

A Retrospective Study of Non-Performing Loans of the Ghana Banking Sector between 1998 and 2019

Charles Adusei*, Jacob Bannerman

Department of Accounting, Banking and Finance, Garden City University College, Kumasi, Ghana
Email: *sircharly2002@gmail.com

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Abstract

This study was conducted as a retrospective analysis of the determinants of Ghana's Non-Performing Loans (NPLs) using historical time series annual data covering the period of 1998-2013 with an extension to 2019 on NPLs to Total Gross Loans (%). A rising NPLs in a bank portfolio is a pressing issue to bank managers and regulators. The ex-post facto research design was used for this study. Using the Seemingly Unrelated Regression model and Principal Component Analysis, the study found money supply, financial development, and macroeconomics variables to be significant determinants of NPL, except real income. NPL is a significant factor used by regulators to determine financial stability and bank asset quality. The study recommends policies targeted at influencing NPLs and the need for regulators to ensure good corporate governance by the banks to avoid bank failure.

Keywords

Retrospective Study, Non-Performing Loan, Banking Sector, Principal Component Analysis, Ghana

1. Background

The banking sector plays an important role in the development of an economy. Yuksel, Dincer, & Karakus (2020) opined that the bank's role of intermediation is critical in the flow of money among the banks, depositors, and borrowers. The stability of the sector is therefore very vital since it determines the step for the development of an economy. Adegboye, Ojeka, & Adegboye (2020) were of the view that financial institutions play a major role in the stability of every economy. Bank loans are contracts between banks that lend money and other legal

persons who borrow it, usually with the promise of repayment of the principal plus interest in the future as affirmed by [Monokroussos & Gortsos \(2020\)](#). [World Bank \(2020\)](#) indicated that NPL is any loan in which interest and principal payments are more than 90 days overdue; or more than 90 days' worth of interest has been re-financed.

High and rising levels of NPLs in many countries continue to a large extent exert strong pressure on banks' balance sheets with possible adverse effects on banks' lending operations. [Ozili \(2018\)](#) stressed that NPLs are important since they reflect the credit quality of the loan portfolio of a bank. [Chiesa & Mansilla-Fernandez \(2020\)](#) asserted that NPL growth has a negative effect on a capital buffer which might ultimately reduce credit supply. [Adegboye, Ojeka, & Adegboye \(2020\)](#) indicated that a higher percentage of NPL is a sign of difficulty in the collection of interest and principal on loans by banks. [Rathore \(2020\)](#) confirms that NPL is an important indicator that indicates the quality of the loan portfolio of financial institutions. [Cerulli et al. \(2020\)](#) suggested that a sharp increase in NPLs reduced bank profitability and increase bank failures, thus understanding the key drivers of NPLs growth are of interest importance for policymakers, regulators, and bank managers.

1.1. Related Studies

[Kjosevski & Petkosvki \(2016\)](#) found that GDP growth, inflation, and domestic credit to the private sector as the most important macroeconomic factors whereas equity to total assets ratio, return on assets, the return on equity, and the growth of gross loans was of importance for bank-specific determinants in the Baltic States between 2005 and 2014 using 27 banks annual data. [Koju, Koju, & Wang \(2018\)](#) investigated NPLs using 30 Nepalese Universal banks between 2003-2015 and established that low economic growth was the primary cause of high NPLs and suggested the need for efficient management and effective policies are required for a stable financial system and economy. [Greenidge & Grosvenor \(2010\)](#) argued that the magnitude of NPLs was a key element in the initiation and progression of financial and banking crisis while [Reinhart & Rogoff \(2010\)](#) pointed out that NPLs can be used to mark the onset of a banking crisis.

[Ozili \(2018\)](#) was of the view that financial development is positively associated with NPLs. He further indicated that NPLs are negatively associated with regulatory capital and bank liquidity, implying that banking sectors with greater regulatory capital and liquidity experience fewer NPLs. [Lou \(2000\)](#) was of the view that a comprehensive understanding of the bank NPLs problem is a prerequisite for any policy recommendation on NPLs workout and prevention. [Adebola & Dahalan \(2011\)](#) found that lending rate, producer price index and industrial production index affect bad loans and that lending rate had a significantly positive effect on NPL within the Malaysian context. [Nkusu \(2011\)](#) affirmed that economic growth, unemployment, and asset prices were determinants of NPLs in a study that analyzed bad loans of 26 advanced economics between 1998 and 2009. [Lou-](#)

zis, Vouldis, & Metaxas (2011), a higher NPA ratio shakes the confidence of investors, depositors, and lenders. It also causes poor recycling of funds, which in turn had a deleterious effect on the deployment of credit. They suggested that performance and efficiency appeared as an important variable for the internal operations of Greek banks.

Farhan et al. (2012), assessed the perception of 201 Pakistani Bankers who were involved in lending decisions of their various banks and found that interest rate, energy crisis, unemployment, inflation, and the exchange rate had a significant positive relationship whereas GDP growth had an insignificant negative relationship with the NPLs. Saba, Kouser, & Azeem (2012), studied the determinants of NPLs in the United States banking sector, the result revealed that real total loans had a positive significant effect whereas interest rate and GDP per capita had a negative significance with NPL. Djiogap & Ngomsi (2012) using panel data of 35 commercial banks from six African countries between 2001 and 2010 to examine NPLs found that negative significant impact of capital adequacy ratio on the level of NPLs. The study affirmed that more diversified banks and well-capitalized banks were better able to withstand potential credit challenges. However, the inflation variable was statistically insignificant in explaining the total business loans ratios of banks.

