

The Influence of Credit Risk on Equity Performance: An Empirical Assessment of Banks Listed on the Ghana Stock Exchange

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ABSTRACT

The purpose of the study is to assess how credit risk exposure among listed banks on the Ghana stock exchange (GSE) affects Returns on Equity (ROE). The study adopts a panel data for the period 2006 – 2017 of seven different banks listed on the Ghana Stock Exchange. The empirical assessment was tested using the fixed and common constant effect regression, correlation and the Granger causality test. Secondary data were extracted from the BoG time series data, Ghana Statistical service and audited annual reports of the listed banks. Credit risk measured by NPLTL was found to negatively and significantly influence ROE. Both the common constant effect and fixed effect of the regression results indicated a negative significant influence of credit risk on ROE. The Granger causality test as well supports the regression findings as credit risk was found to cause ROE. In conclusion, banks must strengthen their credit risk management framework to help combat the credit risk exposures they face. The Ghanaian central bank must as well improve their supervisory role to ensure banks comply with the existing financial regulations.

Keywords: Credit Risk, Financial performance, Monetary Policy, Financial Risk, Ghana Stock Exchange, Banks, Ghana.

JEL Classification: C58; E40; E44.

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Highlights of this paper

- The purpose of the study is to assess how credit risk exposure among listed banks on the Ghana stock exchange (GSE) affects Returns on Equity (ROE).
- Both the common constant effect and fixed effect of the regression results indicated a negative significant influence of credit risk on ROE.

1. INTRODUCTION

Over the years, the business of banking has been considered as a highly risky venture. One of the major reason can be pointed to the information asymmetry between lenders and borrowers. The banking business is quite delicate by nature as a greater proportion (i.e. 85%) of banks liability constitutes deposits from customers (Saunders, 2017). Financial risk is inevitable and credit risk remains a menace that banks over the years have struggled to manage or eliminate as much as possible. As banks engage in the business of financial intermediation, loan will always remain a greater source of banking operation attracting crediting risk. Never the less, other sources of banking business such as bond investments, short-term debt securities, country risk, derivatives, un-used credit limits and credit guarantee or documentary credits as well remain a source of credit risk. In brief, GARP defines credit risk as a potential loss due to the non-performance of a financial contract, or financial aspects of non-performance in any contract (Global Association of Risk Professionals, GARP).

According to KPMG (2007) several banks invested in several credit risk management procedures including methods, processes, resources and technologies to assess, manage and model their level of credit risk, methods even before the global financial crisis. However, the assertion of Gonzalez-Paramo (2011) indicated that abandonment of key underlying risk management techniques and strategies remains one of the major causes of the supposed global financial crisis.

In Ghana, credit risk remains a major challenge among most financial institutions. Amuakwa-Mensah *et al.* (2017) indicated that bad loans or Non-Performing Loans (NPL) remain a major cause of bank failures which is recently led to fold ups and takeover of some domestic banks. Past studies have conclusively and convincingly documented the sources, causes and processes of credit risk occurrence (Hennie, 2003; Fofack, 2005). The 2007 global financial crisis, which was identified in the chronicle as one of the underlying source of bad loans as well affected the Ghanaian banking sector as banks in Ghana recorded high rates of NPLs during these periods (Asiama and Amoah, 2019). It is no doubt that Ghana was reported as one of the sub-region in Africa with the highest interest rates. If this assertion continues, then default rate is expected to increase hence credit risk will forever remain a menace to banks and subsequently affect the growth of the economy. The number of banks in Ghana have increased greatly in recent years from 18 banks in 2004 to 33 banks in 2013 and reduced to 23 banks in 2019 due to a major regulatory structures and monitoring mechanism executed by the BoG in 2017 (Bank of Ghana Financial Sector Report, 2017).

