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Impact of Credit Risk Management on the Profitability of Selected Commercial Banks Listed on the Ghana Stock Exchange

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Authors' contributions

This study was carried out by two authors. Author ESA designed the study, performed the statistical analysis and managed the analyses of the study. Author FSO performed the literature search, put the first draft together and edited the manuscript. Both authors read and approved the final manuscript.

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ABSTRACT

Effective credit risk management is very important to the health of banks because it has the possibility of either ruining or ensuring the sustenance and growth of the bank. This study assessed the impact of credit risk management on the profitability of 6 selected commercial banks listed on the Ghana stock exchange. Secondary data was gathered from the annual reports of the six selected banks and Ghana banking survey for the years under consideration. The study adopted the Random Effect Model within the panel estimation technique framework. The study used return on equity (ROE) to measure profitability of bank, non-performing loans, loan loss provisions ratio, loan to asset ratio and capital adequacy ratio as credit risk. The findings showed that indeed credit risk management have significant relationship with the profitability of banks. While capital adequacy ratio had positive relationship with a bank's profitability; non-performing loans, loan loss provisions ratio and loan to asset ratio shows statistically significant negative relationship with the profitability of a bank. The study recommends that banks should assess and manage credit risk indicators vigorously in order reduce their exposure to these risks.

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1. INTRODUCTION

Banks are one of the institutions that enhance economic development through the financial services they provide to the public and business community [1]. This economic development is achieved through the role they play as intermediaries in deposit taking, provision of credit, currency exchange and money transfers. According to Kargi [2] this same role of banks is a dual role because it is rather through this role that banks are able to generate streams of income. However, the quest to create credit and make profit leaves in its wake risks.

Various authors have explicitly maintained that if these risks are not managed or minimized it may lead to insolvency and bankruptcy [3,4,5]. Different authors have approached the issue of risk differently and have assigned diverging definitions for risk. Gallati [6] defined risk as a situation in which there exists a possibility to adversity, or a condition in which there is a possibility of getting an outcome that differs from what is desired or expected. Kannan and Thangavel [7] describe risk as exposure or danger. Basel [8] intimates that credit risk, liquidity risk, market risk, operational risk among others are types of risks that the banking industry face today. Important among these risks is credit risk, it is one of the main risks that commercial banks encounter [9,2,10]. This is because it is able to thwart the profitability and by extension affect the sustainability of the bank. Afriyie and Akotey [11] indicate that collapse and financial problems encountered by banks and other financial institutions are as a result of inapt credit risk management practices. Rose [12] refers to credit risk as the tendency of loss of value in the assets of a bank and consequently having no value later. Basel [13] defines credit risk as the probability that debtors will default in fulfilling contractually prearranged commitment according to an agreed up on terms. Bank of International Settlement [14] describes credit risk exposure as a major problem confronting the banking system world wide, hence very crucial to the performance of banks. Schroek [15] hinted that the process of risk management is a vigorous, tactical, and integrated process that comprises both the assessment and the reduction of risk.

Korteweg and Polson [16] emphasized the fact that risks in the financial institutions are inevitable thus in order to have an assured level

of continuity, banks must pay attention to the optimum level of risks they manage.

1.1 Research Problem

The very objective of banks is to maximize owners' equity through the advancement of loans to customers, this function undoubtedly helps in financing the activities of private businesses to help build the national economy. However, this function exposes the banks to various types of risks such as market risks, credit risks, among others and of which credit risk is very important. Credit risk analysis and risk appraisal generally have received much attention as a result of the financial instability in global economy. According to Gestel and Baesens [17] most of these studies have concentrated on small, rural and few commercial banks to the neglect big banks listed on the stock exchange. Demirguc-Kunt and Huzingha [18] state that difficulty in obtaining data for research has led to few studies conducted in Africa, hence difficulties in implementing policies to make the banking system more efficient.

In Ghana most of the distresses with banks and financial institutions have hovered around rural banks and microfinance institution Asiedu-Mante [19]. Little have been said on commercial banks, this is because of the scrutiny and relatively intense regulations in the commercial banks. Again, in Ghana banks that are listed on the stock exchange are regulated very well and expected to show high level of professionalism, in terms of risk management and so on. However, recent developments on financial crises in the developed countries have shown that even bigger banks are susceptible various forms of risk chief among them being credit risk. In 2009 the central bank of Greece and Portugal received bail out and these bail outs came on the heels of bad risk management practices in their activities [20,21]. It is rather against this backdrop that this study assesses the impact credit risks have on the profitability of some selected commercial banks listed on the Ghana exchange.