In the Pakistani context, Badar & Javid (2013) used 36 commercial banks during the period of 2002 and 2011 on NPLs found that there was a strong negative long-run relationships among the inflation, exchange rate, interest rate, gross domestic product, and money supply with NPLs. Curak, Pepur, & Poposki (2013) empirically investigated the determinants of NPLs in Southeastern European banking systems. The study sampled 69 banks in 10 countries between 2003 and 2010 the results show that lower economic growth, higher inflation and higher interest rate were associated with higher NPLs. Moreover, the credit risk was affected by bank-specific variables such as bank size, performance (ROA), and solvency. Messai & Jauini (2013) conducted a study on micro and macro determinants of NPLs sampled 85 banks in three countries (Greek, Italy, and Spain) between 2004 and 2008. The study found that the problem loans varied negatively with the growth rate of GDP, the profitability of the banks' assets, and positively with the unemployment rate, the loan loss reserves to total loans, and the real interest rate.

Lou (2000) noted NPLs have direct decreasing effects on bank profits. Skarica (2014) observed that the primary cause of high levels of NPLs was the economic slowdown, unemployed, and the inflation rate. Addai & Chengyi (2015) investigated the impact of delinquent loans on the financial performance of banks in Ghana and found that statistically there was a significant impact of delinquent loans on interest income and net profit. The study recommended that banks must embark on effective and regular monitoring of the lending process. Reddy (2015) observed that the public sector and to some extent the private banks accounted for the bulk Non-Performing Assets where it studied NPLs in India.

Amuakwa-Mensah & Boakye-Adjei (2015) studied the detrimental effect of NPLs had on banks' income and the economy in the banking industry of Ghana. The study made use of a panel regression model, it found that both bank-specific variables (previous year NPL, bank size, net interest margin, and current year's loan growth) and macroeconomic variables (inflation, real gross domestic product, per capita growth, and real effective exchange rate) significantly affected NPL's in the banking industry.

1.2. The Need for and Purpose of the Study

A customer cannot get a loan without a credit assessment and agreed with terms of the loan contract between the lender and the borrower as it should be.

The following questions are concerns for the authors of this paper:

- Why bank still records high NPLs?
- Can this be attributed to internal factors of the bank's operations or external factors beyond it?
- Are the borrowers becoming irresponsible or conditions within the economy or personal factors are the issues?

Chiesa & Mansilla-Fernandez (2020) were of the view that not only do NPLs have repercussions on the cost of capital in the short-term but its impact on a bank's operation in the long term. The authors of this paper align with *Chiesa & Mansilla-Fernandez (2020)* by asserting that minimizing NPLs is critical to ensuring a sound banking system and financial stability. *Bank of Ghana (2020)* reported in their Banking Sector report in January 2020 stated that there has been a significant improvement in asset quality between December 2018 and December 2019. This report indicated that it was possible due to loan recoveries, write-offs, and an increase in credit. This insight came from the 23 banks which comprise of 10 domestic banks and regional banks respectively, with 3 international banks. *PwC (2021)* reported that the banking industry of Ghana has undergone consolidation over recent years and regulatory oversight has improved. Capital levels are now broadly considered adequate but more needs to be done in embedding good risk management practices as outlined in the Capital Requirements Directive (CRD) issued in June 2018.

The high level of Non-Performing Assets (NPAs) taints the overall portfolio but puts a burden on the income statement of banks in the form of higher provisions which will lead to liquidity problems for many banks. A continuous increase in the NPL ratio can lead to a credit crunch as witnessed in other countries in recent times and this could ultimately slow down the developmental agenda of Ghana. *Scardovi (2016)* advised that NPL may arise in response to micro (example, improper bank's corporate governance, and very poor risk and lending policies) and/or macro factors (for example deep and prolonged recession in an economy) and the analysis and understanding of both may help in understanding the events leading to it and may be able to predict one for the future.

As of 2016, the banking sector of Ghana comprised of twenty-nine (29) banks, of which fourteen (14) have domestically controlled. The banks managed 1173 branches and 912 Automated Teller Machines (ATM) distributed across the ten (10) regions of the country. Ghana's situation is worrying considering the problems with non-performing loans as indicated in **Figure 1**.

It is evident from **Figure 1** that the Bank NPLs to total gross loans (%) in Ghana was 13.97 as of 2019. Its highest value over the past 11 years was 21.59 in 2017, this is not a surprise as there was a banking crisis in 2017 which were caused by poor corporate governance, poor credit management practices, bad risk management, NPLs and regulatory lapses through regulatory non-compliance and poor supervision. **Figure 1** shows that NPLs were rising between 2008 and 2010 but they declined between 2010 to 2014. It rose again till 2018 which had a fall. Indeed **Figure 1** shows oscillating of NPLs trend during 2008 and 2019. The percentage of NPLs in Ghana reflects the health of the banking system. A higher percentage of such loans shows that banks have difficulty collecting interest and principal on their credits. This may lead to less profit for the banks in Ghana with its corresponding financial implications and investor's behaviour.

Currently, the banking sector of Ghana comprised of twenty-three (23) banks, of which ten (10) have domestically controlled. This placed Ghana in the 9th position out of 114 countries in terms of worst non-performing loans with 17.29 and 7th in Africa with the lowest of 0.20 with Macao globally in 2016. Global ranking of countries NPLs in 2019 placed Ghana in the 12th position out of 131 countries in terms of worst NPLs an improvement compared to 2017.