In 2017, the BoG after careful examination and review of the financial statements of the universal banks in Ghana revealed some interesting financial malfeasance and financial regulation flouts. In as much as liquidity problems were identified to have caused the underperformance of most of the banks, high credit risk, especially in the amount of NPL recorded in the books of the banks is suspected to have accounted for these financial lapses. Consequently, seven banks, all domestic banks were consolidated and handed to new management. According to the Bank of Ghana, the percentage of non-performing loans to total loans amounted 12.8% and 11.9% in 2009 and 2012 respectively. After this marginal fall, non-performing loans ratio increased to 19.6% in 2009 and further to 22.7% by December 2012. Again, according to the BoG (2017) and Ghana Banking Survey Report (2016) banks in Ghana recorded poor asset quality management in relation to their total loan portfolios between 2016 and 2017. The

report indicated that the total amount of industry's NPLs increased from 18.8% in 2016 to 21.2% in 2017. Thus the NPL among banks increased from GH¢6.09 billion in June 2016 to GH¢7.96 billion in the same period of 2017. Relatively, major performance indicators such as the ROA and ROE declined by 1.2% and 5.2% respectively between the same periods. The industry's profitability experienced a massive declination as income before tax recorded a year on year growth of 0.4 percent as compared to an annual growth of 3%. Interestingly, the average interest rate of banks and the monetary policy rate recorded one of the highest rate within this same (BoG, 2017). If this upwards movement in NPL which remain a major cause of credit risk continues vis-à-vis poor credit risk management techniques, performance among Ghanaian banks will continue to decline as indicated in the report.

One of the cardinal principles of Basel II was for all banks to develop a credit risk framework that can find answers to the challenging questions; 'what is the magnitude of expected loan loss in case of adverse situations in the future?' Finding the perfect answer to this question has compelled many banks to develop several risk management models and improve their credit management principles in areas such as the establishment of an appropriate credit environment, strict credit approval processes, maintaining an appropriate credit administration, measurement and monitoring processes and ensuring adequate controls to assess credit risk exposures. However effective these credit management techniques of banks maybe, it has not completely absorbed banks from probable loan losses, growing loan loss provisions and loss of income (reduce profitability) as indicated in the recent BoG report (Belnye, 2011; Boateng *et al.*, 2016; Amuakwa-Mensah *et al.*, 2017; Asiama and Amoah, 2019).

Studies on the influence of bank credit risk on financial performance is not new in contemporary research. Several studies in in Africa have addressed this issue over the years with complex empirical methods yet similar results (Fofack, 2005; Akinlo and Emmanuel, 2014; Adeola and Ikpesu, 2017). In Ghana, there exist a lot of empirical evidence that suggest that credit risk significantly influences bank performance in both the long and short run. Be as it may be, most of these studies are past hence considered past data and as well shorter time period. This current study, however, looks at the current situation in the Ghanaian banking sector. It is evident that, over the year's banks have invested much in their credit administration processes in order to combat credit risk exposures. If this is a fact, then the study assumes that past studies have not dealt with the current progress of banks in line with new their credit administration hence findings of such studies may not reflect the current situation. This study therefore fills the time gap by considering both past and current data to assess the existing relationship between credit risk and banks performance in terms of ROE. Considering the relationship interest rate has with monetary policy rate, the study considered additional variables which includes bank of Ghana's annual monetary policy rate and the average yearly inflation. This idea was considered laudable because the volatility nature of these variables and the sensitivity of banks response to interest rate over the time period studied.

Primarily, this study seeks to provide a potential empirical explanation in an attempt to provide answers to the current trend of banks credit risk exposures and its influence on ROE by considering time average yearly data series from 2006 to 2017 among banks listed on Ghana Stock Exchange. The study is based on two major hypotheses, thus;

- i. *H₀: Credit risk influence banks performance across all banks listed on the Ghana Stock (cross-section invariant).*
H₁: Credit risk does not influence banks performance across all banks listed on the Ghana Stock (cross-section invariant).
- ii. *H₀: There exist a causal relationship between credit risk management and the performance of banks listed on the Ghana Stock Exchange.*
H₁: There exist no causal relationship between credit risk management and the performance of banks listed on the Ghana Stock Exchange.

The rest of the paper is presented as follows. In Section 2, we present the stylized facts about NPLs in Ghana from 2000 to 2016. The theoretical framework and empirical literature follow in Sections 3 and 4, respectively. Section 5 describes the empirical strategy while Section 6 presents the results of the study. Section 7 concludes the paper with policy implications.

2. LITERATURE REVIEW

2.1. Empirical Review

As earlier mentioned, studies on credit risk and profitability is not a new (Amidu and Hinson, 2006; Ahmad and Ariff, 2007; Hosna *et al.*, 2009; Psillaki *et al.*, 2010; Li and Zou, 2014; Almekhlafi *et al.*, 2016; Apanga *et al.*, 2016; Gadzo *et al.*, 2019).