1.2 Objective of the Study

The objective of the study is to assess the impact of credit risk on profitability of commercial banks listed on the Ghana Stock exchange. The study attempts to find out the relationship between

credit risk indicators (non-performing loans, loan loss provisions ratio, loan to asset ratio and capital adequacy ratio) and return on equity of banks listed on the Ghana stock exchange.

1.3 Research Hypothesis

- H_0 : Credit risk has no significant relationship with profitability of banks listed on the Ghana stock exchange.
- H_1 : Credit risk has significant relationship with profitability of banks listed on the Ghana stock exchange.

1.4 Literature Review

Profitability may be a yardstick which depicts a bank's management methods and competitive standing in market-based banking. Banks employ this indicator to aid in assessing returns they are gaining from assets and equity invested. This parameter moreover help banks to accept some intensity of risk and aid them against short-term crises. Empirical studies use return on assets (ROA) and return on equity (ROE) interchangeably for measuring the profitability of banks and other financial institutions [3,22]. Return on equity indicates the return on reinvested income and therefore provides a measure that could be linked to the shareholders. It also measures the extent to which capital contribution from shareholders are efficiently employed to generate profits and thus depicts the amount of profit a company earned in comparison to the gross amount of shareholder equity found on the statement of financial position. The use of ROE is however, criticised for its inability to provide signal and thus not forward looking. ROE is unable to distinguish between well performing banks from the weak ones. In the 2008 financial crisis, banks with the highest ROE were sometimes the worst affected (European Central Bank, 2010). Another defect of ROE as a measure of profitability is its inability to measure risk leverage and liquidity profile. However, Hosna, Manzura and Juanjuan [23]; Gatsi and Akoto [24]; and Turkson [25] all used ROE as a measure of profitability of banks in their research with the reason being that the use of ROE is robust in terms of investments. The choice of ROE in this study aligns with the explanation of the author above and couple with the fact that all the banks selected for the study are listed on the stock exchange.

Basel Committee on Banking Supervision in 2001 defined credit risk as the possibility of

losing the outstanding loan partially or totally, due to credit events (default risk). Rose [12] in her study also described credit risk as the tendency that certain bank assets (loans) will lose value and consequently have no worth. Studies have shown that credit risks are very vital to the growth or health of every financial institution. Kithinji [26] explained that wrong credit policies, low capital and liquidity levels, poor loan underwriting, sloppiness in credit assessment and inadequate supervision by the central banks are the main source of credit risk. Credit risks many a time manifest in the area of exposure risk, recovery risk and default risk. As a result and in view the areas credit risk manifest, [27,28,23,29] stated that the indicators of credit risk include; capital adequacy ratio, non-performing loans, provision for loan loss or write off ratios, portfolio at-risk, operating efficiency and some bank characteristics.

According to the literature, capital adequacy ratio is a measure of the amount of a bank's capital expressed as a percentage of its risk weighted credit exposures. This means that as capital adequacy ratio increase it is expected that profitability of a bank to increase, because the bank has enough buffer against bankruptcy or insolvency. Capital adequacy ratio measures capital strength and determines whether the banks have sufficient capital against existing and potential losses from credit risk. The relationship between profitability and CAR has been inconsistent, while Hosna et al. [23] reports a positive relationship between CAR and ROE; Goddard, Molyneux and Wilson [30] argued that the relationship could be either positive or negative. Some of the reasons that could be offered for the positive result include the situation where Banks sometimes require expansion into areas that could increase their income but are handicapped. Increased capital enables such expansion into ventures such as loan commitments and standby letters of credit, which could result in additional income. Again, banks with higher capital adequacy are willing to venture into risky but high return investment leading to increased profitability [31]. The growth of net interest margin is very logical in impacting positively on the profitability of banks. The more the margin of interests on loans and other deposit increase, the more profitable the bank is. This thus offset any risk in the operation of the bank.

Other empirical studies that have explored the relationship between credit risk management and

profitability have had conflicting conclusions. For instance, Li and Zou [32] researched on the association between credit risk management and profitability of commercial banks in Europe. Non-performing loan ratio and capital adequacy ratio were used as independent variables and proxy for credit risk, and return on assets and return on equity were used as measures for profitability. Results showed that there is a negative relationship between credit risk management proxies and profitability. Especially non-performing loan was seen to have a significant influence on ROE and ROA whilst CAR had no essential impact on profitability. Again, Gizaw et al. [27] investigated the effects of credit risk management on profitability of commercial banks in Ethiopia. Eight (8) commercial banks were sampled and secondary data was gathered from their annual reports for a twelve year period. It was revealed that variables such as loan loss provisions, non performing loans and adequacy of capital have substantial effects on the performance of commercial banks in Ethiopia.

