Loan performance and lending rate: Testing the existence of adverse selection in the Nigerian credit market

Chimezie O'Brian Abugwu[1], Keghter Kelvin Kur[2*], Henry Chimaobi Urama[3], Chidozie Sunday Abbah[4]

[1,2&3]Department of Economics, University of Nigeria, Nsukka, Nigeria. chimezie.abugwu.198500@unn.edu.ng[1], keghter.kur.200692@unn.edu.ng[2], henry.urama.199574@unn.edu.ng[3]

[4]Department of Economics, Michael and Cecilia Ibru University, Agbarha-Otor, Delta State, Nigeria. abbahchidozie@mciu.edu.ng

*Corresponding author

Abstract: Leaning on the loan pricing theory, this study provided empirical proof of the existence of adverse selection in the Nigerian credit market using the interrelation between the lending rate and non-performing loans as a decision factor. The paper employed Augmented Dickey Fuller (ADF), Phillips Perron (PP), and Kwiatkowski–Phillips–Schmidt–Shin (KPSS) for stationarity tests, Autoregressive Distributed Lag (ARDL) Bound Test for cointegration and an ARDL model for the regression analyses using quarterly data. The results of the analyses showed a positive and consequential link connecting non-performing loans and lending rates, proving the existence of adverse selection in the Nigerian credit market in the short-run and long-run. Based on the results, the study recommends that the apex bank implement a price ceiling in the credit market. Banks and other financial institutions should properly define their lending rates given their cost of funds and other operational expenses. And hence, carefully select viable borrowers from the credit market that suit the bank's credit policy rather than adjust the lending rate up to compensate for higher risk.

Keywords – Adverse selection, ARDL, Credit market, Lending rate, Loan performance, Long-run

1. INTRODUCTION

One of the basic functions of the credit market is to advance loans to the public who need funds for investments and other developmental projects (Abimbola, 2020). This loan usually comes at a cost, which is the lending interest rate, which the debtor has to pay to the lender in addition to the loan principal (Kur, Abugwu, Abbah & Anyanwu, 2021). Sometimes, debtors are not able to service their debt within a reasonable time. When this happens, the loan is said to be a non-performing loan. A loan is said to be non-performing when the bank is unable to recover the loan principal and the interest on the loan or when loans do not generate income after a reasonable time usually for at least 90 days (Abimbola, 2020).

The term lending rate is the rate at which banks advance loans to customers (Igwemma, Ogu, Agba, Odionye & Ogu, 2020). The profit of banks depends largely on the difference between the lending interest rate and the deposit

interest rate. In Nigeria, the rate of interest on deposits is generally low (less than 10%) while interest rates on loans are generally high (as high as 30%) (Awoyemi & Jabar, 2014; CBN, 2021). The high rate of interest on loans is one of the bank-specific factors that lead to the accumulation of non-performing loans by banks (Ahlem & Fathi, 2013). This is because, a high-interest rate increases the probability of borrowing by bad debtors who could take on an undue investment risk that impairs their ability to pay back at an expected time (Eke, Eke & Inyang, 2015).

The consequences of a non-performing loan are not only borne by the debtor, whose assets are seized as collateral, but also by the bank whose profitability, credibility and further credit creation abilities are affected negatively. Non-performing loans (NPLs) as a ratio of total loans are known to be one of the risk assets performance indicators monitored regularly by financial regulators. This is due to its ability to trap borrowers' valuable collateral and make it tough for them to acquire needed funds for investment that would bring about economic growth (Kure, Adigun & Okedigba, 2017).

Putting the Nigerian credit market into perspective, there have been a series of fluctuations over time in the values of non-performing loans and lending interest rates. Non-performing loans as a ratio of total loans rose from 4.6% in 2007 to 7.2% in 2008 before moving to an all-time high of 37.25% in 2009. Even though non-performing loans (as a proportion of total loans) have been on a steady decline since 2010, it still maintains a rate above the CBN 5% prudential threshold in recent times (Kure et al., 2017). The lending rate on the other hand fell from about 16.94% in 2007 to 15.14% in 2008. Just like non-performing loans, it peaked in 2009 at 18.99% and has since struggled to hit that height with fluctuations revolving around 15.59% to 17.55% between 2010 and 2019 respectively. A major part of this work is on whether the spike in non-performing loans to 37.25% can be linked to the spike in the lending rate to 18.99 in 2009. Figure 1 below captures the relationship between non-performing loans (NPL) and lending interest rate (LR) in the Nigerian economy from 2007 to 2020.

Figure 1: Non-performing loan (NPL) and lending interest rate (LR) 2007-2020
Source: Authors' computation

A careful observation of fig. 1 above shows that non-performing loans and lending interest rates exhibited a similar pattern of movement from 2007 up until 2011 when they both fluctuated concurrently in the same direction. However, beyond 2011, the direction of the movement of the variables changed completely as they tilted in different directions. This means that it is not categorically clear whether the lending rate is driving non-performing loans in Nigeria as against the postulations of Ahlem and Fathi (2013) and Igwemma et al. (2020) who claimed that lending interest rates and non-performing loans are positively linked.

