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The Determinants of Interest Rates Spread in Kenya

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Abstract

Purpose: The main objective of the study was to analyze the determinants of interest rate spread in the Kenyan economy. Its specific objectives were to establish the bank specific factors macroeconomic factors and industry specific factors that influence the interest rate spread in Kenya.

Methodology: This study analyzed the determinants of interest rate spreads in Kenya by focusing on eight banking institutions that significantly control deposits and loans market. The study used panel least squares estimation technique on annual data between years 2002 to 2011 to analyze the determinants of interest rates spreads as grouped in literature under: Bank-Specific Factors, Industry-specific data and Macroeconomic factors. The study was carried out using panel quantitative data analysis which involved the panel unit root test; Levin-Lin Chu and Im-Pesaran-Shin Tests and among other diagnostic tests including normality test, heteroscedasticity, Multicollinearity and Hausman tests. The study also used descriptive statistics such as mean, standard deviation. Due to the nature of the study STATA software was used to analyze the data. The analyzed data was then presented using figures, tables and graphs.

Results: Among the bank specific factors the results revealed that non interest income, nonperforming loans and loan asset ratio were significant. In addition among the industry specific factors liquid asset ratio and loan asset ratio were significant. While the finding revealed that only Treasury bill was significant among the macroeconomic factors. These results imply that non interest income, nonperforming loans and loan asset ratio greatly affect interest rate spread negatively. While liquid asset ratio and loan asset ratio greatly contributes to the interest rate spread negatively.

Unique contribution to theory, practice and policy: Several recommendation emanate from the study. Firstly, the high responsiveness of banks spreads to the proxy for the Treasury bill suggests that deregulation must eventually take place. Secondly, banks must continue to seriously deal with the issues of the high levels of non- performing loans and the diseconomies of scale in their operations. Thirdly, if there is to be any success in reducing banks' interest rate

spreads to support long- term economic growth, the competitive environment in the banking system must be enhanced

Keywords: *bank specific factors, macroeconomic factors, interest rate spread, industrial factors*

1.0 INTRODUCTION

The interest rate spreads (measured as the difference between deposit and lending rates) not only indicate the level of in efficiency of the banking sector but show the level of development of the financial system. Bank interest rate spreads have several important implications for growth and development of any economy (Quaden, 2004). Specifically, high interest rate spreads tend to discourage potential savers and thus limiting the quantum of funds available to potential investors. A reduction in lending arising from low savings often leads to low investment and thus the economic growth rate Valverde, Del Paso and Fernandez, (2004).

Empirical studies in developed countries on the determinants of interest rates margin, Saunders and Schumacher (2000) and Maudos and Guevara,(2004), in the European banking sector, Angbanzo,(1997) in the USA and Williams,(2007), in Australia, have found margins to be positively related to the degree of market concentration. Another common consensus in this literature is the positive impact of operational costs banks are facing, which suggests that the technological regime of the bank plays an important role in its pricing strategy. However, there are also some contradictory results reported. For example, Williams (2007), finds a negative relationship between credit risk and interest margin in Australia and interpret this finding by arguing that banks are mispricing the credit risk. Among these studies reviewed such as Saunders and Schumacher (2000), Maudos and Guevara (2004) in the European Union, Angbanzo (1997), in the USA and Williams (2007), in Australia has often lead to inconsistency in the results found on the determinants of interest rates. Some of these inconsistencies are where factors are found to have a positive and significant effect on interest rate spread whereas in other scenarios the relationship is found to be negative. The current study therefore will establish the effect of these factors on the interest rate spread.

Saunders and Schumacher (2000) while examining the interest rate spread for six European countries and the US for the period 1988-1995 found that the banks in these regions were affected by the degree of bank capitalization, bank market structure, and the volatility of interest rates. This study looks at the three categories of factors affecting interest rate spread, however the three categories as adopted in the study is not inclusive of all the factors affecting interest rate. For instance the study looks at volatility which is a macroeconomic factors leaving out other factors such as inflation and real GDP growth.

Within the developing countries studies on the interest rate spread that have been reviewed include those of Brock and Rojas (2000); Robinson(2002); Brock and Franken (2002); Bawumia, Belnye and Ofori (2005) among others. Brock and Rojas (2000) in their study of interest rate spreads in five Latin American countries (Argentina, Bolivia, Colombia, Chile and Peru) during the mid-1990's found that the capital ratio, cost ratio, and the liquidity ratio were statistically significant. In the second stage, the study also examined the effect of macroeconomic variables on interest rate spreads. The results indicated that interest rate volatility increased bank spreads in Bolivia and Chile; the same happened with inflation in Colombia, Chile and Peru. For the other cases, the coefficients were not statistically significant. Despite a tremendous effort to

adopt a more comprehensive approach to interest rate spread this study was conducted in a developing economies and as with the study of Angbazo (1997) which was performed in a developed economy its finding cannot be generalized to the Kenyan context.