The study of Ozili (2017) used loan loss provisions as a proxy for credit risk against key performance indicators including ROE and ROA among listed and non-listed banks in Africa. The findings showed that credit risk significantly influence the profitability of commercial banks in Africa. The findings of Islam and Nishiyama (2016) although indicated a negative influence of credit risk on NIM among South Asian commercial banks, this influence was found to be insignificant.

The study of Ruziqa (2013) assessed the influence of both liquidity and credit risk on the financial performance of Indonesian conventional banks who own assets worth above 10trillion Rupiah. The study used data between the period 2007 to 2011 using ROA, ROE and NIM as performance variables against Non-Performing Loan Ratio (NPLR). The findings of this study reveal a significant negative effect of NPLR on both ROA, ROE and NIM. Same variable proxies were used by Li and Zou (2014) and still found similar results among some European banks. These two studies however are limited in scope due to the short time period studied. A longer time series may show interesting trends as banks get better with time. Findings from Dietrich and Wanzenried (2011), Vong and Chan (2009), Ongore and Kusa (2013) and Miller and Noulas (1997) have all indicated negative relationship between credit risk and bank profitability.

Other studies have also found conflicting results. Several studies including Tarus *et al.* (2012); Angbazo (1997); Demirgüç-Kunt *et al.* (1999); Mendes and Abreu (2003) and Carbo and Rodríguez (2007) showed that credit risk positively influence profitability of commercial banks in case NIM is used as the profitability proxy. This results may be true as banks carry on additional cost or risk to the customers when selling their loan portfolio hence the customer is expected to pay more for the price of loan when the rate of default is expected to be high.

Using data within the period 2000 to 2010 among five Nigerian commercial banks, the study of Kolapo *et al.* (2012) indicated positive relationship between credit risk management and the ROA of the banks. Just as Amidu and Hinson (2006) the study of Boahene *et al.* (2012) is in consonance with Kolapo *et al.* (2012) as the findings also proves that credit risk management and banks ROE are positively related using data within the period 2005 and 2009.

A robust analysis was conducted by Noman *et al.* (2015) using non-performing loans to gross loans (NPLGL) ratio and loan loss reserve to gross loans (LLRGL) ratio as proxy for credit risk. The study assesses the influence of credit risk on all performance ratios. The results showed a statistically negative effect of credit risk on ROA and NIM while on the other hand the implementation of Basel II is significantly positive on NIM but significantly negative on ROA. This shows that credit risk is a tool to improve bank spread but not the asset returns of banks. This study however is not much concern with credit risk management but rather the influence of credit risk on banks financial performance. The study uses a longer time series period compared to previous study hence speculates that sound credit risk management will be reflected in the findings. Thus the study expects to record a

no significant influence or a weak relationship between credit risk and banks performance if credit risk management has successfully and effectively been implemented.

2.2. Conceptual Framework

Based on the empirical review and the research hypothesis, the conceptual framework in Figure 1 represents the study's concept. The main hypothesis is to assess the relationship and casual effects between credit risk and financial performance.

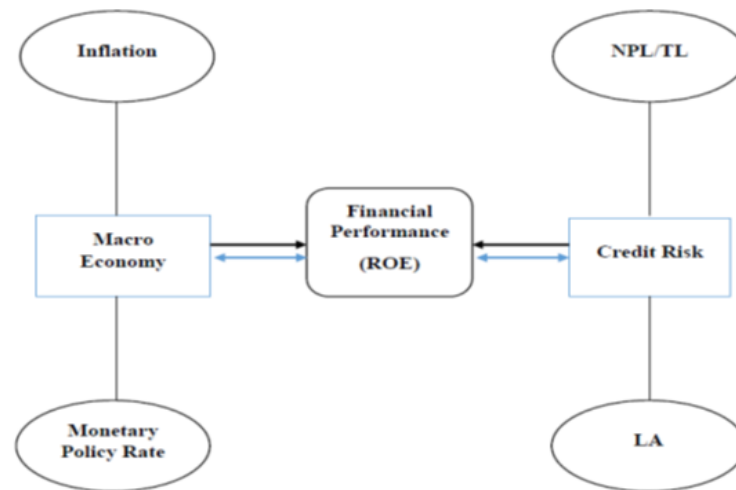


Figure-1. Conceptual framework on credit risk and banks performance.