While the nature of the relationship between non-performing loans and lending rates has caused heated debates among researchers in the extant literature, theoretical arguments posit that when the lending rate is high, prudent borrowers will desist from taking loans from the bank in the panorama that the loan becomes less profit-yielding

(Igwemma et al., 2020), hence suggesting a positive connection between non-performing loans and lending interest rate. This in turn creates the possibility that more bad debtors will take over the credit space and therefore pave way for adverse selection in the credit market.

Credit markets are fraught with uncertainties. This uncertainty occurs due to the existence of imperfect information. Both banks and their customers do not possess all the information necessary for taking credit decisions without risk. Adverse selection arises when borrowers have exclusive information regarding their investment behaviour before the credit relationship begins (Mehrteab, 2005). The effects of adverse selection in the Nigerian credit market can be made clear in two ways. The first is a case where banks exhibit actions that are contrary to the interest of their creditors (Martin, 1998). Here, the investors in banks such as the depositors and the shareholders bear part of the loss from non-performing loans due to the bad choice of banks lending at a high-interest rate which increases the chances of prudent borrowers leaving the credit market. The second is a case wherein the bad debtors, possessing full knowledge of the high risk in the investment undertaken, go on to take a loan from banks at high rates of interest because they will not bear all the loss alone should the investment fail. In these two cases, one agent takes a decision, which has a chance of allocating losses to another agent without the losing agent taking part in the decision-making and the decision takes place due to information asymmetry.

Having seen how unclear the form of the relationship between non-performing loans and lending interest rate is from extant literature, this work is committed to finding out empirically if there is any remarkable connection between non-performing loans and lending interest rates as well as clarifying if adverse selection exists in the Nigerian credit market. This result will hence, guide decision-making by regulators and other actors in the credit market.

2. LITERATURE SURVEY

Lending or extension of credit to private entities, businesses and governments has been acknowledged by researchers as the main business activity performed by banks (Ogundipe, Akintola & Olaoye, 2020; Benson & Agyemang, 2021). As noted by Ogundipe et al. (2020), lending forms the largest asset and major revenue source for commercial banks but also the greatest threat or risk to bank safety and soundness. Bank lending not only serves as a major driver of profit in the banking sector but is also one of the bedrock of economic growth and development through the provision of liquidity for the economy.

In the course of lending, banks are concerned about the risk of lending and the interest rate (Stiglitz & Weiss, 1981). Whereas it may be desirable for banks to increase the lending interest rates, increasing exposure to risk is undesirable since it means reduced likelihood or probability of loan repayment. Stiglitz & Weiss (1981) explained that the risk associated with lending is partly a function of the interest rate bank charges and the amount of collateral required such that the riskiness of loans increases as the interest rate and collateral requirements increases due to the existence of both adverse selection and moral hazard. Hence, an increase in non-performing loans is theoretically linked to increasing interest rates and collateral requirements.

The core objective of our study is to argue with empirical proof, the existence or absence of adverse selection in the Nigerian credit market. Adverse selection or anti-selection is a concept in economics used to describe a market situation in which bad actors drive out good actors from the market leading to losses by market participants – buyers and sellers – depending on the type of market. Narrowed to the credit market, we are looking at the possibility of bad debtors or bad debts driving out good debtors or good debts from the credit market leading to an increase in non-performing loans or bad loans. Moral hazard, a concept most times confused with adverse selection, on the other hand, refers to the change in behaviour or attitude of debtors after credit contracts have been signed and disbursement has taken place. According to Varian (2010), moral hazards are situations that occur

_____

where the actions of one side of the market cannot be observed by the other; hence, it is referred to sometimes as the hidden action problem. Kure et al. (2017) defined non-performing loans as borrowed money whereby the debtor fails to make the agreed and scheduled payments (principal or interest) for at least 90 days.

Brownbridge (1998) discussed moral hazards for bank owners, adverse enticements for bank owners to act against the interest of their creditors (depositors and government), and deposit insurers by taking on risky investments that involve lending at high rates to high-risk borrowers. The researcher pointed out the causes of moral hazard by bank owners including a rise in deposit rates, macroeconomic instability, the expectation by bank owners that government will bail out distressed banks, deposit insurance, bank capital, insider lending, among others. On the part of other borrowers, moral hazard can result from high lending rate, which will encourage debtors to take on high-risk investments in the quest for higher returns, and poor credit monitoring which encourage borrowers to divert borrowed funds to projects other than that for which credit was granted, huge collateral requirements, among others. Whether on the part of bank owners or other borrowers, the bottom line is that moral hazard and adverse selection can trigger the increase in non-performing loans and ultimately to bank failure (Brownbridge, 1998).

Empirically, non-performing loans are attributed to some macroeconomic factors like unemployment, GDP growth rate, inflation, changes in interest rates, etc., and bank-specific factors like operation efficiency, loans-to-asset ratio, exposure to local markets, weak credit management process, ownership structure, etc. Among other factors, Brownbridge, (1998) attributed bad loans of indigenous banks in Uganda, Nigeria, Kenya, and Zambia to credit schemes characterized by lending at high-interest rates to high-risk borrowers. Even though banks can sell eligible bad assets at discount to asset management companies like Asset Management Company of Nigeria (AMCON), Kure et al. (2017) points out that non-performing loans generally mean bad business for banks and a risk to financial stability.

