO which closed in June 2008 led to acute liquidity crunch after an oversubscription of close to Kshs.200 billion was received by four commercial banks. This led to asymmetry in the reserves held by commercial banks and the situation stabilized after Central Bank of Kenya (CBK) stepped in with a number of policy initiatives. Similarly, following discovery of errors in supplementary budget of 2008/2009, Parliament temporarily froze withdrawal of funds from the consolidated fund for spending by line ministries in May 2009, which created a liquidity crunch especially for the small banks (Green et al.2012).

This outlines the operational framework of Kenya's interbank Market and the asset-liability management strategies employed by banks. The operational framework covers the structure, timing, sources of funds to banks, transactions, traders and the settlement of transactions in the interbank market. Unlike in developed money markets where interbank loans have different maturity profiles, the market in Kenya, only trades funds on an overnight basis, uncollateralized and all in domestic currency.

The market is used by banks to smooth out payments as it allows them to clear maturing cash obligations of both customers and other commercial banks as well as provide a source of

funds to meet the statutory requirements on cash reserves. The market is therefore critical in commercial banks liquidity management, allowing banks with liquidity shortages to access funding or banks with excess liquidity over and above their daily requirements to invest and earn a return. In this regard, the market promotes an efficient use of resources. Currently 41 out of the 44 banks trade in the interbank market. There is evidence of market segmentation as lending and borrowing agreements are not open to all banks but rather there are limited established lines of credit.

These lines of credit are created through a credit profiling process that banks conduct on each other i.e. assessing the creditworthiness of the other banks. It is largely done on the basis of, among other factors, size of bank considering parent company if it is a subsidiary, asset sizes and also ownership either foreign, local private or local public. Banks with relationship at ownership levels would have open credit lines even if their asset bases are not strong enough. The credit lines establish lending and borrowing limits for other banks both in terms of volumes it can trade and whether or not the bank can actually trade. The terms of the credit lines are reviewed regularly as creditworthiness of banks change.

There is no specific timeliness for the credit lines but the credit profiling of the banks would dictate their exposure limits to their counterparts. In Kenya, each bank has at least one credit line with at least one other bank, but the exposure volumes would vary. In commercial banks liquidity management practice, banks engage in developing relations with banks with whom they have unrelated risk exposure to ensure smooth settlement of their payments should there be unanticipated upsurge in their cash requirements. The establishment of credit lines is a reflection of the initial evidence of segmentation and lack of an efficient interbank market in Kenya. (Moses Muse Sichei, Samuel Kiplang'at Tiriongo and Chris Shimba 2012).

In terms of timing and settlement of transactions, the interbank market opens between 8.30am and 4.30pm but with two somewhat distinct sessions. The first session (8.30am-3.30pm) allows banks to trade funds to settle interbank customers payments demands. The second session (3.30pm to 4.30pm) is dependent on the outcome of the first session and allows banks to square their positions by trading the excess funds with other banks that find themselves with cash requirements. In this second session, banks also settle bank to bank obligations. Whenever, there are shortages in this session, banks resort to borrowing funds from the CBK discount window for funds, this is done as a measure of last resort.

In Kenya, all interbank transfers and trading transactions are effected through the Kenya Electronic Payments and Settlement System (KEPSS). Interbank deals are concluded bilaterally between commercial banks which originate payments instructions on SWIFT to be effected through the Real Time Gross Settlement (RTGS), a system that was introduced effective August 15, 2006. Payment instructions are standardized. Prior to the introduction of RTGS, instructions were sent to CBK by banks manually and later via SWIFT for manual posting at CBK. In such a case, the clearing account of the lending bank is debited as the borrowing bank is credited with the amount agreed on bilaterally.

Since interbank loans are overnight loans, repayments are done, reversing the entries on the clearing accounts, but with the amounts plus interest on the following working day before 4.30pm. Interest rates charged are on an annual basis and hence pro-rated to daily rates. KEPSS6 through RTGS and the Reuters screen are critical in the execution of interbank trading. Transactions in the interbank market are either initiated by borrowers seeking funds or lenders with excess funds. The need for funds or excess funds available is posted on the Reuters screen where all banks have access.

Before 2003, each bank held funds at the Central Bank in one main single account, but the funds were dedicated for two main purposes, the statutory cash reserve requirements (CRR) funds that facilitate clearing of the interbank transactions. The account was split into two distinct accounts based on the functions of the funds. The CRR account was dedicated to meeting the statutory cash reserves requirement where banks were required to meet this requirement on a daily basis, without which penalties would be levied. On the other hand, the clearing account was mainly dedicated to clearing payments for the interbank market. The separation of CRR ratio accounts from clearing accounts left banks with very little funds in the clearing accounts. Consequently, banks would overdraw their clearing accounts whenever their maturing cash obligations in the interbank market would surpass their clearing account balances. But with the introduction of RTGS, this system did not have a provision for overdrawing in the clearing accounts.

Consequently, CBK introduced an Intra-day Liquidity Facility (ILF) to ensure that all interbank transactions were facilitated to settle and enhance stability of the market. The ILF provides collateralized lending of funds to commercial bank to facilitate their daily intra-day payment obligations in the KEPSS. Under this facility, commercial banks identify and set aside pre-determined amounts of Government securities from their portfolio holdings for securing intra-day borrowings based on their anticipated average daily liquidity requirements. The credit limit for drawdown against any Treasury Bills is 90% of the face value of the security while that of Treasury Bonds is 80% of the face value of the security pledged. The ILF is created once and is availed to the commercial bank on a daily basis until the securities mature or the commercial bank cancels the facility. Even though the ILF is collateralized, the funds are provided to banks interest-free. In case of default; CBK grants a forced

collateralized overnight loan to a commercial bank that has failed to settle ILF as per the ILF Agreement. Funds are advanced to the affected bank at the prevailing CBR rate.

1.1.4 Commercial Banks in Kenya

The Kenyan interbank market is considered to be incomplete because it is not possible to hedge aggregate or idiosyncratic liquidity risk. In this section we consider the allocation that would occur with complete markets where liquidity risk can be hedged (Allen and Gale 2004).

They show that with complete markets and incomplete contracts of the type considered the allocation is constrained efficient. In other words, a planner subject to the constraint of using a fixed payment in the first period cannot improve upon the complete markets allocation. Institutionally there are a number of ways that complete markets can be implemented.

The interbank market in Kenya is considered inefficient because the interest rate in the interbank market is calculated on the basis of the trades for the day hence giving an opportunity to a few market players to determine the rate. Again the market has only one tenor i.e. one day only. This inconveniences banks as they are forced to incur a lot of administrative costs to keep on borrowing on a daily basis as compared to a situation where the tenor is for a long term and banks can borrow for a period of time to help solve their liquidity problems. Again the market only trades in local currency only whereas banks deal in multiple currencies. This will affect banks because they will not be able to raise funds in foreign currencies in case they have liquidity shortage in foreign reserves.