In this conceptual framework, the profit maximization function is represented by financial performance measured by the banks Returns on Equity (ROE) over the study period. On the other hand, the ratio of Non-Performing Loans to Total Loans (NPL/TL) and the ratio of Total Loans to Total Assets (TL/TA) represents the proxy for credit risk exposure. The conceptual framework also presented two other variables. Thus, inflation and central bank's monetary policy was used as a proxy for macroeconomic indicators. The importance of these two variables is to understand their influence or their causal effect on both the dependent and independent variables. The study seeks to find the degree of responsiveness between credit risk exposure of banks and the macroeconomic economic variables and how it transcends to the performance of the banks.

3. METHODOLOGY

The Ghanaian banking sector constituted the population for the study. The sample study included only seven banks listed on the Ghana stock Exchange. The study considered panel data which integrates both time series and cross sectional dimensions. An unbalanced panel data within the period 2006 -2017 is used for the study. The study adopted the ideas of Brewer (1989) and Altunbas (2005) to empirically test the nexus between credit risk and banks financial performance. In this study, the banks Returns on Equity(ROE) was used as a proxy for financial performance whiles the ratio of non-performing loans to total assets and nonperforming loans for the period represented banks credit risk levels. The study empirically tested the extent to which credit risk impact the performances of all the seven banks and as well the causality that exist between credit risk and banks performance among listed banks.

3.1. Theoretical Idea

The assumption of this study is based on the value maximization theory. Thus, as Ghanaian banks engage in the business of banking with a going concern concept, the ultimate vision is to maximize profit likewise maximization shareholder’s wealth. This theory was deemed suitable for the study concept because all banks are listed on the stock exchange and have quite a huge amount of outstanding shares hence nothing remains more significant to the bank than maximizing the returns of the existing stocks just to attract new stock investors.

Considering the concept of Varian (1992) here, the study assumes that the major function of banks listed on the stock exchange are financial intermediaries between the deficit spending units and surplus spending units, thus the taking of deposit and the granting of loans. In this case, the Equation 1 below represent the function of the banks mathematically as:

$$(a_1, \dots, a_n) \dots \dots \dots (1)$$

As banks engage in profit or value maximization activity, the study estimates the function of this activity in as follows:

$$R(a_1, \dots, a_n) - C(a_1, \dots, a_n) \dots \dots \dots (2)$$

Where:

From the Equation 2 above, R (a₁, ..., a_n) and C (a₁, ..., a_n) represents the banks revenues and cost function respectively. In this case, the study anticipates that credit risk exposures to the banks will only leave bad debts in the books of the banks hence will increase the cost function. Whether the credit risk exposure to banks is high or low, it is expected to affect the cost function, however the degree of this effect will be based on the degree of the risk exposure. As represented in the Equation 3 below, the study estimates the new revenue and cost function in relation to profit maximization as:

$$\text{Max } a_1, \dots, a_n R(a_1, \dots, a_n) - C(a_1, \dots, a_n) \dots \dots \dots (3)$$

The optimal set of actions of the firm that will maximize profit is therefore estimated in Equation 4 as follows:

$$a^* = a_1^*, \dots, a_n^* \dots \dots \dots (4)$$

By adopting the profit maximization theory from micro economics, the study estimates the profit function in the following marginal revenue and marginal cost conditions as:

$$\frac{\Delta R(a^*)}{\Delta a_i} = \frac{\Delta C(a^*)}{\Delta a_i} \dots \dots \dots (5) \quad \text{where } i = 1, \dots, n$$

From the Equation 5 above, it is expected that marginal cost of the banks will increase if they are highly exposed to credit risk whiles assuming that the change in revenues remain same. If this continues, banks may be limited to the amount of loans and advances given to borrowers hence limits the banks operational capacity. If this is the case, then it can be concluded that, high credit risk exposure is a threat to profit or value maximization. Whatever the case may be, the burden of profit maximization or the degree of responsiveness between marginal revenue and marginal cost in terms of the banks operations in the area of credit administration rest on the shoulders of the banks. In as much as credit risk exposure may be dependent on macroeconomic variables such as the central bank’s policy rate and inflation, the banks also have a role to play in strengthening their credit administration policies to stand future shocks due to macroeconomic stabilities. In this case, the banks is assumed to keep equal pace between the marginal revenue and marginal cost function, holding all things constant.

