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Risk-Based Credit Pricing in Kenya: The role of Banks' internal factors

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Abstract

Globally, credit scoring adoption has been on the rise on account of increased access to data, computing power, and the need for efficient credit allocation that is supportive of entrenching financial inclusion and economic growth. Relatedly, the adoption of risk-based pricing has gained traction, and, in this paper, we use annual bank level and macroeconomic data spanning the period 2003-2021, to estimate a panel model assessing the drivers of price of credit. Credit pricing in Kenya is affected by the bank size, credit risk, and efficiency among others. In particular, the larger the size of the bank, the lower the price of credit. Overall, the results reveals that the implementation of risk-based pricing will be heterogenous and dependent on bank-specific characteristics and internal policies, while the macroeconomic environment will have a negligible role on the credit prices determined by the banks.

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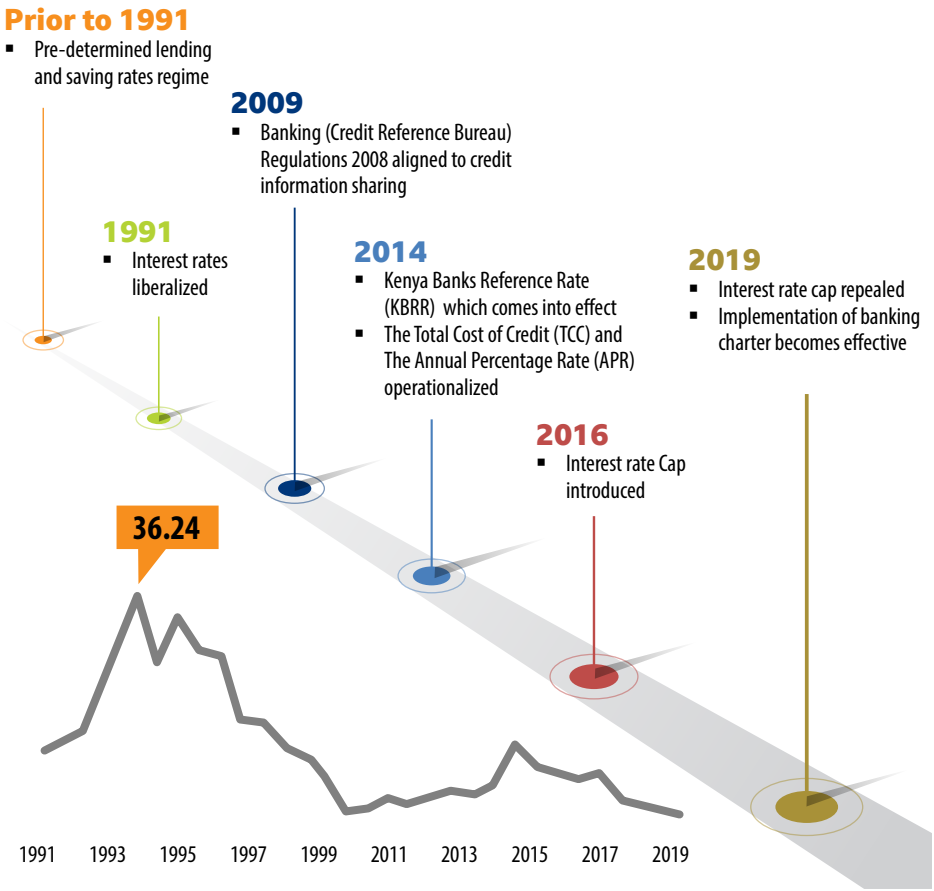
1.0 Introduction

In any business, there is no point in originating transaction that involve great amount of risk for a bitsy return. This logic equally holds for pricing loan products. Since banks are profit maximization entities, they balance the return with the expected loss of capital at risk. Thus, in the event that they are unable to adequately price credit, they tend to shift to less risky investments such as in government securities (KBA, 2022). Even so, the policy makers have often remained concerned as to what extent the latter's pricing mechanism steers the loan market to an optimal market interest rate. Consequently, policy discussions to alleviate pricing constraints to financial inclusion have gained tractions since high interest rates have been argued to have distortional effects on financial inclusion (Olaniyi, 2017) as households and firms would be constrained from accessing bank credit. On the flip side, if the interest rate are considered 'too low', banks would be unable to meet the costs associated with lending, thereby inducing the later to rebalance their portfolio towards trading and fee-related activities (Rajan, 2006; Brei, Borio & Gambacorta, 2020). Thus, the ultimate effect of credit mispricing would be a decline in the volume of credit extended by banks to the economy.