Within Africa, the studies reviewed which have examined interest rate include studies done by Bawumia, Belnye and Ofori (2005), Chirwa and Mlachila (2004), Eita (2012), and Samahiya and Kaakunga (2014). For instance in Ghana, according to Bawumia, Belnye and Ofori (2005) asserted that the advanced failure of interest spreads in developing countries to decline in the context of financial liberalization were mainly due to; lack of changes in the structure and institutional behavior of the banking system, High reserve requirements, adverse selection and adverse incentive (moral hazard) effects which could result in mounting non-performing loans and provision for doubtful debts, High operational costs were also considered to be a source of persistent and wide intermediation spreads (Bawumia, Belnye and Ofori,2005).

Beck, Cull and Gatenga, (2010) examine developments in Kenya's financial sector with a specific focus on stability, efficiency and outreach, and use interest rate spreads as a proxy for the efficiency of financial intermediation. They base their analysis on ex-post constructed spreads and decompose the spreads into different components based on a set of factors such as overhead costs, loan loss provisions and taxes.

According to Kenya Vision 2030 (2008),vision on financial service sector, one of the constraints that will have to be overcome is to lower the present interest rate spread between lending and deposit rates. At 8.6 per cent, the spread is too high for the purposes of mobilizing savings and credit expansion. An acceptable range for interest rate spread would be between 5 per cent and 6 per cent. Institutional reforms are needed in several related segments, including; the commercial justice system; transparency and efficiency in the registration of collateral; improvements in land registration and the companies registry; and expansion of private credit reference bureaus. Completing these reforms will make the financial system capable of competing with others in the region.

1.2 Problem Statement

The widening interest rate spread in Kenya is a concern for both policy makers and households. Despite policy interventions and structural reforms in the financial sector, the spread has consistently risen from the year 2003 up to 2010 with an insignificant drop in year 2011. These spread is also higher than what is experienced by emerging and developed economies. The causes of this persistently increasing interest rate spread despite the many reforms are not known as indicated in the Vision 2030, the bank interest rate spread needs to be maintained at a sustainable level of about 5 per cent to 6 per cent. Among the reviewed studies on interest rate spread there has been conflicting results on the determinants of interest rate spread globally. Such studies have looked at the macro-economic factors while others have explored the bank-specific factors and equally others have examined the bank-industry factors. Few studies within Kenya have adopted a comprehensive and combined approach of including bank specific, industry specific and macro economic factors in analyzing the interest rate spreads in Kenya. Furthermore, the use of panel data methodology has been infrequent in establishing the factors influencing the interest rate spread in Kenya. This study therefore sought to find out the causes of continually widening interest rate spreads in Kenya by establishing the empirical evidence

obtained from analyzing the bank specific, industry specific and the macro economic factors using a panel data methodology.

1.3 Objectives

The study was guided by the following specific objectives;

i. To establish the bank specific factors that influence the interest rate spread.
ii. To investigate the macroeconomic factors that influence the interest rate spread.
iii. To examine the industry specific factors that influence the interest rate spread

2.0 LITERATURE REVIEW

2.1 Theoretical Literature Review

According to Da Silva, Oreiro, de Paula and Sobreira (2007) there are three theoretical approaches to interest rate spread, namely, the monopoly model by Klein (1971), Structure-Conduct-Performance (SCP) theory whose origin can be traced to the work of the Harvard economist Edward Mason in the 1930s and the dealership model of Ho and Saunders (1981). The monopoly model also known as the Klein-Monti Model considers a monopolistic bank as a firm whose main business is to produce deposit and loan services. The difference between deposits and loans can be borrowed on the interbank market. Thus, a firm can borrow funds on the interbank market in case it does not have sufficient deposits to make out more loans. It is believed that the bank has monopolistic power in either the deposit or credit (loan) market, which, in turn, affects its business operations. Consequently, this monopolistic power manifests itself in interest rate spreads. In this case, the bank is able to charge a price higher than its marginal cost. Therefore, the monopoly model predicts that due to monopolistic power, larger commercial banks exercise market control over smaller banks and influence the market price, which in this case, is the interest rate spread. Another outcome of the monopoly model is that the interest spread is an increasing function of banking sector concentration.

Similar to the monopoly model, the Structure-Conduct-Performance (SCP) theory of industrial organization maintains that market concentration encourages firms to adopt less competitive behavior which leads to inefficient markets. The SCP model argues that firms adopt anti-competitive strategies such as collusion and that such behavior impacts on their performance Tushaj, (2010). Therefore, the SCP paradigm implies that market concentration is positively related to interest rate spread. However, the efficient market hypothesis argues to the contrary. Under the efficient market hypothesis, it is argued that bigger banks tend to have narrower spreads due to economies of scale. Thus, variables such as bank size and market power influence a firm's price decision.

The dealership model views a bank as an intermediary between the borrower (firms) and the final lender (households). In this model, the bank faces two types of uncertainty. The first uncertainty is due to lack of harmonization between the loans and deposits which leads to an interest rate risk for the bank Ho and Saunders, (1981).

The second uncertainty that the bank faces concerns the default risk by its customers. The dealership model postulates that a bank lacks knowledge, ex-ante, about the likelihood of default by its customers in the credit market and that this uncertainty exposes the bank to a credit risk.

The more exposure to default risk the bank has, the more likely the bank will widen its interest rate spread in order to shield itself against the risk. This suggests that the interest rate spread is directly related to non-performing loans (NPLs), thus the higher the NPLs the wider the interest rate spread.