In the panel study of Poudel [3] on commercial banks in Nepal using ROA as a measure of profitability, it was seen that bank profitability was inversely related to credit risks. Similarly, Onalapo and Olufemi [33] used secondary data collected from publications of the Central bank of Nigeria for a ten year period, examined the influence capital adequacy have on the performance of some selected banks in Nigeria. The study employed Ordinary Least Square (OLS) technique in the analysis and it showed that, credit risk have no significant relationship on bank profitability. According to Boahene et al. [21], there was substantial and positive relationship between credit risk and commercial bank's performances in Ghana. Six commercial banks in Ghana were studied over 5 year period. Net charge off rates, non-performing loans and pre provision profit as a percentage of net total loans were used as variables indicating credit risk whilst return on equity (ROE) was used to measure profitability. It was suggested that Ghanaian commercial banks enjoy higher profits when there is a decrease in the level of credit risk.

In the study of Kutsienyo [34], it was found that liquidity, capital adequacy and bank size had a significant positive relationship with profitability (ROA) whilst assets quality and operating expenses were negatively related to return on assets. Banking industry concentration and money supply were significantly negatively

related to return on assets whilst inflation and GDP had a significant positive relationship with profitability (ROA). Kargi [35] also assessed the impact of credit risk on profitability of banks in Nigeria. The outcome of the study disclosed that credit risk management has a significant effect on profitability of Nigerian banks. The study concluded that profitability of banks was hugely negatively affected by the level of non-performing loans, loans and advances and deposits.

Kithinji [26] in an attempt to examine the impact of credit risk management on the profitability of commercial banks in Kenya for the period 2004-2008 showed that majority of commercial banks' are not affected by the amount of credit risks. Hosna et al. [23] examined the level of influence credit risk management has on profitability in four Swedish commercial banks. It was revealed in the analysis that credit risk management had impact on profitability in all the sampled banks although NPL had a significant impact than CAR. Bonfim [36] explored the association between credit risk and macroeconomic development employing a broad set of data containing in-depth information for over 3000 firms. It was revealed that firms had the tendency of taking excessive risks in period of economic growth. It was also observed that default probabilities are influenced by several firm-specific characteristics so even as financial conditions has influence in explaining default probabilities, in assessing default probabilities macroeconomic situations should be considered.

2. METHODOLOGY

The study sampled 6 commercial banks listed on the Ghana stock exchange. Data for the study was generated from the annual financial report of these banks between the years 2007 to 2016. To examine the relationship between credit risk management and the profitability of selected banks, balance panel approach was employed. Specifically, random effects model was employed. The rationale behind random effects model is that, unlike the fixed effects model, the variation across entities is assumed to be random and uncorrelated with the predictor or independent variables included in the model. The model is specified below:

$$ROE_{it} = \alpha_0 + \beta_1 NPL_{it} + \beta_2 LLPR_{it} + \beta_3 CAR_{it} + \beta_4 LAR_{it} + \varepsilon_{it} \quad (1)$$

ROE= Return on Equity

NPL= Non-Performing Loans

LLPR = Loan Loss Provision Ratio
 CAR = Capital Adequacy Ratio
 LAR = Loan to Asset Ratio

Random effect model within the panel estimation technique framework was used to find out the relationship, if any, between credit risk management and profitability. The use of this test is based on the assumption that data collected are continuous, balanced in nature and unlike the fixed effects model, the variation across entities is assumed to be random and uncorrelated with the predictor or independent variables included in the model. The general form of the random effect model is specified in equation 2.

$$Y_{it} = \alpha + \beta X_{it} + u_{it} + \varepsilon_{it} \quad (2)$$

The use of the random effect model was based on the fact that the Hausman selection test favoured the random effect model. According to Hosna [23] the Hausman test is a very general test and can be used if two models could be used for the same equation. Again, the null hypothesis states that the random effect model is preferred while the alternative hypothesis is that only the fixed effect model is consistent. If the null hypothesis is rejected then the random effects model cannot be used. The results from the Hausman test (0.38; $p = 0.89$), provide evidence in favour of the random effect model. The study thus used the random effect model for the analysis and discussion.

It is worth mentioning that the model passed all post-estimation tests. It is very appropriate and crucial in business and social science research to perform diagnostics and post-estimation tests since it has the tendency to give robust and efficient result [37]. Especially for panel studies – combines both cross sectional part and time series part, there is the need to perform such test since it exposes the results to biases such as omitted variable, multicollinearity, heteroskedasticity, etc. For instance, the test results of the VIF (mean VIF was 1.13) showed that there is no multicollinearity or the presence of multicollinearity is minimal. Generally, a mean

VIF value of 10 or greater is cause for concern, thus the study passed the test. Again, for the omitted variable test, $F(3, 52) = 1.67$; $p = 0.19$, the study failed to reject the null hypothesis that the model has no omitted variables. This thus indicates that the study accepts the H_0 that there were no omitted variables in the model. In the heteroskedasticity, the study $F(1, 57) = 4.97$; $p = 0.02$.