Owing to the a foregoing, the significance of interest rates in the financial system through the allocation of resources in the economy is underscored by the ability to intermediate between potential savers and borrowers (Kinyua, 1997). Hence, for banks to remain sustainable in its financial intermediation role, the interest rates should be able to cover operating costs, the opportunity cost of holding liquid cash and the cost of provision for loans (Ngugi & Wambua, 2004). However, in hindsight, the trends in the lending rates among the commercial banks in Kenya have persistently remained high for potential borrowers, thereby engender wide interest rate spreads which has been persistently experienced over time (Ngugi, 2004). Njuguna & Ngugi (2000) point a number of factors influencing the interest rate spread in Kenya, including microeconomic factors, institutional factors, market fundamentals, financial instability, capital market developments, legal reforms and monetary policy.

The government, in an effort to assuage the high lending rates, has pursued various policy initiatives. As summarized in **Figure 1**, these policy initiatives range from imposition of controls on lending, saving and interest rates, liberalization of interest rates, improving credit information sharing mechanisms, rolling out lending reference rate, that is the Kenya Banks Reference Rate (KBRR), enhanced transparency in credit pricing through disclosure of all charges and fees of bank products on the Cost of Credit website and risk-based credit pricing framework.

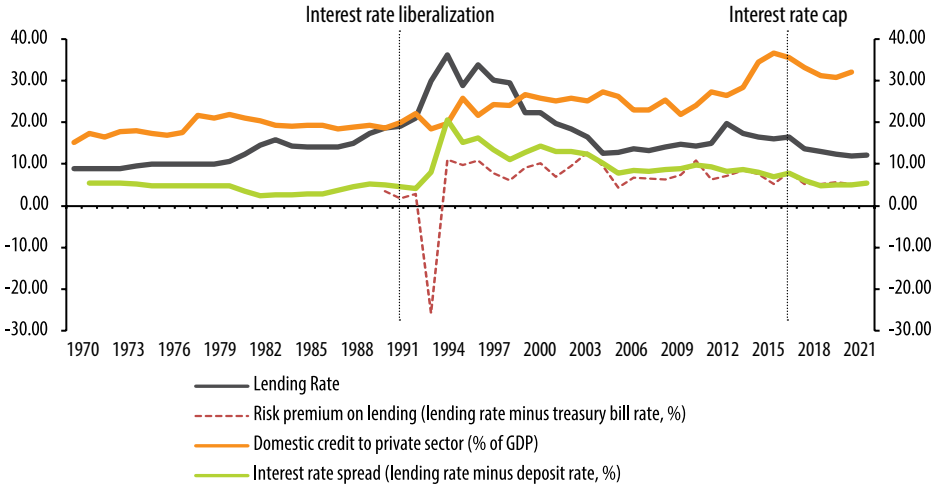
Figure 1: Government Initiatives to lower lending rates, 1991 - 2022



As a result of the banking sector policy reforms, the ratio of banks credit to the private sector to gross domestic product (GDP) took on an upward trajectory (GDP), rising from 15.12 % in 1970 to 22.15 % in 1992, a year after the interest rates were fully liberalized, and a sustained growth was experienced rising up to 35.57 % of GDP in 2016 when the interest rate cap was introduced. From there on, credit growth to the private sector took on a declining trend (**See Figure 2**).

The interest rate liberalization in July 1991, aimed at attracting and promoting new entrants to create competition in the financial sector (Republic of Kenya, 2004), consequently, leading to a competitive economic system, lower intermediation costs and an efficient intermediation process (Wagacha & Ngugi, 2001). This was expected to eventually narrow the interest rate spreads (Njuguna & Ngugi, 2000), as high interest rate spreads signal banking sector inefficiency (Nanjuga, Ntsosa & Motlaleng, 2016). However, the post liberalization period experienced escalating lending rates, which initially rose to an average of 36.24 % in 1994 from 19.00% in 1991. Accordingly, the interest rate spread widened and Ngugi (2001) attributed this scenario to high implicit costs, microeconomic factors, financial instability, high Treasury bill rates, lack of appropriate reforms, a sluggish capital market and tight monetary policies through increased reserve and cash rations.