There are many studies on NPLs in different countries both developed and developing economies. In Ghana's context studies on NPLs authors such as **Amuakwa-Mensah & Boakye-Adjei (2015)**, **Alhassan, Kyereboah-Coleman, & Andoh (2014)**, and **Amuakwa-Mensah, Marbuah, & Marbuah (2017)** their studies have delved into NPLs in Ghana with insightful works. This paper is different due to the methodology and the period for the study. The period was longer

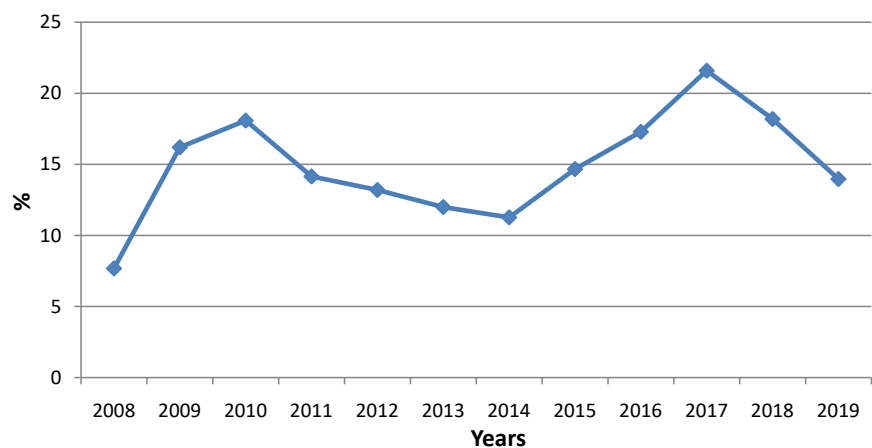


Figure 1. NPLs to total gross loans (%). Source: The World Bank Group and Bank of Ghana, 2020.

from 1998 to 2019 where the data for discussion on the banks was 1998 to 2013 with further discussion on Ghana's NPLs to 2019. This paper adds to several empirical studies on NPLs in Ghana. The methodology was innovative as the paper combined the Seemingly Unrelated Regression model and Principal Component Analysis for the analysis.

This concern must be addressed in the Banking Sector of Ghana as a high ratio may signal a deterioration of the credit portfolio. This can have a negative impact on the overall performance on liquidity, investment capacity, earnings, and profitability. The paper adds to several empirical studies on non-performing loans in Ghana. The study is significant as it explains and examines NPLs which are vital when managing the banking sector and the economy as a whole. There is therefore the need to research into the determinant of non-performing loans within the banking sector of Ghana through a retrospective study. The rest of the paper is organised as follows. The next section describes the methodology of the study, the third section considers the results and discussion of the study and the final section conclude with policy implications and recommendations.

2. Methodology

A retrospective study investigates a phenomenon or issue that has occurred in the past. Such studies most often involve secondary data collection, based upon data available from previous studies or databases. The retrospective study was considered as the outcome of interest has already occurred at the time of initiating this study. A retrospective study design allows the authors to formulate ideas about the possible associations and causes of the issues. The research design used for this study is the ex-post facto research design. This design is used where the phenomenon under study has already taken place according to [Simon & Goes \(2013\)](#).

2.1. Model Specification

The main objective of this study is to examine determinants of NPL in Ghana. The relationship between NPL and its covariates is expressed as a linear function as shown in Equation (1).

$$\text{NPL} = \beta_0 + \alpha \text{MV} + \lambda \text{MS} + \gamma \text{FD} + \varepsilon \quad (1)$$

where NPL represents nonperforming loans; MV denotes measures of money supply (M1, M2 and M2+); MS represents a vector of macroeconomic variables; FD represents a vector of financial development measurements and ε is the error or disturbance term which is assumed to be normally distributed and not serially correlated.

The parameter α is the coefficient of the macroeconomic variables which measures the extent to which the MV affects the NPL. The parameter λ is the coefficient of the vector of measures of the money supply. It represents the degree or extent to which money supply affects NPL. It is a priori expected that

changes in the MS will have a significant impact on the NPL and the coefficient λ is expected to be positive. The parameter γ is the coefficient of the vector of financial development. It represents the degree or extent to which financial development affects the NPL. It is expected that changes in financial development will have a positive or negative effect on the NPL depending on the choice of proxy for financial development.

2.2. Data Source and Variable Description

The historical time series data sets used for the study were NPL of commercial banks which were sourced from the Bank of Ghana's Monetary Time Series, World Bank World Development Indicators, and International Monetary Fund's International Financial Statistics (IFS). Sample data is between 1998 and 2013. The choice of variables, the number of banks, and the choice of the time frame for the study were based on the availability of data and the focus of the study where there was a clear indication on the rise of NPLs in Ghana due to slow-down in the economy and the retrospective nature of the study.

2.2.1. Macroeconomic Variables

The economic conditions are one of the important factors that affect operations and financial conditions of bank customers, and ultimately banking business and performance. Macroeconomic variables and an economy's overall regulatory environment also influence NPL. The model captures the effect, if any, of macro-economic variables on the NPL. MV is a vector of macro-economic variables including inflation rate (INF) denoting GDP deflator; real total output of the economy (Y) proxy by GDP; lending rate; exchange rate (EX).