2.2 Empirical Literature

Samahiya and Kaakunga(2014) conducted a study on determinants of commercial banks' interest rate spread in Namibia. The study adopted a panel data analysis of bank level data. It also applied the OLS technique to identify the bank-specific variables that have been influencing interest rate spread in Namibia over the period 2004 -2011. The results of the study indicate that deposit market share, liquidity levels and operating costs are the main bank-specific determinants of interest rate spread in Namibia. More specifically, they found that the deposit market share and operating costs reduces net interest margin whilst the liquidity levels of a commercial bank increases its net interest margin. Furthermore, it was revealed that the tax paid by a bank, non-performing loans and the capital ratio are not important determinants of the net interest margin. This study falls short by taking *apriori* that interest rate spreads are determined only by bank-specific characteristics. The interest rate spread is broad than the scope that this study examined and as a result a more broad approach to interest rate spread is necessary to investigate the determinants of interest rates spread.

Perez, (2011) conducted a study on the determinants of interest rate spread in Belize. This study examined the components of interest rate spreads using accounting data and identifies the factors that affect interest rate spreads using a panel dynamic least squares model. The study concludes that market share and adversely classified loans are two main determinants of the spread. Based on these findings, the study suggests policy recommendations to reduce information asymmetries and increase competition in the Belizean financial sector. Despite the use of panel regression techniques and use of fixed and random effects model, the study only looks at the bank specific factors totally disregarding the impact of, industry-specific, and macroeconomic variables on the interest rate spread.

Chirwa and Mlachila (2004) conducted a study on financial reforms and interest rate spreads in the commercial banking system in Malawi. The study used monthly panel data from five Malawian commercial banks for the period 1989–99. The study results showed that that spreads increased significantly following liberalization, and panel regression results further suggest that the observed high spreads can be attributed to high monopoly power, high reserve requirements, high central bank discount rates, and high inflation. However, this study only sought to assess the contribution of market characteristics and policy-driven factors to the behavior of commercial bank interest spreads. As a result, this study fails to examine other factors that affect the interest rate spread which includes the industry specific factors as well as the bank specific factors. There is no predetermined expectation that macroeconomic factors are the only factors that affect interest rate spread.

Eita (2012) conducted a study on the determinants of interest rate spread in Namibia for the period 1996-2010. The study adopted a cointegrated vector autoregression (VAR) approach and the results indicated that interest rate spread in Namibia is determined by Treasury bill rate, inflation rate, the size of the economy, financial deepening, bank rate or discount rate and exchange rate volatility. Treasury bill rate, inflation rate and bank rate are associated with an

increase in interest rate spread. The size of the economy and financial deepening are associated with a decrease in interest rate spread. The results suggest that an increasing interest rate policy pursued by the government can cause interest rate spread to rise. Increase in the cost of funds to commercial banks may be passed to consumers in the form of higher interest rate spread. An increase in the cost of doing business will cause interest rate spread to rise. The study thus concluded that interest rate spread can be reduced by increasing the size of the economy which allows for economies of scale and greater competition. It also concluded that financial deepening, which allows a high level of interbank competition, can also reduce the interest rate spread. Just like the reviewed studies above this study also failed to address itself to the bank-specific and industry specific factors that affect interest rate spread. Similarly, there predetermined expectations that the only factors that affect interest rate spread are macroeconomic in nature. This study therefore seeks to take a more holistic approach to interest rate by incorporating both bank-specific and industry-related factors affecting interest rate spread.

Hossain (2012) conducted a study on the determinants of high bank interest spreads in Bangladesh. The study examined the interest rate spread of Bangladesh for the period 1990-2008 using Arellano-Bover Blundell-Bond dynamic panel regression model to a panel of 43 banks and the results revealed persistency in interest spreads and margins. The results also found that high administrative costs, high non-performing loan ratio and some macroeconomic factors are the key determinants of persistently high interest rate spreads and margins. Persistently high spreads and margins in old private banks (established before 1999) are attributed to a certain degree of market power in the post-liberalization period (after 1999). The study concluded that these factors together imply a lack of competition and efficiency in the banking sector of Bangladesh despite financial reforms. Despite the fact that these studies examined macro-economic, industry-related factors as well as the bank-specific factors, it was performed in Bangladesh as thus presenting a contextual gap that this study seeks to address by looking at the determinants of bank-interest rate spread in Kenya.

Dabla and Floerkemeier, (2007) on a study on bank efficiency and market structure in Armenia notes that despite far-reaching banking sector reforms and a prolonged period of macroeconomic stability and strong economic growth, financial intermediation has lagged behind other transition countries, and interest rate spreads have remained higher than in most Central and Eastern European transition countries. Their study examined bank interest rate.