3.2. Model Specification

The model for the study is specified in Equation 6 as follows:

$$Y_{it} = \alpha_0 + \alpha_{it} X_{it} + \mu_{it} \dots \dots \dots (6)$$

From the model, $i=7$ cross sections and $t = 2006-2017$ (time series). The dependent variable Y is measured by banks financial performance, thus ROE which is also a vector of the independent variables that reflects credit risk and some macroeconomic variables. ROE was preferred to ROA as the main dependent variable because the case study banks are all listed on the Ghana stock exchange hence the need to ascertain the maximization of investors equity against credit risk exposure. It is expected that several macroeconomics variables also have some level of influence on financial performance either than credit risk hence additional control variables was ascertained. Again, the intercept α varies across the sample banks to empirically test for influence of credit risk on each bank's performance.

The model based on the assumption can as indicated in Equation 7 can be transformed as:

$$ROE = \alpha_0 + \alpha_1 LA_{it} + \alpha_2 NPLTL_{it} + \alpha_3 MPR_t + \alpha_4 INF_t + \mu \dots\dots\dots(7)$$

Equation 7 is further transformed by taking logs on both sides and presented as:

$$\text{Log}(ROE) = \alpha_0 + \alpha_1 \text{Log}(LA)_{it} + \alpha_2 \text{Log}(NPLTL)_{it} + \alpha_3 \text{Log}(MPR)_t + \alpha_4 \text{Log}(INF)_t + \mu \dots\dots\dots(8)$$

The study variables are explained in Table 1:

Table-1. Study variables.

Variables	Difinitions
Returns on equity (ROE)	Measure of financial performance calculated by dividing annual net income by shareholders' equity
Ratio of total loans to total assets of banks (LA)	Measure of credit risk
Ratio of Non-performing Loans (NPL) to Total Loans(TL): NPLTL	Measure of credit risk
Monetary Poicy Rate (MPR)	Average Annual Monetary Policy Rate of BOG for the time period
Inflation (INFL)	The annual average consumer price index over the period studied with 2006 as base year. The consumer price index on an annual basis

Data on ROE, LA and NPLTL were extracted from the banks audited financial statements for the period studied whiles MPR and INFL was accessed from the BoG macroeconomic time series data and the Ghana statistical service respectively.

3.3. Estimation Procedure

In order to obtain the expected distribution for the time series data, the study performed a descriptive statistic to understand the behavior of the mean, standard deviation, skewness, kurtosis and the Jarque-Bera (JB) test to determine the normality of the distribution. The study also estimated and perform the common constant effect, fixed effect and Granger Casualty test to test the study's hypothesis.

The importance for testing the Granger causation is to aid understand the movements among the variables that causes a nexus between (X and Y). In this estimation procedure, the granger causality is estimated as follow:

$$X_t = \gamma_0 + \sum_{i=1}^n \delta_i X_{t-i} + \sum_{j=1}^m \sigma_j Y_{t-j} + \mu_t \dots\dots\dots (9)$$

$$Y_t = \alpha_0 + \sum_{i=1}^m \alpha_i X_{t-i} + \sum_{j=1}^n \beta_j Y_{t-j} + \mu_{2t} \dots \dots \dots (10)$$

Where (i) m and n represents the number of lagged.

(ii) X and Y are representing the terms respectively.

(iii) μ_{1t} and μ_{2t} are the random errors.

In order to test the causation between X and Y or Y and X, the study estimated F-test on the joint significant of X and Y respectively. The estimation of the test is therefore carried out as follows:

$$H_0: \sum_{j=1}^m \sigma_j = 0 \dots \dots \dots (10) \text{ and } H_0: \sum_{i=1}^m \alpha_i = 0 \dots \dots \dots (11)$$

Based on this assumption the results will be rejected if the calculated k is the number of parameters estimated in 10 and 11 and as well used the F-statistic to make a decision at 5% significant level. The study used SPSS 20.0 and Microsoft Excel 2016 as the statistical tool for the entire data analysis.

4. RESULTS

The results and the discussion of findings was based on the output from the descriptive statistics, common Constant effect estimates, the fixed effect estimates, correlation matrix and the Granger Causality Tests.

