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BANK SPECIFIC DETERMINANTS OF INTEREST RATE MARGINS IN AN ENVIRONMENT OF INTEREST RATE CAPPING AMONG COMMERCIAL BANKS IN KENYA (2016-2019)

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ABSTRACT

Among other common forms of government financial control, caps on interest rates have been declining over the past several decades as most industrialized countries and a rising number of developing countries continue liberalizing their financial policies. However, in several countries the last financial crisis reopened the debate on interest rate controls as a tool for consumer protection. Interest rate margin is one of the critical components in the lending decision process of commercial banks. Commercial banks are independent business entities that set their own interest rate margin based on the central bank base rates. The aim of this study was to analyze bank specific determinants influencing bank margins interest rates in the midst of capping among commercial banks in Kenya using secondary data for the period 2013 to 2018, a period characterized by unrestricted and interest rate cap. The specific objectives were to analyze the influence of: credit risk, capital adequacy, operation efficiency, and liquidity risk and bank size on interest rate margins. The study adopted exploratory research design. Panel data was employed using annual data over the period before interest rate, covering 2013-2015, and after capping of interest rate, covering 2016 to 2018. Thirty-eight commercial banks in Kenya which were in normal operation as at 31st December 2018 were used giving 228 firm observations. Interest rate margins was informed by Dealership Model and its extensions while analyzing the influence of bank specific determinants, that is, credit risk, capital adequacy, operation efficiency and liquidity risk on interest rate margins. Applying STATA 13.0 employing Dynamic Stochastic General Equilibrium modeling, Generalized Method of Moments approach was used in the analysis. Descriptive statistics in form of pie charts, graphs, and summary statistics were presented. Inferential statistics was analyzed using regression analysis to establish the influence of bank specific economic determinants on the interest rate margin. The findings would be useful to policy makers, shareholders, customers in the respective commercial banks in Kenya. The government could also utilize the findings in making policies affecting commercial banks in Kenya which could have an impact on interest rate margin.

Key Words: Credit Risk, Capital Adequacy, Operation Efficiency, Liquidity Risk, Bank Size & Interest Rate Margin

1.0 BACKGROUND TO THE STUDY

Among other common forms of government financial control, caps on interest rates have been declining over the past several decades as most industrialized countries and a rising number of developing countries continue liberalizing their financial policies. However, in several countries the last financial crisis reopened the debate on interest rate controls as a tool for consumer protection. Traditionally, the core function of any commercial bank is the extension of loans and the larger proportion of banks' assets is formed by loans (Fungacova *et al.* 2014). In this regard, interest rate margin is an important measure of not only bank profitability but also the social cost of financial intermediations. According to Maudos and Guevara (2004) observed that higher interest rate margins could bring about a higher profitability and better stability for the banking sector, especially for a non-well-functioning economy. Interest rate margin is one of the critical component in the lending decision process of commercial banks. Commercial banks are independent business entities that set their own interest rate margin based on the central bank base rates. The interest rate margin is the percentage of the loan amount that is added to the central bank base rate so as to arrive at the interest rate charged on customers who borrow from commercial banks. When banks lend money to customers, interest is charged on it for a number of reasons, including value preservation, compensation for risk, and profits among others (Sheriff and Amoako, 2014).

The main goal of every banking institution is to operate profitably, commercial banks in any country play an important role in the economy by undertaking intermediation functions. Commercial banking has become a very critical business which has contributed to the furtherance of economic activities around the world. Banking business involves receiving funds from the public and utilizing such funds in whole or in part for granting loans, advances and credit facilities and for investing funds. The intermediation function of a bank is observed in the process of channeling capital from customers with surpluses to those with deficits. By carrying out this intermediation function banks collect surplus funds from the savers and allocates them to those with a deficit of funds (the intermediation function), thus channeling funds from savers to borrowers at a price (charged as interest income, this interest charged sometimes has a ceiling as per the law in a capped environment but we find banks charging clients different rates below the ceiling) these habits makes them competitive in the business environment thereby increasing economic efficiency by promoting a better allocation of resources.

One way in which commercial banks can increase their profit margins is through increasing interest rate margin and lower deposit rates. Banks do not add low interest rate margin to the central bank base rate because the revenue from the interest income would not be enough to cover the cost of deposits, general expenses and the loss of revenue from non-performing loan portfolio. On the other hand, they cannot add a high interest rate margin because they will not be able to keep the banking relationship with the borrowers with high lending rate. Thus, determination of the appropriate interest rate margin usually becomes a major issue in banking industry. Moreover, the factors that determine the level of commercial banks' interest rate margins are important concerns not only for specific banks but also to policy makers, the banking industry and the public at large.

Moreover, the loanable funds theory considers the interest rate margin as the function of four variables: savings, investment, the desire to hoard money and supply of money. Rational expectation theory have posited that the best estimation for future interest rates is the current spot rate and that changes in interest rates are primarily due to unexpected information and or changes in economic factors (Irungu, 2013).

Asgharpur *et al* (2016) posited that there was a unidirectional causality relationship between interest rate to economic factors; the findings had practical policy implications for decision makers in the area of macroeconomic planning particularly in developing countries. The results implied that banks had to reduce interest rate to decrease the negative impacts of the economic factors.

1.1.1 Commercial Banking Industry in Kenya
In Kenya, the banking sector plays a leading role in the financial sector, particularly with respect to mobilization of savings and provision of credit. An analysis of bank interest rate leading to the interest rate margins is therefore central to the understanding of the financial intermediation process and the macroeconomic environment in which banks operate. The Companies Act, the Banking Act, the Central Bank of Kenya Act and the various prudential guidelines issued by the Central Bank of Kenya (CBK), govern the Banking industry in Kenya.

According to Central Bank of Kenya (CBK) (2018), the Bank Supervision Report indicated that there were 43 commercial banks operating in Kenya out of which three (Dubai bank Ltd, Chase bank Ltd and Imperial Bank Limited) were in receivership. Two banks, that is, DIB Bank Ltd and Mayfair Bank Ltd, were licensed to commence operations in April 2017 and June 2017 respectively. This meant that a total of 38 commercial banks were in normal operation in Kenya since 1st January 2013 up to 31st December 2018, the period under study. The Kenyan banking sector fulfils an important function in the economy through its provision of deposit and loan facilities. Kenya had 40 banks and a wide network of financial organisations which provided KES 1.78 trillion in loans as of June 2018. In addition to introducing a range of new services and innovations, such as mobile banking, the largest banks have been rapidly expanding over the last few years, with the Co-operative Bank and equity banks alone growing by over 32 percent (Deloitte Consulting Limited, 2018).The sector appears to exhibit good competitive fundamentals: 38 percent of the market is held by the four largest banks, making it less concentrated than many other banking markets including Tanzania, South Africa and Germany. Since 2004 the largest banks have lost market share, with Barclays' share more than halving. Over this time, challenger banks have grown, with Equity Bank – the most significant – increasing from a negligible share to become the second largest bank in the market, after Kenya Commercial Bank (KCB). Other players have emerged with emergence of mobile money. Equity is the largest bank by branches, CBA bank is currently the biggest by customer numbers having taken over Mpesa customers driven by the popular mobile loans Mshwari.

Profits in the sector appear high in absolute terms, but are much more moderate when measured in proportion to the scale of the banks. Combined banks made over 100 billion in profits in 2018. They have also diversified from the traditional interest's income after interest rate capping came into being in 2016 to more conservative non funded income segments, trade finance, foreign

exchanges and insurance. By these measures, they are consistent with the profit levels observed in a range of other Kenyan businesses and regional banks. There is a long-standing political concern in Kenya regarding the effectiveness of competition in the banking sector and, in particular, a perception that lack of competition is resulting in high lending rates in the country that triggered capping (Finance Act Amendment, 2016). The size of the difference between lending rates and deposit rates (the interest rate spread) was publically called into question. The spreads between deposit and lending rates tend to be larger for large banks, suggesting that this could be a manifestation of market power, which would imply a lack of competition or efficiency in the market. However, also acknowledges that the effect observed for market size is small and may be explained by other market dynamics. As of July 2014, the average lending rate for Kenyan banks stood at 16.91 percent, down from 17.02 percent in 2013 and 20.15 percent in 2012 from 2016 the average has been 13 percent as the law capped the chargeable rate at Central Bank Rate (CBR) plus four. However the plus four varies with different clientele, the margin is the negotiation range. There has also been a slight rise in the deposit rate since 2013, and together these have resulted in a narrowing of the spread. Interest rates charged within this margin are influenced by a wide range of market, economic and competitive factors. The purpose of this thesis was to examine the way that bank specific factors were affecting interest rates spreads within the capped margin in Kenya and identify policy interventions that could increase the affordability of credit in the market.

1.1.2 Functions of Commercial Banks in Kenya

Commercial Banks are generally categorized as a service industry, and their main activities are customer-service oriented. According to CBK (2011), the licensed commercial banks are expected to perform a number of general bank functions. One of the main functions of commercial banks is providing a safe storage for the clients' money. Banks keep the money deposited by customers in vaults. They also undertake to make the money accessible to customers when the latter need it (CBK, 2012).This is done for customers who have accounts with that bank.

The customer accounts are of various types and include current account, personal account, children account, and saving account, to name a few. Commercial banks also facilitate the transfer of money from one account to another. This service comes in handy, particularly for customers wanting to transfer large sums without moving around with the money. The commercial banks facilitate transfer of funds within and across other banks, locally and internationally. This is very convenient for customers (CBK, 2010).

Another important function of banks is offering money lending services. The loans banks give are repaid in installments over a certain period of time that is agreed upon the bank and the borrower during the time of applying for the loan, and they attract interest on the amount borrowed. There are several types of loans, and the rate of interest charged depends on the repayment period and the amount that the customer borrows. Banks also offer financial advice to their customers, for example on the best approach to funding a business start-up (CBK, 2010, 2011).In such cases they provide the customers with the best repayment plan and even business management tips.

Banks offer foreign exchange services which include selling foreign currencies to the customers, exchanging foreign currencies for shillings and selling foreign currency to make cross-border payments. This is called foreign currency dealership. Also, foreign suppliers normally want to know the creditworthiness of local importers before they ship the goods and corresponding local banks provide guarantees in form of letters of credit. Thus, banks act as the collateral for the local trader to secure the deal (CBK 2008). The banks also offer their customers investment services. They do this by selling and buying shares of listed companies to the customers or for the customers. Other times they sell their own shares to the customers, offering the latter investment opportunities (CBK, 2009).

Banks act as trustees whereby they are authorized to manage the property of a deceased person on behalf of the family so that the inheritance wrangles that normally follow one's death do not destroy the business or estate of the deceased. Banks also keep valuable items for customers. These valuables include: title deeds, expensive jewelry among others (CBK, 2012). Like any other services that they offer, they charge a fee for the safe keeping of valuable items. Banks also offer their customers advice on taxation matters. They guide their customers in preparing tax returns. This is important for customers as it preempts defaulting on taxes and the attendant penalties that can kill a business.

Commercial banks engage in activities such as facilitating payments by telegraphic transfer, eft, pos, Internet banking, issuing bank drafts and bank cheques. Other functions of commercial banks include accepting money on term deposit, lending money by overdraft, installment loan, and providing documentary and stand-by letters of credit, providing guarantees, performance bonds, securities underwriting commitments and other forms of off-balance sheet exposures (CBK, 2010).Other services include documents and precious items safekeeping, sales, distribution or brokerage, unit trust and similar financial product deals; cash management, merchant banking and private equity financing; underwriting bonds treasury bills and similar credit-related money market securities. However, nowadays most large commercial banks have established a function to handle investment banking (CBK, 2012).

1.1.3 Evaluation of Interest Rate Cap

Interest rate caps, in the form of usury laws, likely represent the longest, and most repeated, government intervention in financial markets. The earliest advocates of usury laws preferred an interest rate of zero. Aristotle stated that money was sterile and should earn no interest. Governments dating from ancient Egypt through the modern day have imposed interest rate ceilings for a variety of reasons (Smith 1896).

Glaeser and Scheinkman (1999) noted that usury laws play many roles throughout history and sought to explain why interest rate caps have had a pervasive historical presence. In their formal model, assuming money was available to borrow at the cap rate, interest rate caps were welfare-enhancing because they provided a means for individuals to insure themselves cheaply against income shocks. In their model, consumers could not self-insure with savings so they had to borrow from other consumers.

Benmelech and Moskowitz (1997) observed that in the eighteenth century, usury laws in Britain mandated a 5 percent interest rate ceiling. The British laws had formed the basis for usury laws in America. They showed that the maximum legal interest rate by state from the year 1641 to 1891 ranged from 5.73 percent in Virginia to unbounded in California. The maximum legal rate had a median of 8 percent. The higher rate caps legislated in America likely helped to attract investment capital. They concluded that usury laws, when binding, reduced credit and economic activity.