1.2 Research Problem

The interbank money market has been proven to be incomplete and highly segmented i.e. banks discriminate each other according to their size, risk profiles and products. Large banks tend to discriminate against small banks in terms of credit extended and the interest rate charged, which is usually higher than those charged on their peers. The segmented nature of the market has limited its ability to facilitate banks' liquidity management strategy (Bruche and Suarez, 2010).

This research will be focusing on why the interbank money market is segmented and yet all banks are supervised by central bank of Kenya through prudential guidelines and operate in the same market with similar risks and challenges. Again the interbank market products are all in Kenya shillings and hence sometimes banks which run short of foreign reserves cannot benefit from the interbank market. Interbank money market doesn't offer sharia compliant products and hence currently we have sharia compliant banks which may have liquidity problems and may wish to borrow from the interbank market under sharia laws. The market only lends product for one day where as some banks may have liquidity gaps which will last for long period of time.

The recent case studies show that there is a possibility of removing the segmentation nature of the interbank money market by removing all the barriers i.e. credit lines among banks so that banks can be allowed to lend or borrow money from any bank operating in Kenya so long as its compliant with the CBK prudential guidelines. The case studies show that the efficiency of the interbank market in Kenya can be enhanced through a number of developments such as adding lending products with maturities of more than one day so us to have a term structure,

increasing the number of currencies traded, developing a benchmark interbank interest rate and increasing linkages with other money market segments and monetary policy.

Despite the importance of the interbank market, there is limited research on it in Kenya. (Green et al. 2012) studied the interbank market in Kenya and found no segmentation in the interbank market. However, this is inconsistent with what has been observed in Kenya and there is need for more research in the interbank money market(Vent Ganga,Porte et al (2009)studied the interbank market in Kenya and explored varied measures of segmentation and they concluded that there should be high degree of market breadth and depth with varied instruments spanning different tenors; narrow bid-ask spreads and presence of symmetric information, open credit lines and proper coordination among participants i.e. there should be a clear structure of the operations in the interbank market with clear rules of engagement.In 2012 the Centre for Research on Financial Markets and Policy department in the Kenya Bankers association conducted a study about efficiency and segmentation in the interbank money market in Kenya and concluded that the interbank market is highly inefficient and segmented.

1.3 Objectives of the study

To determine the efficiency and segmentation of the interbank money market.

1.4 Value of the study

This paper will be beneficial to policy makers of the interbank money market i.e. Central Bank of Kenya in getting the insight of how the market has been operating and challenges that are posed to the current arrangement and help them devising ways of improving the interbank market to enhance its efficiency by putting the required infrastructure as well as formulate

policies which will help improve on the interbank money market, as well as improve on its segmentation nature.

Kenya Bankers Association is an association for all banks in Kenya it acts on behalf of member banks in lobbying for their rights .In this case Kenyan banks will benefit greatly as they will be informed about the challenges of the interbank market and how they can be able to improve it by enhancing efficiency and reducing its segmentation nature in order to benefit from the market optimally.

Despite the importance of the interbank market, there is limited research on it in Kenya. Green et al. (2012) studied the interbank market in Kenya and found no segmentation. However, this is inconsistent with what has been observed in Kenya and there is need to explore varied measures of segmentation on the Kenyan interbank market. The interbank money market has not been researched on exhaustively by researchers and I believe future researchers can review this research paper in their literature review as well as guiding them in setting up the framework of their research work i.e. scope of their research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter of literature review provides a background analysis on the existing literature relating to the operations of the interbank money market as well as efficiency and segmentation of the interbank money market in Kenya. The following literature review combines research from various journals, books, online sources, comprising of primary research findings, and reporting with some secondary sources for definition purposes. The review provides general research information on efficiency and segmentation of the interbank money market in Kenya and how its operations affect liquidity management in banks.

2.2 Review of Theories

Past studies have attempted to model an efficient interbank money market and have shown that an efficiently functioning interbank market, is mainly characterized by a number of features, namely, first it should be run by professionals sufficiently equipped with the capacity to assess the risks related to the market participation, second there should be high degree of market breadth and depth with varied instruments spanning different tenors, narrow bid-ask spreads, presence of symmetric information, open credit lines and proper coordination among participants i.e. there is a clear structure of the operations in the interbank market with clear rules of engagement. However, they argued that the interbank market may fail to allocate liquidity efficiently because of some externalities, especially adverse selection problem and asymmetric information, about the counterparty risks defined by the quality of assets that the participating banks hold, this creates counterparty risks and fragmentation of the market.

2.2.1 Financial System Network Theory

According to Leitner, Y (2005) Modern financial systems exhibit a high degree of interdependence, with connections between financial institutions, stemming from both the asset and the liability sides of their balance sheets, the use of network theories can enrich our understanding of financial systems. They explore several critical issues.

First, they address the issue of systematic risk, by studying two questions, how resilient financial networks are to contagion and how financial institutions form connections when exposed to the risk of contagion. Second, they consider how network theory can be used to explain freezes in the interbank market. Third, they examine how social networks can improve investment decisions and corporate governance, based on recent empirical results. Fourth, they examine the role of networks in distributing primary issues of securities. Finally; they consider the role of networks as a form of mutual monitoring. The turmoil in financial markets witnessed in 2007 has revealed once again, the intertwined nature of financial systems. While the events unfolded, it became clear that the consequences of such an interconnected system are hard to predict as connections in the financial world are varied.

The dependencies between financial institutions stem from both the asset and the liability sides of their balance sheets. For instance, direct asset linkages result from exposures between banks acquired through the interbank market. Financial institutions are indirectly connected by holding similar portfolio exposures. When they share the same mass of depositors, banks are connected in a network through the liability side of the balance sheet. In the context of financial systems, the networks represent financial institutions, and the links are created through mutual exposures between banks, acquired on the interbank market by holding

similar portfolio exposures or by sharing the same mass of depositors. In this case, we argue that network theory may provide a conceptual framework within which the various patterns of connections can be described and analyzed in a meaningful way.

A network approach to financial systems is particularly important for assessing financial stability and can be instrumental in capturing the externalities and the risk associated with a single institution may create for the entire system. A better understanding of network externalities may facilitate the adoption of a macro prudential framework for financial supervision. Regulations that target individual institutions, as well as take into account vulnerabilities that emerge from network interdependencies in the financial system, may prevent a local crisis from becoming global. More connections between banks may reduce the risk of contagion. Although the risk of contagion might be expected to be larger in highly interconnected banking system, research indicates that shocks may have complex effects, to the extent that the more complete the set of links between banks is, the lower the risk of contagion in the system.

2.2.2 Liquidity Management Theory

As pointed out by Allen L. and Sounders (1992) banks borrow from the interbank market or to sell assets in order to cover liquidity shortage in presence of credit risk. The following trade-arises. On the one hand, tradable assets decrease the cost of liquidity management. On the other hand, uncertainty about credit risk of tradable assets might spread from the secondary market to the interbank market, lead to liquidity shortages and socially inefficient bank failures. The paper shows that liquidity injections and liquidity requirements are effective in eliminating liquidity shortages and the asset purchases are not. The paper explains how collapse of markets for securitized assets contributed to the distress of the interbank

markets in August 2007. The paper argues also why the interbank markets during the 2007-2009 crisis did not freeze despite uncertainty about banks quality.