Independent Variable **Dependent Variable**

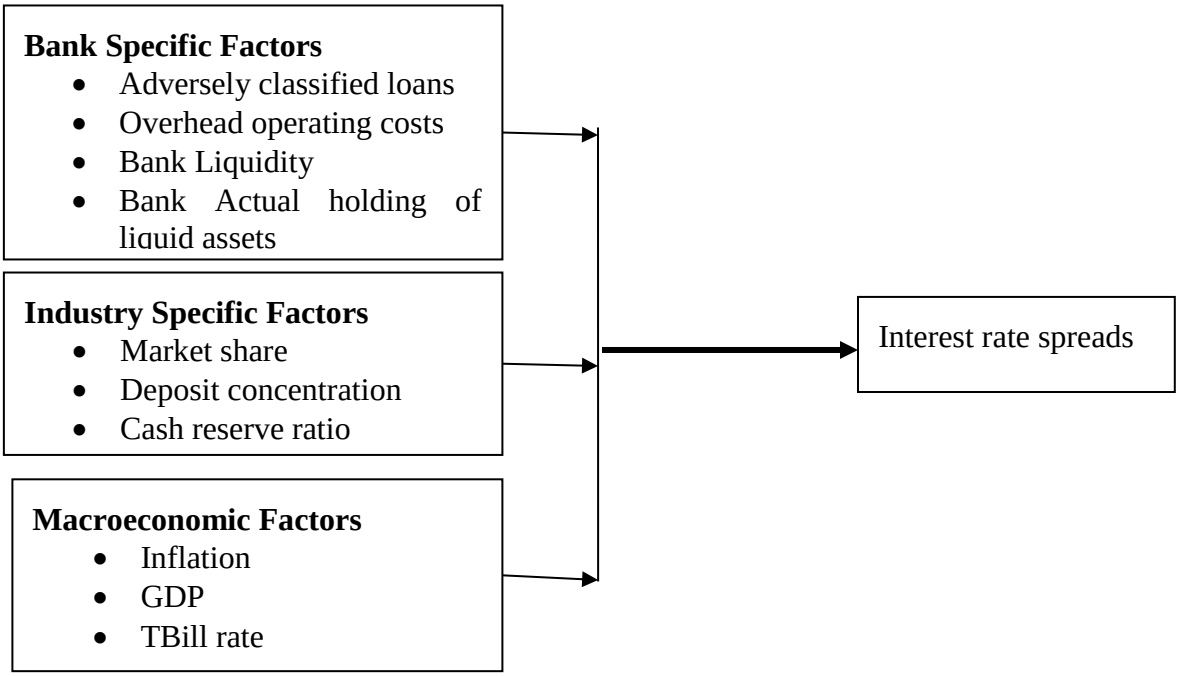

Figure 1: Conceptual Framework

Source: Ghosh, (2008).

2.3 Econometric Model Specification

The study was based on the model by Ghosh, (2008), the general model takes the following form:

$$WIM_{it}=\beta_0+\beta_1 K_{it}+\beta_2 Z_t+\beta_3 M_t+\varepsilon_{it} \quad \varepsilon_{it} \sim N(0,\sigma^2) \quad \ldots\ldots\ldots(1)$$

The current study modified the above model in attempt to assess the factors that affect interest rate spreads. The modified model can been decomposed into;

K- Bank-specific variables,

Where K constitutes; adversely classified loans, overhead operating costs, bank liquidity, Bank Actual holding of liquid assets

Z- Industry specific variables

Where Z constitutes; cash reserve requirements, market share and concentration of deposits.

M- Macro-economic variables

Where M constitutes; GDP growth, Treasury bill rate and inflation

***i*- Indexes banks**

***t* - Denotes year**

WIM- Measures wide interest margin which measures the interest rate spread.

Apriori expectations from the literature review, Poghosyan & Poghosyan (2010), Perez (2011) suggest a positive correlation of interest rate spreads with adversely classified loans, cash reserve requirements, operating cost, the ratio of actual holdings to required holdings, excess liquidity, market share and GDP growth; while concentration of deposits, inflation, 91 day treasury bill rate and non-interest income should be negatively correlated with the interest rate margin.

3.0 RESEARCH METHODOLOGY

The study employed explanatory research design. Both time series and cross section data were collected for the eight financial institutions. A sample of eight major commercial banks in Kenya was drawn from the population. Purposive sampling was used. Data was collected from secondary sources mainly, which included but not limited to published financial statements of the eight commercial banks over the period 2002 to 2011. The study used quantitative data analysis. This involved the panel unit root test Levin-Lin and Chu test. The study also used descriptive statistics. Due to the nature of the study STATA software was used. Diagnostic tests were conducted in the study given that panel data set was used.

4.0 RESULTS AND DISCUSSIONS

4.1 Descriptive Results

Results in Table 1 shows that the mean of interest rate spread during the period under study was 0.761429 with a standard deviation of 0.023853 implying that the interest rate spread had a minimum variation in that period. The results also further indicate that Bank operating cost had a mean of 0.0797143 with a standard deviation of 0.0210673 implying that there was a minimum variation in the banks operating cost in that period. The mean of Liquidity ratio was 0.3886429 with a standard deviation of 0.1679373 which implies that the Liquidity ratio had a minimum variation in that period whereas the mean of Bank's liquid asset ratio was 0.3377143 with a standard deviation of 0.1415196. The results also indicated that the mean of the bank's non-interest income was 0.0288714 with a standard deviation of 0.0120252.