Figure 2: Trends in credit market indicators, 1970 - 2021



Source: KNBS Economic Survey (Various)

The policy developments in the banking sector notwithstanding, the lending rates remained high triggering the introduction of interest rate capping from September 2016 to November 2019, in order to curtail the cost of borrowing for consumers and cushion borrowers from predatory lending. However, consistent with international experience, which have shown that interest rate caps have produced undesirable outcomes such as: reduction in credit supply; higher non-interest fees and commissions and reduced transparency in the cost structure of bank lending origination; adverse compositional changes in loan and deposit maturity; and reduce the effectiveness of money supply (Safavian and Zia, 2018), the proportion of credit to the private sector declined.

On repealing the interest rate cap in November 2019, the commercial banks affirmed their commitment to CBK on responsible pricing of credit, by implementing the risk-based credit pricing, which is entrenched in the Banking Sector Charter[1]. Thus, the banks will be able to price loans based on the customer's risk profile and all positive and negative information from Credit Reference Bureaus (CRBs). In this context, as demonstrated by various studies (See Edelberg, 2006; Berger, Frame and Miller, 2005; Magri and Pico, 2011; Walke, Fullerton Jr and Tokle, 2018), the increased use of risk-based pricing will anchor increased access to credit by borrowers deemed to be of higher -risk. Nonetheless, the operationalisation faces two hurdles with the potential to suffocate this nuanced strategy to address credit market issues.

First, the Kenyan banks are still faced with the problem of adverse selection. In principle, interest rates applied to borrowers should reflect their default risk (Chatterjee, Corbae, Nakajima and Rios-Rull, 2007), and this positively effects borrowers access to credit market. When banks increase interest rates too much, they would potentially attract the riskiest borrowers. In this case it is rational to fix an upper-bound for the interest rate and reject the applications of the borrowers who are perceived as the riskiest (Stiglitz and Weiss, 1981). Even when asymmetric information can be reduced with the use of credit scoring models, there are still some limits to the possible increases in interest rates related to borrowers' affordability and usury laws. Hence, the riskiest borrowers could be nevertheless left out of the market. Second, as argued by Gambacorta (2008), an increase in the cost of financial intermediation due to operating cost and credit risk leads to higher lending rates since banks attempt to recoup the costs.

This paper relates to empirical work on evidence on banks' risk-pricing on consumer loans (Edelberg, 2006), risk-based pricing and screening for riskier market segments (Berger, Frame and Miller, 2005; Magri and Pico, 2011; Walke, Fullerton Jr and Tokle, 2018; Strahan, 1999) and the importance of the degree of asymmetric information between the bank and the borrower for the pricing decision of banks (Cerqueiro, Degryse, and Ongena, 2011; Gambacorta and Mistrulli, 2014 and Einav, Jenkins and Levin (2012). However, our focus deviates from these previous studies. We acknowledge that banks' first line

1. The banking charter is hinged on four central pillars: - (i) Adoption of customer-centric business models by banks; (ii) Risk-based credit pricing; (iii) Enhanced transparency and information disclosure; and (iv) Entrenching an ethical culture in banks.

of defense against losses is their operating income. As such, adequate pricing of credit risk is important for their solvency and ultimately financial stability. Yet, these banks price risks in competitive markets and their risks is likely to be affected by market and macroeconomic factors as well as bank specific policies.

As such, the key contribution of this paper is to assess the role of banks internal factors in influencing credit pricing amidst the operationalization of risk-based pricing framework in Kenya.

The remainder of the paper is structured as follows. Section 2 presents the stylized facts of the Kenyan banking sector. Section 3 reviews existing literature, while Section 4 presents the methodology, Section 5 results and discussions. Finally, section 6 concludes and highlights policy recommendation.

2.0 Kenyan Banking Sector: Stylised Facts

Policy developments in the banking sector has shaped the recent trends, such as the total number of institutions, efficiency of the banking system, the costs of operation, the sectors' income patterns, the market structure and the riskiness of bank loan portfolio. According to CBK (2021), at the end of 2021, the Kenyan banking sector comprised 38 Commercial Banks, 1 Mortgage Finance Company, 1 Mortgage Refinance Company, 9 Representative Offices of foreign banks, 14 Microfinance Banks (MFBs), 3 Credit Reference Bureaus (CRBs), 17 Money Remittance Providers (MRPs), 8 non-operating bank holding companies and 68 foreign exchange (forex) bureaus. Out of the 40 banking institutions, 37 were privately owned while the Kenya Government had majority ownership in 3 institutions. Of the 37 privately owned banks, 22 were locally owned while 15 were foreign owned.

