Microfinance Banks Utilization of Information Cues in the Prediction of Loan Default and Credit Risk in Nigeria: The Lens Modelling Approach

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ABSTRACT

Credit risk has substantially increased in the last few years in most Microfinance banks in Nigeria even with layout mechanisms to checking this. This study was therefore focused on exploring the information cues utilized by loan officers in correctly predicting default and credit risk. 207 Microfinance banks from the six geo-political zones of the country were selected and used for the study and the loan officers were purposively selected in the administration of the questionnaire. This formed the judgment criterion of the model. 207 borrowers were also selected for the study. This group made up the environment criterion. The Lens Modelling approach was deployed in analyzing both criteria using default and/or credit risk cues such as borrowing capacity, interest rate, and appraisal procedure used in screening potential borrowers, banks' monitoring plans for borrowers, and the number of active borrowers on the banks' repayment calendar. Analyzed results showed that there was a high linear predictability of the judgment criterion (R^2_s = 0.879) and the environment criterion (R^2_e = 0.977). The achievement index of 0.943 further confirmed that the loan officers were consistent in their predictions of defaulting clients using the determining variables. Consequently, the study suggests an in-depth review of the root causes of default and/or credit risk as this study revealed that the loan officers had a firm grasp of the information cues that could predict credit risk and showed that the increased default rate was probably due to other factors outside their control.

Keywords: Microfinance Banks, Default/Credit Risk, Cues Utilization, Prediction, Nigeria
JEL Classification: G2, G21

1. INTRODUCTION

The banking sector in Nigeria plays a significant role in the country's economy in mobilizing savings, facilitating transactions, providing credit, facilitating investment, and promoting financial inclusion among other roles. According to the Central Bank of Nigeria (CBN) which regulates and supervises banks and other financial institutions in the country, there are 24 commercial banks, 5 merchant banks, 43 mortgage banks, 1 agricultural bank and 916 microfinance banks licensed to perform these roles (CBN, 2024). These banks are, however,

diverse in structural formation which affects their different roles significantly. For instance, commercial banks are established to provide financial services such as loans, savings and checking accounts, credit cards, investment opportunities, and to facilitate international trade and foreign exchange transactions; and are mostly created to serve the larger corporate sector even though individuals and small businesses are also serviced. Merchant banks are also licensed to provide specialize financial services such as corporate finance, advisory services, underwriting and investment management to businesses. In addition to these, they help businesses raise capital through debt and equity

financing, manage risk and make strategic financial decisions. Merchant banks also play a crucial role in facilitating mergers and acquisitions as well as other complex financial transactions for corporate clients. Mobilizing both domestic and offshore funds into the housing sector is the exclusive role of mortgage banks. Microfinance banks provide financial services such as loans, savings accounts and other financial products to small entrepreneurs, low-income individuals, and micro-enterprises. While commercial, merchant, mortgage banks, et cetera, are mainly set up to serve big and corporate businesses, microfinance banks, on the contrary, are established to service small businesses and low-income Nigerians who dwell mostly in the rural parts of the country. In other words, they are created to bridge the financial inclusion gap created by the absence of the big banks in rural areas. Invariably, these Nigerians are hardly serviced by the big commercial and merchant banks either because they are located far from their environment or their services are way beyond their reach. The implications is that, very many Nigerians are excluded as a result of this, and it was for this singular reason that licenses were further granted for the establishment of more microfinance banks particularly in rural Nigeria. According to the CBN (2012), 39.2 million adult Nigerians representing 46.3% of the 84.7 million adult population were financially excluded as at 2012; 54.4% of the excluded population were women, 73.8% were younger than 45 years, 34.0% had no formal education, and 80.4% resided in rural areas. Consequently, the financial inclusion strategy of the apex bank as at then, was to encourage the establishment of microfinance banks branches in rural areas and most importantly, at least 5 units of such branches per 100,000 adult population. The strategy was pertinent because as at 2011, Nigeria had only 866 microfinance banks and the network served only 3.8% of the adult population (3.2 million clients). Of these 3.2 million clients, 65% used savings product, 14% used credit products and 4% used Automated Teller Machines (ATM) cards. Therefore, CBN strategy was to increase scale and operating capacity of microfinance banks by taking advantage of the opportunities provided by the launch of the National Financial Inclusion Strategy.