Table 1: Unit Root Tests at Level

Variable	Obs	Mean	Std. Dev.	Min	Max
spread_exp~t	70	.0761429	.023853	.03	.14
oc_ratio	70	.0797143	.0210673	.042	.122
liquidratio	70	.3886429	.1679373	.033	.82
liquid_ass~o	70	.3377143	.1415196	.03	.694
nii_assets~o	70	.0288714	.0120252	.009	.052
crr	70	.0615	.0157026	.045	.1
loans_asse~o	70	.5806286	.2644129	.254	1.664
deposit_conc	70	.0885429	.049163	.02	.203
gdpgrowth	70	.0421	.0209998	.005	.07
inflation	70	.0875	.0424021	.02	.151
tbill	70	.066	.0207399	.03	.09
npls	70	5587.386	5645.558	100	20920.08

The Cash reserve requirements had a mean of 0.0615 with a standard deviation of 0.0157026 while the mean of Loans to asset ratio was 0.5806286 with a standard deviation of 0.2644129 implying that the variation in Loans to asset ratio in that period was minimum. The market share and concentration of deposits had a mean of 0.0885429 and a standard deviation of 0.049163 while the GDP Growth had a mean of 0.0421 and a standard deviation of 0.0209998. The mean of inflation during the period under study was 0.0875 with a standard deviation of 0.0424021 while the mean of Treasury bill was 0.66 with a standard deviation of 0.0207399 which implies that there was a minimum variation in that period and non performing loans had a mean of 5587.386 and a standard deviation of 5645.558.

4.2 Unit Root Tests

Most economic variables are usually non-stationary in nature and thus the univariate analysis (test for unit roots) was performed in order to check whether the variables have a unit root. The three popular panel unit roots tests (Levin-Lin Chu, Im-Pesaran-Shin Test and Maddala and Wu) the Levin-Lin Chu test is of limited use, because the null hypothesis and the alternative hypothesis are so strict that it is not realistic in practice Hoang and McNown, (2006). The Im-Pesaran-Shin (IPS) test is not as restrictive as the Levin-Lin-Chu test, since it allows for heterogeneous coefficients. The null hypothesis is that all individuals follow a unit root process and thus the study adopted the Im-Pesaran-Shin Test.

The results in the table 2 below indicates that Cash Reserve Requirements, GDP Growth, Inflation Rate and Treasury Bill Rate at level and therefore are said to be stationary and integrated of order zero i.e. I(0). Interest Rate Spread, Operating Costs Ratio, Liquidity Ratio, Liquid Assets Ratio, Non-interest Income assets ratio, Loans Asset Ratio and non performing

loans were established to be non-stationary at level as indicated in Table 2 below and they were therefore difference and also tested for stationary.

Table 2: Unit Root Tests at Level

Variables	IPS t-stat	Critical Values			P-value	Decision
		1%	5%	10%		
Interest Rate Spread	-1.9463	-2.470	-2.170	-2.010	0.1381	Non-stationary
Operating Costs Ratio	-2.315	-2.470	-2.170	-2.010	0.0354	Stationary
Liquidity Ratio	-2.01	-2.470	-2.170	-2.010	0.3709	Non-stationary
Liquid Assets Ratio	-1.6144	-2.470	-2.170	-2.010	0.3478	Non-stationary
Non-interest Income assets ratio	-1.3815	-2.470	-2.170	-2.010	0.5331	Non-stationary
Cash Reserve Requirements	-4.4826	-2.470	-2.170	-2.010	0.0000	Stationary
Loans Asset Ratio	-2.088	-2.470	-2.170	-2.010	0.0737	Non-stationary
Deposit Concentration	-1.0855	-2.470	-2.170	-2.010	0.8704	Non-stationary
GDP Growth	-2.6906	-2.470	-2.170	-2.010	0.0032	Stationary
Inflation Rate	-3.7066	-2.470	-2.170	-2.010	0.0001	Stationary
Treasury Bill Rate	-3.3166	-2.470	-2.170	-2.010	0.0003	Stationary
npls	-1.1184	-2.470	-2.170	-2.010	0.8387	Non stationary

4.3 Unit Root Analysis at First Difference

Given that Interest Rate Spread, Operating Costs Ratio, Liquidity Ratio, Liquid Assets Ratio, Non-interest Income assets ratio Loans Asset Ratio and non performing loans were non-stationary at level thus they were differenced and tested for stationarity. The Table 3 below presents the results for the unit root test where the results are indicative of the absence of a unit root i.e. the variables becomes stationary after first difference and as a result are said to be integrated of order one.

Table 3: Unit Root Analysis at First Difference

Variables	IPS t-stat	Critical Values			P-value	Decision
		1%	5%	10%		
Interest Rate Spread	-3.5587	-2.470	-2.170	-2.010	0.0008	Stationary
Liquidity Ratio	-3.3811	-2.470	-2.170	-2.010	0.0017	Stationary
Liquid Assets Ratio	-3.4285	-2.470	-2.170	-2.010	0.0016	Stationary
Non-interest Income assets ratio	-2.733	-2.470	-2.170	-2.010	0.0071	Stationary
Loans Asset Ratio	-2.8999	-2.470	-2.170	-2.010	0.0042	Stationary

Deposit Concentration	-2.9009	-2.470	-2.170	-2.010	0.0036	Stationary
npls	-2.9512	-2.470	-2.170	-2.010	0.0030	Stationary

4.3.1 Levin-Lin Chu test for unit root at level

The results in the table 4 below indicates that Cash Reserve Requirements, GDP Growth, Inflation Rate, Interest Rate Spread, Operating Costs Ratio, Liquidity Ratio, Liquid Assets Ratio, Non-interest Income assets ratio Loans Asset Ratio and Treasury Bill Rate are stationary at level test and therefore are said to be stationary and integrated of order zero i.e. I (0). While non performing loans are non stationary at level test Table 4 below and they were therefore difference and also tested for stationary.