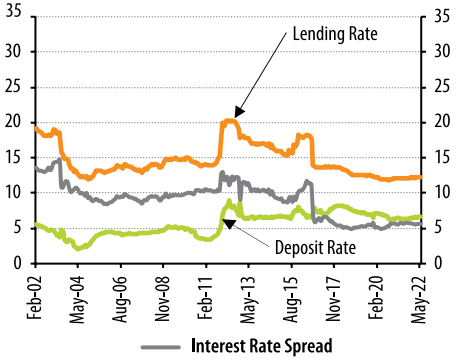
As illustrated in **Figure 3**, three trends are evident in the Kenyan banking industry. First, the interest rate spread has continued to shrink over the years (**Figure 3a**), and superficially, it would be argued that the narrowing registered in the later part of 2016 is attributed to the decline in the lending rate on the account of the introduction of the interest rate cap. However, when considerations are given to the trends in the growth of net interest income in comparison to the growth in the operating cost, the higher degree of coverage evident from 2011 (**Figure 3b**) is a clear indicator of improving bank efficiency over the years; a major contributor to lower cost of credit. The cost income ratio has also been on a downward trend in the recent years.

Second, in terms of the structure, the banking industry has remained competitive as evidenced by low asset concentration levels (**Figure 3c**).[2] The low concentration

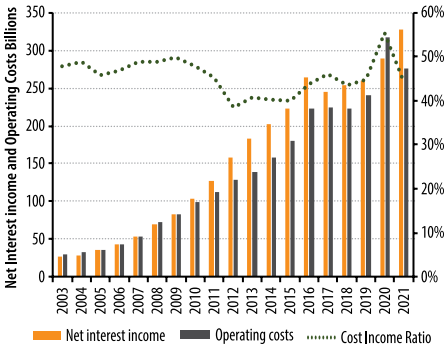
2. The overall banking sector concentration of assets generally maintained a declining trend, slightly edging up from 2012. As at end 2021, the highest level of bank concentration in the banks' credit activity, as measured by Herfindahl-Hirschman Index (HHI) equaled 863.2, as the index equaled 773.4 for banks' assets and 769.7 for bank deposit activity. A measure below 1000 depicts a competitive market structure.

Figure 3: Recent trends in Kenyan credit market

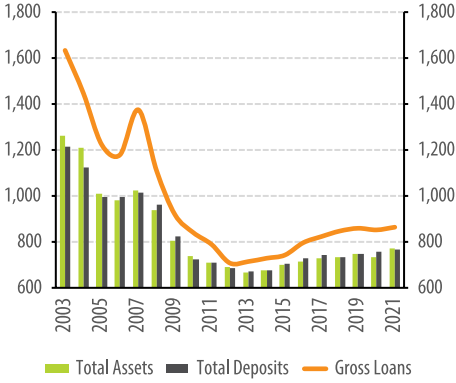
(a) Interest rate spread, February 2002 – May 2022



(b) Cost Income Ratio, Operating costs and Net interest income, 2003 – 2021

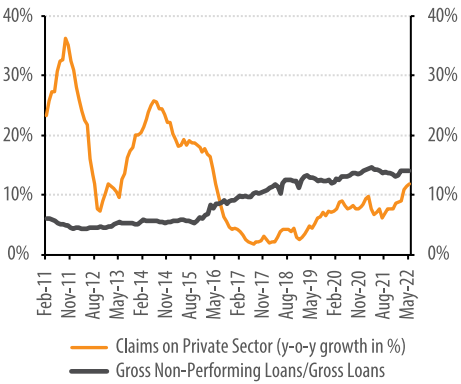


(c) Concentration of banking sector activities, 2003 – 2021



Source: Central Bank of Kenya and Kenya Bankers Association database

(d) Credit growth and riskiness of banks' loan portfolio



in the industry's credit, assets and deposits - reflects the inability of banks to set excessively high interest rates. Lastly, the rising credit risk – measured by the ratio of gross non-performing loans to gross loans, has constrained private sector credit growth (**figure 3d**); consistent with the argument that a rise in the riskiness of bank's loan portfolio has the implication of raising the interest rates and thus discouraging borrowing (Feyen & Huertas, 2020). This challenge is compounded when lenders are not able to effectively price risk in their loans due to regulatory bottlenecks/ impediments.