Messai and Jouini (2013) sampled 85 banks across Spain, Greece, and Italy. They applied panel data analysis to test for the determining factors of non-performing loans. The study reported that non-performing loans are inversely linked with the profitability of banks' assets and GDP growth rate but positively with real interest rate and unemployment rate. The relationship between non-performing loans and interest rates was further strengthened by Ogundipe et al. (2020) using data from three commercial banks in Nigeria – Guaranty Trust Bank, First Bank of Nigeria, and United Bank of Africa – and the Central Bank of Nigeria statistical database. The study showed a positive link between lending interest rates and non-performing loans.

Using data from 1999 to 2012 for nine licensed commercial banks in Sri Lanka, Ekanayake and Azeez (2015) reported that the rate of non-performing loans in Sri Lanka is linked to both banks' specific factors and macroeconomic conditions. More specifically, the study showed that non-performing loans increase with deteriorating banks' efficiency, increasing loan-to-asset ratio, increasing prime lending rate, and decreases with an increase in GDP growth rate. The study also pointed out that smaller banks incur more loan defaults compared to larger banks.

Roman and Bilan (2015) tested for the macroeconomic determinants of non-performing loans for all EU countries using data from 2000 to 2013. The researchers noted that the study confirms the findings of previous studies that the main determinants of non-performing loans are unemployment, GDP growth, and domestic bank credit. The study also noted that the financial soundness of banks depends on the quality of public finances. Adusei (2018) used data for Ghana covering from 1998 to 2013 and found that non-performing loan is determined by macroeconomic variables, money supply, and financial development. In another study in Ghana, Benson and Agyemang (2021), applied panel data analysis on data from the seven universal banks listed on Ghana Stock Exchange for the period 2009 to 2016. The study reported that non-performing loans and lending rates are

negatively and significantly related. This is a sharp contrast to other studies (including Ekanayake & Azeez, 2015; Ogundipe et. al., 2020 and Messai & Jouini, 2013) that reported a positive link between non-performing loans and lending rates:

Though there are numerous works on the determinants of non-performing loans, very few works exist on adverse selection, moral hazard, and credit market with no study specifically on the Nigerian credit market. Among these very few studies are Klonner and Rai (2005) and Marashdeh (1997). Klonner and Rai (2005) used a natural experiment to test for information asymmetries in Roscas (rotating savings and credit associations) in South India. The study also compared the difference in default rates between early and late recipients of the accumulated contribution of Roscas members at regular meetings before and after the imposition of a ceiling on bids in September 1993 by the Indian government. The study found evidence of adverse selection and further pointed out that adverse selection is more prominent in newly established branches and urban areas.

Marashdeh (1997) considered the Malaysian Credit Market to explore the impact of adverse selection and moral hazard. The study utilized monthly data covering January 1983 to November 1993 and unconstrained 3SLS method for estimation and reported the absence of adverse selection in the Malaysian credit market. However, the study noted that commercial banks were willing to lend more at higher interest rates, which contributed to the problem of moral hazard.

3. PROBLEM STATEMENT

Researchers like Stiglitz and Weiss (1981) as well as Ogundipe et al. (2020) among others focused on different segments of the credit market and pointed out the level of uncertainty in determining the credit worthiness of credit applicants in banks and other financial institutions. Both banks and their customers do not possess all the information necessary for taking credit decisions without risk. To navigate the credit market, therefore, banks and other financial institutions are tempted to increase the lending rate to knock off the perceived risk associated with extending credit. However, this act comes with enormous effects which include the accumulation of non-performing loans, reduced profitability of banks and other financial institutions, reduced access to credit, and ultimately poor economic growth. To cushion these effects, the Asset Management Company of Nigeria (AMCOM) was established on July 19th, 2010 as a crucial stabilizing and re-vitalizing tool obliged to revamp the financial system by way of effectively and efficiently resolving the non-performing loan assets of the banks in the Nigerian economy. A notable success was recorded in reducing non-performing loans. Available data show that between 2011 and 2020 (post-AMCOM), the ratio of non-performing loans to total loans never exceeded 14.81% and was even as low as 2.96% in 2014. Meanwhile, in the pre-AMCOM period, it racked up to 37.25% in 2009 (see figure 1 above). However, grounds remain to be conquered as the ratio of non-performing loans to total loans still falls above the CBN 5% prudential threshold in recent times (Kure et al., 2017). Hence, this study tests for the existence of adverse selection in the Nigerian credit market as well as providing further guides to policy makers, regulators, banks and other financial institutions to ensure effective credit administration and a viable economy at large.

4. RESEARCH METHODOLOGY OR METHODS

The study employed the econometric model approach where loan performance is expressed as a function of lending interest rate and other factors connected with loan performance in the credit market. It argues that non-performing loans in the credit market cannot be eliminated. This assertion is based on two reasons; firstly, the persistent effect of financial crises as agreed by Reinhart and Reinhart (2010), Amuakwa-Mensah and Boakye-Adjei (2015), and Ekanayake and Azeez (2015). Reinhart and Rogoff (2009) observed with international evidence that financial crises are followed by a decade-long slowdown of output growth. Secondly, interest rate fluctuations

could also be a culprit. Messai and Jouini (2013), Ekanayake and Azeez (2015), Ogundipe and Olaoye (2020), and Oloruntoba (2021) opined that interest rate has a robust impact on loan repayment. Ogundipe and Olaoye (2020) further argued that the slenderest adjustment in lending rate will expressively increase the value of non-performing loans and incidents of default.