Table 4: Unit Root Tests at Level

Variable	llc t statistic	P value	Decision
Spread expost	-5.0051	0.0060	Stationary
Oc ratio	-.4.7997	0.0394	Stationary
Liquid ratio	-4.4640	0.0482	Stationary
Liquid asset ratio	-4.4830	0.0287	Stationary
Nii asset ratio	-5.7490	0.0000	Stationary
Crr	-5.7334	0.0415	Stationary
Loans assets ratio	-7.8507	0.0000	Stationary
Deposit conc	-2.8793	0.0234	Stationary
GDP growth	-8.8849	0.0000	Stationary
Inflation	-14.4131	0.0000	Stationary
Tbill	-9.2801	0.0000	Stationary
Npls	-2.9013	0.2394	Non stationary

4.3.2 Unit Root Tests First Difference

Given that a non performing loan was non-stationary at level thus it was differenced and tested for stationarity. The Table 5 below presents the results for the unit root test where the results are indicative of the absence of a unit root i.e. the variables becomes stationary after first difference and as a result are said to be integrated of order one.

Table 5: Unit Root Tests First Difference

Variable	Llc t statistic	P value	Decision
Npls	-5.6714	0.0064	stationary

4.4 Test for Normality of Residuals

The test for normality was first examined using the graphical method approach as shown in the Figure 2 below. The results in the figure indicate that the residuals are normally distributed.

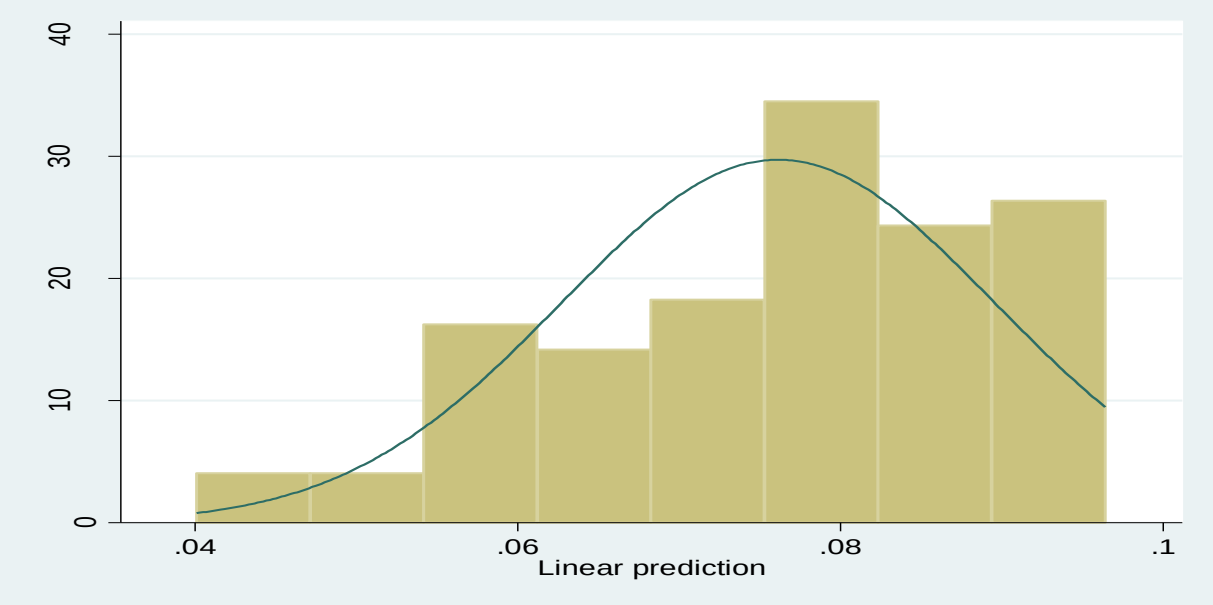

Figure 2: Graphical Examination of Normality of residuals

To further establish whether the residuals are normally distributed the study adopted the Jarque-Bera test which is a more conclusive test than the graphical inspection approach of testing for normality. The Table 6 below indicates the results of the Jarque-Bera test. The null hypothesis under this test is that the residuals are not significantly different from a normal distribution. Given that the p-value is greater than 5% for the residual, the null hypothesis is accepted and thus the conclusion that the residuals are normally distributed.