Eleven years after the launch, a survey of financial inclusion of Nigerians by Enhancing Financial Innovation and Access (EFInA) (2023) revealed that, 4 in 5 adult Nigerians or 80% of adult population now have access to financial services; an indication that the CBN strategy is yielding positive results considering the fact that 46.3% were excluded in 2011. Of this 80%, 12.7% are currently serviced by microfinance banks as against 3.8% in 2011. This progression has also come with a cost as this service expansion has equally increased the credit risk of most microfinance banks, and in extreme case scenario, has led to the collapse of some (Asongo and Idama, 2014). While some factors such as excessive credits creation, insider abuses, poor loan recovery strategies, et cetera; are adduced to the rising credit risks in these banks, Umoren et al. (2018) were of the view that, high level of credit risks was an indication of poor and unsound banking practices principally caused by the failure of loan officers to correctly detect and predict loan default. Although there are mechanisms of checking loan performance and/or default in most banks, the reasoning on the other hand is that, acquisition of extra skills and adaptation of some judgmental cues by loan officers in predicting default will most likely go along way in saving some banks from liquidation. According to Nigeria Deposit Insurance Corporation (NDIC) statistics, between 1968 and 2000, 16 commercial and 15 merchant banks were liquidated; from 2000 to 2009, 10 commercial and 3 merchant banks folded up; 6 commercial banks also collapse between 2010 and 2023; and within the last decade, 103 microfinance banks also failed (NDIC, 2023). According to Marshal (2017), the banks' failure was attributed to most loans being granted without detailed and proper analyses which increased the percentage of total risks to assets by more than 40%. These analyses are usually done by loan officers. Consequently, to stem the tide of default and microfinance banks' liquidation as observed by these studies, it is imperative to analyze the variables that caused default and increase credit risks by presenting same as cues to loan officers. In other words, these variables were carefully chosen based on their impact on default as suggested in most literature and previous studies and were presented to loan officers as cues in checking default. Accordingly, the loan officers are the judgment criterion of the defining variable – default. The response collected and analyzed provides a summary of not only their prediction capacity of default but also their capacity to control it. Abdel-Khalik and El-Sheshai (1980), and Karelaia and Hogarth (2008), suggest that this set of information cues in forming judgments on default should also be based on available data and established statistical data. This implies that, in forming judgments in real-life decision situations such as predicting default, the predictor (loan officer) is equally at liberty to search for information and build hypotheses of the event relating to default.

Although studies such as Marshal (2017), Kanu and Isu (2014), and Umoren et al. (2018), attempted to give reasons for banks' possible failure in Nigeria with possible solutions, these studies' exposè were rather reparatory. And even when preventive measures were suggested, none captured the key variable – the role of the presiding loan officer. This study fills this gap and in addition, uses the Lens Modelling Approach in carefully selecting cues associated with default that can be deployed by loan officers in checking same. In order to achieve the study's set objectives, the borrowers from the banks were modeled as 'environment criterion' because, in event of default, borrowers' roles are inseparable from the lenders'. That is, the performance of any loan is the totality of both party's effort. Therefore, loan demand and supply cues with marked effect or influence on default and credit risk such as; borrower's capacity, interest rate charge, lending requirements, borrower's monitoring, active borrowers at a point in time, and appraisal/assessment procedure of potential borrowers were used in analyzing the objectives such as; to determine the environmental and judgmental criteria and linearity in the prediction of default and/or credit risk in microfinance banks, and to provide informed judgment based on the indices of choice analyzed and particularly the achievement index in predicting default.