Blitz and Long (1991) stated that legal rate ceilings could reduce the interest rate margins of personal loan credit to some borrowers, but when ceilings were sufficiently low to affect the observed market rate in a significant way, there was a substantial lessening on the number of borrowers involved in the legal market. Relatively low risk borrowers who remained in the legal lending market appeared to gain from the lower cost loans made when higher risk potential borrowers were excluded.

Zinman (2004) showed that imposing a binding interest rate cap harmed those with huge credit facilities in commercial banks because of reduction in access to credit increased foreclosures, defaults, and bankruptcies. Further, the results showed that the borrowers were forced to shift into more expensive substitutes for installment credit facilities. A shift into products such as cheque overdrafts and pawn shops worsened the financial conditions of borrowers.

Imposing more regulations on payday lenders would make consumers worse off, stifle competition, and do little to protect consumers from concerns of over-indebtedness and high-cost lending. He argued that unintended consequences, such as shifting borrowers into more expensive credit facilities products, could occur because of heavy constraints on end of the month when the salary is being paid to the lenders (Zywicki, 1999).

The economic and political rationale for putting ceilings on lending rates is to protect consumers from usury or to make credit cheaper and more accessible. At least 76 countries around the world, representing more than 80 percent of global GDP and global financial assets, impose some restrictions on lending rates. These countries are not clustered in specific regions or income groups, but spread across all geographic and income dimensions. Of the countries with interest rate caps, a third introduced them to protect consumers from usury. This rationale is particularly used by high income countries (Ferrari *et al*, 2018).

Across the world, interest rate capping has been utilized by some countries. Many countries in Africa have established interest rate ceilings to protect consumers from high interest rates charged by micro-lenders. Such ceilings are often the response of governments facing political or cultural pressure to keep interest rates low. The general idea is that interest rate ceilings limit the tendency of some financial service providers to increase their interest yields especially in markets with a combination of no transparency, limited disclosure requirements and low levels of financial literacy.

Despite good intentions by many African counties, interest rate ceilings can actually hurt low-income populations by limiting their access to finance and reducing price transparency. If

ceilings are set too low, financial service providers find it difficult to recover costs and are likely to grow more slowly, reduce service delivery in rural areas and other more costly markets, become less transparent about the total cost of loan, and even exit the market entirely.

Table 1. 1: The Use of Interest Rate Caps around the World
Source: EIU Global Microscope for Financial Inclusion (2018)

Serial No.	Europe and Central Asia	Sub-Sahara Africa	Middle East & North Africa	Asia Pacific	Latin America & Caribbean	North America
1.	Armenia	Benin	Algeria	Australia	Bahamas	Canada
2.	Belgium	Burkina Faso	Egypt, Arab Rep.	Bangladesh	Bolivia	United States
3.	Estonia	Cameroon	Lebanon	Cambodia	Brazil	
4.	Finland	Central African Rep.	Libya	China	Chile	
5.	France	Chad	Malta	India	Colombia	
6.	Germany	Congo, Rep.	Morocco	Indonesia	Ecuador	
7.	Greece	Côte d'Ivoire	Syrian Arab	Japan	El Salvador	
8.	Ireland	Equatorial Guinea	Tunisia	Korea, Rep.	Guatemala	
9.	Italy	Gabon		Lao PDR	Honduras	
10.	Kyrgyz Republic	Guinea Bissau		Myanmar	Jamaica	
11.	Netherlands	Kenya (2016-January 2020)		Nepal	Nicaragua	
12.	Poland	Mali		Philippines	Paraguay	
13.	Portugal	Niger		Sri Lanka	Uruguay	
14.	Russian Federation	Nigeria		Thailand	Venezuela, RB	
15.	Slovak Republic	Senegal		Vietnam		
16.	Slovenia	South Africa				
17.	Spain	Togo				
18.	Switzerland					
19	Turkey					
20.	United Kingdom					

In African, there were twenty four countries which had introduced interest rate capping as indicated in table 1.1

2.0 STATEMENT OF THE PROBLEM
The financial sector in Kenya has been rapidly growing and thus the number of players going into the market has been rapidly increasing. Various factors are pushing banks to redesign their

strategies and adopt economic variables. To begin with there is the factor of competition from other banks, secondly non-bank financial institutions have given banks a run for their money by providing financial services and products conveniently to their customers thus curtailing the role of intermediation that is core to any bank. With increased competition from non-bank financial institutions, such as mobile money and loans. Mshwari, M-kesho, KCB Mpesa, Timiza and Tala. It is worth to note that banks more than ever, have found the need to redesign response to economic forces to remain competitive and their profitability and their customer base. Attracting large amounts of deposits is crucial for any bank. Consequently, paramount question arises including; what extent do economic determinants such credit risk, capital adequacy, bank diversification, operation efficiency and liquidity risk affect the interest rate margins within the capping interest rate environment in Kenya?

Interest rates in the Kenyan banking system keeps on varying along the spread and are influenced by various factors and can thus greatly affect the performance of banking institutions. According to Robinson (2014), banks interest margins were affected by unanticipated changes in interest rates where a shift on CBR could move to the bank interest rate either downwards or upwards to the ceiling. The exposure of banks profitability and net worth to unanticipated changes in interest rates is what is meant by the term interest rates risk. The potential impact of interest rates on commercial banks financial performance has long been a concern for policy makers and bankers. Matu (2015) observed that poor performance of commercial banks put pressure on them to retain high lending rates as mentioned in the maximum chargeable rate in an attempt to minimize the loses associated with the loans and in the process affecting the bank's clients. Proper interest rate management reduced bank exposure to risk and provided an opportunity to stabilize and improve their net income. This had been a major concern for most banks operating in Kenya. Interest rates determine the profitability of a commercial bank among other factors (Gadner *et al,* 2016). Charging maximum allowable interest rates have remained a macroeconomic problem that has been difficult to eliminate as banks would prefer charging even more. Flannery (2016), found a negative relation between the bank interest rates and bank net asset position. Bosson and Jog-Kun (2015), however found out that profitability of Ghanaian banks was skewed towards large banks and that there was correlation between bank size and profitability.

Banks that originally focused on local markets have extended their range in terms of markets and products to a national, multinational, and even globally. Other banks that majored in asset financing have resorted to expanding their bank services to consumer banking. Banks have chosen to respond to forces in a positive way so as not to overlook customer values, increased global competition, liberalization and other economic, political, and social dynamics (Kotler, 1999). Such dynamism of the environment has forced banks to redesign their strategies and redefine their business priorities to focus on cost reduction, product differentiation, increase deposits, and customer-centric services. Failure to constantly redesign strategies that adapt the bank to its environment could lead to a strategic mismatch between what an organization offered and what markets demanded. Although the ways in which banks implement these vary, but the underlying objectives remain the same.

Locally, studies that have been carried out on interest rate including Ngari (2013) who found that

there was a positive linear relationship between interest rate spread and Return on Assets (ROA). Kipngetich (2014) observed that for banks to attain high financial performance, then interest rates was among the key determinants. Different factors influenced the behavior of interest rates thereby contributing to how they influence the banks performance. Commercial banks therefore should come up with opportunities to take advantage of interest rates and maximize in quality portfolio in order to improve on their financial performance. While the above studies provided valuable insights on interest rates and financial performance they only provided partial insight on the influence of specific interest rates determinants and performance of commercial banks.

The importance of analyzing the effect of bank specific economic determinant on interest rate margin is more pronounced in developing countries like Kenya because financial markets are usually underdeveloped and prone to shocks and risks of closures. Recent closures cited as Charterhouse bank, Dubai bank limited, Imperial bank limited and Chase bank limited considering that banks are typically the only major source of finance for the majority of firms and are usually the main depository of economic savings (Athanasoglou *et al*, 2015).

The interest rate margins for selected commercial banks in Kenya before capping of central bank interest rate (year 2013) and after capping of central bank interest rate (year 2018) is provided in table 1.1:

Table 1. 2: Lending Interest Rate (%) for a Five Year Loan for Selected Commercial Banks in Kenya

Bank Year	Guardian	KCB	SBM (Fidelity Bank	Credit Bank	Consolidated
2015	14.1	16.6	21.0	24.5	25.4
2018	13.0	13.5	12.5	14.0	12.0

Source: Source: Central Bank of Kenya (2015: 2018)

From Table 1.3, it could be deduced that different commercial banks in Kenya charged different interest rate margins which raises the concern as to what informed the variations. Comparing the lending interest rates for the year 2015, which was before the formation of the capping of interest rate indicated that there was a variation of lending interest rates for all the commercial banks in Kenya? This was an indication that there were determinants influencing the interest rate margins across the commercial banks in Kenya. Considering lending interest rates for the selected commercial banks in Kenya for the year 2018 which was after enactment of a law capping interest rates, some banks were adding less than the bank interest rate of 4 percent prescribed as the maximum rate which any commercial bank in Kenya could add to the CBR. This was depicted by commercial banks such as Guadian Bank Ltd, Kenya Commercial Bank Ltd, SBM Bank and Consolidated Bank Ltd.

Despite, the capping of central bank rate in Kenya, commercial banks in Kenya continue to charge different lending interest rates. Rationally, it was expected that commercial banks would add the 4 percent, which was the maximum interest rate margin, to the CBR. However, this was

not the case in commercial banks in Kenya. Some commercial banks added less than the 4 percent to the CBR while others added the 4 percent, being the maximum interest rate margins. Understanding the bank specific economic determinants, that is, credit risk, capital adequacy, operation efficiency, liquidity risk and bank size before and after the introduction of capping of CBR and their influence on interest rate margins is crucial to the management of commercial banks, stakeholders and other interested groups such as the central bank and the government of Kenya.

3.0 OBJECTIVE OF THE STUDY

3.1 General Objective
To analysis of bank specific determinants of interest rate margins in the midst of capping among commercial banks in Kenya.

3.2 Specific Objectives
Specifically, the study sought to achieve the following objectives:
1. To analyze the influence of credit risk on interest rate margins in the midst of capping among commercial banks in Kenya.
2. To analyze the influence of capital adequacy on interest rate in the midst of capping among commercial banks in Kenya.
3. To analyze the influence of operation efficiency on interest rate margins in the midst of capping among commercial banks in Kenya.
4. To examine the effects of liquidity risk on interest rate margins in the midst of capping among commercial banks in Kenya.
5. To establish the influence of bank size on interest rate margins the midst of capping among commercial banks in Kenya.

4.0 RESEARCH HYPOTHESES
The study postulated the following hypotheses:
Ho$_1$: Credit risk has no significant effect on interest rate margins in the midst of capping among commercial banks in Kenya.
Ho$_2$: Capital adequacy has no significant effect on interest rate margins in the midst of capping among commercial banks in Kenya.
Ho$_3$: Operation efficiency does not significantly influence interest rate margins in the midst of capping among commercial banks in Kenya.
Ho$_4$: Liquidity risk does not significantly influence interest rate margins of in the midst of capping among commercial banks in Kenya.
Ho$_5$: Bank size does not significantly influence interest rate margins in the midst of capping among commercial banks in Kenya.

5.0 THEORETICAL LITERATURE

5.1 Agency Theory
The agency theory is a supposition that explains the relationship between principals and agents in business, and is concerned with resolving problems that can exist in agency relationships.

Hence, the third justification of financial intermediaries relates to their role to regulate money creation and financing of an economy (Fama 1980 and Merton 1995).

Agency theory assumes both the principal and the agent are motivated by self-interest, and this assumption of self-interest dooms agency theory to inevitable inherent conflicts. The inherent risks and concerns of solvency in a financial system require the monetary and prudential supervision that is not possible in direct interaction of savers and investors. Government has a considerable role in trying to ensure that information failures are reduced or eliminated. Banks are regulated in their offering of services as financial intermediaries and hence do exists to reduce and eliminate conflicts between parties in financial transactions.

5.2 Asymmetric Information Theory
The primary reason for financial intermediation is informational asymmetries between participants of financial system. Some people or all may have no perfect knowledge in the market, or one individual may have information more than others, and such scenario will enable some people to pay more or less than others for the same product. The existence of banks will enable information to be available to the market at a more relatively standard manner. Financial intermediaries therefore are expected to mitigate these explicit and implicit costs. In a world of asymmetric information there is likely to be a misallocation of scarce resources, with consumers paying too much or too little, and firms producing too much or too little, hence there is market failure. Potentially, this could be a harmful situation because one party can take advantage of the other party's lack of knowledge. Markets do work best when knowledge is perfect and is shared evenly by all parties involved in a transaction. Hence, asymmetric knowledge is an economic problem because one party can exploit their greater knowledge. The existence of banks as financial intermediation corrects the problem of asymmetric information.