Table 6: Jarque-Bera Test for Normality of Residuals

```
. sktest r

                    Skewness/Kurtosis tests for Normality
                                                      ------- joint -------
    Variable |   Obs   Pr(Skewness)   Pr(Kurtosis)  adj chi2(2)   Prob>chi2
-------------+-------------------------------------------------------------
           r |    70        0.6369         0.0260         5.08       0.0787
```

4.5 Test for Multicollinearity

According to William *et al.* (2013), Multicollinearity refers to the presence of correlations between the predictor variables. In severe cases of perfect correlations between predictor variables, Multicollinearity can imply that a unique least squares solution to a regression analysis cannot be computed Field, (2009). Multicollinearity inflates the standard errors and confidence intervals leading to unstable estimates of the coefficients for individual predictors Belsley *et al*.,(1980). Multicollinearity was assessed in this study using the correlation coefficients. According to Field (2009) correlation coefficients values in excess of 0.8 is an indication of the presence of Multicollinearity. The results in Table 7 present correlation coefficients results and were established to be less than 0.8 and thus according to Field (2009) indicates that there is no Multicollinearity.

Table 7: Correlation Coefficients Matrix at 5% test

	spread~t	oc_ratio	l~dratio	liquid_~	nii_as~o	crr	loans_~o
spread_exp~t	1.0000						
oc_ratio	0.2974*	1.0000					
liquidratio	-0.0906	-0.4941*	1.0000				
liquid_ass~o	-0.1032	-0.4745*	0.9948*	1.0000			
nii_assets~o	0.2544*	0.7685*	-0.3688*	-0.3443*	1.0000		
crr	-0.2869*	0.2066	0.0335	0.0848	0.2664*	1.0000	
loans_asse~o	-0.1294	0.3461*	-0.6616*	-0.6578*	0.3761*	0.1058	1.0000
deposit_conc	0.3486*	0.4381*	-0.1551	-0.1221	0.6627*	0.1537	0.0611
gdpgrowth	0.0341	-0.1857	-0.0827	-0.1021	-0.0744	-0.5373*	0.0870
inflation	0.0637	-0.0875	-0.1108	-0.1302	-0.0812	-0.4262*	-0.0165
tbill	0.1207	0.0086	-0.0273	-0.0277	-0.0585	0.1651	0.0036
npls	0.0251	0.6281*	-0.5618*	-0.5491*	0.6915*	0.2177	0.7376*

	deposi~c	gdpgro~h	inflat~n	tbill	npls
deposit_conc	1.0000				
gdpgrowth	-0.0560	1.0000			
inflation	-0.0487	-0.1833	1.0000		
tbill	-0.0283	-0.2902*	0.0358	1.0000	
npls	0.4556*	-0.0423	-0.0614	-0.0724	1.0000

4.6 Test for Heteroscedasticity

The error process may be Homoskedastic within cross-sectional units, but its variance may differ across units: a condition known as group wise Heteroscedasticity. The xttest3 command calculates a modified Wald statistic for group wise Heteroscedasticity in the residuals. The null hypothesis specifies that $\sigma^2_i = \sigma^2$ for i =1...Ng, where Ng is the number of cross-sectional units. The results in Table 8 indicate that the null hypothesis of Homoskedastic error terms is not rejected as supported by a p-value of 0.1435.

Table 8: Test of Heteroskedasticity

```
. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (7)   =         9.83
Prob>chi2 =       0.1987
```

4.7 Test for Autocorrelation

Because serial correlation in linear panel-data models biases the standard errors and causes the results to be less efficient, the study adopted the Woolridge test for autocorrelation which identifies serial correlation in the idiosyncratic error term in a panel-data model. From the Table 9 the null hypothesis of no serial correlation is strongly rejected given that the p-value is significant (p-value = 0.0003). This is therefore corrected for in stata using the using the "Xtregar" Command which addresses for the presence of serial correlation.

Table 9: Test of Autocorrelation

```
Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
     F(  1,         6) =      52.939
               Prob > F =       0.0003
```

4.8 Test for Fixed and Random Effects

The Hausman test is the standard procedure used in empirical panel data analysis in order to discriminate between the Fixed and Random Effects model. A fixed effect model assumes differences in intercepts across groups or time periods, whereas a random effect model explores differences in error variances. To establish an appropriate model a Hausman test was performed where the null hypothesis of test is that the preferred model is random effects vs. the alternative the fixed effects. Table 10 illustrates the results of the Hausman test. A resultant p value of 0.000 was less than the conventional p value of 0.05 leading to the rejection of the null hypothesis that the unique errors (*ui*) are t correlated with the regressors and this therefore implies that fixed effects model is more appropriate.