GDP growth reflects a positive economic environment that is beneficial to both households and businesses, incomes of households and businesses grow which makes it possible for borrowers to have sufficient funds to service their debts. Inflation can have a positive or negative impact on non-performing loans in case of price stability or price instability contributing to the debtor's capacity to repay the loan or otherwise. The lending rate can be defined as the weighted average rate that typically meets the short- and medium-term financing needs of the private sector. The rate is normally differentiated according to the credit-worthiness of borrowers and the objectives of financing. An increase in interest rates produces an additional burden and the level of non-performing loans. High lending interest reflects the high-risk premium that banks charge for low credit quality debtors indicating poor credit portfolio. The exchange rate may affect loan losses for those loans nominated in foreign currency; this is so in emerging markets as there is no matching currency between the incomes of the households and what the businesses receive and their loans debts. The implication is that changes in the exchange rate may affect the debt burden. Depreciation of domestic currency increases debt and the debtor's inability to repay the loans leading to loan losses for the banks.

2.2.2. Financial Development

The financial structure of an economy, in particular, the extent to which an economy is developed financially is critical in the effectiveness of loan performance. Proxies for financial sector development are captured in the FD variable. They include private sector credit/GDP (CPS/Y); private sector credit/total domestic credit (CPS/DC); broad money/GDP (M2+/Y); narrow money/broad money (M1/M2+); and total domestic credit/GDP (DC/Y).

2.3. Estimation Strategy

The model is estimated in five stages using Seemingly Unrelated Regression. Each stage captures three measures of money supply in a simultaneous equation format and a measure of financial development.

$$NPL = \beta_o + \alpha MV + \lambda MS + \gamma FD + \varepsilon \quad (2)$$

In order to accurately estimate the parameters in the above specified econometric models using time series data, four steps are followed. First, a Principal Component Analysis is done to test the robustness of the results and include only the relevant variables in the estimation. The PCA will also account for correlation among the measures of financial development and the sufficiency at which the proxies adequately measure financial development. The second step examines the stationarity status of the individual series in the regression model to ensure that the estimated relationships are not spurious. Then the existing long-run equilibrium relationship among the variables in the models specified above is tested using SUR model.

Greene (2003) viewed seemingly unrelated regression (SUR) as a special case of the generalized regression model $E(y) = X\beta$, $V(y) = \sigma^2\Omega$; however, it does not share all of the features or problems of other leading special cases (e.g., models of heteroskedasticity or serial correlation). While, like those models, the matrix Ω generally involves unknown parameters which must be estimated, the usual estimators for the covariance matrix of the least squares estimator $\hat{\beta}_{LS}$ are valid, so that the usual inference procedures based on normal theory are valid if the dependent variable y is multinormal or if the sample size N is large and suitable limit theorems are applicable. Also, unlike those other models, there is little reason to test the null hypothesis $H_0: \Omega = I$; the form of Ω is straightforward and its parameters are easy to estimate consistently.

2.3.1. Principal Component Analysis

Principal Component Analysis is a dimension reduction tool used to test the robustness of the results. In a model with many variables, the probability of over-fitting the model and producing conclusions that cannot be used to generalise the other data sets is very high. When there are strong correlations between the various variables in the model, they can be reduced to a few principal components through an orthogonal transformation. These few principal components will contain much of the information in the original larger set of variables. A

PCA converts a set of observations of possibly correlated variables into a set of values of linearly uncorrelated variables.

2.3.2. Tests for Stationarity

After the PCA is done and the principal components have been obtained, a unit root test is done on the selected variables to test for the stationarity. Stationarity means that the relationship has no trend and is thus constant over time. In estimating the parameters of a model using time series data, a test for the stationarity of the variables is required to determine the order of integration of each variable used. This is very crucial in the cointegration process for specifying an econometric model. This study thus tests for stationarity of the endogenous and exogenous variables within the framework of the Augmented Dickey-Fuller and Phillips-Perron test procedure. This is to prevent spurious regression which is a common problem associated with time-series data.

3. Results and Discussion

3.1. Descriptive Statistics of Variables

The descriptive statistics of the variables are shown in **Table 1**, which shows the mean, standard deviation, minimum value and maximum value.

The study used means to describe the central tendency of the data set and standard deviation to describe the dispersion within the data. From the data set, the proxies for financial development had the highest mean range. The ratio of private sector credit to real income, the ratio of broad money to real income, and ratio of credit deposit to real income had the highest mean values respectively

Table 1. Descriptive statistics of variables.

Variable	Mean	Standard Deviation	Min	Max
lnINF	3.015	0.459	2.633	4.391
lnY	1.775	0.376	1.237	2.642
lnM1	7.511	1.330	5.332	9.642
lnM2	7.964	1.361	5.778	9.937
lnM2+	8.210	1.365	5.967	10.201
lnLR	3.232	0.232	2.862	3.738
lnEX	-0.127	0.602	-1.465	0.668
lnRISK	1.409	0.991	-0.693	2.590
lnCPS/Y	-21.068	0.220	-21.436	-20.719
lnCPS/DC	-0.789	0.193	-1.096	-0.461
lnM2+/Y	-20.309	0.300	-20.837	-19.898
lnM1/M2+	4.158	1.302	2.203	6.105
lnDC/Y	-20.278	0.356	-20.723	-19.673

Source: Author's Construct, 2020.

and comparatively low level of dispersion as shown in their respective standard deviations of 0.220, 0.3 and 0.356. Measures of money supply (M1, M2 and M2+) had a similar range of mean values between 7.5 to 8.2 and standard deviations ranging from 1.3 to 1.4. In all, the ratio of private sector credit to domestic credit had the least dispersion with a standard deviation of 0.193.