5.3 Transaction Cost Economies
When an organization has economies of scale, total unit prices assumes a downward trend including interest rates in lending pricing. Big banks may wield market power attracting economic factors working in their favor to have lower pricing. This theory inform when firms should organize new activities within the boundaries of the firm and how firms can benefit from sharing resources across different businesses within their own firm boundaries. This theoretical framework suggests that economic and competitive allows firms to obtain greater market power by blocking out competitors and through vertical integration to amass power which can lead to offering lower interest rates. More specifically, diversified companies are able to cross-subsidize their businesses, and reduce prices, which helps raising barriers for entry and/or squeezing competitors out of the market (Miller, 2009). Vertical integration allows companies to avoid market costs, control product quality and prevents its technology from spilling over to suppliers, and other intermediaries (Penrose, 1959). Hence, from a transaction cost perspective firms should diversify whenever doing so increases their market power and/or they can organize the additional activities more efficiently than the market or their competitors.

5.4 Dealership Theory
Dealership theory is the starting point for analyzing the determinants of banks' intermediation spreads which was the seminal work by Ho and Sanders (1981). In their pioneering study, Ho

and Sanders (1981) model banks as mere intermediaries between lenders and borrowers where intermediation spreads depend on four basic components: (i) the degree of bank risk aversion; (ii) the degree of competition in the banking market; (iii) the average size of bank transactions; and (iv) interest rate risk. Subsequently, other scholars have extended this model to incorporate additional factors explaining net interest margins.

The literature on spreads consists of studies on the determination of interest margins as well as interest rate spreads. The most influential theoretical model of determination of interest margins is the bank dealership model by Ho and Saunders (1981), in which the size of bank interest margins is explained on the basis of the uncertainties associated with deposit and loan markets, hedging behavior and expected utility maximization. Banks are assumed to be risk-averse dealers in their role as financial intermediaries. The model is premised on the fact that banks receive deposits in random intervals while the requests for loans come in a stochastic manner and these requests have to be satisfied. This randomness, and therefore the uncertainty brought about by the manner in which deposits come and the manner by which customers make loan requests implies that banks face an inventory risk, which has to be compensated through a spread between loan and deposit rates—this is the pure interest spread. The interest margin arising from Ho–Saunders model is computed on the basis of banks that offer similar or homogeneous loans and deposits, and differences in interest margins across the banks is on account of average transaction costs, changes in interest rates, risk taking behavior of bank managers and the extent of competition within the bank's market (Allen,1988).

Subsequent studies have modified some of the assumptions in the Ho and Saunders (1981) model, for instance, McShane and Sharpe (1984) assume that banks face uncertainty in the short-term money market interest rates, as opposed to deposit and loan interest rates. In undertaking intermediation between depositors and borrowers, they assume that banks maximize expected utility and risk aversion in loan and deposit markets.

Allen (1988) extends Ho–Saunders model (1981) to treat banks as passive dealers akin to specialists on securities exchanges. Consequently, they change their prices as a way of changing demand for their products—deposits and loans. Lending rates are set by discounting default-risk adjusted true prices of the loan while deposit rates are determined by putting a mark-up on default-risk adjusted true price of the deposit. According to Allen (1988), the spreads are influenced by monopoly power and risk premium. In situations of risk neutrality, interest spreads are minimized since there is no need for a risk premium to compensate banks for the uncertainty surrounding the arrival of deposits and request for loans.

Overall, a multiple of factors have emerged from the literature on the determination of interest rate spreads and margins. These include degree of bank risk aversion, market structure of the banking sector, volatility of money market interest rates, regulation, efficiency of banks and bank-portfolio. Other factors are credit risks, liquidity of banks, share of foreign capital, bank size, as well as economic factors that are industry-specific or macro in nature

5.5 Interest Rate Theories
The theory of Interest explains the relationship between inflation and the real and nominal interest rates arrived at. This relationship is known as the Fisher Effect. The Fisher Effect states that an increase in the growth rate of the money supply will result in an increase in inflation and an increase in the nominal interest rate and with interest rate capping the growth is towards the cap ceiling, which will match the increase in the inflation rate. Fisher (1930) first put forward that the relationship between interest rates and inflation is termed as the Fisher Effect. It postulates that the nominal interest rate in any period is equal to the sum of the real interest rate and the expected rate of inflation. Fisher (1930) studied that the nominal interest rate could be decomposed into two components, a real rate plus an expected inflation rate. Fisher indicated that there exist a relationship between the inflation and interest rates in a perfect world, with real interest rates being unrelated to the expected rate of inflation and determined entirely by the real factors in an economy, such as the productivity of capital and investor time preference.

The fisher effect theory has the same conclusions with the International Fischer Effect (IFE). IFE theory suggests that foreign currencies with relatively high interest rates will tend to depreciate because the high nominal interest rates reflect expected rate of inflation, Madura (2000). This theory also proposed that changes in the spot exchange rate between two countries will also tend to equate the differences in their nominal interest rates (Craigwell, 2000). Fisher's rate of interest is important because it provides a basis for the idea that monetary policy should be concerned mainly with managing inflation expectations in order to keep real interest rates at a stable level that promotes saving and investment. Fisher (1930) examined the relationship between nominal interest rates and the rate of inflation for the U.S and the U.K.

5.6 Modern Monetary Theory
Modern monetary theory explains exclusively how the government, central bank and the commercial banking sector interacts, with some economists arguing that understanding of reserve accounting is critical to understanding monetary policy options. This theory was developed by a group of economist including Randal Wray (2009) and Bill Mitchell. All of the commercial banks must have an account with the central bank. This permits the banks to manage their reserves that is, the amount of available short-term money that a particular bank holds. So when the government spends, treasury will debit its cash operating account at the central bank, and deposit this money into private bank accounts (and hence into the commercial banking system). This money adds to the total reserves of the commercial bank sector. MMT argues that taxes and bond offerings are not best conceptualized as funding sources for the Treasury, but rather as reserve draining devices to maintain price and interest-rate stability (Tymoigne, 2013). In most countries, commercial banks' reserve accounts with the central bank must have a positive balance at the end of every day; in some countries, the amount is specifically set as a proportion of the liabilities a bank have that is on its customers. This is known as a reserve requirement. At the end of every day, a commercial bank will have to examine the status of their reserve accounts. Those that are in deficit have the option of borrowing the required funds from the central bank, where they may be charged a lending rate which is also referred to as the discount rates on the amount they borrow. In a balanced system, where there are just enough total reserves for all the banks to meet requirements, the short-term interbank lending rate will be

in between the support rate and the discount rate. Both the Treasury and the central bank are involved in these reserve management operations to maintain interest rate stability (Palley, 2012).

5.7 Interest Rate Parity Theory

Interest Rate Parity theory (IPRT) assumes that differences in interest rates between a country and its trading partners account for the rate of change in the nominal exchange rate. The theory of interest rate parity relates to the difference between foreign and domestic interest rates with the difference in spot and future exchange rates. This parity condition states that the domestic interest rate should equal the foreign interest rate plus the expected change of the exchange rates. The interest rate differential between domestic country and world is equal to the expected change in the domestic exchange rate (Bhole and Dash, 2002).

The IPR theory states interest rate differentials between two different currencies will be reflected in the premium or discount for the forward exchange rate on the foreign currency if there is no activity of buying shares or currency in one financial market and selling it at a profit in another. The theory further states that the size of the forward premium or discount on a foreign currency should be equal to the interest rate differentials between the countries in comparison (Fielding, 2005). Sargent and Wallace (2001) posited that a high interest rate policy may lead to a reduction in demand for money and increase in price level. This is because an increase in interest rate implies an increase in government debt. If investors are risk-neutral and have rational expectations, the future exchange rate should perfectly adjust given the present interest rate differential.

6.0 EMPIRICAL STUDIES

6.1 Interest Rate Margin

Ho and Saunders (1981) in which the spread was decomposed into a pure spread and the remaining component that was explained by market structure, regulation and idiosyncratic bank factors. The pure spread was explained by the degree of bank risk aversion and the market structure of the banking sector. The volatility of money market interest rates was found to have a long-run impact on the spread. Other factors that drive the interest margins were the regulatory variables, efficiency of banks and bank-portfolio effects. Credit risk was found to play a minimal role while higher bank liquidity was associated with lower interest rate margin.

McShane and Sharpe (1984) in their study suggested a theoretical model of determining bank interest margins based on hedging performance of interest margin determination the dealer model of bank interest margin determination and applied this model to Australian banks. Their model assumed the following about banks in undertaking intermediation between suppliers of funds and borrowers: maximization of expected utility and risk aversion in loan and deposit markets.

Angbazo (1997) observed that banks' interest rate margins should generate sufficient income to increase the capital base as risk exposure increases. Schumacher (2000) suggested that it was not clear whether high interest rate margins were good or bad from a social welfare perspective.

High interest rate margins added to the profitability and capital of banks so that they could insulate themselves from macroeconomic and other shocks.

Ndung'u (2000) points out that the liberalization experience in Kenya shows that domestic interest rates have remained high even when inflation has been low and declining. That is, the economy has been on a deflationary trend since 1994, save for a few blips in 1997, and the exchange rate has been volatile. These implications of banking sector inefficiency have spurred numerous debates in developing countries about the determinants of banking sector interest rate spreads. In the light of the increasing interest rates charged on loans compared to those offered on deposits, these interest rates vary among commercial banks in the country.

According to Saunders and Schumacher (2000), impact of bank's interest margin on the level of welfare of a country could be twofold. In cases when the margin is low, it usually indicates a competitive market with low intermediation costs for their clients. On the other hand, a high interest margin might reflect that banks are well-capitalized and stronger towards market shocks, benefiting high profit levels but this causes the clients to bear higher costs.

According to Sargent and Wallace (2001) a high interest rate policy could lead to a reduction in demand for money and increase in price level. This was because an increase in interest rate implied an increase in government debt. If investors are risk-neutral and had rational expectations, the future exchange rate could perfectly adjust given the present interest rate differential. The theory further stated that the size of the forward quality on a foreign currency could be equal to the interest rate differentials between the countries in comparison.

The interest rate differential between domestic country and world was equal to the expected change in the domestic exchange rate (Bhole and Dash, 2002). The Interest Rate Parity theory stated interest rate differentials between two different currencies will be reflected in the discount for the forward exchange rate on the foreign currency if there was no activity of buying shares or currency in one financial market and selling it at a profit in another.

Lower interest rates reduced margins, banks gained from their business with customers, since the spread between the interest rate on deposits and the nominal interest rates declines. But there were also other factors, such as new competitors in the markets that led to a decline in bank interest rate margins. More competition meant lower prices, which forced banks, to reduce their interest rates on loans issued to customers and increased interest rates on deposits, in order to retain existing customers and acquired new ones. In order to overcome the decrease in margins, banks had to look for alternative sources of income (McDonald and Keassey 2002).

According to Drakos (2003), interest rate margins serve as indicators of the efficiency of the banking system and, consequently used for competition policy evaluation. On the other hand, however, increases in banking competition could weaken financial stability (Weill 2004). Due to lower profits and banks taking more risks, an increase in the probability of bankruptcy could be induced.

Brock and Franken (2003) studied interest rate spread in Chile, showing that the influence of industry concentration, business cycle variables, and policy variables on interest rate spreads differed markedly depending on whether the spreads were computed from balance sheet data or from disaggregated loan and deposit data.

The present literature advocated that the main factors that determine differences in interest rate spreads for banks and its changes over the time were bank-specific characteristics were total assets, equity to assets ratio, liquidity level, market share, level of concentration in the system, entry regulations, restrictions on bank activities, institutional framework (Demirgüç-Kunt *et al,* 2004).

Sollogoub (2006) posited that high interest rate was an indicative of inefficiency in the banking sectors of developing countries, as it was widely acknowledged that interest rate margins were an adequate measure of bank intermediation efficiency.

According to Matu (2006) the poor performance of commercial banks puts pressure on them to retain high lending rates in an attempt to minimize the loses associated with the loans and in the process affecting the bank's clients. Proper interest rate management reduced bank exposure to risk and provides an opportunity to stabilize and improve their net income. This high interest rates had remained a macroeconomic problem that was difficult to eliminate had been a major concern for most banks operating in Kenya.

Beck and Hesse (2006) used bank-level dataset on the Ugandan banking system to examine the factors behind the consistently high interest rate margins. While foreign banks had lower interest rate margins, there was no robust and economically significant relationship between interest spread and privatization, foreign bank entry, market structure and banking efficiency. Similarly, macroeconomic variables explained little of the over-time variation in bank interest rate margins. Bank-level characteristics, on the other hand, such as bank size, operating costs, and composition of loan portfolio, explained a large proportion of cross bank, cross-time variation in interest rate margins.

Crowley (2007 and Grenade (2007) observed that there was a pervasive view amongst some stakeholders that high interest rate margins were caused by the internal characteristics of the banks themselves, such as their tendency to maximize profits in an oligopolistic market, while many others such as Hassan and Khan (2010) argued that the interest rate margins were imposed by the macroeconomic, regulatory and institutional environment in which banks operated.