Table 10: Random and Fixed Effects Test

	Coefficients (b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
oc_ratio	.2548478	.2907623	-.0359145	.134381
liquidratio	.3669538	.1230627	.2438911	.2320142
liquid_ass~o	-.4453535	-.1585561	-.2867974	.2615535
nii_assets~o	-.7960492	.3227989	-1.118848	.3977773
crr	-.2614285	-.803379	.5419505	.2029559
loans_asse~o	-.045085	-.0069866	-.0380984	.0073226
deposit_conc	.081496	.1655283	-.0840323	.0885047
gdpgrowth	-.0141063	-.2169222	.2028159	.
inflation	-.0417145	-.1093047	.0675902	.
tbill	.1642722	.1780185	-.0137463	.
npls	9.38e-07	-1.14e-06	2.08e-06	9.54e-07

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(10) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 10.11
Prob>chi2 = 0.4309
(V_b-V_B is not positive definite)

4.9 Determinants of Interest Rates Spread Model.

The results presented in the Table 11 below shows the results on the determinants of interest rate spreads. The results indicate that the interest rate spread is affected by liquid asset ratio. More specifically, rate spread is found to be negatively (β = -0.3742) and significantly (p = 0.042) affected the liquid asset ratio. The study also found that interest rate spread is negatively and significantly affected by non interest income asset ratio (β = -6311, p =0.045) Treasury Bill Rate affects interest rate spread. More specifically, interest rate spread is found to be positively (β = 0.267) and significantly (p = 0.01) affected by the Treasury Bill Rate. The results further indicate that interest rate spread is negatively (β = -0.0341) and significantly (p = 0.004) affected by Loans Asset Ratio and nonperforming loans is negatively (β = -1.140) and significantly (p = 0.002) affected by interest rate spread.

Table 11: Determinants of Interest Rate Spread in Kenya

Variables	Coef.	Std.	t	P>t
oc_ratio	0.2216	0.2518	0.880	0.384
Liquidratio	0.3039	0.2762	1.100	0.277
liquid_assets_ratio	-0.3742	0.1880	-1.990	**0.042**
nii_assets_ratio	-0.6311	0.3187	-1.980	**0.045**

Crr	-0.2977	0.3461	-0.860	0.394
loans_assets_ratio	-0.0341	0.1148	-2.970	**0.004**
deposit_conc	0.0788	0.1159	0.680	0.502
Gdpgrowth	-0.0531	0.1658	-0.320	0.750
Inflation	-0.0517	0.0708	-0.730	0.468
Tbill	0.2670	0.0887	3.010	**0.001**
npls	-1.140	0.354	-3.220	**0.002**
_cons	0.1133	0.0409	2.770	0.008

5.0 DISCUSSION CONCLUSIONS AND RECOMMENDATIONS

5.1 Discussion

First objective of the study was to establish the effect of bank specific factors on interest rate spread. The results revealed that non interest income, nonperforming loans and loan asset ratio were significant, operating cost, deposit concentration and liquidity ratio were all found to be non significant These results imply that non interest income, nonperforming loans and loan asset ratio greatly affect interest rate spread negatively. This is consistent with the study of Brock and Rojas (2000) who found out that nonperforming loan was positive and statistically significant.

Another objective of the study was to establish the effect of industry specific factors on interest rate spread. The results indicated that liquid asset ratio and loan asset ratio were significant, while cash reserve ratio was found to be non significant. These results imply that liquid asset ratio and loan asset ratio greatly contributes to the interest rate spread negatively. This is consistent with the study of Angbazo (1997) who found out that the proxies for default risk (ratio of net loan charge offs to total loans) negatively and significantly affects the interest rate spread.

The third objective was to determine the effect of macroeconomic factors on interest rate spread. The finding revealed that only Treasury bill negatively and significantly affects the interest rate spread while GDP and inflation were found insignificant. These results imply that treasury bill greatly contributes to the interest rate spread. This is consistent with the study of Eita, (2012) who found out that interest rate spread in Namibia is determined by Treasury bill rate.

5.2 Conclusions

Based on the findings above the study concluded that non interest income, nonperforming loans and loan asset ratio are the ideal factors that affect the interest rate spread. From these finding the study therefore asserts that there is a significant relationship between non interest income, nonperforming loans and loan asset ratio and interest rate spread.

Secondly, the study concluded that liquid asset ratio and loan asset ratio greatly affect the interest rate spread. These were guided by the findings that revealed that liquid asset ratio and loan asset ratio were significant. From these finding the study therefore asserts that there is a significant relationship between liquid asset ratio and loan asset ratio and interest rate spread

Lastly, the study concluded that Treasury bill affects interest rate spread. These were guided by the findings that revealed that only Treasury bill negatively and significantly affects the interest rate spread. From these finding the study therefore asserts that there exist a relationship between Treasury bill and interest rate spread.

5.3 Recommendations

Several policy implications emanate from the study. Firstly, the high responsiveness of banks spreads to the proxy for the Treasury bill suggests that deregulation must eventually take place. This will eliminate the current distortion and permit spreads to narrow. Secondly, banks must continue to seriously deal with the issues of the high levels of non- performing loans and the diseconomies of scale in their operations. Thirdly, if there is to be any success in reducing banks' interest rate spreads to support long- term economic growth, the competitive environment in the banking system must be enhanced. Lastly the governments need to reduce public borrowings in order to allow the banks to lend to the general public so as to reduce crowding effect of private investments.

5.4 Suggestions for further research

A similar study should be conducted with regard to the other banks which were not captured in this study for comparison purposes. A similar study need to be conducted using other independent variables like monopoly power, central bank discount rates, size of the economy, financial deepening and exchange rate volatility which were not captured in this model. This study can be extended by exploring the impact of financial sector development on interest rate spreads in the banking system. With the establishment of the credit unions and insurance companies in recent times, it would be interesting to examine how those developments have influenced banks spreads in Kenya.

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