3.0 Literature Review

Literature underpinning bank credit suggests that credit pricing is influenced by factors which could be classified broadly into banks' idiosyncratic attributes, the industry structure and the prevailing macroeconomic environments (Aboagye et al., 2008; Wambua & Were, 2013 and Kiptui (2014).

The bank-specific characteristics such as size impacts the pricing behavior in terms of the actual price determined and on efficiency gains on the account of economies of scale. Most empirical studies have established a positive relationship between the bank size and the lending rate. For instance, Ngomsi and Djiogap (2012) in his study on the determinants of bank long-term lending behavior in the Central African Economic and Monetary Community's six countries established a positive relationship between the size of the bank and loan pricing. Additionally, Emmanuel and Kofi (2013) employing GMM for the case of Ghanaian banks also found results consistent with Ngomsi and Djiogap (2012). Other studies such as Stein (2000), Theodossiou (2011) and Bashir (2003) had also investigated have explored credit pricing among various bank sizes and established that large banks have a comparative advantage relative to the small banks. Therefore, they are able to tap on the economies of scale to provide and attain efficiency gains. Moreover, large banks allows managers to invest more in different geographical and business segments to address the issues of asymmetric shocks (Saurina, 2002 and Rajan & Dhal, 2003).

Credit risk has also been empirically established to have an impact on credit pricing. Using a sample of 456 banks in 41 Sub-Saharan African countries to examine the determinants of bank interest margins, Ahokpossi (2013) showed that bank-specific variables like credit risk and liquidity risk significantly determine interest rate spreads. Similary, Nampewo (2013) also determined that non-performing loans were significant and positively affect the interest rate spread. The risk associated with customers is often factored into credit pricing. Some studies have established an association between banks credit risk to its overall cost efficiency. More specifically, credit risk has a negative impact on banks cost efficiency (Hassan & Bashir, 2003; Niţoi & Spulbar, 2015 and Rumler & Waschiczek, 2016), as it is deemed an indicator of poor credit management by the bank (Pancurova & Lyocsa, 2013).

The bank deposits have a positive impact on the commercial banks' lending volumes as they enable banks to lower the loan prices given the large volumes of loanable fund at their disposal (Olusanya et. al, 2012). This is the case since customers' deposits, being the source of bank loans, there is definitely a direct positive effect of customer deposits on the banks' lending (Mc Cathy et al., 2010). Din and Khawaja (2007) examined the determinants of interest rate spread in Pakistan using panel data of 29 banks. The results showed that inelasticity of deposit supply is a major determinant of interest rate spread. The study indicated that the main reason for inelasticity of deposits supply to the banks is due to the absence of alternate options for the savers. This is in conformity with the earlier study by Sebatian (2009) who found out that demand deposits liabilities had the most significant positive effect on the banks' credit allocations in the Nigerian credit market.

Empirical studies have established a positive relationship between the banking industry concentration and credit pricing. The study by Ahokpossi (2013) showed that in addition to bank-specific variables like liquidity risk and credit risk significantly determine interest rate spreads, when compared to inefficient banks, efficient ones increase their margins more in concentrated markets. This, therefore, indicates that policies that promote competition and reduce market concentration would help lower interest margins in Sub Saharan Africa. Stein (2000) also demonstrated a positive significant effect of competition in influencing reduction in bank lending rates. In contrary, Aiello & Bonanno (2016a) and (2016b) have showed that higher concentration reduces competition by fostering collusive behaviour among banks. Even so, Demirguc-Kunt et al. (2004) finds that industry concentration in developing countries is negatively associated with the efficiency of the banking system.