Kipngetich (2011) carried out a study on different factors influencing the behavior of interest rates thereby contributing to how they influence the banks performance. He observed that commercial banks could come up with opportunities to take advantage of interest rates in order to improve on their financial performance. While the above studies provided valuable insights on interest rates and financial performance they only provided partial insight on the influence of specific interest rates determinants and performance of commercial banks.

Hamid (2011) indicated that interest rate could be decomposed into different components. Banks charge higher interest rates to riskier borrowers in anticipation of defaults, and so interest rate therefore account for loan loss provisions in the decomposition. Interest rate also account for overhead costs, taxes, and required reserves, all the above are factors that contribute to higher interest rate margins.

Mang'eli (2012) noted that fluctuations of market interest rates spread exerted significant influence the performance of commercial banks. Under general conditions, bank profits increased with rising interest rates. The study further argued that the banking system as a whole is immeasurably helped rather than hindered by an increase in interest rate margin.

As Karumba and Wafula (2012) found out in a recent study of collateral-backed lending in Kenya, interest rate margin increased with rise in the collateral pledged. This was contrary to what would had been expected that higher interest rate margins for firms pledging little or no collateral.

Siddiqui (2012) estimated the interest rate spread in Pakistan based on individual bank specific factors assessing the determinants of interest rate spread of commercial banks in Kenya: An empirical investigation using annual panel data of 22 banks. The variables include market share measured as deposits of the bank as a percentage of total deposits of the banking sector, liquidity risk variable, administrative expenses as a percentage of total assets, non-performing loans as a percentage of net advances, net interest income as a percent of total income and return on assets after payment of tax as a percent of average assets. The interest rate margin was found to be significantly affected by administrative costs, non-performing loans and return on assets in all the regression.

This study sought to investigate the influence of interest rate determinants on the performance of commercial banks in Kenya. Interest rates are the major economic factors that influenced the economic growth in an economy. They could be used to control inflation and to boost economic development. The interest rates determinants that were studied are Inflation Rates, discount rates, Exchange Rate and reserve requirement to determine the influence they have on performance of banks. In Kenya, the banking sector played a dominant role in the financial sector, particularly with respect to mobilization of savings and provision of credit. African countries, particularly at the bank-level, like Kenya are still grappling with the challenge of higher interest rate spreads Maigua and Mouni (2016).

6.2 Credit Risk Bank and Interest Rate Margin
The theoretical model of Ho *at el* (1981) indicated that there was a positive correlation between interest rate and credit risk. The model argued that when banks were faced by deterioration in credit risk, they hedged against the impending loss by transferring a portion or all of it to their borrowers. The finding was done by increasing the lending rate or decreasing interest on deposits. The study indicated that increased in lending rates compromised the ability of borrowers to repay.

Stieglitz and Weiss (1981) cautioned banks against high interest rates. The two scholars point out that higher interest rate negatively affected the quality of a bank's loan mainly because of incentive and adverse selection effects. First, it raised the overall riskiness of the portfolio of assets. Rising interest rates reduced the returns on all projects and made less risky projects unprofitable. This could make firms switch to more risky projects as interest rates rise. Secondly, the banks had to screen borrowers. This was because at a high borrowing interest rate, borrowers may be less worried about the prospect of nonpayment. Banks could monitor the behavior of borrowers but information was at a cost and also, not perfect. This implied that the rational profit maximizing banks had to practice credit rationing, which defeated the assumption generally made in financial liberalization literature, that of interest rate liberalization eliminating credit rationing.

Leopold and Friiuhwirth (2001) showed ideally how to integrate interest rate on credit risk. They proposed a simple two factor model where the default intensity of borrowers was driven by interest rates and the stock index, which in turn were correlated. The study indicated that interest rate changes had an impact on the credit quality of assets, showed that in terms of hedging a bond portfolio, both credit and interest rate risk had to be taken into account.

6.3 Capital Adequacy and Interest Rate Margin

The rule of thumb is that banks should progressively convert some of their earnings into capital to cover any liabilities that could occur in the future. For institutions with limited earnings there are strategic decisions that need to be taken to ensure capital adequacy. These include right issues, initial public offers, mergers and acquisitions or direct injections from shareholders. It is imperative that a bank is not being run on depositors' funds since these are liabilities on call at any time.

In the study the size of the bank could affect the attitude towards wholesale funding, including the access to the markets (Allen *et al.* 1989) and the cost of the funds that were obtained. Furthermore, the importance of the bank's size was derived by the economies of scope and scale that could be achieved. For example, a larger bank could have better access to financial markets and interbank markets because of its larger counterparty network and its wider range of collateral. Moreover, the business model of a bank, which distinguished banks from other financial institutions.

The model results suggested that a higher ratio of capital adequacy was associated with lower interest margins. The finding was in line with the hypothesis of Brock and Franken (2003), under which less capitalized banks had reasons to accept more risk associated with higher margins, in order to obtain higher profits. Likewise, more capitalized banks invested more carefully, as the risk of capital was larger. The researchers could be able to afford shocks to their balance sheets, but also gave up on financial leverage, which could lead to lower interest rate margins and lower returns on capital.

Higher capital adequacy of a bank was associated with lower interest margins. The dealership model, which predicted a positive relationship, as net interest rate margins could increase the capital base as the exposure to risk increases. The finding was in line with the hypothesis raised

by Brock and Franken (2003), put forward that less capitalized banks had the motivation to accept more risk associated with a higher spread in order to receive higher returns.

6.4 Operation Efficiency and Interest Rate Margin
According to Ndung'u and Ngugi (2000), financial reforms and liberalization could improve efficiency in the intermediation process. This implied that the spread could decline over time as liberalization is accomplished and the financial sector develops. But in Kenya, financial liberalization seems to have led to a widening interest rate margin. Studies had shown that there was a relationship between operational efficiency and interest rates margin. However, the evidence had been contrasting as the effect had not been conflicting. Findings of various studies had revealed inconsistencies regarding the relationship between operational efficiency and interest rate spread. The study further noted that it had been observed that large interest rate margins occurred in developing countries due to high operating costs, financial taxation or repression and lack of a competitive banking sector among other factors.

6.5 Liquidity Risk and Interest Rate Margin
(Angbazo, 1997) posited that liquidity risk was expected to affect interest rate margins positively. Banks with high liquidity risk tended to borrow emergency funds at high cost and therefore charged a liquidity premium that was displayed in higher interest rate margins. Brock and Saurez (2000) carried out a study on a multi-country study of five Latin American countries made up of Bolivia, Chile, Peru, Argentina and Columbia, over the period 1991 to 1996, employing the Ho and Saunders (1981) two-step framework, and noted that for Latin America, interest rate margins were determined by liquidity risk.

The coefficient before liquidity ratio had a negative sign because banks with higher levels of liquid assets could receive less interest income than banks with less liquid assets. If the deposit market was sufficiently competitive, higher liquidity tended to be negatively correlated with net interest margins. (Brock and Franken, 2003).

The liquidity risk premium theory stated that long-term rates were equal to the geometric average of the current and expected short-term rates plus a liquidity risk premium that 17 increases with the maturity of the security. For example, according to the liquidity premium theory, an upward-sloping yield curve could reflect the investors 'expectations that future short term rates could rise, be flat, or fall, but because the liquidity premium increases with maturity, the yield curve could nevertheless increase with the term to maturity (Crouhy, 2005).

6.6 Bank Size and Interest Rate Margin
Large banks were hypothesized to have difficulty extending relationship loans interest rates to informational opaque small businesses because of Williamson-type organizational diseconomies of providing relationship lending services along with providing transactions lending services and other services to their large corporate customers (Williamson, 1988). The exclusion of firm-specific information could have resulted in biases if large and small banks tend to lend to different firms.

Moore and Craigwell (2000) used firm-level data of Barbadian banking industry on their findings to assess the relationship between interest rates and loan sizes. Six banks were reviewed for the period 1986 to 1998. Using fixed effects panel data framework, the study found a negative relationship between interest rates and bank sizes. The study concluded that interest rates differences were as a result of minor loans among other factors. This was different to traditional finance theory which discussed that as bank sizes rose, interest rates also would rise to accommodate the increase in associated risk of the loan.

Large banks could also be disadvantaged because relationship lending often requires lower interest rates information that could be difficult to transmit through the communication channels of large organizations (Stein 2002) In the context of this argument, one literature examined whether large banks are less inclined to make small business loans. A number of studies found that large banks allocated a far lower proportion of interest rates on their assets to small business loans than do small banks where it induced lower interest rates to lending customers.

7. 0 CONCEPTUAL FRAMEWORK

The general objective of this study was to analysis the bank specific determinants of interest rate margins of commercial banks in Kenya. This overall objective of the study was conceptually and diagrammatically represented in Figure 2.1.
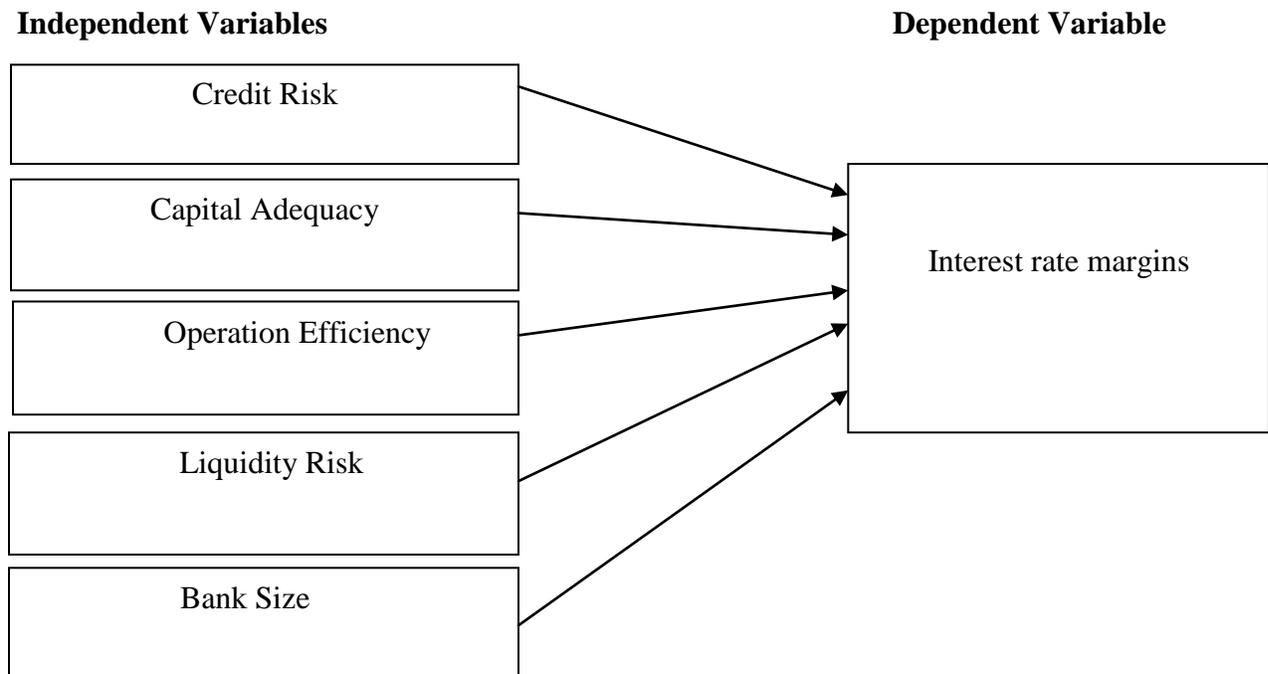
Independent Variables   **Dependent Variable**

Figure 2. 1 Conceptual Framework

Source: Author (2019)

8.0 RESEARCH METHODOLOGY

8.1 Research Design
The study will employ an explanatory approach by using panel data research design. According Ranjit (2005), explanatory research attempts to clarify why and how there is a relationship between two or more aspects of a situation or phenomenon. Explanatory research aims at answering the question why. This type of research attempts to go above and beyond exploratory and descriptive research to identify the actual reasons a phenomenon occurs (Kumar, 2005). Hence explanatory research design was utilized employing panel data approach.

Panel data models provide much more insights than time series models or cross section data models since it is theoretically possible to separate the effects of specific effects and actions (Hsiao 2003). With panel data, variations across commercial banks in Kenya and time periods are accounted for. The analysis of panel data is the subject of one of the most active and innovative bodies of writings in econometrics; the reason is that this type of data provides such a rich environment for the development of estimation techniques and theoretical results. Studies have been able to use panel data, that is, time-series cross-sectional data to examine issues that could not be studied in either cross-sectional or time-series settings alone.

With panel data, it was easy to control for unobserved heterogeneity across countries. This was upheld by Ben-Porath (1973) who observed that at a certain point in time, in a cohort of women, 50 percent may appear to be working. It was ambiguous whether this finding implied that, in this cohort, one half of the women on average would be working or that the same one-half would be working in every period. These had quite different implications for policy and for the interpretation of any statistical results. Cross-sectional data alone could never explain much on the issue. The main value of a panel data set compared to a cross-section is that it will permit the researcher sufficient flexibility in defining differences in behavior across subjects the subject under study.