3.2. Results of the Correlation Matrix and Principal Component Analysis on Financial Development

3.2.1. Correlation Matrix on Financial Development

Table 2 displays the Correlation Matrices employed to measure the relationship between the variables. The table records high correlations of 0.93 while the minimum value of 0.47. InCPS/DC has a weak negative and significant relationship with InCPS/Y of ($r = -0.47$, $p < 0.001$) at 0.05 significance level. Moreover, InM2+/Y had a strong positive and significant relationship with InCPS/Y of ($r = 0.87$, $p < 0.001$) at 0.05 significance level. InM2+/Y had a strong negative and significant relationship with InCPS/DC of ($r = -0.70$, $p < 0.001$) at 0.05 significance level. InM1/M2+ had a strong negative and significant relationship with InCPS/Y of ($r = -0.85$, $p < 0.001$) at 0.05 significance level. InM1/M2+ had a strong positive and significant relationship with InCPS/DC of ($r = 0.74$, $p < 0.001$) at 0.05 significance level. InM1/M2+ had a strong negative and significant relationship with InM2+/Y of ($r = -0.90$, $p < 0.001$) at 0.05 significance level. InDC/Y had a strong positive and significant relationship with InCPS/Y of ($r = 0.88$, $p < 0.001$) at 0.05 significance level. InDC/Y had a strong negative and significant relationship with InCPS/DC of ($r = -0.84$, $p < 0.001$) at 0.05 significance level. InDC/Y had a strong positive and significant relationship with InM2+/Y of ($r = -0.92$, $p < 0.001$) at 0.05 significance level. InDC/Y had a strong negative and significant relationship with InM1/M2+ of ($r = -0.93$, $p < 0.001$) at 0.05 significance level. Variables with negative signage mean that the variables are inversely correlated with NPL which implies that as these variables increase NPL decrease. On the other hand, variables with positive signage means that it is positively correlated with NPLs which implies that as these variables increases so does NPL's. The result sums up the need and call by many authors such as [Addai & Chengyi \(2015\)](#), [Reddy \(2015\)](#) and [Amuakwa-Mensah & Boakye-Adjei \(2015\)](#)

Table 2. Correlation matrix for financial development.

Variable	lnCPS/Y	lnCPS/DC	lnm2+/Y	lnM1/M2+	lnDC/Y
lnCPS/Y	1.00				
lnCPS/DC	-0.47	1.00			
lnM2+/Y	0.87	-0.70	1.00		
lnM1/M2+	-0.85	0.74	-0.90	1.00	
lnDC/Y	0.88	-0.84	0.92	-0.93	1.00

Source: Author's Construct, 2020.

where they indicated that both bank specific variables and macroeconomic variables significantly affect NPLs in the banking industry.

The correlation matrices were estimated to examine the level of correlation between the proxies of financial development in order to avoid the problem of multi-collinearity. As shown in **Table 2**, the correlation value between most of the measures of financial development in absolute terms exceeds 0.5. It is therefore necessary to use each measure of financial development exclusively in the estimation model. This calls for the use of Principal Component Analysis (PCA) to examine the sufficiency of each proxy in explaining variations in financial development in Ghana. Hence the next section presents the analysis on Principal Component Analysis.

3.2.2. Principal Component Analysis on Financial Development

The PCA helps to estimate by how much each of the individual proxies for financial development explains variations in Non-Performing Loans in Ghana. In **Table 3**, the first four proxies for financial development explain 100% variations in NPLs. 85% of the variation is explained by the first eigenvalue.

Furthermore, 96% of the variation is explained by the first two eigenvalues together. This is an acceptable large percentage. It should be noted that all the proxies for financial development were not put into a single equation, but rather each of the proxies in one separate equation to prevent multicollinearity. As explained in **Table 2**, there exists high correlation between the measures of financial development. All the five indicators were exclusively used to examine the effect of each proxy of financial development on NPLs.

Table 4 shows the first principal component is a measure of $\ln DC/Y$, $\ln M1/M2+$ and $\ln M2+/Y$ with corresponding scores of -0.48 , -0.47 and 0.46 . $\ln M2+/Y$ and $\ln CPS/Y$ are positively related as they have positive signs which means $\ln M2+/Y$ increases with the increasing value of $\ln CPS/Y$. The same can be said on $\ln DC/Y$ and $\ln M1/M2+$ but in the opposite direction. Banks with high $\ln DC/Y$ and $\ln M1/M2+$ tend to have high NPLs. The second principal component is strongly correlated with two of the original variables that are, $\ln CPS/DC$ and $\ln CPS/Y$. This suggests that these two variables vary together. If one increases then the other one tends to as well, this component can be viewed as a measure of how

Table 3. Principal component analysis.

Component	Eigenvalue	Difference	Proportion	Cumulative
1	4.26	3.71	0.85	0.85
2	0.55	0.45	0.11	0.96
3	0.09	0.004	0.020	0.98
4	0.09	0.095	0.019	1.00
5	0.00	-	0.00	1.00

Source: Author's Construct, 2020.

Table 4. PCA scoring coefficients.

Variable	Comp 1	Comp 2	Comp 3	Comp 4
lnCPS/Y	0.43	0.58	0.32	-0.37
lnCPS/DC	-0.39	0.79	-0.18	0.09
lnM2+/Y	0.46	0.15	0.11	0.87
lnM1/M2+	-0.47	-0.05	0.87	0.14
lnDC/Y	-0.48	-0.07	0.30	0.28

Source: Author's Construct, 2020.

well it affects NPL positively. The study could state that based on the correlation of 0.79, this component is primarily a measure of lnCPS/DC. It follows that banks/financial institutions with high values would tend to have low NPL whereas those with small values would have some serious challenges of NPLs. The third principal component increases with lnM1/M2+. In fact, the study could state that based on the correlation of 0.87, this component is primarily a measure of lnM1/M2+. This suggests that banks that place more attention on lnM1/M2+ tend to have better revenue from loans due to fewer NPLs. The fourth component increases with lnM2+/Y. In fact, the study could state that based on the correlation of 0.87, this component is primarily a measure of lnM2+/Y.