2. MATERIAL AND METHODS

2.1. Study Area

The study area is Nigeria, which lies between 9.0820° North and 8.6753° East. With a population of 229,152,217 (National Population Commission - NPC, 2024) occupying an area of 923,768 Sq km, Nigeria is Africa's most populous black nation. It is surrounded by countries such as Chad and Niger in the north, Benin in the west, Cameroon in the east, and the Atlantic Ocean in the south. Nigeria has enormous resource potentials in natural, agriculture and human dimensions. The vast population of Nigeria confers on the country a major financial and marketing hub. With a population of over 200 million, Nigeria has a large consumer base that presents opportunities for financial services and products. The country's financial sector is also supported by a growing economy and a burgeoning middle class.

One of Nigeria's strengths lies in its diverse range of financial institutions which include commercial banks, merchant banks, mortgage banks, agricultural bank, microfinance institutions, insurance companies, and capital markets. These institutions provide a wide array of financial services including savings and loans, investments opportunities and insurance products. The presence of both brick-and-mortar banks and FINTECH companies further enhance the accessibility and efficiency of financial services.

Moreover, Nigeria's financial sector is also seeing a significant growth and innovation, with the adoption of technology and digital solutions which play a critical role in expanding financial inclusion. The sector is regulated by the CBN and other regulatory bodies such as NDIC, and this ensures stability and confidence in the sector. The robust regulatory framework provided by the CBN has not only saved many banks from total collapse but has also protected consumers interests in terms of fees and charges, dispute resolutions and the promotion of initiatives such as the National Financial Inclusion Strategy, Small and Medium Enterprises (SMEs) support funds through the banks.

2.2. Sampling/Data

Nigeria is divided into six geopolitical zones, which are further split into 36 states plus the Federal Capital Territory. The North-East, North-Central, and North-West geopolitical zones have 6, 6, and 7 states, respectively; while the South-East, South-South, and South-West zones have 5, 6, and 6 states. Most government strategic planning (social and economic) are design according to this subdivisions. It is, however, different with private sector set-up, including the establishment of most banks. According to CBN report (2024), there are 916 Microfinance banks/institutions spread across the six zones: North-East (37), North-Central (98), North-West (116), South-East (179), South- South (93), South-West (335), and Abuja (58).

Accordingly, a multi-stage sampling technique was used in selecting the states from the zones, the microfinance banks (loan officers), and the borrowers from the banks. First, each state was selected from each zone based on having the highest number of microfinance banks in their different zones; and from the population of microfinance banks, a sample for both the banks and borrowers was derived using Taro Yamane (1967) formula at ±10% error margin as cited in Eboh (2009) as follows:

$$n = N/1+N(e)^2$$

Where n is the sample size, N is the population size, and e is the level of precision (error margin).

Data were elicited through administration of questionnaires on the respondents. In the case of the borrowers, a list of borrowers from the selected banks was obtained and random numbers table (Mendenhall and Reinmuth, 1982) was used in selecting the respondents. Trained data collection personnel were used in the administration of the questionnaires. The loan officers of the selected banks, on the other hand, were purposively selected after the banks were randomly picked using the same random numbers Table 1. They were also interviewed by the trained data collectors.

2.3. The Lens Model

The Lens model is used primarily to assess human judgmental situations in which people make judgments on the basis of a set of explicit cues from the environment. The model, formulated by Brunswik (1964) in Karelaia and Hogarth (2008) emphasizes the similarities between the environment and the subject response and shows how statistical methods can be deployed to capture judgmental processes (Riahi-Belkaoui, 2000). As shown in Figure 1, the right side of the model describes the relationship between the judgments (Y_s) and the level of (X_i) in terms of their correlation (R). The left side of the model describes the relationship between the actual criterion or event (Y_e) and the level of cues (X_i). The analysis relies on a regression model when the cues are continuous and on an analysis of variance model when the cues take on categorical values.