This paper studies banks decision whether to borrow from the interbank market or to sell assets in order to cover liquidity shortage in presence of credit risk. Tradable assets decrease the cost of liquidity management. On the other hand, uncertainty about credit risk of tradable assets might spread from the secondary market to the interbank market, lead to liquidity shortages and socially inefficient bank failures.

The paper shows that liquidity injections and liquidity requirements are effective in eliminating liquidity shortages and the asset purchases are not. The paper explains how collapse of markets for securitized assets contributed to the distress of the interbank markets in August 2007. The paper argues also why the interbank markets during the 2007-2009 crisis did not freeze despite uncertainty about banks. First, asymmetric information about risk of banks, assets implies that banks, preference for liquidity sources depends on the risk of their assets. As in Myers and Majluf (1984) banks with safer assets prefer to borrow rather than sell their assets shock to the credit risk reduces expected return on banks.

Although borrowing on the interbank market also entails an adverse selection, the safer banks prefer to borrow, because they can retain their valuable assets instead of selling them. The adverse selection on the secondary market is worsened by the fact that also riskier but liquid banks are willing to sell, further diminishing the expected quality of assets sold. The safer banks. Preference to borrow is crucial for understanding the vulnerability of relying on secondary and interbank markets when managing liquidity.

This vulnerability materializes in a transmission of adverse selection from the secondary to the interbank market. Next, as long as the share of the riskier banks is sufficiently low,

liquidity transfer between the illiquid and liquid banks as well as investors purchasing assets is uninterrupted. Cash reserves in the banking system and equilibrium has two notable features. First, the average risk of borrowing banks is lower than the one of the selling banks. For a given amount of cash reserves held by banks, in general there are not enough interbank loans for all banks to borrow. In such a case, the safer illiquid banks borrow and the riskier illiquid banks go to the secondary market, because they are more willing to sell than the safer banks. Second, as cash reserves in the banking system increase and the interbank loans become more abundant, the equilibrium interbank loan rate might increase and the equilibrium price of the asset decreases.

The reason is that higher cash reserves increase supply of interbank loans inviting safer banks to the interbank market. Because of increasing riskiness of borrowing and lending banks, the equilibrium price of the asset falls and the equilibrium interbank loan rate might increase despite the fact that the interbank loans become more abundant. Once share of the riskier banks is sufficiently high, the liquidity transfer breaks down and banks fail due to illiquidity. Due to decrease in the expected value of the sold asset, its price becomes so low that the illiquid banks cannot cover their liquidity shortfall just by selling the asset. Hence, all illiquid banks have to borrow on the interbank market. However, this means there is not enough liquidity for all banks to borrow, because the interbank loan rate is capped by the illiquid banks.

As pointed out by Reboredo (2004), there is interplay between efficiency and solvency of a bank production plan, which corresponds to the expected profit of the bank. This relationship can be concluded that there is a trade-off between solvency and profitability. If a bank follows a policy of ensuring solvency, it will tie up a lot of liquidity and thus unable to make profits through lending. The converse applies to banks which keep less liquidity and make

high profits because of less money paid to depositors. High solvency implies less liquidity and interest rate risk and that implies less profits. There are three strategies which banks use to manage their liquidity as explained below.

An aggressive ALM strategy entails utilizing the following strategies. First is computing the funds gap, second is anticipating the evolution of the interest rate. This requires analytical work to provide forecasts of interest rates. Finally, is the adjustment of the structure of assets and liabilities that are sensitive to interest rate, in order to maximize the net interest margin. This requires a robust money market, including the interbank money market. The main disadvantage of aggressive ALM strategy is that in case of a failure, it could lead to major losses for the bank.

A defensive strategy tries to preserve the current level of net interest margin by protecting it from any change in interest rates. This type of management tries to maintain a balance between the sensitive assets and liabilities for a certain period of time (i.e. use a zero funds gap). If this point is reached, an increase of interest rates generates a change of collected and paid interests in the same way, so the net interest margin remains unchanged.

Both the defensive and the aggressive ALM strategy are bank management extremes and they are not used in practice. A mix of strategies is often used and its application depends on the market characteristics, the nature of the money market, the risk appetite of the bank management and shareholders and the other types of inter-correlated but inherent bank activity risks. As such, the variations in the banks strategies are more of degree of defensiveness or aggressiveness at a particular time period than a clearly defined strategy. The

mix of strategies and the continuous review and adjustments in portfolios has implications on funds available for trading in the interbank market.

2.3 Summary of Literature Review

Little work, at least to my knowledge has been done on the efficiency and segmentation of the interbank money market in developing markets in general, and Kenya in particular. (Green et al., 2012) studied the interbank market operations in Kenya. They tested for convergence of interest rates in the interbank market across bank sizes and ownership structures and found that interbank interest rates generally converge, implying lack of market segmentation. (Gatenga et al., 2010 et al., 2010) argue that the market is fragmented, with large banks serving specific lines of credit and market niches, but not contributing to competition in the sector.

There is need to explore varied measures of segmentation on the Kenyan interbank market, and whether segmentation affects market efficiency. The interbank market does not have clear rules and regulations apart from the bilateral lines of credit agreements between banks. This make the market to be highly segmented as banks are not aware of other banks dealings and yet they are participating in the same market and for the same purpose i.e. managing liquidity.

The interbank market is not directly linked with any other money market such as treasury bills market in terms of pricing .In this market its only banks that are involved in trading and hence there are other organizations that are doing banking business in the same competitive market in case there is interest asymmetry in the market, because licensed deposit micro finance institutions are forced to canvass deposits at high rates hence disadvantaging commercial banks since their customers who are attracted with high interest rates being offered by licensed deposit microfinance institutions again customers borrowing money from DTMs are charged high interest because of high cost of funds thus increasing delinquency rates in

DTM,s resulting in liquidity shortage in the financial system.In view of the above the interbank money market is considered to be highly segmented and inefficient.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

Chapter three discusses the methodology used in gathering, processing the collected data into meaningful information. The process of research for the study was primarily confirmatory. It encompasses the research design that take into consideration aspects like the size of the random sample, in relation to the target population, the variables under the study, the approach to the research, and the methods employed in data collection.

The research approach used by the study took the form of a study population from which a sample was drawn; the development of data research instruments, data gathering procedures, processing of the data, presentation and analysis of all data was reviewed from which a conclusion was drawn. The research methods endeavor to answer the research questions about testing the efficiency and segmentation of the interbank money market in Kenya.

3.2 Research Design

The study employed the descriptive survey on the interbank money market to seek evidence on how the interbank money market operates and the relationship between the players in the interbank market. Descriptive survey design was chosen because the elements and the variables that were studied were selected without making any attempt to control or manipulate findings. Data was collected from all the banks of each category i.e. small, medium and large so that the study could come up with definitive data from the fieldwork; the process was based on understanding of the distinct methodological traditions.