Hsiao *et al.,* (1995) observed that in empirical studies investigators often encounter problems of shortage of degrees of freedom and multi-collinearity. That is, the information provided by the sample is not rich enough to meet the requirement of the specified model. To narrow this gap, investigators either often have to impose ad hoc prior restrictions. Exploratory research is used to develop a better understanding (Hair *et al.*, 2003) and provides useful information for a proper understanding of an issue or circumstance.

8.1 Justification of Using Dynamic Stochastic General Equilibrium (DSGE)
The motivation behind using a DSGE model to analyze the economic determinants of interest rate margins are three-folds. First, since equations that describe DSGE models are derived from the explicit modeling of the optimization problems of economic agents, the effects of policy changes on the expectations of economic agents are captured by DSGE models. This makes DSGE models more suitable for policy analysis especially in monetary policy and business cycles as pointed out by Lubik and Surico (2006) where they observed that previous studies failed to detect structural breaks following changes in monetary policy, because they did not control for the heteroskedasticity problem induced by policy changes in their econometric tests.

They showed that once heteroskedasticity was controlled for, structural breaks were detected in the data following policy changes. Secondly, current generation of DSGE models has been proven to have good empirical performance giving better results compared to reduced-form models, such as Vector Autoregression (VAR), SVAR models. Thirdly, the system GMM will be applied to the entire commercial banks in Kenya because such estimator requires large number of observations and small time period which provide consistent estimates.

DSGE models have gained popularity in contemporary macroeconomics, with greater interest coming from scholars, and then major economic decision-makers who are mainly interested in policy policy-making procedures in central banks across the globe (Tovar, 2009). These frameworks are vital as they clearly define the goals and challenges faced by households and businesses. As such, they help to define the prices and allocations based on marketplace relations in an uncertain environment. DSGE models permit analysis of important macroeconomic issues whereby numerical advances have made it possible to estimate models with many parameters without restrictions.

Fernández-Villaverde (2010) indicated that DSGE models are dynamic in nature which assess how the economy evolves over time. DSGE models are based on the assumptions of stochastic disturbance whereby considerations are made that the economy is subjected to random shocks. These shocks include sudden changes in productivity and prices, IT changes or unfavorable economic policies. The DSGE entails a unique category of dynamic stochastic macroeconomic constructs that feature a sound micro-founded general equilibrium framework, characterized by the optimizing behavior of rational agent's subject to technology, budget, and institutional constraint (Smets *et al.,* 2010).

The GMM is a numerical approach that brings together observed economic data with the information in population moment conditions to generate estimates of the unknown parameters of this economic model. Once parameters have been obtained, inference can be performed about the basic question that is of interest in the research study.

The first step in GMM is to write the moment's conditions as a condition of orthogonality between regression and a set of instrumental variables. This involves specifying the list of instrumental variables. For the GMM estimator to be identified, at least as many tools as estimated parameters must be specified. A GMM estimation begins with an economic theory and the data are used to produce estimates of the model parameters.

Estimation is done under minimal statistical assumptions, and often less attention is given to the fit of the model. In a method of moments, a population moment condition is that a vector of observed variables, v_t, and unknown parameter vector θ with true value θ_0 which satisfy a $kx1$ element vector of conditions:

$$E[f(v_t, \theta)] = 0 \text{ for all } t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots..3.1$$

The method of moment estimator θ_T^* is used to solve the analogous sample moment conditions given as:

$$g_T(\theta_T^*) = T^{-1} \sum f(v_t, \theta_T^*) = 0 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.3.2$$

Where T is the size of the sample.

Consequently, under the usual regularity conditions, $\theta_T^* \xrightarrow{T} \theta_0$, where θ_0 is the solution for equation 3.2, in which there are k unknowns and k equations leading to unique solution. Suppose that f is a $qx1$ vector and $q > k$ meaning there are k unknowns and q equations implying that there is no unique solution.

GMM picks a value for θ such that it approaches closest to satisfy equation 3.2. The closeness can be defined by the following criterion function:

$$Q_T(\theta) = \left[T^{-1}\sum f(v_t,\theta)\right]W_T\left[T^{-1}\sum f(v_t,\theta)\right] = g_T(\theta)'W_T g_T(\theta)\dots\dots\dots 3.3$$

Where W_T is the weighting matrix, converges to a positive definite matrix W as T grows large. The GMM estimator depends on the weight matrix $Q_{GMM}(W_T)$ which becomes the GMM estimator of θ_0 (true value) given as $\hat{\theta}$ can be obtained by finding argument of the minimum (argmin) of equation 3.3 as follows:

$$Q_{GMM}(W_T) = \hat{\theta} = \arg\min Q_T(\theta)\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.4$$

In applying the GMM approach, there are pertinent advantages including the requirement is a moment condition in which there is no need to log-linearize any variable. Further, while non-linearities is not a problem when utilizing GMM approach, GMM is robust to heteroskedasticity and distributional assumptions.

The other advantage of using GMM is that the correlation of the error term and the dependent variable is eliminated. GMM methodologies, as linear and dynamic methodologies, are introduced to remove this correlation.

8.3 Model Specification
The Generalized Method of Moments (GMM) of estimation of DSGE model was employed in analysis of influence of bank margins interest rate on credit risk, cost of capital, profit margin, cash reserve ratio and liquidity cost of the commercial banks in Kenya. The system GMM was applied to the entire commercial banks in Kenya since such estimator require large number of observations and small time period to provide consistent estimates. In the differenced GMM, the past values of dependent variable are used as the instruments for the current first differences of the dependent variable. One of the alternatives to the taking first difference is the using forward orthogonal deviations, suggested by Arellano and Bover (1995). The forward orthogonal deviation is implemented where the average of future values of each variable are deducted from the current value. This methodology is helpful in the availability of missing variables and it also protects the degree of freedom.

This implies that current realizations of the dependent variable are determined by past realizations. The problem in first difference GMM is the weak instrument. Estimation of dynamic model depicted in equation 3.5 was carried out:

$$Y_{ijt} = \alpha_0 + \alpha_1 Y_{ijt-1} + \alpha_{21} CR_{ijt} + \alpha_3 CA_{ijt} + \alpha_4 BD_{ijt} + \alpha_5 OE_{ijt} + \alpha_6 LR_{ijt} + \varepsilon_{ij,t} ....3.5$$

Where $Y_{ijt}, Y_{ijt-1}, CR_{ijt}, CA_{ijt} BD_{ijt}, OE_{ijt}, LR_{ijt}, \varepsilon_{ij,t}$ represents interest rate margin, lagged interest rate margin, credit risk, capital adequacy, bank diversification, operation efficiency and liquidity risk respectively.

9.0 DATA ANALYSIS

9.1 Summary Statistics
The secondary data indicated that commercial banks in Kenya were grouped under three categories: small, medium and large, based on the market share. A bank with market share below 1% is labeled 'small'; one with a market share bigger than 1% but less than 5% is labeled 'medium'; and one with a market share above 5% is labeled 'large'. The market share index used is a computed composite of net assets, deposits, capital, number of loan accounts and number of deposit accounts (CBK, 2018). Out of the 38 commercial banks, 6 were categorized as large, 9 as medium and the rest 19 as small as indicated in Appendix A.1 giving full list and grouping of each individual bank as at 31st December 2018.

The summary statistics before (period covering 2013 to 2015) and after (period covering 2016 to 2018) capping of interest rate for the thirty eight commercial banks in Kenya is presented in Table 4.3.

Table 4. 1: Summary Statistics

Variable	2013 – 2015				2016 – 2018			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Interest Rate Margin	0.1305	0.0238	0.0645	0.1926	0.1217	0.0283	0.0220	0.1991
Credit Risk	0.0673	0.0582	0.0000	0.2697	0.0948	0.0907	0.0000	0.6056
Capital Adequacy	0.1561	0.0459	0.0693	0.3211	0.1653	0.0602	-0.0749	0.4222
Operation Efficiency	0.6164	0.3307	0.2029	2.1789	0.6738	0.4147	0.0999	2.8111
Liquidity Risk	0.4176	0.0231	0.2024	0.9812	0.4176	0.1534	0.0911	0.8048
Bank Size	0.0250	0.0273	-0.0751	0.0725	0.0177	0.0452	-0.4380	0.0857

Source: Author (2019)

The results in table 4.3 depicted that before the interest rate capping in Kenya, that is, the period over 2013-2015, the commercial banks in Kenya were charging a mean interest rate margin of 13.05 percent. After the interest rate capping, that is, the period over 2016 to 2018, the mean interest rate margin dropped to a mean of 12.17 percent. Upon comparing the bank sizes before and after the interest rate capping, the descriptive statistics showed that the mean was 0.0250 and 0.0177 respectively. This in essence indicated that after interest rate capping, variances of the bank size was reduced. This meant that the sizes of commercial banks in Kenya's variances was reduced.

The mean of credit risk showed that credit risk increased after capping of the interest rate depicted by the mean before interest rate capping was from 0.0673 and after interest capping was 0.0948. This characteristic showed that commercial banks started to increase their provisions for
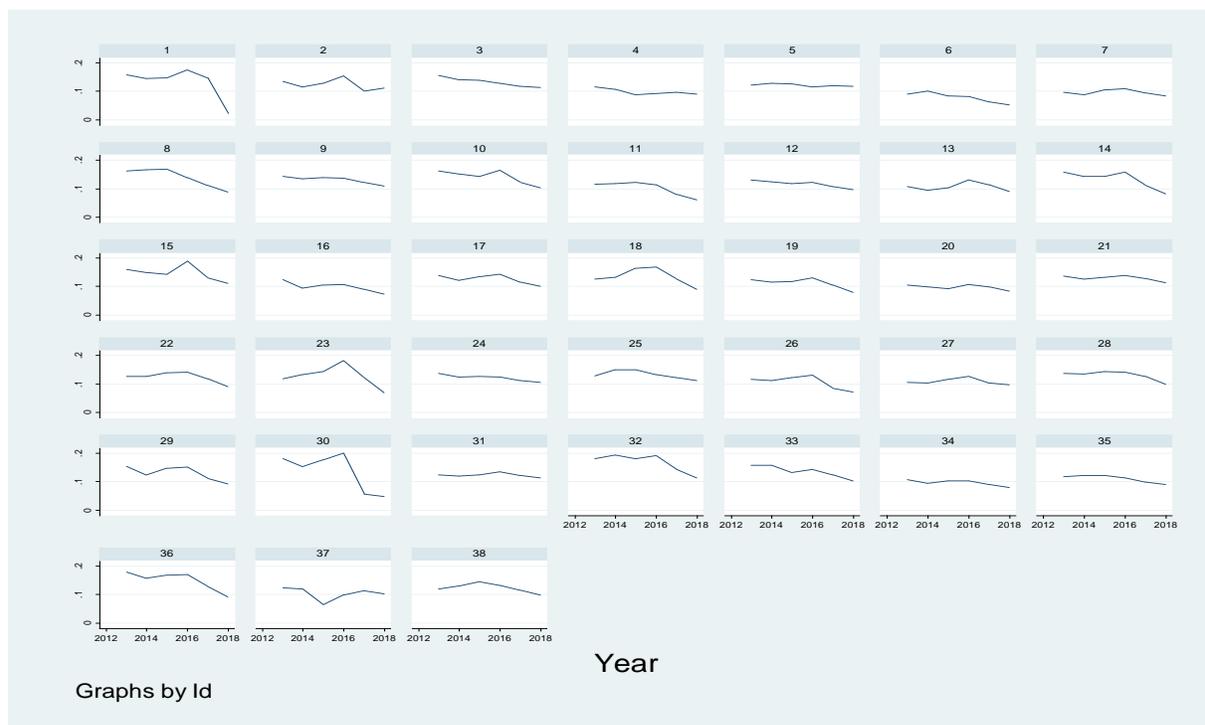
loan losses after interest rate capping to cover higher cost of bad debt required to be written offs. Comparing the maximum credit risk points for the period before and after interest rate capping, the results showed that after interest rate capping a maximum value, 0.6056, was portrayed which was more than the maximum value, 0.2697, before interest rate was controlled. This characteristics showed that credit risk increased after interest rate capping.

The mean of capital adequacy increased after interest rate capping from 0.1561 to 0.1653 respectively. Also, on maximum points, commercial banks in Kenya portrayed a higher maximum value for the period covering 2016 to 2018, which was after interest rate capping, compared to the period covering 2013 to 2015, which was before interest rate capping.

Operation efficiency before interest rate capping was 0.6164 while operation efficiency increased after interest rate capping to0.6738. The optimal efficiency ratio for commercial banks in Kenya is 0.50. This indicated that the characteristic of operation efficiency before and after interest rate was higher than the optimal efficiency required in the industry.