In this study, the human judgment criteria denoted by Y_s, is modeled as a linear function of a set of cues, X_1, X_2, X_3, X_4, X_5; and the environment criteria, Y_e, is also modeled as a linear function of the same cues. Consequently, Y_s and Y_e are a summation of a set of cues on a scale of 0-5 (using conjoint measurement) based on a respondent's assessment of the factors predicting default. And, the variables are;

Y_s = the judgment criteria = the Loan officers in the selected Microfinance banks

Y_e = the environment criteria = the borrowers from Microfinance banks

Table 1: Selection of sample size for the banks and the borrowers

	North-East (Adamawa)	North-Central (Plateau)	North-West (Kano)	South-East (Anambra)	South-South (Cross River)	South-West (Lagos)	Total
Population of Microfinance Banks	13	42	56	74	35	153	373
Sample banks	12	30	36	43	26	60	207
Sample borrowers	12	30	36	43	26	60	207

X_1 = Borrower's capacity (Assets owned in naira)

X_2 = Bank's rate of interest (in naira)

X_3 = Number of active borrowers in terms of loan repayment (if active = 1, otherwise = 0)

X_4 = Borrower's monitoring process (Is poorly monitored borrowers a default risk? Yes = 1, otherwise = 0)

X_5 = Loan appraisal/assessment procedure (Is poorly appraised loan a default risk? Yes = 1, otherwise, 0)

It follows that, $Y_s = \sum \Omega_i X_i + e$ (1)

And,

$Y_e = \sum \Omega_i X_i + e$ (2)

Where, $\sum \Omega_i X_i$ is the sum of weighted values of the different cues.

From Figure 1, the achievement index, Ω is expressed as:

$\Omega = GR_e R_s + C \sqrt{(1-R^2_e)(1-R^2_s)}$ (3)

Where, $G = \hat{Y}_e \hat{Y}_s$, is the matching index, and is the correlation between the predictions of both models. R_e and R_s are the multiple correlations of the models of the environment (borrowers) and the judgment (loan officers), and C, is the correlation between the error terms of the two models. A high linear predictability of the environment criterion (R_e) and the judgment criterion (R_s), is

Figure 1: Environment-judgment interaction in loan default/credit risk prediction
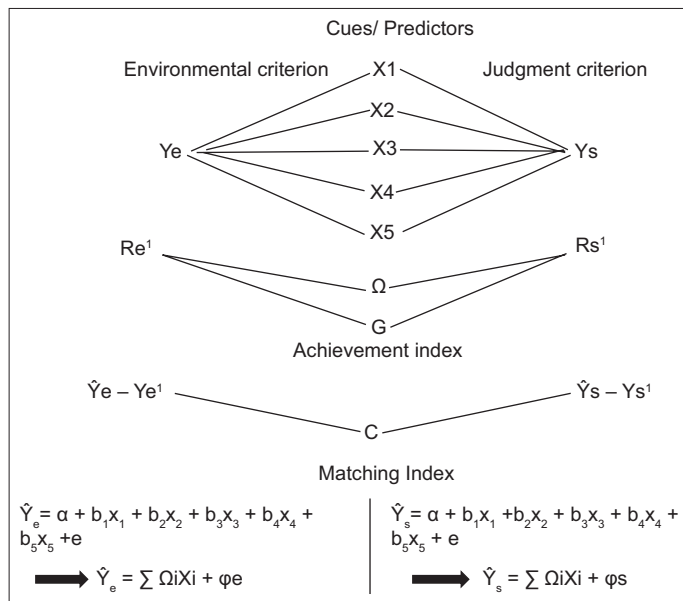
an indication of well modeled functions and a pointer to a good prediction (Karelaia and Hogarth, 2008). In addition, a high achievement index is a proof of consistency in the judge's (loan officer) prediction of loan default/credit risk.