It is also imperative to note that the existing theoretical analysis of non-performing loans is very limited (Kobayashi & Nakajima, 2019). However, some empirical literature such as Atoi (2018) on non-performing loans takes a queue from the theory of information asymmetry which was initially introduced by Akerlof (1970). According to the theory, it may perhaps not be straightforward to distinguish between worthy and unscrupulous debtors. This difficulty can give rise to what is known as adverse selection and moral hazard problems. Rothschild and Stiglitz (1976) expanded this theory of adverse selection and defines it as the situation in which the probability of loan default rises with increasing interest rates and the quality of borrowers deteriorates as the cost of borrowing increases (Musara & Olawale, 2012). This theory is established on the assumption that banks lack the confidence in determining credit-worthy borrowers from a group of prospective borrowers who have diverse credit-risk exposures ex-ante. As a result, financial intermediaries are more likely to lend to high-risk borrowers or debtors who have little or no concern about the exploitive nature of the lending conditions and are thus susceptible to loan default (Ezeoha, 2011). With this in mind, the model is expressed thus;

$LNPL_t = \beta_0 + \lambda_1 IRS_t + \lambda_2 LR_t + \lambda_3 GDP_t + \lambda_4 LNPL_{t-1} + \mu_t$ …………………………………………………....1

Where LNPL = Natural log form of Non-performing loan to total loan ratio

IRS = Interest rate spread

LR = Lending interest rate

GDP = Gross domestic product growth rate

β_0 = Intercept term

λ_{1-4} = Slope coefficients

μ = Error term and

t = Time

The study employed quarterly data (converted from World Development Indicators 2020 annual publication) that spans through 2007Q1 – 2020Q1 and adopts the Autoregressive Distributed Lag (ARDL) model to explore the connection existing between loan performance and lending rate in the Nigerian credit market. This model was established by Pesaran and Shin (1999) and consequently improved by Pesaran, Shin, and Smith (2001). We adopted the model for three key reasons. Firstly, it solves the endogeneity problem as well as the inability to test hypotheses in the long run with limited coefficients connected to the Engle-Granger method. In other words, it has superior statistical properties on small samples, as it is a relatively better measure in the case of small samples. Secondly, it estimates both long-run and short-run simultaneously, without losing the short-run dynamics. Finally, it hardly encounters the problem of stationarity since it utilizes variables integrated at levels, first difference, or a mixture of both, as long as they are not integrated at an order higher than one that is, I(1).

An unrestricted error correction model (ECM) is derived from the bound test (Pesaran et al, 2001). The error correction model can adequately integrate short-run changes with the long-run equilibrium and still retain the long-run information (Ogbonna, Mobosi & Ugwuoke, 2020). Thus we specify equation 1 and present it as ARDL-ECM accordingly;

$$\Delta LNPL_t = \beta_0 + \eta_1 LNPL_{t-1} + \eta_2 IRS_{t-1} + \eta_3 LR_{t-1} + \eta_4 GDP_{t-1} + \sum_{i=1}^{p} \kappa_i \Delta LNPL_{t-1} + \sum_{i=1}^{p} \forall_i \Delta IRS_{t-1} +$$

$$\sum_{i=1}^{p} \phi_i \Delta LR_{t-1} + \sum_{i=1}^{p} \delta_i \Delta GDP_{t-1} + \mu_t \sim\sim\sim\sim\sim\sim\sim\sim\sim\sim (2)$$

where: Δ represents the difference operator;

η_1, η_2, η_3, and η_4 represent the long-run estimates;

$\kappa_i \; \forall_i$, ϕ_i and δ_i represent the short-run estimates;

μ_t is white noise at time t.

The ARDL model can automatically pick out its most suitable lag length. Although, the suitability of the lag selection order of the model is what determines the most befitting calculation of the f-statistic (Kur, Chukwu & Ogbonna, 2021). To conduct the ARDL bounds test, we pre-test long-run association by testing for co-integration through the f-test. The null hypothesis (i.e H_0: H_0: $\lambda_1 = \lambda_2 = \lambda_3 = \lambda_4$) of no co-integrating relationship among the variables in equation 2 is compared against the alternative hypothesis (H_1:H_0:$\lambda_1 \neq \lambda_2 \neq \lambda_3 \neq \lambda_4$) of co-integrating relationship. This information is utilized to decide whether the null hypothesis will be rejected or not. The critical values (upper and lower) are used to decide on the appropriate action to take. If f-stat>I(1) (upper critical value), it means there is a long-run co-integrating relationship. In this study, we do not accept the null hypothesis (H_0) of no long-run association. We, therefore, conclude with the assertion that the variables exhibit a long-run association between themselves.