3.3 Target Population

The target population was the entire population of 44 banks to which the study generalizes the conclusions.

The target population in the study involves all banks in all categories i.e. small, medium and large banks. Identifying the target population pave way for the sample size population which was important because it yields some knowledge about the population of concern, especially for the purposes of statistical inference. Data from the central bank of Kenya was sought so as to provide evidence of how the interbank money market is segmented.

3.4 Data Collection Methods

In this study, the data collection exercise was carried out to come up with concrete data that Would invaluably prove the extent of efficiency and segmentation of the interbank money market. The study was able to use a number of data collection instruments from two main sources which were the primary and secondary sources of data collection. The primary data collection instruments include observation of how banks trade with each other in the interbank money market, so as to extract valuable first-hand data from the groups of respondents. Secondary sources of data collection involves the documentary reviews of data of previous researches, and is able to provide information that is important for making informed conclusions and recommendations concerning the case study (Robinson, 2002).Surveys could be powerful and useful tools for collecting data.

Conducting a survey is the only available option for acquiring the data necessary to answer an important research question like in this case where it bridges out the facts on the efficiency and segmentation of the interbank money market in Kenya. Interbank money market data from Central Bank of Kenya for the last 5 Years was sought, and also made observation of how individual banks have been trading with each other. A list of the population of the study i.e. banks is attached in appendix 1.

3.5 Data Analysis

In this research exercise Statistical Package for the Social Science (SPSS) software was used to analyze data because it's the most popular statistical packages which could perform highly complex data manipulation and analysis with simple instructions as compared to other software.SPSS is the statistical package most widely used by scientists. SPSS is the package that is the easiest to use for the most widely used statistical techniques and one can use it with either a Windows point-and-click approach or through syntax (i.e., writing out of SPSS commands.)

3.5.1 Models for Analyzing Data

In this study two model approaches was used to analyze interbank segmentation and efficiency as suggested by (Allen and Gale 2000) and Green et al. (2012)

3.5.2 Exposure Matrix

Exposure matrix model was used to analyses the segmentation nature of the interbank money market. According to the network framework, there exist three potential types of interbank structures. First was complete structure in which each bank was symmetrically connected to

other banks in the system. This means that each bank in the system borrows and lends to all other banks in the system. Allen and Gale (2000) argue that when an interbank market has a complete structure, the effect caused by unexpected shock in one bank can be absorbed by a large number of banks, which reduces the intensity of the shock.

Second, was the incomplete structure where banks were only connected to their neighbors i.e. those in the same or neighboring segment for instance small banks trade among themselves and the medium size banks but do not trade with large banks. When the interbank market was incomplete the initial shock in one bank was transmitted to its neighbors but in a large magnitude, which had ripple effects. Third, there was incomplete and disconnected structure which meant existence of unconnected interbank market segments. Freixas et al. (2000) added in their analysis a fourth market structure which was called a money Centre. A money center was symmetrically connected with other banks that were not connected among themselves. They show that under this structure when a shock hits a bank that was connected to the money center, there was no effect on the money Centre. However, if the shock hit the money center it affected all the banks that were connected.

3.5.3 Convergence of Interest Rates

The study used empirical testing for convergence of interest rates in the different segments of the market in the same way as done by Green et al. (2012). Interbank market segments were formed on the basis of bank ownership, size and interbank volumes. As a first step to indicate existence of market segments, we observed convergence of interbank rates over 5 years period(2009-2013) than the period used by Green et al. (2012), and then test for statistical differences in interbank rates across the segments over specific periods. In essence, we tested the null hypothesis that the interbank rate charged for banks within the same bank size

classification as defined were not statistically different from the rates across the different bank segments, tests were used to check whether the deviations of the interest rates for the different market segments were statistically equal to zero or not.

CHAPTER FOUR

DATA ANALYSIS AND INTERPRETATION OF FINDINGS

4.1 Introduction

This chapter presents the results and discussion of findings that have been arranged according to the objectives of the study i.e. testing segmentation and efficiency of the interbank market in Kenya.

In this study two approaches have been used to analyze interbank money market data in testing efficiency and segmentation nature of the market. The first approach is network framework approach suggested and widely used in other developed interbank markets in Europe and USA.The method was suggested by Allen and Gale (2000) to study the presence of segmentation in the interbank money market.

Exposure matrices is used to analyze types of interbank money market structures i.e. complete structure in which each bank is symmetrically connected to other banks in the system, second is incomplete and disconnected structure where banks are only connected to the banks in the same and neighboring segment. Third is money center where banks are symmetrical connected with other banks that are not connected among themselves.

4.2 Determining Segmentation Nature of the market

In analyzing the segmentation nature of the market, the study analyzed interbank exposures, lending and borrowing preferences index of the small medium and large banks. As illustrated in Table 4.1herein below, there is inadequate interaction among banks.

Table 4.1: Utilization of Trading Relationships

	BORROWER			
LENDER		**Small**	**Medium**	**Large**
	Small	46%	63%	66%
	Medium	53%	78%	66%
	Large	28%	84%	100%

Source: Research finding

4.2.1 Intensity of Lending and Borrowing Activity

In analyzing the intensity of lending and borrowing activity between banks, I have used an approach suggested by Coco et al (2009).In this case for every lender and borrower category, a lender preference index (LPI) and Borrower Preference Index (BPI) is computed, LPI is the ratio of total funds that each category of banks, say large banks has lent to other category of banks during a given day, over the total amount of funds that the large banks have lent in the interbank market during the same day. In this case.Let F_i^{j-k} denote the amount lent by bank

category j to

Bank category j to bank category k on loan,

(1) LPI=Large, Medium, t $=\sum_{i\in t}$ Fi $^{\text{Large-medium}}$/LPI $=\sum$ i $\in t F_i^{\text{Large-all}}$

Where t denotes the time period in this case a day. This ratio is more likely to be high if large banks rely on medium banks more than on small banks to lend funds in the market.

In computing Borrower Preference Index (BPI) as the ratio of total funds that each bank category has borrowed from the other category in a given period, as a fraction of the total amount of funds that the bank category has borrowed from the market in the same period.

(1) BPI= Large, Medium, t $=\sum_{i€t} Fi^{Large\text{-}medium}$/LPI $=\sum$ i €t$F_i^{Large\text{-}all}$

Using the above equations to calculate borrower Preference Index (BPI) and Lender Preference Index (LPI) across different bank categories.

Table 4.2: Lender Preference Index

	Small	**Medium**	**Large**
Small	**31%**	**36%**	**33%**
Medium	**10%**	**28%**	**27%**
Large	**7%**	**31%**	**66%**

Source: Research finding

Table 4.3: Borrower Preference Index

	Small	**Medium**	**Large**
Small	**57%**	**32%**	**11%**
Medium	**36%**	**33%**	**25%**
Large	**23%**	**40%**	**37%**

Source: Research finding

4.2.2 Testing for efficiency in CBR rate in influencing interbank money market rate in balancing liquidity.

The third objective was to establish the relationship between the CBR rate and the interbank rate so as to determine the effectiveness of the interbank money market in responding to the policy rates. The findings were sought by the use of Pearson correlation product method. Pearson correlation coefficient Method provides the measure of linear relationship between

CBR rate and interbank rate while coefficients of determination (r^2) indicate the extent to which CBR rate influences interbank money market rate. The findings are presented in herein below.