Table 5 shows the results from the unit root test of the data sets. The data was tested at the level and first differenced. The result indicates that inflation and risk premium were stationary at the level. However, real income, money supply (M1, M2 and M2+), lending rate, and all the measures of financial development (CPS/Y, CPS/DC, M2+/Y, M1/M2+ and DC/Y) were not stationary at the level. However, all the non-stationary variables became stationary after first differencing. The unit root test has two significance; statistical significance and economic implications. First, the presence of the unit implies that Ordinary Least Squares (OLS) cannot be used in the estimation procedure. The use of OLS in the presence of unit root leads to spurious regression. Thus, if a series has unit root and OLS is used as econometric method used in estimation can lead to the wrong sign of the parameter and overestimation or underestimation of the parameters of the variables. The economic implication is that the presence of unit root in data series results in a permanent effect if there is a shock.

Table 6 shows the relationship between non-performing loans and their covariates. The results show that inflation is a significant determinant of non-performing loans. Thus, inflation has a negative significant effect on non-performing loans in models 1 and 3. Though inflation has a negative relationship with non-performing loans in other models, it is insignificant in explaining variations in NPL. Explaining the relationship with NPL must be done with caution. As inflation increases, NPL decreases as shown in the negative sign of the parameter. This result is rather surprising as it is expected that an increase in inflation will lead to an increase in NPL. The result does not align with Farhan et al. (2012),

Table 5. Unit root test (test for stationary).

Variable Name	ADF Unit Root Test		PP Unit Root Test	
	Level	1st Difference	Level	1st Difference
lnNPL	-1.849	-2.651*	-2.042	-2.663*
lnINF	-3.926***		-3.940***	
lnY	-2.171	-4.607***	-2.082	-5.383***
lnM1	-1.074	-3.385**	-1.208	-3.363**
lnM2	-1.287	-2.659	-1.403	-2.632*
lnM2+	-1.720	-2.622	-1.740	-2.725*
lnLR	-2.549	-2.677*	-2.416	-2.722*
lnEX	-2.517	-2.675*	-2.613	-2.658*
lnRISK	-3.217**		-3.219**	
lnCPS/Y	-0.882	-5.255***	-0.691	-6.439***
lnCPS/DC	-1.375	-4.171***	-1.391	-4.145***
lnM2+/Y	0.261	-3.151***	0.227	-3.119***
lnM1/M2+	-0.230	-4.309***	-0.178	-4.680***
lnDC/Y	-0.694	-3.816***	-0.622	-4.141***

Source: Author's Construct, 2020, Note: *, ** and *** represents 1%, 5% and 10% significant levels respectively.

Table 6. Estimated results.

Variable	(1a)	(1b)	(1c)	(2a)	(2b)	(2c)	(3a)	(3b)	(3c)
Constant	-19.43 (-2.45)**	-16.694 (-1.99)*	-14.245 (-1.68)	0.526 (1.730)*	0.518 (0.30)	0.532 (0.31)	-11.192 (-1.35)	-11.925 (-1.49)	-6.646 (-0.86)
lnINF	-0.34 (-2.88)**	-0.287 (-2.32)**	-0.249 (-1.99)*	-0.143 (-1.05)	-0.142 (-1.04)	-0.142 (-1.05)	-0.284 (-2.10)*	-0.194 (-2.12)*	-0.194 (-1.55)
lnY	0.102 (0.46)	-0.017 (-0.07)	-0.409 (-0.17)	-0.091 (0.40)	-0.092 (-0.41)	-0.091 (-0.41)	0.470 (1.65)	0.346 (1.40)	0.234 (0.92)
lnLR	0.608 (1.86)*	0.755 (2.23)**	0.888 (2.65)**	0.621 (1.12)	0.622 (1.12)	0.625 (1.13)	1.142 (3.71)***	1.166 (3.88)***	1.244 (3.84)***
lnRISK	-0.108 (-1.92)*	-0.099 (-1.63)	-0.093 (-1.46)	-0.043 (-0.60)	-0.043 (-0.60)	-0.043 (-0.61)	-0.164 (-2.23)**	-0.170 (-2.38)**	-0.139 (-1.88)*
lnEX	1.212 (5.28)***	0.985 (4.75)***	0.971 (4.41)***	0.390 (2.07)*	0.387 (2.09)*	0.391 (2.09)*	1.599 (3.60)***	1.426 (4.02)***	1.224 (3.50)***
lnM1	-0.736 (-3.92)***			-0.013 (-0.21)			-0.980 (-2.69)**		
lnM2		-0.544 (-3.33)***			-0.011 (-0.20)			-0.857 (-2.94)**	

Continued

lnM2+			-0.490 (-3.03)***		-0.014 (-0.24)		-0.637 (-2.40)**
lnCPS/Y	-1.271 (-2.76)**	-1.062 (-2.23)**	-0.907 (-1.90)*				
lnCPS/DC				-1.130 (-1.91)*	-1.128 (-1.90)*	-1.124 (-1.91)*	
lnDC/Y						-0.884 (-1.70)	-0.897 (-1.84)*
							-0.542 (-1.19)

Source: Author's Construct, 2020, Note: *, ** and *** represents 1%, 5% and 10% significant levels respectively.