Regarding impact of macroeconomic factors, that is the level of economic growth and inflation, the findings are mixed. Some studies (See Hesse and Beck (2008), Ikhide (2009), Chekol, Mutwol and Tarus (2012), Jonas, Emmanuel, Kofi (2013) and Kiptui (2014)) have found macroeconomic factors to be signifivant in influencing credit pricing behavior. For instance, Jonas, Emmanuel, Kofi (2013) posit that the macroeconomic environment is key in determining lending decision of the bank. A pro-cyclical relationship between economic growth and bank lending exists (Ngomsi and Djiogap, 2012; Vazakidis and Adamopoulos, 2009). In contrast, Wambua and Were (2013) found that macroeconomic variable such as real economic growth were not significant in influencing interest rates spreads.

4.0 Methodology

4.1 Data

The study uses annual bank-level variables of 38 commercial banks licensed by the Central Bank of Kenya as of December 2021, collected from Kenya Bankers Association financial database of audited financial statements over- the period 2003 - 2021. The use of audited financial statements was preferred as it anchors the study on more reliable data. Additionally, the utilization of panel data in this study makes the findings more robust, as opposed to reliance to either time series or cross section data, since it captures factors of specific effects, gives more informative data, more degrees of freedom, more variability and less collinearity among variables.

4.2 Definition and measurement of variables

Table 1 presents the operationalization of terms.

Table 1: Operationalization of Variables

Variable	Operationalization	Rationale
Dependent Variable		
Lending rate	Interest income divided by Total loans advances	Weighted average lending rate
Independent Variable		
Bank idiosyncratic attributes		
Bank size	Logarithm of total assets	Were and Wambua (2013)
Credit Risk	Non-Performing Loans by Total loans advances	Nampewo (2013)
Deposits	Logarithm of total deposits	Mc Cathy et al. (2010).
Bank efficiency	Cost Income Ratio (CIR) obtained by dividing Total operating expenses by Total Income	A consistent measure of bank efficiency is Cost Income Ratio (CIR)
Industry structure		
HHI	HHI index computed based on bank assets	Ikhide (2009)

Variable	Operationalization	Rationale
Macroeconomic environments		
Economic growth	Annual GDP growth rate	Demirguç-Kunt & Huizinga (1998), Bikker and Hu (2002) and Were & Wambua (2013),
Inflation rates	Annual inflation rate	Ongeri (2012).

4.3 Empirical Model Specification

The empirical model specification is build using panel data approach, previously applied in studies such as Cihak (2004); Gambacorta (2008); Georgievska et al. (2011) and Mbao et al. (2014). The baseline model is specified in **Equation 1**, where the estimation is undertaken at the industry level and the error term is assumed to be distributed independently and identically in a manner that the variance is equal to zero.

$$\text{Lending Rate}_{it} = \alpha + \beta X_{it} + \gamma W_t + \delta Z_t + \varepsilon_{it} \quad \text{..... Equation 1}$$

Where Credit Price is defined as the Average credit price for bank (**I** indexes bank **I** and **t** indexes time **t**), is a vector of bank specific variables for bank **I** and time **t**. contains time varying, banking-industry specific variables, is a vector of time-variant macroeconomic variables, and is error term for bank **I** and time **t**.

Further, to investigate the heterogeneity across the banks, separate analysis was undertaken at the bank-tier level. In that regard, the banks were grouped into three tiers based on the Central bank of Kenya weighted composite index[3] methodology. Banks with a weighted composite index of over 5 percent were classified as Tier 1 banks, while those with a weighted composite index of between 1 percent and 5 percent were categorized as tier 2 banks, and tier 3 banks have a weighted composite index of less than 1 percent. **Equation 2** presents the model specification for the tiered analysis, with the variable names being similar to those specified in the baseline model represented by **Equation 1.**

$$\text{Lending Rate}_{it} = \begin{cases} \alpha + \beta X_{1it} + \gamma W_t + \delta Z_t + \varepsilon_{it}, & \text{if weight} > 5\% \\ \alpha + \beta X_{\_2it} + \gamma W_{\_t} + \delta Z_{\_t} + \varepsilon_{\_it}, & \text{if } 1\% < \text{weight} < 5\% \\ \alpha + \beta X_{\_3it} + \gamma W_{\_t} + \delta Z_{\_t} + \varepsilon_{\_it}, & \text{if weight} < 1\% \end{cases}$$

..... Equation 2

3. The index comprises net assets, customer deposits, capital and reserves, number of deposit accounts and number of loan accounts.