Table 4.4: Relationship between CBR and Interbank Rate

		INTERBANK	CBR
INTERBANK	Pearson Correlation	1	.831(**)
	Sig. (2-tailed)	.	.000
	N	89	89
CBR	Pearson Correlation	.831(**)	1
	Sig. (2-tailed)	.000	.
	N	89	89

** Correlation is significant at the 0.01 level (2-tailed).

Source: Research finding

The findings in Table 6 show the linear correlation between CBR rate and Interbank money market rate indicating a strong positive significant relationship of **(r = 0.831, p = 0.000)** the significant positive linear relationship implies that interbank money market rate is influenced by the changes in CBR rate.

Table 4.5:Model Summary of Coefficient of Determinationr^2

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.790(a)	.624	.613	3.97320

Source: Research finding

a Predictors: (Constant), CBR

Using coefficient of determination r^2 = (0.624) which is 0.624x100 = 62.4%. It implies that CBR rate influences interbank money market rate by 62.4% . The 37.6% influence of the interbank money market rate is attributed to other factors such as demand and supply of credit as well as the structure of the market.

Hypothesis Testing

Since calculated P-value was less than 0.05, the null hypothesis was rejected. Hence there is a significant relationship between CBR rate and interbank money market rate.

4.2.3 Testing the relationship between interbank money market rate and other key monetary policy rates.

The objective was to establish the relationship between the interbank rate and other key policy rates that i.e. the 91 day treasury bills rate, the average banks deposit rate and the average liquidity rate so as to determine the effectiveness of the interbank money market in responding to the policy rates. The findings were sought by the use of Pearson correlation product Method. Pearson correlation coefficient Method provides the measure of linear relationship between interbank rate and policy rates. While coefficients of determination (r^2) indicate the extent to which policy rates influences interbank money market rate. The findings are presented in herein below.

Table 4.6 Relationship between Interbank and policy rates

		INTERBANK	LIQUIDITY	DEPOSIT	TBILLS
INTERBANK	Pearson Correlation	1	-.747(**)	.511(**)	.859(**)
	Sig. (2-tailed)	.	.000	.001	.000
	N	60	60	60	60
LIQUIDITY	Pearson Correlation	-.747(**)	1	-.184	-.724(**)
	Sig. (2-tailed)	.000	.	.283	.000
	N	60	60	60	60
DEPOSIT	Pearson Correlation	.511(**)	-.184	1	.573(**)
	Sig. (2-tailed)	.001	.283	.	.000
	N	60	60	60	60
TBILLS	Pearson Correlation	.859(**)	-.724(**)	.573(**)	1
	Sig. (2-tailed)	.000	.000	.000	.
	N	60	60	60	60

** Correlation is significant at the 0.01 level (2-tailed).

Source: Research finding

(i) Liquidity Vs. Interbank Money Market

The findings in Table above show that there is a strong negative linear relationship between the interbank money market and the average liquidity position in the market **(r=-0.724, P=0.000)** This is because when liquidity is high in the market there is less demand in the interbank money market hence low interbank rate. Again when the liquidity is low in the market their will be high interest rates in the interbank money market, in this case it was

concluded that the interbank money market is responding appropriately to the liquidity position in the market.

Table 4.7: Model Summary of Coefficient of Determination r^2

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.747(a)	.558	.545	4.30940

Source: Research finding

A Predictors: (Constant), LIQUIDITY

Using coefficient of determination r^2 = (0.558) which is 0.558x100 = 55.8%. It implies that liquidity position rate influences interbank money market rate by 55.8% . The 44.2% influence of the interbank money market rate is attributed to other factors such as demand and supply of credit as well as the structure of the market.

Hypothesis Testing

Since calculated P-value was less than 0.05, the null hypothesis was rejected. Hence there is a significant relationship between liquidity rate and interbank money market rate.

(ii) Deposit rate Vs Interbank Money Market

The findings in Table 6 above show that there is a moderate positive linear relationship between the interbank money market and the average deposit rates in the market **(r=-0.511, P=0.001)** This is because when banks tend to increase deposit rates in order to stabilize their liquidity position and generally there is an interplay between deposit rates and interbank money market rates. When interbank bank rate is high banks will shy off from borrowing from the interbank and instead they increase the deposit rates in order to attract deposits, in this case it was concluded that there is moderate linear relationship between interbank money market and deposit rates.

Table 4.8: Model Summary of Coefficient of Determination r^2

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.511(a)	.261	.239	5.57237

Source: Research finding

a Predictors: (Constant), DEPOSIT

Using coefficient of determination r^2 = (0.239) which is 0.239x100 = 23.9%. It implies that deposit rate influences interbank money market rate by 23.9%. The 76.1% influence of the interbank money market rate is attributed to other factors such as demand and supply of credit as well as the structure of the market.

Hypothesis Testing

Since calculated P-value 0.001 was less than 0.05, the null hypothesis was rejected. Hence there is a significant relationship between deposit rate and interbank money market rate.

(iii) 90 Days Treasury bills rate Vs Interbank Money Market

The findings in Table 6 above show that there is a strong positive linear relationship between the interbank money market and the 90 days treasury bills rate in the market **(r=0.859, P=0.000)** This is because when the treasury bill rate is high most of the customers will prefer to withdraw their money from banks and invest the same in treasury bills.In this scenario banks tend to suffer liquidity problems hence resorting to rush to interbank market to borrow so as to cushion themselves against liquidity challenges. In this case it was concluded that there is strong linear relationship between interbank money market and 90 days treasury bills rates.

Table 4.9: Model Summary of Coefficient of Determination r^2

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.859(a)	.738	.730	3.31945

Source: Research finding

a Predictors: (Constant), TBILLS

Using coefficient of determination r^2 = (0.738) which is 0.738x100 = 73.8%. It implies that 90 days treasury bills rate influences interbank money market rate by 73.8%. The 26.2% influence of the interbank money market rate is attributed to other factors such as demand and supply of credit as well as the structure of the market.

Hypothesis Testing

Since calculated P-value 0.000 was less than 0.05, the null hypothesis was rejected. Hence there is a significant relationship between deposit rate and interbank money market rate.

Table 4.10:Consolidated Model Summary of coefficient of determination

Mode	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.912(a)	.831	.810	2.78704

Source: Research finding

a Predictors: (Constant), TBILLS, DEPOSIT, LIQUIDITY, CBR

Using consolidated coefficient of determination r^2 =(0.831) which is 0.831*100 =83.1%.It implies that all the predictors i.e. 90 days Treasury bills rates ,deposits rates ,liquidity rates and CBR rates influence the interbank money market rates by 83.1%.The 16.9% Influence is attributed to other factors that such as demand and supply.