Upon ascertaining the presence of a co-integrating relationship, we estimate the long run model together with the unrestricted error correction model (ECM) to ascertain the short-run dynamics, thus;

$$\Delta LNPL_t = \beta_0 + \sum_{i=1}^{p} \kappa_i \Delta LNPL_{t-1} + \sum_{i=1}^{p} \forall_i \Delta IRS_{t-1} + \sum_{i=1}^{p} \phi_i \Delta LR_{t-1} +$$

$$\sum_{i=1}^{p} \delta_i \Delta GDP_{t-1} + \psi ECM_{t-1} + \mu_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(3)$$

Where

ECM = the error correction model that emanates from the tested equilibrium relationship in the long-run

ψ = the coefficient that signifies speed of adjustment

μ_t = white noise

5. DATA ANALYSIS AND DISCUSSIONS

Table 1: Descriptive statistics

	NPL	LR	IRS	GDP
Mean	10.59	16.64	7.82	4.10
Median	8.35	16.76	7.99	4.84
Maximum	37.25	18.99	11.06	8.04
Minimum	2.96	13.64	3.27	-1.79
Std. Dev.	8.07	0.99	1.73	3.03
Observations	53	53	53	53

Source: Authors' computation

From the descriptive statistics, the mean of NPL is significantly smaller than the maximum NPL value. However, the mean of NPL is closer to the minimum NPL. This shows that NPL values cluster around the minimum value, showing that the number of NPL in Nigeria's credit market has not changed significantly over time. Nevertheless, this assertion would be evaluated using the findings from the empirical analysis. The absolute difference between the mean NPL and maximum NPL is 26.66, while the absolute difference between the mean NPL and minimum NPL is 7.63. This shows that overall, NPL values cluster around the minimum value and have not changed

significantly on the average over time, however, there are times when shocks in the credit market dramatically affected NPL leading to spikes in the NPL series.

Similarly, the standard deviation of the NPL is larger than the standard deviation of LR, IRS, and GDP (by 7.08, 6.34, and 5.04 respectively), indicating that the NPL series has more spike than LR, IRS, and GDP. The study asserts that the spikes in NPL might have been caused by the changes in LR, IRS, and GDP over time. However, this study seeks to ascertain empirically if the changes in LR, IRS, and GDP resulted in these noticeable spikes in NPL as well as overall changes in NPL over time in Nigeria's credit market.

Table 2: Stationarity test result

Variables	ADF Test		PP Test		KPSS Test	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
IRS	-3.78*		-1.96	-2.76***	0.15*	
LNPL	-2.25	-3.13**	-1.72	-3.13**	0.17*	
LR	-2.46	-2.43	-1.08	-3.21**	0.26**	
GDP	-3.94**		-2.35	-2.46	0.07**	

***, **, * denotes stationary at 10%, 5% and 1% level of significance.
Source: Authors' computation

Table 3: Summary of stationarity test

Variable	ADF test	PP test	KPSS test
IRS	Stationary at levels	Not Stationary at 1st diff	Stationary at levels
LNPL	Stationary at 1st diff	Stationary at 1st diff	Stationary at levels
LR	Not Stationary at 1st diff	Stationary at 1st diff	Stationary at levels
GDP	Stationary at levels	Not Stationary at 1st diff	Stationary at levels

Source: Authors' computation

The Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test was introduced due to the stationarity disagreement between the Augmented Dickey Fuller (ADF) and Phillips Perron (PP) tests. Whenever there is a form of disagreement and discrepancy between the ADF and the PP test, the KPSS becomes the "best" unit root test to use (Afriyie, Twumasi-Ankrah, Gyamfi, Arthur & Pels, 2020). The KPSS test which tests the stationarity is suitable for very small values of the parameter. However, it is advisable not to use the KPSS test independently. Rather, it should be used as a complementary unit root test of shorter time series. According to Fedorová (2016), the KPSS test is considered a suitable complement for unit root tests not only because it directly tests the stationarity but especially because it can be used for shorter time series.

From the stationarity test result above, for IRS, the ADF and KPSS test shows that it is stationary at levels. For LNPL, the ADF, PP, and KPSS test results show that it is not an I(2) series (that is, it is not integrated of order 2). This justifies its usage in the model because series integrated of order 2 cannot be incorporated into an ARDL model. Similarly, the PP and KPSS test justifies the incorporation of LR in the model because it is not an I(2) series. Lastly, the ADF and KPSS test shows that GDP is stationary at levels. Since IRS, LNPL, LR, and GDP are not I(2), they can be incorporated into an ARDL model.

_____

Table 4: Results for long run test using the F-Bound test

	F-stat	I(0)	I(1)
10%	3.80	2.37	3.2
5%	3.80	2.79	3.67
1%	3.80	3.65	4.66

Source: Authors' computation

To determine if a long-run relationship exists among LNPL, LR, IRS, and GDP, the ARDL bounds test was conducted. These variables are said to have a long-run association if the value of F-stat is greater than the I(1) – upper-class boundary. From the result, the F-stat is greater than the upper-class boundary {I(1)} at a 5% and 10% significance level. This implies that there is a cointegrating relationship existing between LNPL, LR, IRS, and GDP. The long-run relationship that exists among non-performing loans, lending rate, interest rate spread, and Gross Domestic Product growth indicates that the long-run fluctuations in non-performing loans can be attributed to changes in lending rate, interest rate spread, and Gross Domestic Product growth rate.