3. RESULTS AND DISCUSSION

3.1. Judgmental Criterion (Loan officers) of Default/Credit Risk Prediction

Table 2 presents the descriptive statistics of the judgmental criterion (loan officers) and particularly the results of the correlation analysis of responses from microfinance bank officials on loan default prediction. According to the table, there is a strong and positive correlation between loan default and the selected cues. Specifically, there is a strong correlation between default and borrowing Capacity (0.705), interest rate (0.678), and loan appraisal procedure (0.565); which suggests how impactful these cues are on loan default. On the other hand, periodic monitoring of borrowers and the number of active borrowers still repaying loans, though positive, had a weak relationship with default prediction. This also implies that, although these factors may impact on default, their influences are not on the same pedestal with borrowing capacity, interest rate charges, and appraisal procedure. It is important to note that, the fact that the capacity to borrower (in terms of assets owned and ability to generate cash for repayment) had the strongest correlation with default shows the importance microfinance banks place on this factor.

In Table 3, the regression analysis of judgmental cues/criteria used by loan officers in predicting default is presented. According to the table, a borrower's capacity, interest rate charge by the bank, loan appraisal procedure, monitoring frequency of borrowers, and number of active borrowers who repay their loans were variables used in the regression analysis. The choice of these variables as highlighted before now, was based a pre-test conducted on some microfinance banks on the likely determinants of loan default as well as some researches carried out by other authors on default and credit risk. Akpan et al. (2014) in their analysis of loan default of beneficiaries of a government scheme had concluded among others that interest rate charged, visits by loan officers, time interval between application and disbursement were the variables influencing default. Turvey and Weersink (1997), also alluded to the fact that, credit risk depended on a borrower's expected rate of return and the interest rate on debt. These assertions, in addition to the pre-test conducted, formed the bases for the choice of the variables. As revealed in the table, all the variables were positively related to the loan officers' judgmental criteria of loan default/credit risk in the banks. In

Table 2: Descriptive statistics of judgmental cues on loan default/credit risk

Variables	Mean	Standard Deviation	n	95.0% Confidence Interval for B		Correlation
				Lower Bound	Upper Bound	
Borrowing capacity	56.777	20.446	207	−4965.459	−3216.652	0.705
Interest rate	19.576	6.044	207	88.788	140.124	0.608
Appraisal	23.657	8.960	207	253.784	419.076	0.565
Borrowers monitoring	20. 759	3.892	207	151.784	268.908	0.482
Active clients	12.834	2.259	207	116.766	386.522	0.362

addition to this, the variables were also significant at 1% level of significance. However, in Lens Modelling technique, emphasis is rather placed on R^2 instead of the relationship between the environmental criterion and the predictors or the judgmental criterion and the predictors, as well as the significance levels. According to Karelaia and Hogarth (2008), a high R^2 value of the environment criterion (R_e) and the judgment criterion (R_s) is indicative of the predictability of the linear models – that is, the prediction of the default and credit risk. Consequently, with R^2 value of 0.879 for the judgment criterion, it shows how informed the loan officers were in predicting default and/or credit risk, utilizing the "default/credit risk information cues".

3.2. Environmental Criterion (Borrowers) of Loan Default/Credit Risk Prediction

Like the judgment criterion on default/credit risk, the descriptive statistics of environmental criterion also shows a positive correlation between the borrowers' perception of these cues on loan default/credit risk. As shown in Table 4, a borrower's capacity to generate cash to repay the loan just as in judgment criterion had the strongest positive relationship with default/credit risk, which underscores how important this factor is in credit risk evaluation. The borrower's monitoring process, interest rate charged, loan

assessment and appraisal procedure of potential borrowers, and number of active borrowers on the bank's repayment schedule were the other variables that positively correlated with default/credit risk, respectively.

Table 5 shows the regression analysis of the same cues based on borrowers' view of their impact on default and credit risk. Accordingly, all the cues except the number of active borrowers at a point in time had positive impact on default or credit risk, and all were significant except the same cue. The R^2, which is a key diagnostic of the Lens model is 0.977. The linear assumption of the model posits that, a high R_s and R_e are suggestive of the consistency in the prediction of the variable under study. Therefore, with $R^2_s = 0.879$ and $R^2_e = 0.977$, it implies that the loan officers of microfinance banks in Nigeria were consistent in predicting the loan default/credit risk of their banks.