4.4 Estimation Strategy

Three approaches exist in practice for estimation of panel data models. That is, using pooled OLS, fixed effects or random effects techniques. We estimated all the three models (See **Appendix 3**), and thereafter used the Hausman test to determine the ideal model. Under the fixed effects model, though the intercept may differ across individuals, each intercept does not vary over time, and that is, it is time invariant. When using the random effect model, we are essentially saying that the banks included in the sample are a drawing from much larger universe of such banks and that they have a common mean value for the intercept and the individual differences in the intercept values of each company are reflected in the error term. Thus, under the fixed effects model, the error terms are considered as parameters to be estimated, whereas in the random effects model the error terms are assumed to be random (Baltagi & Kao, 2007).

This study therefore employed this test to decide which model (Fixed or Random) best suits the data. The Hausman test result (See **Appendix 4**) shows that a *p-value* of the Chi square statistic is *0.0341*, and we rejected the null hypothesis which says the Random effect model is appropriate for this study, in favor of the fixed effects model.

5.0 Results and Discussions

The study sought to assess the impact of banks internal factors in shaping the banks lending rate, and consequently gain insights on issues to take in account as banks pursue the operationalization of risk-based pricing framework. As such, table 2 presents the industry level and the tier-level panel regression estimation results.

Table 2: Fixed effect model results

Variables	Industry		Bank Tiers					
			Tier 1 Banks		Tier 2 Banks		Tier 3 Banks	
	Coefficient	t statistic	Coefficient	t statistic	Coef-ficient	t statistic	Coefficient	t statistic
Constant	1.108	0.877	0.440***	7.497	-0.050	-0.304	1.334	0.776
Ln (Bank size)	-2.057***	-9.789	-0.001	-0.034	0.071*	1.896	-2.448***	-8.963
NPL/Gross loans	10.197***	21.324	-0.047	-1.356	-0.139*	-1.841	11.974***	19.138
Ln (Deposits)	2.028***	10.619	-0.009	-0.543	-0.057	-1.518	2.378***	10.108
Cost Income Ratio	0.123*	2.774	-0.068***	-3.579	-0.033	-1.384	0.135**	2.527
HHI	-0.000	-1.361	-0.000***	-6.338	0.000	0.548	0.000	0.151
GDP	-0.032	-1.508	-0.001	-1.226	-0.003	-1.348	-0.058*	-1.665
Inflation rate	0.006	0.577	-0.001	-2.549	-0.001	-1.078	0.007	0.427

Significance is indicated by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.010$

The results in **Table 2** indicate that bank size (measured as a natural logarithm of total bank assets), credit risk (proxied by the ratio of non-performing loans to Gross Loans), the level of bank deposits and the level of bank efficiency are statistically significant, with the implication that they influence the bank lending rates.

At the industry level analysis, bank size is found to have a negative relationship with the lending rates, and it is statistically significant at 5 percent level. Thus, pointing to declining lending rates as the economies of scale creeps in the banks' operations. Similar pattern is evident among tier 3 banks, contrary to the paradoxical positive

and statistically significant relationship at 10 percent manifested between the bank size and the lending rates among tier 2 banks. The scenario manifested by the tier 2 banks is counterintuitive and more importantly, it is inconsistent with economic theory, particularly given the argument that the reverse could be true by taking into consideration the increased capacity to invest in efficient technologies and the advantages of large economies of scale.

Additionally, the results indicate that an increase in credit risk leads to higher bank lending rates at the industry level and among the tier 3 banks. In contrast, tier 1 and tier 2 banks point to a situation where an increase in credit risk will lead to a decline in lending rates. This revelation of the pattern among tier 1 and tier 2 banks is somewhat puzzling, as it is not clear the strategies they deploy to minimize their exposure to the credit, or at it bests, how they are able to go against the grain to drive the lending rates down: *Could it be as a result of shifting to a less risky clientele? Possibly yes, possibly not.*

The level of deposit mobilization at the industry level analysis and among the small banks are positively associated with the lending rates. In that case, increased deposits levels will lead to higher lending rates. This could possibly be explained by the need to charge higher lending rate spread to cover for the mitigation risk the banks could incur from their customers.