Table 5A: Long run estimates – Dependent variable: LNPL

Variable	Coefficient	t-statistic	Prob
C	-4.0438	3.3812	0.2391
LR	0.6308*	2.8628	0.0068
IRS	-0.4792*	-3.2392	0.0025
GDP	-0.1783*	-2.8238	0.0075

Table 5B: Error Correction Estimates – Dependent variable: D(LNPL)

Variable	Coefficient	t-statistic	Prob
D(LNPL(-1))	0.4426*	4.5310	0.0001
D(LR)	0.4105*	11.3974	0.0000
D(LR(-1))	-0.2848*	-6.5784	0.0000
D(IRS)	0.1048*	3.7651	0.0006
D(IRS(-1))	-0.0850**	-2.1761	0.0358
D(IRS(-2))	0.0532***	1.8653	0.0699
D(GDP)	-0.0448**	-2.5359	0.0154
ECM (-1)	-0.0743*	-4.5839	0.0000

$R^2 = 0.91$ Adj $R^2 = 0.90$ DW-Stat = 2.1189 χ^2_{LM} = 2.9024 [0.2323] χ^2_{Hete} = 13.0856 [0.2878]

*, **, and *** respectively denotes significance at 1%, 5% and 10% levels. χ^2_{LM} denotes Breusch-Godfrey Serial Correlation LM Test, χ^2_{Hete} denotes Breusch-Pagan-Godfrey Heteroskedasticity Test

Source: Authors' computation

Following the bound test result which shows the presence of a long-run correlation between the variables, the long-run model was estimated to investigate the nature of the relationship that exists among the variables. The result in table 5A shows the long-run influence of lending rate, interest rate spread, and GDP growth rate on non-performing loans.

_____

From the long-run estimates, the lending rate emphatically affects non-performing loans positively. That is, a percentage rise in the lending interest rate would increase non-performing loans by about 63%. This shows that adverse selection exists in the Nigerian credit market in the long run. An increase in the lending interest rate scares away low-risk borrowers because an increase in lending rate increases the cost of investment and thus, does not look attractive to investors. However, high-risk borrowers still demand loans even with rising interest rates. This is akin to the results of Ogundipe et al, Ekanayake and Azeez (Ogundipe et al., 2020; Ekanayake & Azeez, 2015). They found that lending rate and non-performing loans have a positive relationship. On the contrary, interest rate spread negatively and significantly affects non-performing loans. If the interest rate spread increases by a percentage point, non-performing loans would reduce by about 48%. To understand this result the source(s) of changes in IRS will be brought into perspective. Changes in IRS could result from two things: First, an increase (decrease) in lending rate with deposit rate held constant. In this case, a positive (negative) relationship will result between NPL and IRS. Secondly, a (an) decrease (increase) in deposit rate with lending rate held constant. Here, the relationship between NPL and IRS will be negative as is the case in this study. This is because, a low deposit rate means a reduced cost of funds for financial institutions hence more returns at the prevailing lending interest rate, which reduces the incentive to increase the lending interest rate. In the same vein, the GDP growth rate is inversely linked to non-performing loans. A percentage point increase in GDP growth rate would reduce non-performing loans by about 18%. This result corroborates with the study of Roman and Bilan (2015), who explored macroeconomic determinants of non-performing loans among European Union countries and found GDP growth and non-performing loans to be inversely related. This finding is not surprising because when GDP is growing, it shows that economic activities are on the increase, suggesting that the economy is a good investment destination. A good investment destination enhances the productivity of loans. This is one of the reasons why the expansion of the economy improves loan performance. Messai and Jouini (2013); Ekanayake and Azeez (2015) also found that GDP growth rate and non-performing loans are inversely related.

For the short-run coefficients, a percentage increase in non-performing loans in the current quarter would significantly increase non-performing loans in the following quarter by about 0.44%. Also, if the lending interest rate increases by 1% point, non-performing loans would increase by about 41%. This reflects the existence of adverse selection in the short run as well. The findings also confirm that an increase in interest rate spread affects non-performing loans positively. This means that, if the interest rate spread would increase by 1%, non-performing loans would equally increase by about 10%. Lastly, if GDP growth would rise by 1%, the effect on non-performing loans would be a decrease of about 5%. The error correction model (ECM) term captures the speed upon which the model adjusts to long-run equilibrium. The result shows the adjustment speed of the model in the long-run equilibrium is about 7%. To determine how reliable these results are, the study conducted Autocorrelation and Heteroscedasticity tests. The P-values of χ^2_{LM} and χ^2_{Hete} are 0.2323 and 0.2878 respectively. These probability values (which are greater than 0.05) show that there is no significant evidence of heteroscedasticity and autocorrelation in the model. Thus, inferences made from the results are reliable.