In addition to the linear predictability of the model, the achievement and the matching indexes give greater insight to the prediction power of the model. The logic of lens model is that, the judgment decision (loan officers) should match the environmental decision or criterion (borrowers) to the extent that the judges' reliance on specific cues matches the model of the environment. The calculated correlation between the environment and the judgment, $\hat{Y}e^1\hat{Y}s^1$- the achievement index was 0.943 and the matching index was 1.125. The achievement index clearly shows that the loan officers' prognosis of loan default and/or credit risk was quite high. The matching index, on the other hand, measures the loan officers' "knowledge" of the linear relation in default/credit risk; but care should be taken in the interpretation since it only reflects how well the weights were applied to the cues in the linear model. As stated by Karelaia and Hogarth (2008), that care should be exercised in interpreting the index because of judges' (loan officers) ecological differences. In other words, weights used by the judges (loan officers) may differ greatly from the weights used in the ecology, and the existence of high inter-cue correlation may affect the index.

Table 3: Regression analysis of judgmental cues used in predicting default/credit risk

Variables	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Standard Error	Beta		
(Constant)	−4091.055	427.533		−9.569	0.000
Borrowing capacity	114.456	12.550	0.633	9.120	0.018
Interest rate	336.430	40.409	0.550	8.326	0.006
Appraisal	210.346	28.633	0.510	7.346	0.010
Monitoring	251.644	65.948	0.265	3.816	0.001
Active clients	497.831	113.964	0.305	4.368	0.012

R^2=0.879, Adj. R^2=0.858, Standard Error=235.259

Table 4: Descriptive Statistics of environmental cues on loan default/credit risk

Variables	Mean	Standard deviation	n	95.0% confidence Interval for B		Correlation
				Lower bound	Upper bound	
Borrowing capacity	30.22	14.69	207	70.226	81.652	0.893
Interest rate	22.30	4.32	207	107.091	142.936	0.710
Monitoring	38.21	7.50	207	24.406	46.868	0.730
Active clients	9.64	5.57	207	−19.595	8.279	0.510
Appraisal Procedure	17.74	4.29	207	125.342	432.068	0.560

Table 5: Regression analysis of environmental cues on default/credit risk

Variables	Unstandardized Coefficients		Standardized Coefficients	t	Sig
	B	Standard Error	Beta		
(Constant)	−693.066	49.770	-	−13.925	0.000
Borrowing capacity	75.939	2.797	0.816	27.147	0.011
Interest rate	125.014	8.776	0.396	14.245	0.025
Appraisal procedure	212.028	12.001	0.341	17.667	0.001
Borrowers Monitoring	35.637	5.499	0.196	6.480	0.027
Active client	−5.658	6.824	−0.023	−0.829	0.414

R^2=0.977, Adj. R2=0.974, Standard Error=37.011

4. CONCLUSION

The banking sector in Nigeria is positioned to assists other sectors and particularly the business sector and individuals in credit supply necessary for economic growth among other functions. To ensure that all Nigerians are financially included and properly serviced even in the remotest part of the country was the reason for the expansion of microfinance banks and institutions. Like other financial institutions, their existence is believed to be threatened by high default rate and credit risks arising from the failure of many Nigerians to honor their loan obligations either because of the harsh business environment occasioned by government policies, or basically the individualistic tendencies of avoiding payments by all means. It is pertinent to note that, this has not only increased microfinance banks credit risks but has led to the collapse of many. To forestall this, it is expedient that loan presiding officers are gifted in the art of loan supply instruments so as to check the excesses of many potential borrowers. One way of doing this is to be well crafted and abreast with certain cues that protect the institution and guide against the high default rate which increases banks' overall credit risks. The Lens model, from the analysis conducted, disclosed that the banks were properly situated in achieving this aim, and more than overwhelming in their predictive capacity. The question is, if microfinance banks loan officers could correctly predict loan default/credit risk, what is responsible then for the failure of some of these banks if not high credit risk? Unravelling this will certainly require an in-depth study which is outside the scope of this study, and will require other researchers who may wish to explore.

5. ACKNOWLEDGEMENTS

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