4.1. Descriptive Statistics

The descriptive in Table 2 statistics recorded a positive mean for all variables. The mean recorded for ROE indicates that banks listed on the stock exchange on average are making positive returns. This conclusion can also be drawn from the minimum for ROE which recorded a positive return of 0.935 with a standard deviation of 1.779. In as much as the mean recorded for the ratio of total loans to total assets (LA) is higher than the mean for the banks Non-performing loans (NPL), the minimum for LA was negative. As expected, the mean MPR is higher than the mean INFL. This is so because the level of inflation is one of the determinants of MPR whiles MPR is one of the tools used by the central bank to control inflation.

Table-2. Descriptive statistics.

Variable	Mean	Max	Min	Std.Dev	Skewness	Kurtosis	Jarque-Bere Test
LOG(ROE)	2.013	3.135	0.935	1.779	-0.835	1.05	3.35
LOG(LA)	2.125	3.186	-1.067	1.197	0.779	2.23	4.17
LOG(NPLTL)	1.113	1.925	1.113	1.046	-1.197	1.18	2.88
LOG(INFL)	1.125	1.314	0.925	0.113	0.046	1.31	2.16
LOG(MPR)	1.225	1.414	1.097	0.102	0.52	0.88	3.11

Source: Researchers data analysis output.

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ROE and NPTLA are negatively skewed flattering to the left as compared to LA, INFL and MPR which are positively skewed and flattering to the right of the normal distribution curve. It can as well be concluded kurtosis values for all variables are less than 3, an indication that the distribution curve of the data is platykurtic and not normally as the statistical distribution are extremely dispersed. The platykurtic nature of the statistical distribution is also reflected in the Jarque-Bere Test were the values of all variables exceeds 0. From the descriptive statistics, it can be concluded that the time-series for the variables among the 7 banks are not normally distributed.

4.2. Regression Results

The study tested for both the common constant effect and fixed effect estimates for the banks. In Table 3 below, the regression results for the common constant effect of indicate that LA which measures the banks ratio of total loans to total assets positively and significantly predicts banks ROE. This positive relation depicts that the higher the LA ratio the higher the banks ROE. This somehow expected as an increase in the LA ratio may also mean that the total loans of the banks have increased as well. Total loans have the propensity to increase the net interest margin of the banks however this may only be realized if there exist effective proper due diligence and credit management administration in the banks. The failure of banks to properly administer the necessary guidelines as stated in the Basel I and II in relation to credit administration may likely leads to high customer defaults. This is evident in the negatively significant influence NPLTL has on ROE as indicated in the regression results. The regression results depict that the variable ROE will reduce by -0.542 in case there is a unit change in the variable NPLTL. This basically means that high NPLTL which is one of the measures of credit risk have negative influence on ROE which measured the financial performance of the banks. Briefly, the study concludes that, banks listed on the GSE are facing some level of credit risk which is influencing the rate of returns of equity investments.

Both INFL and MPR have negative influence on ROE, however, the results indicated that MPR significantly synchronizes with ROE. This study confirms the results of Nkrumah *et al.* (2018) which as well asserts that monetary policies, specifically, higher MPR significantly distorts the performance of banks.

Table-3. Common constant effect estimates.

Variables	Coefficient	SE	t-stat	Prob.
Constant	0.075	1.753	0.007	0.221
LOG(LA)	0.220	1.631	3.886	0.007**
LOG(NPLTL)	-0.542	1.020	-3.675	0.003*
LOG(INFL)	-0.064	2.120	-1.475	0.999
LOG(MPR)	-0.113	1.097	-0.686	0.019**
Results				
R-Squared	0.719			
Durbin Watson	1.897			

Source: Researchers data analysis output.

Dependent variable: ROE * means significance at 1% ** means significance at 5% .

The R-squared which is normally termed as the co-efficient of determination recorded 0.719. this means that Durbin Watson Statistic recorded a value of 1.541 indication that there is no presence of first order Auto correlation as the DW is quite closer to two. This results however assumes that the intercept value remains the same for all banks with an identical slope coefficient for both LA and NPLTL which represents the credit risk variable.

The fixed effect estimates of the regression results showed similar results as the common constant effect estimates, however, the co-efficient of all variables in the common constant effects estimates are higher than the

fixed effect estimates. Thus to say, both method for the regression analysis has established that LA positively and significantly influences ROE, NPLTL negatively and significantly affects ROE whiles MPR has a significantly negative influence on ROE of all banks listed on the GSE.