Variable	(4a)	(4b)	(4c)	(5a)	(5b)	(5c)
Constant	20.244 (2.66)**	21.857 (2.87)**	22.031 (2.71)**	-11.366 (-1.91)*	-4.524 (-1.14)	-0.138 (-0.04)
lnINF	0.011 (0.09)	0.025 (0.21)	0.023 (0.20)	0.196 (1.12)	0.019 (0.14)	-0.083 (-0.62)
lnY	0.171 (0.66)	0.164 (0.69)	0.169 (0.70)	-0.196 (-0.56)	0.237 (0.83)	0.312 (1.00)
lnlR	1.223 (3.80)***	1.244 (4.08)***	1.228 (4.02)***	1.029 (3.22)***	0.994 (2.88)**	0.996 (2.54)**
lnlRISK	-0.110 (-1.58)	-0.104 (-1.57)	-0.104 (-1.53)	-0.070 (-0.97)	-0.089 (-1.16)	-0.117 (-1.39)
lnEX	0.213 (0.66)	0.157 (0.53)	0.132 (0.38)	-0.610 (-0.88)	0.350 (0.94)	0.701 (2.02)*
lnM1	0.141 (0.62)			2.737 (2.14)		
lnM2		0.186 (0.90)			1.20 (1.50)	
lnM2+			0.195 (0.84)			0.245 (0.45)
lnM2+/Y	1.123 (2.60)**	1.229 (2.81)**	1.241 (2.60)**			
lnM1/M2				-2.434 (-2.54)**	-1.430 (-2.04)*	-0.609 (-1.24)

Source: Author's Construct, 2020.

where it was indicated that inflation has a significant positive relationship with NPLs by 201 Pakistani Bankers in their study on NPL whereas [Badar & Javid \(2013\)](#) aligns with this result as a confirmation of their study which indicated

that inflation has a strong negative long-run relationship with NPL. Moreover, [Curak, Pepur, & Poposki \(2013\)](#) affirmed in their study of NPL that higher inflation has an association with higher NPLs. [Skarica \(2014\)](#) observed that the primary cause of high levels of NPLs among others is an inflation rate. [Nkusu \(2011\)](#) stressed that borrowers' repayment ability could be affected by inflation from many aspects to affect NPL in either a positive or negative direction. [Djiogap & Ngomsi \(2012\)](#) affirmed that the inflation variable is statistically insignificant in explaining the total business loans ratios of banks in a study conducted within the CEMAC region on NPLs.

Another variable of interest is real income. Real income has a negative relationship with NPL in models 1 - 3 and 5a. The statistical effect of changes in real income on NPL is insignificant. In other words, changes in real income have no significant effect on NPL. The result is in the agreement with studies by several authors on NPL such as [Farhan et al. \(2012\)](#) in their study on NPLs in the Pakistani Banking Sector discovered that GDP growth has an insignificant negative relationship with the non-performing loans. [Saba, Kouser, & Azeem \(2012\)](#), studied the determinants of non-performing loans in the United States banking sector, it was revealed that GDP per capita has a negative significance with NPL. [Badar & Javid \(2013\)](#) researched into the impact of macroeconomic forces on nonperforming loans on commercial banks in Pakistan. The study applied a vector error correction model where it found strong negative long run relationships existed of gross domestic product with NPLs. [Messai & Jauini \(2013\)](#) conducted study on micro and macro determinants of non-performing loans sampled 85 banks in three countries (Greek, Italy and Spain) between 2004 and 2008. A study found that the problem loans varied negatively with the growth rate of GDP.

The lending rate has a positive and significant relationship with NPL. Thus, lending rate is a significant determinant of NPL. It must be noted that the magnitude of the parameter is huge in both models 1 and 3. A percentage change in lending rate leads to approximately (0.6 to 0.9) percentage change in NPL in the same direction in models (1a, 1b and 1c). Also, a percentage change in lending rate leads to approximately 1.1 to 1.2 percentage change in lending rate in the same direction. Specifically, for instance, a percentage increase in lending rate leads to approximately 0.9 percent increase in NPL in model (1c) and 1.2 percent increase in model (3c). The result is in agreement with [Adebola & Dahalan \(2011\)](#) where their study revealed that the lending rate had a significant positive effect on NPL using the banking sector of Malaysia. On the other hand, [Louzis, Vouldis, & Metaxas \(2011\)](#) in a study on NPLs using nine (9) largest banks in Greece indicated that interest rates affected losses in all categories of loans. [Farhan et al. \(2012\)](#) and [Saba, Kouser, & Azeem \(2012\)](#) in separate studies on NPLs using the United States banking sector confirmed that interest rates had a negative significance with NPL's. [Badar & Javid \(2013\)](#) stressed that there was strong negative long-run relationship existed between the lending rates and NPLs. [Messai](#)

& Jauini (2013) suggested that problem loans had positive relationships with a real interest rate in a study of eighty-five (85) banks in Greece, Italy and Spain on their micro and macro determinants of NPLs. Concerning the result of this study. It is a fact that the lending rate is significant to NPLs but can be positive or negative as indicated by Farhan et al. (2012) and Saba, Kouser, & Azeem (2012).

Surprisingly, a sign of the parameter of risk is negative. It was expected that risk premium will have a positive relationship with NPL. Thus, a high-risk premium will lead to a reduction in NPL and vice versa. From the result, a percentage change in risk premium will lead to approximately 0.16 increases in NPL in model 3b. Curak, Pepur, & Poposki (2013) empirically investigated the determinants of non-performing loans in Southeastern European banking systems and the result shows that credit risk was affected by bank-specific variables such as bank size, performance (ROA) and solvency. Lou (2000) opined that a comprehensive understanding of bank NPLs will avert avoidable problems in credit risk.