9.3 Graphical Representation

The summary statistics when presented graphically by country based on the bank interest rate trends over the years of 2013 to 2018 is presented in Figure 4.1.
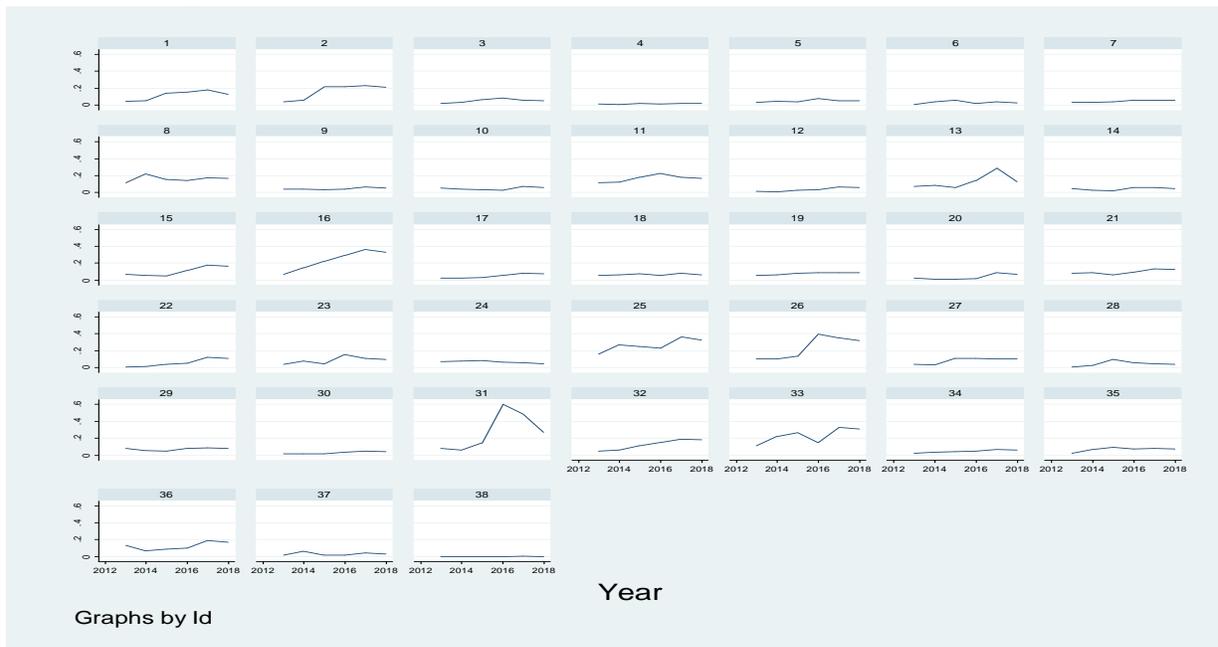

Where 1. African Bank of Kenya, 2. Bank of Africa 3. Bank of Baroda 4. Bank of India 5. Barclays Bank 6. Citibank 7.Commercial Bank of Arica 8. Consolidated Bank of Kenya 9. Co-operative Bank of Kenya 10. Credit Bank 11. Development Bank of Kenya 12. Diamond Trust Bank 13. Ecobank Kenya Limited 14. Equity Bank Kenya Limited 15. Family Bank Limited 16. First Community Bank Limited 17. Guaranty Trust Bank (K) Ltd 18. Guardian Bank Limited 19.

Gulf African Bank Limited 20. Habib Bank A.G Zurich 21. Housing Finance Bank Limited 22. I & M Bank Limited 23. Jamii Bora Bank Limited 24. KCB Bank Kenya Limited 25. Middle East Bank (K) Limited 26. National Bank of Kenya Limited 27. NIC Bank Limited 28. M-Oriental Bank Limited 29. Paramount Bank Limited 30. Prime Bank Limited 31. SBM Bank Ltd (Fidelity Commercial Bank Limited) 32. Sidian Bank Limited 33. Spire Bank Ltd 34. Stanbic Bank Kenya Limited 35. Standard Chartered Bank Kenya Limited 36. Trans-National Bank Limited 37. UBA Kenya Bank Limited 38. Victoria Commercial Bank Limited

Figure 4. 1: Interest Rate Trends for the Period 2013 to 2018
Source: Author (2019)

As shown in figure 4.1, average interest rate in the thirty-eight banks almost moved in the one direction except for UBA Kenya Bank Limited which reduced tremendously between the year 2014 and 2015. This was an indicative that UBA Kenya Bank Limited reduced interest rate margins in that period despite the other banks maintain or increasing the interest rate margin.
The summary statistics by country based on credit risk trends over the years of 2013 to 2018 is presented in Figure 4.2.
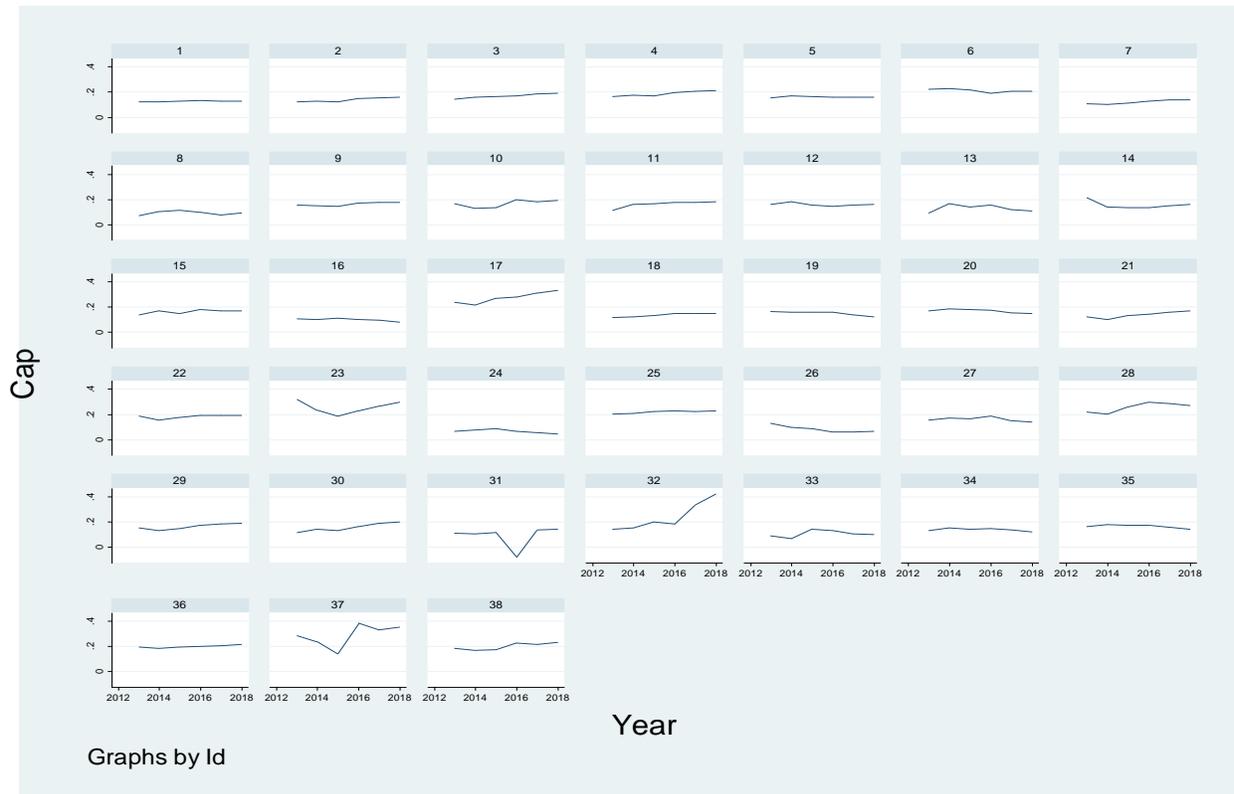

Graphs by Id

Where 1. African Bank of Kenya, 2. Bank of Africa 3. Bank of Baroda 4. Bank of India 5. Barclays Bank 6. Citibank 7.Commercial Bank of Arica 8. Consolidated Bank of Kenya 9. Co-operative Bank of Kenya 10. Credit Bank 11. Development Bank of Kenya 12. Diamond Trust Bank 13. Ecobank Kenya Limited 14. Equity Bank Kenya Limited 15. Family Bank Limited 16. First Community Bank Limited 17. Guaranty Trust Bank (K) Ltd 18. Guardian Bank Limited 19. Gulf African Bank Limited 20. Habib Bank A.G Zurich 21. Housing Finance Bank Limited 22. I & M Bank Limited 23. Jamii Bora Bank Limited 24. KCB Bank Kenya Limited 25. Middle East Bank (K) Limited 26. National Bank of Kenya Limited 27. NIC Bank Limited 28. M-Oriental Bank Limited 29. Paramount Bank Limited 30. Prime Bank Limited 31. SBM Bank Ltd (Fidelity Commercial Bank Limited) 32. Sidian Bank Limited 33. Spire Bank Ltd 34. Stanbic Bank Kenya

Limited 35. Standard Chartered Bank Kenya Limited 36. Trans-National Bank Limited 37. UBA Kenya Bank Limited 38. Victoria Commercial Bank Limited

Figure 4. 2: Credit Risk Trends for the Period 2013 to 2018
Source: Author (2019)

The results as depicted in figure 4.2 indicated that out of the thirty eight commercial banks in Kenya, eleven commercial banks, that is, African Bank of Kenya, Bank of Africa, Development Bank of Kenya, First Community Bank Limited, National Bank of Kenya Limited, NIC Bank Limited, M-Oriental Bank Limited, SBM Bank Ltd (Fidelity Commercial Bank Limited), Sidian Bank Limited, Spire Bank Ltd and Standard Chartered Bank Kenya Limited, had their credit risk on the rise over the period 2014 to 2015. Two commercial banks, that is, Consolidated Bank of Kenya and UBA, Kenya Bank Limited reduced their credit risk over the period 2014 to 2015. The summary statistics by country based on capital adequacy trends over the years of 2013 to 2018 is presented in Figure 4.3.

Where 1. African Bank of Kenya, 2. Bank of Africa 3. Bank of Baroda 4. Bank of India 5. Barclays Bank 6. Citibank 7.Commercial Bank of Arica 8. Consolidated Bank of Kenya 9. Co-operative Bank of Kenya 10. Credit Bank 11. Development Bank of Kenya 12. Diamond Trust Bank 13. Ecobank Kenya Limited 14. Equity Bank Kenya Limited 15. Family Bank Limited 16. First Community Bank Limited 17. Guaranty Trust Bank (K) Ltd 18. Guardian Bank Limited 19. Gulf African Bank Limited 20. Habib Bank A.G Zurich 21. Housing Finance Bank Limited 22. I & M Bank Limited 23. Jamii Bora Bank Limited 24. KCB Bank Kenya Limited 25. Middle East Bank (K) Limited 26. National Bank of Kenya Limited 27. NIC Bank Limited 28. M-Oriental
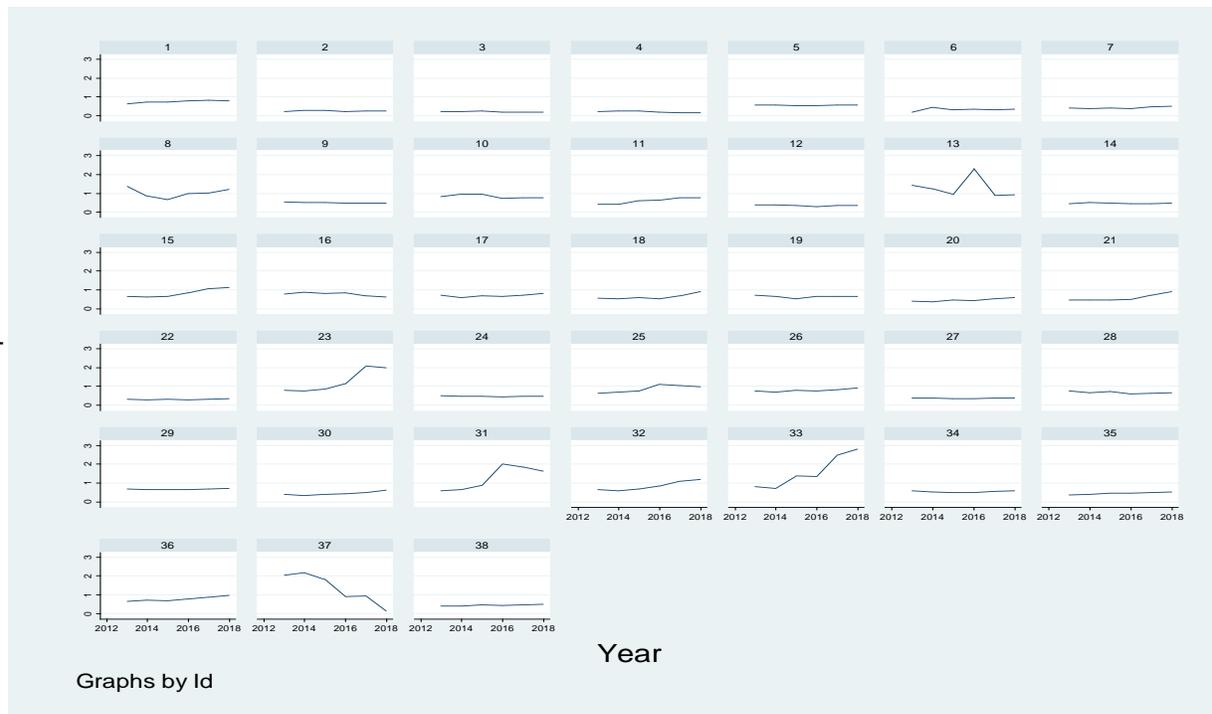
Bank Limited 29. Paramount Bank Limited 30. Prime Bank Limited 31. SBM Bank Ltd (Fidelity Commercial Bank Limited) 32. Sidian Bank Limited 33. Spire Bank Ltd 34. Stanbic Bank Kenya Limited 35. Standard Chartered Bank Kenya Limited 36. Trans-National Bank Limited 37. UBA Kenya Bank Limited 38. Victoria Commercial Bank Limited

Figure 4. 3: Capital Adequacy Trends for the Period 2013 to 2018
Source: Author (2019)

The results in figure 4.3 showed that out of the thirty eight commercial banks in Kenya; Guaranty Trust Bank (K) Ltd, M-Oriental Bank Limited and Spire Bank Ltd increased their capital adequacy over the period 2014 and 2015. Jamii Bora Bank Limited sharply reduced its capital adequacy over the period 2013 to 2015 while UBA Kenya Bank Limited also sharply reduced its capital adequacy over the period 2014 to 2015.
The summary statistics by country based on operation efficiency trends over the years of 2013 to 2018 is presented in Figure 4.4.