Table-4. The fixed effect estimates.

Variables	Coefficient	Standard error	t-statistic	Probability
Constant	0.075	1.450	0.002	0.124
LOG(LA)	0.195	1.077	2.164	0.003**
LOG(NPLTL)	-0.477	0.927	-2.953	0.007*
LOG(INFL)	-0.059	1.977	-1.991	1.231
LOG(MPR)	-0.095	1.023	-0.752	0.039**
Results				
R-Squared	0.789			
Durbin Watson	1.897			

Source: Researchers data analysis output.

Dependent variable: ROE * means significance at 1%, ** means significance at 5.

The R-squared and DW for the fixed effect estimates of the regression recorded a higher value than the common constant effect estimates. As shown in the Table 4 the R-squared value recorded was 78.9% and DW of 1.897.

4.3. Correlation Matrix

The correlation matrix results in Table 5 below indicated a weaker positive relationship between LA and ROE whiles on the other hand recorded a weaker positive relationship between NPLTL and ROE just as predicted in both the common constant estimates and fixed effects estimates regression results. Both MPR and INFL recorded a weaker relationship with ROE, however, the relationship between MPR and ROE is stronger and significant compared to the relationship between INFL and ROE. This is however expected because MPR remains a major determinant of bank net interest margin.

Table-5. Result of the correlation matrix.

Variables	LOG(ROE)	LOG(LA)	LOG(NPL)	LOG(INFL)	LOG(MPR)
LOG(ROE)	1				
LOG(LA)	0.221**	1			
LOG(NPLTL)	-0.393**	-0.386*	1		
LOG(INFL)	-0.347	-0.173*	0.415*	1	
LOG(MPR)	-0.449**	0.513	0.536*	0.721*	1

Source: Researchers data analysis output.

* means significance at 1%, ** means significance at 5.

Other interesting relationships were as well established between the study variables. The relationship between INFL and NPL was significant compared to LA which recorded a negatively insignificant relationship. MPR recorded a stronger significant relationship with NPL compared to LA which recorded an insignificant positive relationship.

Again, to confirm the absence of auto-correlation between the variables, the variance inflation factor (VIF) was used. The findings of the VIF as presented in Table 6 shows that there exists no auto correlation among the independent variables as all the VIF values were less than 10.

Table-6. Results of variance inflation factor.

Variable	VIF	1/VIF
LOG(LA)	1.220	0.819
LOG(NPLTL)	1.450	0.689
LOG(INFL)	1.560	0.641
LOG(MPR)	1.590	0.628
Mean VIF	1.4550	

Source: Researchers data analysis output.

4.4. Granger Causality Tests

The Granger causality tests was further used to test the patterns of correlation among the empirical data set. The major objective here is to understand the causalities among the variables. Based on the hypothesis tested, both proxies used as credit risk was found to granger cause ROE. Thus, The Granger causality test predicted a uni-directional relationship between ROE and NPLTL as NPLTL was found to have a significant causality on ROE just as LA significantly causes ROE. However, the causality between NPLTL and ROE is significant at 1% compared to the causality between LA and ROE which was significant at 5%. This is an indication that, NPLTL as predicted by other results has a stronger influence on bank’s ROE compared to LA. Other causalities predicted between the variables include a unidirectional relationship between ROE and INFL, INFL and LA, LA and MPR, NPLTL and INFL while no-directional relationship was predicted between NPLTL and LA, MPR and INFL.

Table-7. Result of the granger causality tests.