4.2.4 Testing Convergence of Interest Rates in Different Market Segments

Table 5.1: Convergence of interest rates mean test

Null Hypothesis	Mean Test
Large banks segment is the same as the medium banks segment	t=-6.315426 (0.000)***
Large bank segment is same as the small banks segments	t=-4.052106 (0.000)***
Medium bank segment is same as the small banks segments	t=-7.791805 (0.000)***

Source: Research finding

Mean test checks whether the deviations in interest rates mean are statistically different from zero. The assumption is that if the series mean is statistically different from zero, then there is segmentation in the interbank market. Convergence of interest rates in different segments of the market was done in the same way as done by Green et al (2012).Convergence of interest rates was analyzed over a long period and then tested for statistical differences in interbank rates across the segments over specific periods.

The null hypothesis was that the interbank rate charged for banks within the same bank size classification are not statistically different from the rates across the different bank segments. A test to check whether the deviations of the interest rates for the different market segments are statistically equal to zero or not. The results indicate that the null of equality of interest in all sets of transactions across the different bank sizes is rejected. This implies that interest rates across the different sizes of the bank do not converge meaning there exists market segmentation between large and medium size banks and large and small banks.

4.3 Interpretations of the findings

The analysis of borrower preference index as illustrated in table 4.1,small banks tend to lend more to other category of banks than they borrow from them i.e. by 53% to medium and 28% to large banks respectively this is because big banks are perceived to be strong and safe to deal with. Medium size banks transact with their peers to a tune of 78% and large banks to a tune of 84%. Large size banks transact with 100% of their peers, small banks transact with only 46% of their peers.Small banks transact on average with 46% of their peers, 63% with medium banks and 66% with large banks. This trends shows that big banks have more trading relationships with their peers as compared to small banks which are perceived to be risky as their asset base is small and the interbank market is not collaterised.Again most small banks are owned by individuals and hence they don't have strong corporate governance structures hence fail to pass the test of credit profiling process, before they form trading relationship.

As illustrated in table 4.2 herein below large banks prefer to borrow money from their peers which account to 66% of their total lending to the large banks. Medium size and small size banks borrow from large banks about 28% and 10% respectively. Medium size banks lending preference starts with large banks followed by their peers and then small banks. Large banks borrow 58%, medium size,31% and small banks 13% of the total lending from medium size banks. Lending preference of small banks is balanced in terms of volumes with large banks contributing about 31% to large banks, medium size banks lend about 37% and small banks about 32% of their total lending. This clearly demonstrates there is asymmetries in financing with some borrowers being given preference that others.

As Illustrated in table 4.3 borrowing preference index statistics, large banks over a period preferred to borrow most of their funds from either medium banks 40% or other peer banks 37% and small banks 23%.Medium size banks prefer to borrow most of its funds from either small banks 36%, their peers 33% with large banks providing 31%.Small banks obtained most of its funding 57% from its counterpart peers while the medium and large banks provided 32% and 11% respectively over the same period. It is noteworthy to indicate that while the strongest borrowing relationship existed among the small banks, the weakest relationship was between large and small banks, where they can only borrow 11% of their borrowing needs. This analysis indicates that there exists a lending and borrowing pattern in the interbank money market.

BPI and LPI indicate that there exists lending and borrowing patterns in the interbank market, this is a clear indication that the market is fragmented and segmented on the basis of transaction volumes. Interbank transaction volumes are rationed on the basis of bank size. Most banks lend or borrow from banks that are larger as can be seen from the patterns. This is because banks want to create and build lending relationships with banks which have less correlated liquidity shocks and they allow banks to insure liquidity risks in the event of the market distortions (Cocco et al 2009).

The interbank money market plays a key role in channeling liquidity to the market as well as act as a conduit for the transmission of monetary policy through the interest rate. The central bank of Kenya uses the Central bank rate to control liquidity levels in the market. When liquidity is high the central bank increases the CBR rate so as to mop up liquidity and when liquidity in the market is low central bank reduces the rate so as to channel liquidity to the

market. An effective interbank rate is supposed to respond accordingly with the policy rate.In the analysis of the correlation between the CBR and interbank rate. The analysis has proved that the interbank market responds to the policy rates significantly which proves that the interbank money market is efficient.

The research has concluded that the interbank money market is highly segmented and fragmented in various aspects, first the interbank market is segmented in terms of products i.e. the interbank money market only trades in one currency, and banks with liquidity requirements in foreign currency cannot borrow foreign currency similarly banks with large foreign currency reserves cannot lend in the interbank money market. Second the market is segmented in terms of the size of the bank i.e. big banks prefer to trade with their peers as they perceive small banks to be very risky to deal with. Banks require their peers to open a credit lines before they start trading with each other, through this process small banks are discriminated by big banks as they fail to pass the credit profiling test because of the size of their assets base, capital and profitability.

Third the market is segmented in terms of pricing, big banks tend to charge small banks high interest rate compared to what they charge their peers and medium sized banks.

In analyzing the efficiency of the market, the study have found that the market is efficient, because the market is able to adjust to other monetary policy rates, i.e. when the CBR is changed interbank money market rate changes accordingly. This indicates that the interbank money market is not affected by its segmentation nature in acting as a conduit for the transmission of monetary policy during period of volatility flows and acting as a benchmark for price discovery in pricing for other bank products of the banks as Loans and deposits.

Though the market is not formally linked to any other market the study have proved that the interbank money market rate is correlated with a 90days treasury bills. This indicates that the market is informally linked to other money markets as they are able to respond to the changes to other rates.

Little research has been done in this area of testing segmentation and efficiency of the interbank money market in developing countries especially Kenya. However a lot of research has been done in developed countries, Green et al (2012) studied the interbank market operations in Kenya. They tested for convergence of interest rates in the interbank market across bank sizes and ownership structures and found that interbank interest rates generally converge, implying lack of market segmentation Gatenga et al (2010) studied interbank money market operations in Kenya and concluded that the market is fragmented with large banks serving only specific lines of credit and market niches, and not contributing to competition in the sector. This study has tested segmentation and efficiency of the interbank money market in Kenya.

This study has tested segmentation of the interbank money market by using different methods used in developed countries i.e. Network exposure matrix, convergence of interest rates and determining Borrower preference index and Lender preference index as opposed to the previous researchers who only tested convergence of interest rates and made conclutions.In testing for the efficiency of the interbank money market, the study has used various testing techniques i.e. testing how the interbank money market rate responds to policy rates i.e. CBR rate, treasury bills rate, average rates charged by banks on their assets and liabilities and ability of the interbank money market to distribute liquidity symmetrical in all the financial

institutions. This study has found that the interbank money market is highly segmented in various aspects, i.e. big banks prefer to deal with their counterparts because they perceive small banks to be too risky. Again they charge high interest rates to small banks since their risk premium is high. The study has concluded that the interbank money market is efficient.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMENDATIONS

5.1 Summary

This chapter presents the summary, conclusion and recommendations on the study about testing segmentation and efficiency of the interbank money market in Kenya. I have used the interbank data for the period January 2009 and December 2013 to test the segmentation and efficiency of the interbank money market. In my analysis I have concluded that the interbank money market in Kenya is incomplete, highly segmented but relatively efficient. Banks are categorized according to their asset base, i.e. small, medium and big banks. Big banks tend to discriminate small banks as they perceive them to be risky, big banks trade with their peers who transact big volumes and also charge low interest rates as compared to trading with small banks where they transact low volumes and charge low interest rates.