6. RESEARCH IMPLICATIONS

Leaning on the loan pricing theory of Stiglitz & Weiss (1981), this study provided empirical proof for the existence of adverse selection in the Nigerian credit market. To achieve this core objective, this study set out by using various econometric tools to appraise the nature of the relationship between loan performance proxied by non-performing loans and three determining factors – Lending interest rate (LR), Interest rate spread (IRS), and GDP growth rate (GDP). The stationarity (otherwise, unit root) test results revealed that none of the variables is integrated of order two (all were stationary either at levels or after the first difference), hence confirming the suitability of the ARDL

model adopted for the analysis. The bound test result validates the existence of long-run nexus between the variables by way of the value of the upper-class boundary being less than the value of the f-stat. The estimation results showed that lending interest rate (LR) is of positive and significant influence on the natural log of non-performing loans (LNPL) while interest rate spread (IRS) and GDP growth rate (GDP) are negatively and significantly related to the natural log of non-performing loans (LNPL), all in the long run. Conversely, the short-run results on the other end, show that LR and IRS are positively and significantly related to LNPL while GDP is negatively but significantly related to LNPL. Further results in the short run show that the lagged values (t-1) of LNPL, LR, and IRS significantly impact the current value of LNPL. The slight difference between the R-squared and the adjusted R-squared shows the suitability of the variables adopted for the analysis while the Autocorrelation and Heteroscedasticity tests showed the absence of serial correlation and heteroscedasticity respectively.

It is in light of these findings that this study recommends that the apex bank implement a price ceiling in the credit market. This will serve to curb the greediness of banks and other financial institutions in continuously raising lending interest rates and accumulating more non-performing loans, hence strengthening the financial market and preventing bank failure. This will also ensure that funds are channelled to more productive sectors of the economy with considerable risk levels, as banks will be forced to cherry-pick from existing borrowers those with viable projects and a higher probability of repayment since they now have limited power over the lending interest rate. Of great importance also, is the fact that implementing a price ceiling in the credit market will increase access to credit by viable borrowers who would have been chased out in the current market situation by high-risk borrowers with ever-increasing willingness to borrow at high lending rates.

Also, banks and other financial institutions are advised to properly define their lending rates given their cost of funds and other operational expenses associated with extending credit and carefully select viable borrowers from the credit market that suit the banks' credit policy rather than adjust the lending interest rate to compensate for higher risk.

7. CONTRIBUTIONS TO SCIENTIFIC COMMUNITY AND FUTURE RESEARCH

Careful consideration of the literature review reveals that while many studies exist on the determinants of non-performing loans, no work has been tested for the existence of adverse selection in the Nigerian credit market. Also, while the majority of the existing studies report a positive link between the lending interest rate and non-performing loans, other extant literature reports an adverse relationship between the two variables. Hence, the absence of common ground in this regard. However, there is a common ground among some researchers (like Ekanayake & Azeez, 2015; Roman & Bilan, 2015; Adusei, 2018) that non-performing loan results from macroeconomic and bank-specific factors.

This paper has strengthened the position of existing literature with evidence of adverse selection in the Nigerian credit market. Also, while the previous studies used annual data for analyses this study provided evidence based on quarterly data analysis. This paper to the best of our knowledge will therefore be the first work to test for the existence of adverse selection in the Nigerian credit market using quarterly data.

8. CONCLUSION

This study used various econometric tools to investigate the existence of adverse selection in the Nigerian credit market using the relationship between non-performing loans and lending rate as the core decision variables. The result of the analysis showed a robust and positive link between the lending rate and non-performing loans in both the short run and long run, hence proving the existence of adverse selection in the Nigerian credit market. This is a

_____

situation such that high-risk borrowers who are willing to pay higher lending rates crowd out low-risk borrowers who are conscious of the lending rates.

9. FUNDING

ORCID

Chimezie O'Brian Abugwu https://orcid.org/0000-0003-2414-495X
Keghter Kelvin Kur https://orcid.org/0000-0003-1276-385X
Henry Chimaobi Urama https://orcid.org/0000-0002-8613-6405
Chidozie Sunday Abbah https://orcid.org/0000-0003-2025-0798

References

Abimbola, E. (2020). Impact of Non-Performing Loan on Bank Performance in Nigeria: A Case Study of Selected Deposit Money Banks. *Journal of Business & Economic Policy*, 7(4), 56-70. doi:10.30845/jbep.v7n4p7

Adusei, C. (2018). Determinants of Non-Performing Loans in the Banking Sector of Ghana between 1998 and 2013. *Asian Development Policy Review*, 6(3), 142-154.

Afriyie, J. K., Twumasi-Ankrah, S., Gyamfi, K. B., Arthur, D., & Pels, W. A. (2020). Evaluating the Performance of Unit Root Tests in Single Time Series Processes, *Mathematics, and Statistics*, 8(6), 656 - 664. DOI: 10.13189/ms.2020.080605.

Ahlem, S. M., & Fathi, J. (2013). Micro and Macro Determinants of Non-performing Loans. *International Journal of Economics and Financial Issues*, 3(4), 852-860.

Amuakwa-Mensah, F., & Boakye-Adjei, A. (2015). Determinants of non-performing loans in Ghana banking industry. *International Journal of Computational Economics and Econometrics*, 5(1), 35–54.

Atoi, V. N. (2018). Non-performing Loan and its Effects on Banking Stability: Evidence from National and International Licensed Banks in Nigeria. *Central Bank of Nigeria (CBN) Journal of Applied Statistics*, 9(2), 43-74.

Awoyemi, B. O., & Jabar, A. A. (2014). Prime Lending Rates and the Performance of Microfinance Banks in Nigeria. *European Journal of Business and Management*, 6(12), 131-137.

Benson, R., & Agyemang, O.O. (2021). Lending Rate and Loan Portfolio of Banks in Ghana. *ISSRA Journal of Entrepreneurship and Business Management*, 1(1), 37 – 48.