Where 1. African Bank of Kenya, 2. Bank of Africa 3. Bank of Baroda 4. Bank of India 5. Barclays Bank 6. Citibank 7.Commercial Bank of Arica 8. Consolidated Bank of Kenya 9. Co-operative Bank of Kenya 10. Credit Bank 11. Development Bank of Kenya 12. Diamond Trust Bank 13. Ecobank Kenya Limited 14. Equity Bank Kenya Limited 15. Family Bank Limited 16. First Community Bank Limited 17. Guaranty Trust Bank (K) Ltd 18. Guardian Bank Limited 19. Gulf African Bank Limited 20. Habib Bank A.G Zurich 21. Housing Finance Bank Limited 22. I & M Bank Limited 23. Jamii Bora Bank Limited 24. KCB Bank Kenya Limited 25. Middle East Bank (K) Limited 26. National Bank of Kenya Limited 27. NIC Bank Limited 28. M-Oriental Bank Limited 29. Paramount Bank Limited 30. Prime Bank Limited 31. SBM Bank Ltd (Fidelity Commercial Bank Limited) 32. Sidian Bank Limited 33. Spire Bank Ltd 34. Stanbic Bank Kenya
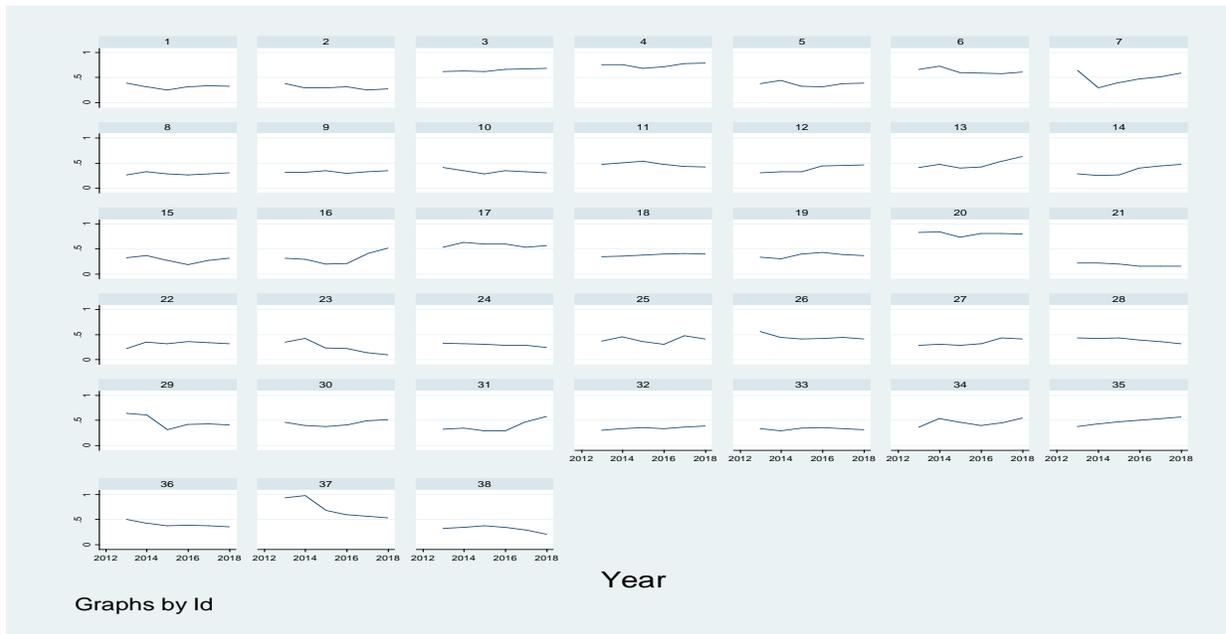
Limited 35. Standard Chartered Bank Kenya Limited 36. Trans-National Bank Limited 37. UBA Kenya Bank Limited 38. Victoria Commercial Bank Limited

Figure 4. 4: Operation Efficiency Trends for the Period 2013 to 2018
Source: Author (2019)

The results in figure 4.4 showed that Consolidated Bank of Kenya, Ecobank Kenya Limited and UBA Kenya Bank Limited had their operation efficiency reduced, that is, cost of operation in relation to the total assets reduced implying that operation efficiency improved for these three commercial banks over the period 2014 to 2015. Out of the thirty eight commercial banks Spire Bank Ltd had increased operation efficiency, that is, the operating expenses in relation to total assets increased, implying that operation efficiency dropped for this commercial bank over the period 2014 to 2015.
The summary statistics by country based on liquidity risk trends over the years of 2013 to 2018 is presented in Figure 4.5.
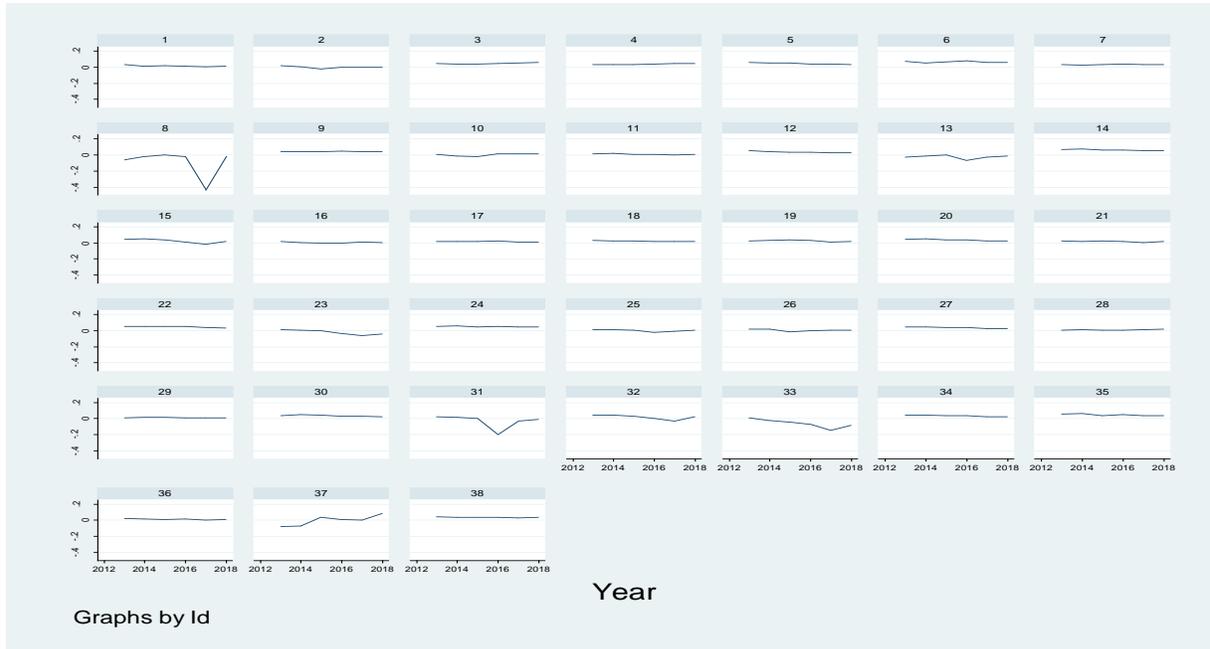

Where 1. African Bank of Kenya, 2. Bank of Africa 3. Bank of Baroda 4. Bank of India 5. Barclays Bank 6. Citibank 7.Commercial Bank of Arica 8. Consolidated Bank of Kenya 9. Co-operative Bank of Kenya 10. Credit Bank 11. Development Bank of Kenya 12. Diamond Trust Bank 13. Ecobank Kenya Limited 14. Equity Bank Kenya Limited 15. Family Bank Limited 16. First Community Bank Limited 17. Guaranty Trust Bank (K) Ltd 18. Guardian Bank Limited 19. Gulf African Bank Limited 20. Habib Bank A.G Zurich 21. Housing Finance Bank Limited 22. I & M Bank Limited 23. Jamii Bora Bank Limited 24. KCB Bank Kenya Limited 25. Middle East Bank (K) Limited 26. National Bank of Kenya Limited 27. NIC Bank Limited 28. M-Oriental Bank Limited 29. Paramount Bank Limited 30. Prime Bank Limited 31. SBM Bank Ltd (Fidelity Commercial Bank Limited) 32. Sidian Bank Limited 33. Spire Bank Ltd 34. Stanbic Bank Kenya Limited 35. Standard Chartered Bank Kenya Limited 36. Trans-National Bank Limited 37. UBA Kenya Bank Limited 38. Victoria Commercial Bank Limited

Figure 4. 5: Operation Efficiency Trends for the Period 2013 to 2018
Source: Author (2019)

The results in figure 4.5 indicated that liquidity risk reduced for Jamii Bora Bank Limited, Paramount Bank Limited and UBA Kenya Bank Limited over the period 2014 to 2015 while liquidity risk for Commercial Bank of Arica reduced in the year 2013, then it started to increase from the year 2014 to 2015.

The summary statistics by country based on bank size trends over the years of 2013 to 2018 is presented in Figure 4.6.

Where 1. African Bank of Kenya, 2. Bank of Africa 3. Bank of Baroda 4. Bank of India 5. Barclays Bank 6. Citibank 7.Commercial Bank of Arica 8. Consolidated Bank of Kenya 9. Co-operative Bank of Kenya 10. Credit Bank 11. Development Bank of Kenya 12. Diamond Trust Bank 13. Ecobank Kenya Limited 14. Equity Bank Kenya Limited 15. Family Bank Limited 16. First Community Bank Limited 17. Guaranty Trust Bank (K) Ltd 18. Guardian Bank Limited 19. Gulf African Bank Limited 20. Habib Bank A.G Zurich 21. Housing Finance Bank Limited 22. I & M Bank Limited 23. Jamii Bora Bank Limited 24. KCB Bank Kenya Limited 25. Middle East Bank (K) Limited 26. National Bank of Kenya Limited 27. NIC Bank Limited 28. M-Oriental Bank Limited 29. Paramount Bank Limited 30. Prime Bank Limited 31. SBM Bank Ltd (Fidelity Commercial Bank Limited) 32. Sidian Bank Limited 33. Spire Bank Ltd 34. Stanbic Bank Kenya Limited 35. Standard Chartered Bank Kenya Limited 36. Trans-National Bank Limited 37. UBA Kenya Bank Limited 38. Victoria Commercial Bank Limited

Figure 4. 6: Bank Size Trends for the Period 2013 to 2018
Source: Author (2019)

9.4 Correlation Matrix
The correlation relationship between the explanatory variables for measuring interest rate margin before the bank interest rate capping is illustrated in table 4.4.