The effect of the exchange rate on NPL was also of interest to the study. The result shows that the exchange rate has a positive and significant effect on NPL in models 1, 2 and 3. A percentage change in the exchange rate leads to a change in NPL in the same direction. Interpretation of exchange rate on NPL is counterintuitive. An increase in exchange rate means a depreciation of a currency whilst a decrease in exchange rate means an appreciation of a currency. The result is in alignment with Amuakwa-Mensah & Boakye-Adjei (2015) study on NPL's in the banking industry of Ghana. The study confirmed among other things that real effective exchange rate significantly affected NPLs.

The money supply was found as a significant determinant of NPL as shown in models 1 and 3. The study used three measures of the money supply (M1, M2 and M2+). All the measures of the money supply were found to have a negative relationship with NPL in models 1 and 3. The coefficient of the parameter of the money supply was significant at 1% and 5% in models 1 and 3 respectively. Badar & Javid (2013) researched the impact of macroeconomic forces on nonperforming loans on commercial banks in Pakistan during of 2002 and 2011 where the study assessed 36 commercial banks considered the long and short-run dynamics between nonperforming loans and macroeconomic variables. The study applied a vector error correction model where it found that there was strong negative long-run relationship existed between money supply and NPLs.

All the proxies for financial development had a significant effect on NPL. However, the sign of the parameter of financial development depends on the type of proxy in question. For instance, the ratio of private sector credit to real income, the ratio of domestic credit to real income, ratio of private sector credit to domestic credit and ratio of the narrow money supply to broad money supply had a negative relationship with NPL. Meaning, an increase in any of these variables as a proxy for financial development leads to a reduction in NPL. On the other hand, the ratio of the broad money supply to real income had a positive

relationship with NPL. This implies that an increase in ratio of the broad money supply to real income will cause NPL to increase in the same direction. [Greenidge & Grosvenor \(2010\)](#) argued that the magnitude of NPLs is a key element in the initiation and progression of financial and banking crises while [Reinhart & Rogoff \(2010\)](#) stressed that NPLs can be used to mark the onset of a banking crisis.

4. Conclusion, Policy Implications, and Recommendation

The study ascertains the determinants of NPLs in Ghana's banking sector using the Bank of Ghana's Monetary Time Series, World Bank World Development Indicators, and International Monetary Fund's International Financial Statistics Sample data between 1998 to 2013. The empirical results support the view that inflation is a significant determinant of non-performing loans. This implies that inflation could be a policy target to influence the level of non-performing loans in Ghana. However, the sign of the parameter of inflation was negative. Using inflation as policy instruments means that influencing the factors that reduce inflation will cause non-performing loans to increase due to their inverse relationship. The choice of inflation as a policy instrument should be done with caution due to the sign of the parameter of the coefficient of inflation. Real income on the other hand had a negative insignificant relationship with NPL. Policy instruments that influence real income do not affect NPL.

Concerning the lending rate, it has a positive and significant relationship with NPL. The magnitude of the lending rate is approximately unitary elastic. Changes in lending rate affect NPL by the same magnitude. Using lending rates as policy instruments to influence NPL would be effective in changing the level of NPL. Also, risk premium had a negative and significant effect on NPL. Thus, risk premium and NPL moves in the opposite direction. Changes in lending rate by a unit percentage lead to less than proportionate change in NPL in the opposite direction due to the inelastic coefficient of the parameter of risk premium.

The exchange rate was found as a significant determinant of NPL. The sign of the coefficient of the parameter of the exchange rate is positive. An increase in the exchange rate means a depreciation of a currency whilst a decrease in the exchange rate means an appreciation of a currency. Policies that cause depreciation of the Ghana Cedi would lead to an increase in the level of NPL. On the other hand, factors that cause an appreciation of the Ghana Cedi would cause the level of NPL to decrease. The exchange rate could therefore be targeted as a policy instrument to influence the level of NPL. Similarly, the money supply could be used to influence the level of NPL in Ghana.

Financial development is a significant determinant of NPL in Ghana. The effect and the direction of financial development on NPL however depend on the choice of proxy as policy instruments. For instance, while the ratio of private sector credit to real income, the ratio of domestic credit to real income, the ratio of private sector credit to domestic credit, and the ratio of the narrow money

supply to broad money supply have a negative effect on NPL, the ratio of the broad money supply to real income has a positive effect on NPL.

The confirmation of the study findings aligns with Ozili (2018) that weak supervision of the lending standards by banks and non-bank financial institutions is actively involved in the financial intermediation process. Insisting that by this any unexpected events might affect borrowers' ability to repay bank loans hence rise in NPLs. Also, PwC (2021) suggestion that more needs to be done by the banks in the area of embedding good risk management practices supports the findings of this study. Amuakwa-Mensah, Marbuah, & Marbuah (2017) were particular that proper underwriting and monitoring systems should be instituted by banks before and after issuance of loans, this they said would increase the operating cost of banks and make them inefficient in the short-term. It would however help in recovering debt hence reducing the possibility of bad debt in the medium to long term.

This paper suggests that using the lending rate as a policy instrument and other policy instruments that lead to an appreciation of the Ghana Cedi if given adequate attention would be effective in changing the level of NPLs within the Banking Sector of Ghana. The paper further prescribed those banks must step up their loan recovery efforts and tightens credit risk management practices to minimize losses from non-performing loans. There is a need for regulators to ensure good corporate governance by the banks to avoid bank failure. The findings of this study though within the context of the Ghana Banking Sector it is of essence to other countries within the Sub-Saharan West African countries whose banks are saddled with non-performing loans where lessons can be learned.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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