The study has found that the interbank money market responds to policy rate and is correlated with the market liquidity rate and 90 day treasury bills. This indicates that the interbank money market is significantly efficient and is able to play critical roles i.e. in channeling liquidity to the market. Again the study has concluded that the interbank money market rate is correlated with the average assets and liability rates charged by the banks, this indicates that the interbank rate acts as a price discovery. Interbank money market is able to distribute liquidity effectively to all the banks. The interbank market can be improved by putting mechanisms of setting up the price for the market, as opposed to interbank market of developed countries.

5.2 Conclusion

The study is seeking to study the extent to which interbank money market is segmented and its impact on the efficiency of the market operations. Efficiency is defined to mean how effective interbank money market is performing its key functions i.e. in liquidity distribution, price discovery. In using network framework approach the study has found out that the interbank money market is incomplete, highly segmented in terms of the size of the banks.

Large banks discriminate small banks in terms of opening credit lines as they perceive them as risky to deal with because of their small size of asset base and profitability, they charge high interest rates to small banks, than what they charge to their peers because of the risk nature, large banks hold most of their liquidity and thus control liquidity in the interbank market. This segmentation nature of the market has affected it to perform critical functions thus banks are not able to effectively use the market to rebalance their portfolios while performing the asset liability management functions. Small banks find themselves with liquidity shortages, which they cannot borrow from large banks. This exclusion forces banks to adopt a defensive assets liability management strategy where they keep too much liquid assets, to hedge against liquidity risks which affects their revenues.

The interbank money markets fail to play its critical role of price discovery in the money market. Interbank rate is supposed to respond accordingly to the CBR rate so as to act as perfect benchmark of pricing other assets and liabilities in financial institutions. Again interbank money market is highly dependent on government deposits, when there is a shock especially in terms of movement of government deposits it hits the interbank market severely.

Table 12 appendix 2 presents a comparison of the Kenyan interbank money market and markets of developed countries i.e.UK, EU and USA interbank market in terms of some characteristic and dimensions. Several lessons can be drawn from these case studies in terms of characteristics of an efficient interbank market. First, an efficient interbank market should be “deep and highly competitive” this will distribute liquidity and price counterparty risks appropriatly,Second segmentation of interbank market is a matter of degree, Even in developed countries there is an element of segmentation. Third, an efficient interbank market must be integrated with other with other money market segments in the same country such a treasury bills and commercial paper. Fourth, an efficient interbank market should trade in more than one currency to enable banks perform their ALM strategy across currencies. Fifth an interbank market should have more than one tenor and a well behaved yield curve. Sixth, a reliable interbank rate is transparent, covers a credible panel of banks and is not subject to manipulation. Finally in terms of the link between the interbank market and monetary policy, the Kenyan system is quite close to the UK, Specifically, the LIBOR is linked to the official bank rate, which is manipulated by the bank of England which is the equivalent of the Central Bank Rate (CBR) in Kenya.

5.3 Recommendations for policy and practice

This section, deals with policy recommendations in improving the market in ensuring that segmentation nature of the market is eliminated and efficiency of the market is enhanced, in line with the objectives of this study, the researcher based his recommendation on findings and thus the following recommendations are provided for future actions.

Counterparty risks are the main cause of segmentation; banks judge their peer banks on the basis of their assets size, risk profiles, ownership, corporate governance structure and performance. Central bank of Kenya should enhance confidence on the part of the potential lenders. Counterparty risks can be addressed using CAMPARI lending principle that defines the critical considerations for lending and borrowing. The CAMPARI principle requires bank to consider a number of factors namely the Character of the borrowing bank. The ability to repay, the means/margins in terms of assets and profits of a borrowing bank, purpose of the loan, amount of the loan whether its adequate, repayment terms and the insurance collateral. The supervisory role of CBK is instilling market discipline and adherence to financial management and reporting standards is critical in enhancing confidence in the market.

In improving of the asymmetrical information regarding the character of the bank there is needed to address three critical issues. First there is need to work on insurance security of the loan. The interbank market should have both secured and unsecured lending. The introduction of horizontal repos attempted to deal with the security issue in Kenya but uptake is slow due to difficulties of realizing the security as lending bank doesn't hold lien on the collaterals. Second there is need address the problem of the purpose of the loan. Overnight lending is not only limiting in terms of the use of the funds, but also makes it difficult to introduce

collateral, as security perfection takes time. Finally prudential regulations are important in ensuring that banks are strong so as to induce confidence on the part of their potential lenders. Central bank should strengthen their supervisory role in instilling market discipline and adherence to financial management and reporting standards by banks.

There is need to increase the products traded in the market beyond, the traditional overnight lending and borrowing as well as linking the interbank market with other markets i.e. treasury bills, treasury bonds and repos, this will allow a well behaved yield curve for the interbank market which can be used to price other financial instruments. Foreign currency loans should be introduced in the interbank market to enable banks do asset liability management functions across currencies. The interbank rate should be developed into a credible and reliable benchmark for the money market in Kenya.

There is need to structure the products to have short term and long term unsecured loans which will enable banks borrow funds in order to reduce the clerical work of borrowing on a daily basis in case the bank is facing a long term liquidity gap. Again there is need to have a sharia compliant products which can be used with banks that offer Islamic banking. Central bank should convince banks that engage in aggressive strategy to change their modes of operation with regard to risk when the market is too liquid, because banks that use defensive approaches of ALM strategy lead to wastage of liquidity or inefficient allocation of liquidity and therefore adversely impacting on the transmission of monetary policy signals.

5.4 Limitations of the study

The researcher encountered a problem of getting data from central bank of Kenya because the bank information is treated with some level of confidentiality. However, this was overcome through giving assurance that confidentiality will be maintained and information used only for the study purpose.

Some respondents misunderstood the intention of the researcher thought that the study was meant to spy on their activities and refused to provide useful data. This however was overcome by explaining the purpose of this study being conducted.

Lack of cooperation from the senior staff because their normal working schedule was inconvenienced. This was overcome by replacing respondents who were busy with those who are available.

5.5 Suggestions for further studies

There is limited research in interbank money market in Kenya, the results of this study point to numerous opportunities for future researchers in exploring different areas of the interbank money market operations as follows;

The future research should attempt to investigate how the interbank money market can be linked with other market segments.

The future research should attempt to investigate the impact of consolidating the interbank market by including all financial institutions like deposit microfinance institutions which are licensed by CBK and offer financial products like banks.

The future research should attempt to investigate other regional interbank money market so as to determine how they function.

The future research should attempt to investigate how fast does the interbank money market responds to policy rates.