Brownbridge, M. (1998). Financial distress in local banks in Kenya, Nigeria, Uganda, and Zambia: causes and implications for regulatory policy. *Development Policy Review*, 16(2), 173-188.

Central Bank of Nigeria. (2021). Statistical Bulletin. Abuja.

Ekanayake E. M. N. N., & Azeez A. A. (2015). Determinants of Non-Performing Loans in Licensed Commercial Banks: Evidence from Sri Lanka. *Asian Economic and Financial Review*, 5(6), 868-882

Eke, F. A., Eke, I. C., & Inyang, O. G. (2015). Interest rate and commercial banks' lending operations in Nigeria: A structural break analysis using chow test. *Global Journal of Social Sciences*, 14(1), 9-22.

Ezeoha, A. E. (2011). Banking consolidation, credit crisis, and asset quality in a fragile banking system. *Journal of Financial Regulation and Compliance, Emerald Group Publishing*, 19(1), 33-44

Fedorová, D. (2016). Selection of unit root test based on length of the time series and value of ar (1) parameter. *Statistika*, 96(3), 47 – 64

Igwemma, A. A., Ogu, C., Agba, U. P., Odionye, J. C., & Ogu, L. C. (2020). Commercial Banks Loans and Lending Rate in Nigeria: A Toda-Yamamoto Causality Approach. *Journal of Economics and Sustainable Development*, 11(2), 12-20.

Klonner, S., & Rai, A. S. (2005). *Adverse Selection in Credit Markets: Evidence from South Indian Bidding Roscas.*

_____

University of Bath - Centre for Development Studies, South Asia, India.

Kobayashi, K., & Nakajima, T. (2019). A theory of non-performing loans and debt restructuring. OAP-PRI Economics Workshop Series Bank, Corporate and Sovereign Debt, 1- 30

Kur, K. K., Abugwu, O. C., Abbah, S. C., & Anyanwu, O. (2021). Public debt and economic growth: What we know today about the Nigerian economy tomorrow. *African Social Science and Humanities Journal*, 2(4), 192-206.

Kur, K. K., Chukwu, O. N., & Ogbonna, E. O. (2021). Impact of external debt on sectoral performance: Comparative study of Nigeria and Botswana. *African Social Science and Humanities Journal (ASSHJ)*, 2(4), 217 – 232

Kure, E., Adigun, M., & Okedigba, D. (2017). Non-Performing Loans in Nigerian Banks: Determinants and Macroeconomic Consequences. *Central Bank of Nigeria Economic and Financial Review*, 55(3), 1-24.

Marashdeh, O. (1997). Adverse Selection and Moral Hazard Effects in the Malaysian Credit Market: An Empirical Analysis. *Malaysian Management Journal,* 2(1), 71-78.

Mehrteab, H. T. (2005). Adverse selection and moral hazard in group-based lending: evidence from Eritrea. S.n. Available at: http://dissertations.ub.rug.nl/FILES/faculties/eco/2005/h.t.mehrteab/c2.pdf

Messai, A. S., & Jouini, F. (2013). Micro and Macro Determinants of Non-performing Loans. *International Journal of Economics and Financial Issues*, 3(4), 852-860.

Musara, M., & Olawale F. (2012). Perceptions of start-up small and medium-sized enterprises (SMES) on the importance of business development services providers (bds) in improving access to finance in South Africa. *Journal of Social Science,* 30(1), 31-41

Ogbonna E. O., Mobosi, A. I., & Ugwuoke W. O. (2020). Economic growth in an oil-dominant economy of Nigeria: The role of financial system development. *Cogent Economics & Finance, 8:1*, 1810390, DOI: 10.1080/23322039.2020.1810390

Ogundipe, A.S., Akintola, A. F., & Olaoye, S.A. (2020). Interest Rates and Loan Performance of Deposit Money Banks in Nigeria. *EPRA International Journal of Economic and Business Review*, 8(1), 13 – 20.

Oloruntoba, O. (2021). Credit management dimensions and loan performance of deposit money banks in Nigeria. *Caleb International Journal of Development Studies (CIJDS)*, 4(1), 109 – 121. https://doi.org/10.26772/cijds-2021-04-01-06

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, *16*(3), 289–326. https://doi.org/10.1002/jae.616

Reinhart, C. & Rogoff, K. (2010) *From Financial Crash to Debt Crisis*, NBER Working Paper 15795.

Roman, A., & Bilan, I. (2015). An Empirical Analysis of the Macroeconomic Determinants of Non-Performing Loans in EU 28 Banking Sector. *Revista Economică,* 67(2), 108-127.

Rothschild, M., & Stiglitz, J. (1976). Equilibrium in competitive insurance markets: An essay on the economics of imperfect information. *Quarterly Journal of Economics*, 90(4), 629-649.

Stiglitz, J. E., & Weiss, A. (1981). Credit Rationing in Markets with Imperfect Information. *The American Economic Review*, 71(3), 393-410.

Varian, H. R. (2010). *Intermediate Microeconomics: A Modern Approach (8th edition).*W. W. Norton & Company, Inc., 500 Fifth Avenue, New York, N.Y. 10110. ISBN 978-0-393-93424-3

World Bank (2020). World Bank Development Indicators.