Hypothesis	F-Stat	Prob.	Relationship
DLOGNPLTL does not Granger Cause DLOGROE	1.335	0.017*	Uni-directional
DLOGROE does not Granger Cause DLOGNPLTL	0.657	0.297	
DLOGINF does not Granger Cause DLOGROE	2.197	0.027**	Uni-directional
DLOGROE does not Granger Cause DLOGINF	1.679	0.3450	
DLOGMPR does not Granger Cause DLOGROE	1.197	0.187	Uni-directional
DLOGROE does not Granger Cause DNGDPG	6.013	0.037**	
DLOGNPLTL does not Granger Cause DLOGLA	2.125	0.111	no-directional
DLOGLA does not Granger Cause DLOGNPLTL	3.297	0.214	
DLOGLA does not Granger Cause DLOGROE	1.142	9.E-13	uni-directional
DLOGROE does not Granger Cause DLOGLA	3.813	3.E-17**	
DLOGINF does not Granger Cause DLOGLA	2.546	0.287	Uni-directional
DLOGLA does not Granger Cause DLOGINF	4.097	0.036**	
DLOGMPR does not Granger Cause DLOGLA	1.979	0.317	Unidirectional
DLOGLA does not Granger Cause DLOGMPR	0.313	0.573*	
DLOGINF does not Granger Cause DLOGNPLTL	1.125	0.225	uni-directional
DLOGNPLTL does not Granger Cause DLOGINF	1.179	0.006*	
DLOGMPR does not Granger Cause DLOGNPLTL	1.279	0.545	Uni-directional
DLOGNPLTL does not Granger Cause DLOGMPR	0.046	0.033*	
DLOGMPR does not Granger Cause DLOGINF	0.325	0.557	no-directional
DLOGINF does not Granger Cause DLOGMPR	1.557	0.411	

Source: Researchers data analysis output,

(*) and (**) means that the null hypothesis is rejected at 1% and 5% level of significance respectively. The test is performed on the logarithm of the first difference in the data series.

In as much the study has established the causal relationship between the variables, the restricted F-test was further used to test the impact of credit risk on banks performance.

Based on the assumption that at least one of the constants are not the same i.e. credit risk and its effects Bank performance varies across banks in Ghana, the F- test statistic is estimated as:

$$F_{Stat} = \frac{\left[\frac{R_{FE}^2 - R_{CC}^2}{N-1} \right]}{\left[\frac{1 - R_{FE}^2}{NT - k} \right]} = \frac{\left[\frac{RSS_{CC} - RSS_{FE}}{N-1} \right]}{\frac{RSS_{FE}}{NT - k}}$$

Based on the results predicted by the Common Constant Effect Estimates and the Fixed Effect Estimates regression, the F_{stat} results and the critical value for the data sets is presented in Table 8:

Table-8. F_{stat} and critical value.

Statistic test	Results
F_{stat}	4.375
Critical value	5.677

Source: Researchers data analysis output.

The results from the Table 8 indicates that the value of the F_{stat} is less than the critical value ($4.375 < 5.677$) hence the prediction of the Common Constant Effect Estimates will be accepted. Base on this results, it can be concluded that credit risk as measured by LA and NPLTL have a similar effect or influence on the performance of all 7 banks listed on the Ghana stock Exchange. This literally means that, the failure of banks to strengthen their credit management and monitoring mechanism will affect financial performance. The findings of the study through the regression, correlation and granger causality test supports the argument of some existing literature that indicated the significant negative influence of credit risk on banks performance. In as much as this current study included current data and as well a longer time period compared to other studies, the evidence of the results still supports the findings of Gadzo *et al.* (2019); Apanga *et al.* (2016); Boahene *et al.* (2012); Opoku *et al.* (2016) who opined that credit risk has a negative significant influence on banks returns on equity(ROE) among banks in Ghana. Similarly, the findings of study as well supports several existing findings as discussed in empirical review (Vong and Chan, 2009; Dietrich and Wanzenried, 2011; Ongore and Kusa, 2013; Ruziqa, 2013; Li and Zou, 2014; Islam and Nishiyama, 2016; Ozili, 2017).

5. CONCLUSION

Clearly, credit risk still remains a financial menace among banks in Ghana be it in the short term or long term hence needs to be given the necessary attention. Even though the correlation results revealed a negatively weaker significant relationship between NPLTL and ROE, banks still have major roles to play in ensuring that customers deposits are safe against risk. There is a need for banks listed on the stock exchange to improve their credit risk management techniques and beef up credit monitoring and assessment methodologies to enable them stand against both internal and external shocks that may directly or indirectly affect their financial standings.

Currently, the Central bank of Ghana has embarked on a strict supervision and monitoring mechanism to ensure that banks in Ghana comply and strictly work with the existing banking act. If this initiative by the BoG continues, existing banks may have no choice than to invest in complex or effective risk management technologies that can manage or completely eradicate financial risk and improve performance. A vibrant financial system remains one of the significant factor that contributes to economic growth hence eradicating credit risks is an equal responsibility for the banks, regulatory body and government as a whole.

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