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Appendix I

LIST OF BANKS AND 6 DEPOSIT TAKING MICRO FINANCE INSTITUTIONS IN KENYA AS AT 30TH OCTOBER 2013

SR No.	NAME	Category
1	Kenya Commercial Bank Ltd	Large
2	Standard Chartered Bank Ltd	Large
3	Barclays Bank of Kenya Ltd	Large
4	Co-operative Bank of Kenya Ltd	Large
5	CFC Stanbic Bank Ltd	Large
6	Equity Bank Ltd	Large
7	Bank of India Ltd	Medium
8	Bank of Baroda Ltd	Medium
9	Commercial Bank of Africa Ltd	Medium
10	Prime Bank Ltd	Medium
11	National Bank of Kenya Ltd	Medium
12	Citibank N.A.	Medium
13	Bank of Africa Ltd	Medium
14	Chase Bank Ltd	Medium
15	Imperial Bank Ltd	Medium
16	NIC Bank Ltd	Medium
17	Eco bank Ltd	Medium
18	I & M Bank Ltd	Medium
19	Diamond Trust Bank Ltd	Medium
20	Family Bank Ltd	Medium
21	Housing Finance Co. of Kenya Ltd	Medium
22	Habib Bank Ltd	Small
23	Oriental Commercial Bank Ltd	Small
24	Habib A.G. Zurich	Small
25	Middle East Bank Ltd	Small
26	Dubai Bank Ltd	Small
27	Consolidated Bank of Kenya Ltd	Small
28	Credit Bank Ltd	Small

29	Trans-National Bank Ltd	Small
30	African Banking Corporation Ltd	Small
31	Giro Commercial Bank Ltd	Small
32	Equatorial Bank Ltd	Small
33	Paramount Universal Bank Ltd	Small
34	Jamii Bora Bank Ltd	Small
35	GT Bank Ltd	Small
36	Victoria Commercial Bank Ltd	Small
37	Guardian Bank Ltd	Small
38	Development Bank of Kenya Ltd	Small
39	Fidelity Commercial Bank Ltd	Small
40	Charterhouse Bank Ltd	Small
41	K-Rep Bank Ltd	Small
42	Gulf African Bank Ltd	Small
43	First Community Bank Ltd	Small
44	UBA Kenya Bank Ltd	Small
	Deposit Taking Micro-Finance Institutions	
1	Kenya Women Finance Trust DTM Ltd	Large
2	Faulu Kenya DTM Ltd	Large
3	SMEP DTM Ltd	Large
4	Rafiki DTM K Ltd Medium	Medium
5	Remu DTM Ltd Medium	Medium
6	Uwezo DTM Ltd Small	Small

Source; Central Bank of Kenya Website as at 30th October 2013

Appendix II

Comparison of Kenyan, UK, EU and US Interbank Market

	Dimension	**London Interbank Market**	**EU Interbank Market**	**USA Interbank Market**	**Kenyan Interbank Market**
1	Level of Development	Deep and highly competitive	Deep and highly competitive	Deep and highly competitive	Shallow and uncompetitive
2	Level of segmentation	Limited segmentation credit lines are open to all banks irrespective of size and volumes traded	The market is segmented	The market are characterized by one directional lending from smaller to large banks	The market is highly segmented in terms of volumes and the interest rates charged
3	Central Bank role	-The FX&MMC of the Bank of England controls the seven-day interbank rate .This enhances the link between the policy rate (repo rate) with short term market rates and hence the efficiency of monetary policy. - Bank treasurers are regularly audited to ensure they make consistent and credible offers for money. Failure to provide consistent offers that can be backed by market conditions can lead to the bank being excluded from the panel of banks	- Limited role of the ECB	-The Federal Reserve is not involved in controlling the interbank rate, but only indirectly through provision of reserves. - There is no regulator audit of the bank of the credibility of the bilateral fixing /setting the lending rates, - The Fed reserve bank ensures the target range of rates is pre-announced by the FOMC	- CBK indirectly influences the interbank through provision of reserves -No audit of the credibility of the bilateral fixing /setting the lending rates.

4	Rules of Engagement	There is a structured market which is well developed and is regulated by the FX&MMC of the Bank of England that generates the rules of engagement.	There is a structured market which is well developed	Participants in this market can either trade directly with each other or use the services of a broker. The brokers do not take positions themselves but rather bring buyers and sellers together on an anonymous basis	No clearly established rules of engagement in this market. But bilateral lines of credit agreements
5	Participants of the market	Both banks and large corporations participate in this market	Only banks participate	All depository institutions that maintain accounts with the federal reserve bank i.e. banks and thrift institutions	Only banks are involved in this market
6	Linkage with other money market segment	The market is well integrated with other markets such as the certificates of deposits, local authorities' deposits, treasury bills and commercial paper.	The market is linked to other markets	There are two types of trading, the direct trading (bilateral arrangements) and the brokered trading. The interest rates (federal funds rates) between these markets are linked	The market is not directly linked with any other money market such as the treasury bills market in terms of pricing.
7	Currencies Traded	Trades in 10 different currencies (US dollar, Euro, British Pound, Japanese yen, Canadian Dollar, Swiss Franc, Australian Dollar, Danish Kroner, New Zealand Dollar, and the Swedish	The EURIBOR uses Euros and Euro deposits instead	Trades in single currency- the US dollar.	Trades in a single currency-the Kenya shilling

		Kroner)			
8	Tenor and existence of well-behaved yield curve	15 different maturities from overnight to 12 months. There is a well behaved yield curve. This provides a good basis for pricing other financial instruments	EURIBOR covers 15 different maturities. EONIA covers the overnight	Typically overnight trades.	Single tenor (overnight only) hence no existence of a yield curve
9	Ex-ante or ex-post computation of interest rate	The LIBOR is computed ex-ante (before trade), which ensures that data exist for every tenor and currency.	The Eonia is computed *ex-post* for rates charged by a selected panel of banks. The choice of the panel of banks for the Euribor and Eonia is based a clearly defined criterion that ensures all market conditions are taken into account, including the diversity of the Euro area market.	Rates are determined bilaterally through verbal agreements between trading banks but with close monitoring by the OMO desk of the Fed Reserve Bank to make sure the rates are within the predetermined target range. The overall market rate is determined ex-post.	The interbank rate is computed ex-post (after trade). This means that if there is no trade, no data
10	Trades Included in computation of interest rates	Computed based on trimmed mean (excluding the 2 extreme quartiles) of the submissions of panels of banks. This minimizes market manipulation by a few offers.	Computed based on trimmed mean (excluding the top and bottom15% extreme quartiles) of the submission of panels of banks. This minimizes market manipulation by a few offers	Ex-post trades	All trades for the day are used to compute the interbank rate. This allows a few trades to manipulate the market rate

11	Input from the public	The public makes input on any concerns about the LIBOR rate which are taken seriously by the FX&MMC. This enhances the role of the LIBOR rate as a benchmark rate for other funds.	No input from the public	No public participation in the price setting process.	The market does not gain input from the public on the rates charged.
12	*Collateral*	Unsecured	Both secured and unsecured	Unsecured	Unsecured