Table 4. 2: Correlations of Interest Rate Margin Model for the Period 2013-2018

	Interest Rate Margin	Credit Risk	Capital Adequacy	Operation Efficiency	Liquidity Risk	Bank Size
Interest rate margin	1	0	0	0	0	0
Credit Risk	0.1956	1	0	0	0	0
Capital Adequacy	-0.0509	-0.2183	1	0	0	0
Operation Efficiency	0.0075	0.2512	0.0980	1	0	0
Liquidity Risk	-0.3476	-0.2508	0.4201	0.1717	1	0
Bank Size	-0.0975	-0.4800	0.0287	-0.7355	-0.0904	1

Source: Author (2019)

The results confirmed the level of correlation between the dependent variable (interest rate margin) and independent variables (credit risk, capital adequacy, operation efficiency, liquidity risk and bank size). This analysis was also meant to demonstrate whether there was likely to be a problem of multi-co linearity in the regression results. When the correlation coefficient between any two variable combinations was analyzed, results showed that the correlation coefficient between all of the two variable combinations was in the range of below 0.5. The overall correlation relationships between the explanatory variables ranged below 0.5, implying a lower degree of co linearity between the variables.

The correlation relationship between the explanatory variables for measuring interest rate margin for the period 2016 to 2018, which was after bank interest rate capping, is illustrated in table 4.5.

Table 4. 3: Correlations of Interest rate margin Model for the Period 2016-2018

	Interest rate margin	Credit Risk	Capital Adequacy	Operation Efficiency	Liquidity Risk
Interest rate margin	1	0	0	0	0
Credit Risk	0.0526	1	0	0	0
Capital Adequacy	0.0629	-0.3852	1	0	0
Operation Efficiency	0.0902	0.5590	-0.1193	1	0
Liquidity Risk	-0.3139	0.2126	0.1034	0.3319	1

Source: Author (2019)

The results confirmed the level of correlation between the dependent variable (interest rate margin) and independent variables (credit risk, capital adequacy, operation efficiency, liquidity risk and bank size). This analysis was also meant to demonstrate whether there was likely to be a problem of multi-collinearity in the regression results. When the correlation coefficient between any two variable combinations was analyzed, results showed that the correlation coefficient between all of the two variable combinations was in the range of below 0.5. The overall correlation relationships between the explanatory variables ranged below 0.5, implying a lower degree of co linearity between the variables

Table 4. 4: Regression Results for Commercial Banks before Capping of Bank Interest Rate in Kenya for the period 2013-2015

Dependent Variable	Interest rate margin		
	Coeff. (SE)	z-Values	p-Values
Independent variables			
Lagged Interest Rate	0.7998* (0.0611)	13.09	0.000
Credit Risk	0.0197 (0.0258)	0.77	0.444
Capital Adequacy	0.1244* (0.0312)	3.98	0.000
Operation Efficiency	-0.0165 * (0.0078)	-2.10	0.036
Liquidity Risk	-0.0375* (0.0084)	-4.46	0.000
Bank Size	-0.1576** (0.0921)	-1.71	0.087
_Const.	0.0329* (0.0123)	2.67	0.008

Model statistics

F	38.75
Prob > F	0.0000
R-squared	0.7711
Adj. R-squared	0.7512

Asterisks * and ** indicate significant at the 5% and 10% level respectively.
Source: Author (2019)

The model of analysis of bank specific economic determinants influencing interest rate margins of commercial banks in Kenya was assessed. The results showed that the model had R-squared value of 0.7711 indicating that the model accounted for 77.11% of the variation in the bank specific factors which were used in the analysis and the model was good to be utilized in analysis of the bank specific factors, p=0.000< 0.05, at 5 percentage level of significance. The model delivered an intercept estimate of 0.0329 which was a positive and significant, p=0.008< 0.05, at 5 percentage level of significance. According to Everitt (2002), the intercept is the parameter in an equation derived from a regression analysis corresponding to the expected value of the response variable when all the explanatory variables are zero. From the above regression equation, it was revealed that holding credit risk, capital adequacy, operation efficiency and liquidity to a constant zero; the intercept coefficient was positive and statistically significant at 5 percent level indicating that most of the variables were captured in the model which determined interest rate margin for the thirty eight commercial banks in Kenya under the period of study.

The results showed coefficient of the variable representing lagged interest rate margin (p=0.000< 0.05) which was positive and significant at 5 percent level of significance. This implied that the previous year's interest rate margin had a positive effect on the current interest rate margin.
The results also showed that the coefficient for capital adequacy was positive and significant, p=0.000< 0.05, at 5 percent level of significance. This implied that increasing equity capital increases interest rate margin in the commercial banks in Kenya.

The coefficient of the variable for operation efficiency was negative and significant, p=0.000< 0.05, at 5 percent level of significance. This meant that as operation efficiency increased interest rate margins reduced in the commercial banks of Kenya. Although the relationship between operating expenditure and bank interest rates appears straightforward implying that higher expenses meant increased interest rate margin and the opposite, this could not always be the case. The reason is that higher amounts of operating expenses could be associated with higher volume of banking activities and therefore higher revenues necessitating the commercial bank to reduce interest rate margins for their customers. This was supported by Anjichi (2014) who observed that a higher amount of expenses was associated with higher volume of banking activities and therefore higher revenues and lower interest rate margins.

The coefficient of the variable for liquidity risk was negative and significant, p=0.000< 0.05, at 5 percent level of significance. This implied that interest rate margins for commercial banks in Kenya which were highly liquid were associated with lower interest rate margins as they did not have to incur extra costs of sourcing funds when faced with increased demand for credit.

The results showed coefficient of the variable of bank size (p=0.087< 0.1) which was negative and significant at 10 percent level of significance. The bank size had a negative effect on the current interest rate margin implying that as a banking institution grew it tended to add lower interest rate to the central bank base rate. The reason could be that the institution gains market power as it grows to attract more funds and also gains from economies of scale and technology thereby making cheaper funds available to its customers. This finding was supported by Radha (2011) who observed that different segments of the banking sector in Kenya was influenced by bank size influencing lending decisions.

The results for the system GMM estimation after the bank interest rate capping is shown in Table 4.7.

Table 4. 5: Regression Results for Commercial Banks after Capping of Bank Interest Rate in Kenya for the period 2016-2018

Dependent Variable	Interest rate margin		
	Betas (SE)	z-Values	p-Values
Independent variables			
Lagged Interest Rate	0.4246* (0.1636)	2.60	0.009
Credit Risk	0.0259 (0.0215)	1.20	0.230
Capital Adequacy	0.0479** (0.0291)	1.64	0.100
Operation Efficiency	-0.0061 (0.0047)	-1.28	0.200
Liquidity Risk	-0.0304 (0.0168)	-1.81	0.071
_Const.	0.0422* (0.0221)	2.00	0.045
Model statistics			
F	5.94		
Prob > F	0.000		
R-squared	0.3406		
Adj. R-squared	0.2832		

Source: Author (2019)

The model of analysis of bank specific economic determinants influencing interest rate margins of commercial banks in Kenya was assessed. The results showed that the model had R-squared value of 0.3416 indicating that the model accounted for 34.16 percent of the variation in the bank specific factors which were used in the analysis and the model was good to be utilized in analysis of the bank specific factors, p=0.000< 0.05, at 5 percentage level of significance. The model delivered an intercept estimate of 0.0422 which was a positive and significant, p=0.045< 0.05, at

5 percentage level of significance. According to Everitt (2002), the intercept is the parameter in an equation derived from a regression analysis corresponding to the expected value of the response variable when all the explanatory variables are zero. From the above regression equation, it was revealed that holding credit risk, capital adequacy, operation efficiency and liquidity to a constant zero; the intercept coefficient was positive and statistically significant at 5 percent level indicating that most of the variables were captured in the model which determined interest rate margin for the thirty eight commercial banks in Kenya under the period of study.

The results showed coefficient of the variable representing lagged interest rate margin (p=0.000< 0.07) which was positive and significant at 5 percent level of significance. This implied that the previous year's bank interest rate had a positive influence on the current interest rate margin.
The coefficient for capital adequacy was 0.0479 and significant at 10 percent level of significance $(p = 0.1000 < 0.01)$ indicating that capital adequacy influenced interest rate margin.

9.5 Hypotheses Testing
The stated hypotheses were tested in various sections in this study and the summary of the results before and after the interest rate capping in Kenya were as follows:

Ho₁: Credit risk has no significant effect on interest rate margins of commercial banks in Kenya.
The observed test statistic, $P = 0.444 > 0.05$, of the coefficient of credit risk among the commercial banks in Kenya was not significant at 5 percent level before bank interest rate capping implying that credit risk determined the bank interest rate. Therefore the null hypothesis was not rejected at the 5 percent level of significance.
After bank interest rate capping, that is, for the period covering 2016 to 2016, test statistic was $P = 0.282 > 0.05$, which was not statistically significant at 5 percent level of significance implying that credit risk did not influence determination of interest rate margin among the commercial banks in Kenya.

Ho₂: Capital adequacy has no significant effect on interest rate margins of commercial banks in Kenya.
The observed test statistic, $P = 0.000 < 0.0.05$, relating to the coefficient of the capital adequacy among the commercial banks in Kenya was significant at 5 percent level. Therefore the null hypothesis was rejected at the 5 percent level of significance. This implied that capital adequacy determined interest rate margin influenced the interest rate margin at 5 percent level of significance.
After bank interest rate capping, test statistic, $P = 0.390 > 0.05$, was not statistically significant at 5 percent level of significance implying that capital adequacy did not influence the interest rate margin among the commercial banks in Kenya.

Ho₃: Operation efficiency does not significantly influence interest rate margins of commercial banks in Kenya.
The observed test statistic, $p = 0.036 < 0.05$, relating to coefficient of operation efficiency among the commercial banks in Kenya was significant at 5 percent level. Therefore the null hypothesis was rejected at the 5 percent level of significance. This implied that operation

efficiency influenced bank interest rate margin at 5 percent level of significance.

After bank interest rate capping, test statistic, $P = 0.689 > 0.05$, was not statistically significant at 5 percent level of significance. This therefore meant that the null hypothesis was not rejected at the 5 percent level of significance. Hence operation efficiency did not influence interest rate margin among the commercial banks in Kenya.

Ho₄: Liquidity risk does not significantly influence interest rate margins of commercial banks in Kenya.

The observed test statistic, $P = 0.000 < 0.0.05$, relating to the coefficient of liquidity risk among the commercial banks in Kenya was significant at 5 percent level. Therefore the null hypothesis was rejected at the 5 percent level of significance. This implied that liquidity risk influenced the bank interest rate.

After bank interest rate capping, test statistic, $P = 0.958 > 0.05$, was not statistically significant at 5 percent level of significance. Therefore the null hypothesis was not rejected at the 5 percent level of significance. This implied that liquidity risk did not influence the interest rate margin among the commercial banks in Kenya.

Ho₅: Bank size does not significantly influence interest rate margins of commercial banks in Kenya.

The observed test statistic, $p = 0.087 > 0.05$, relating to the coefficient of the bank size among the commercial banks in Kenya was not significant at 5 percent level but significant at 10 percent level of significance, $p = 0.087 < 0.10$. This implied that bank size influenced the interest rate margin at 10 percent level of significance. Therefore the null hypothesis was rejected at the 10 percent level of significance implying that bank size influenced the interest rate margin.

After bank interest rate capping, test statistic, $P = 0.958 > 0.05$, was not statistically significant at 5 percent level of significance implying that liquidity risk did not influence the interest rate margin among the commercial banks in Kenya. Therefore the null hypothesis was not rejected at 5 percent level of significance

10 CONCLUSIONS AND POLICY IMPLICATIONS

10.1 Conclusion

Upon application of GMM model before and after the interest rate capping, various results were depicted as discussed in this section.

10.1.1 Before Interest Rate Capping

Application of GMM model before the interest rate capping, indicated that holding credit risk, capital adequacy, operation efficiency and liquidity to a constant zero; the intercept coefficient was positive and statistically significant at 5 percent level indicating that most of the variables were captured in the model which determined interest rate margin for the thirty eight commercial banks in Kenya under the period of study.

The results also showed that the coefficient for capital adequacy was positive and significant at 5 percent level of significance implying that increasing equity capital increases interest rate margin

in the commercial banks in Kenya. The coefficient of the variable for operation efficiency was negative and significant, at 5 percent level of significance. This meant that as operation efficiency increased interest rate margins reduced in the commercial banks of Kenya.

The coefficient of the variable for liquidity risk was negative and significant at 5 percent level of significance. This implied that interest rate margins for commercial banks in Kenya which were highly liquid were associated with lower interest rate margins as they did not have to incur extra costs of sourcing funds when faced with increased demand for credit.

The results showed coefficient of the variable of bank size was negative and significant at 10 percent level of significance. The bank size had a negative effect on the current interest rate margin implying that as a banking institution grew it tended to add lower interest rate to the central bank base rate.

10.1.2 After Interest Rate Capping
The results showed coefficient of the variable representing lagged interest rate margin which was positive and significant at 5 percent level of significance. This implied that the previous year's bank interest rate had a positive influence on the current interest rate margin.

The coefficient for capital adequacy was 0.0479 and significant at 10 percent level of significance indicating that capital adequacy influenced interest rate margin.

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