The Herfindahl Index (HHI) was used to measure the degree of concentration in the banking sector. Theoretically, a positive relationship between lending rates and HHI, since high bank concentration leads to less competition. Only tier 2 and Tier 3 banks are consistent with this theoretical underpinning. At industry level and among the tier 1 banks, there is a negative relationship between the lending rates and HHI. While the results on divide between tier 2 and tier 3 banks versus tier 1 and industry level analysis may look contradictory, there is a possibility that it the case when looked from the lens of Kenyan banking sector manifesting an oligopolistic structure and market segmentation between smaller banks and big banks whereby the latter control a comparatively large share of the market (deposits and loans) mainly due to good reputation and customer loyalty. Large banks are generally perceived to be well managed and stable. Therefore, they can mobilize more deposits at relatively near-zero or relatively lower deposit rates while at the same time attracting large loan applications despite charging relatively higher rates leading to higher lending rates.

The macroeconomic conditions, represented by GDP and inflation, have less influence on the lending rates. A result that contradicts the findings by Were & Wambua (2013), who found that real economic growth (a proxy to GDP) provides greater opportunities for diversification and increased economic activities that can heighten the demand for loans leading to high lending rates.

6.0 Conclusion and Policy Recommendation

Credit pricing in Kenya is chiefly affected by the size of the bank, credit risk, the bank deposits and efficiency level. At the industry level analysis, bank size is found to have a negative relationship with the lending rates, and it is statistically significant at 5 percent level. Similarly, the pattern is evident among tier 3 banks. Contrary to the paradoxical positive and statistically significant relationship at 10 percent manifested between the bank size and the lending rates among tier 2 banks. Additionally, the results indicate that an increase in credit risk leads to higher bank lending rates at the industry level and among the tier 3 banks, but the contrary is the case among tier 1 and tier 2 banks.

The level of deposit mobilization at the industry level analysis and among the small banks are positively associated with the lending rates. The Herfindahl Index (HHI), which was used to measure the degree of concentration in the banking sector was found to have a positive relationship with lending rates among tier 2 and Tier 3 banks. The macroeconomic conditions, represented by GDP and inflation, have less influence on the lending rates.

Thus, in the operationalization of the risk-based pricing framework, pursuit of consistent internal policies remains critical, and the pursuit of ideal framework is anchored each bank's peculiarities. The impact of macroeconomic environment is

negligible.

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Appendix

Appendix 1: Summary of Statistics

Variable	Obs	Mean	Std. Dev	Min	Max
Credit Price	674	0.278	1.340	0.021	24.842
Bank size	677	16.998	1.610	6.477	20.592
Credit Risk	673	0.069	0.094	0	1.211
Deposits	677	16.680	1.716	4.290	20.290
Bank efficiency	676	0.981	10.636	-0.551	276.000
HHI	679	827.044	172.194	668.971	1260.839
Economic growth	679	4.953	1.731	-0.300	7.500
Inflation rates	679	8.3438	4.284	3.200	18.930

Appendix 2: Correlation Matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Credit Price	1.00							
(2) Bank size	-0.12	1.00						
(3) Credit Risk	0.58	-0.34	1.00					
(4) Deposits	-0.08	0.99	-0.35	1.00				
(5) Bank efficiency	-0.05	-0.19	-0.00	-0.22	1.00			
(6) HHI	0.15	-0.44	0.26	-0.42	0.08	1.00		
(7) Economic growth	-0.02	0.02	0.01	0.03	-0.06	0.02	1.00	
(8) Inflation rates	0.04	-0.25	0.05	0.24	0.04	0.41	0.06	1.00

Appendix 3: Regression Output

Variable	Pooled OLS		Fixed Effects		Random Effects	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Constant	-0.295	-0.449	1.108	0.877	0.276	0.299
Bank size	-1.493***	-8.967	-2.057***	-9.789	-1.840***	-9.691
Credit Risk	9.165***	19.850	10.197***	21.324	9.835***	21.246
Deposits	1.520***	9.646	2.028***	10.619	1.847***	10.440
Bank efficiency	0.035	0.800	0.123*	2.774	0.096	1.989
HHI	0.000	0.102	-0.000	-1.361	-0.000	-0.783
Economic growth	-0.031	-1.320	-0.032	-1.508	-0.032	-1.491
Inflation rates	0.006	0.614	0.006	0.577	0.006	0.680

Appendix 4: Hausman Test

Test: Ho: difference in coefficients not systematic

chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 15.15

Prob>chi2 = 0.0341

(V_b-V_B is not positive definite)

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