3. RESULTS

Table 1 shows the descriptive statistics for variables in the analysis of covariance models. The Table also showed that all the variables distributed normally, this is seen with positive mean values. It can also be observed that there were low or less variability in all the variables, as evidenced by the values of standard deviation. The data indicates that 6 banks and 5 variables were selected for the study though the observation was 60. The study again used the panel technique because it was appropriate for the dataset.

Results on Table 2 showed that all the variables were statistically significant in impacting the profitability of a bank. While, non-performing loans and capital adequacy ratio positively impact on the profitability of banks, loan loss provision ratio negatively impact the profitability of a bank. However, loan to asset ratio statistically did not impact on the profitability of banks. For instance with non-performing loans, at 1% significance level, a percentage increase in non-performing loans (NPL) increases profitability (ROE) by 0.03. Similarly, at 1% significance level any percentage increase in capital adequacy ratio (CAR) increase the profitability of that bank by 0.04. This is an indication that the higher the NPL or the CAR the better it is for the banks in terms of profitability.

From Table 2, it was shown that non-performing loan, loan loss provision ratio and loan asset ratio were statistically significant and had inverse or negative impact on the profitability of banks in Ghana. Results indicate that at 10% level of

Table 1. Summary statistics of the variables

Variables	Observations	Mean	Std. deviation	Minimum	Maximum
ROE	60	.2460017	.1439151	-.274	.5
NPL	60	.1069183	.0865663	.057	.194
LLPR	60	.047835	.0305198	.01	.14
CAR	60	.18354	.0547931	.103	.33
LAR	60	.49129	.1186418	.281	.70

Table 2. Random effect estimation results (ROE dependent variable)

Variables	Coefficient	Robust Std. Err	Z	P> t	[95% Conf. Interval]	
NPL	.0304900	.011620	2.62	0.009	.0000771	.0005327
LLPR	-2.94606	.8734938	-3.37	0.001	-4.658076	-1.234043
CAR	.0368059	.0031195	11.80	0.000	.0306918	.0429201
LAR	-.2520339	.1638161	-1.54	0.124	-.5731075	.0690398
_cons	.5531786	.0942652	5.87	0.000	.3684223	.737935

significance, a percentage change increase in NPL reduces the profitability (ROE) of a bank by 0.724, similarly, a percentage increase in LLPR results in 1.32 fall in the profitability of a bank. Moreover, an increase in LOR reduces profitability by 0.51. Nonperforming loan is a charge against the income statement of banks. It thus indicates the proportion of default loans to the actually performing loans. According to other empirical studies, it is employed to show whether banks are employing efficient credit risk management systems or not. Therefore, the less the ratio the more effective the credit risk management. Though in studies like Kargi [35] NPL was insignificant, but negative to banks profitability, the fact remains that higher NPL is inimical to the growth, sustenance and profitability of the bank. PWC (2008) retorted that banks in a bid to boost confidence of clients and dispel fears, clean up by trying to sell the bad debt and non-performing loans. This is done by reallocation of funds to entities that are more efficient and effective to enhance the liquidity standings of the bank. This moreover enhances the ratings of the bank, to enhance capital adequacy standings.

Loan loss provision ratio (LLPR) and loan asset ratio negatively affect the profitability of banks in the sense that the more a bank makes provision for loan loss it reduces the profits or those provision creeps gradually into the profit margins of the bank. This allusion may not be out of place because; it is out of the profits that a bank or a firm uses to hedge against risks and others. Hence the more there are provisions against risk the more the profit sinks. Like Loan loss provision ratio (LLPR), loan to asset ratio (LAR) represent the amount of loans advance with respect to total asset of the bank. Every bank takes percentage of its deposits or liquid assets and use them to grant or advance loans to clients. It becomes imprudent and highly risky for a bank to advance loans equivalent to its total asset. Because any default or delay would be able to wreck the profitability and by extension the existence of the bank. It is worth mentioning

that the study passed all post-estimation tests. It is very appropriate and crucial in business and social science research to perform diagnostics and post-estimation tests since it has the tendency to give robust and efficient result [32]. Especially for panel studies – combines both cross sectional part and time series part, there is the need to perform such test since it exposes the results to biases such as omitted variable, multicollinearity, heteroskedasticity, etc. For instance, the test results of the VIF (mean VIF was 1.72) showed that there is no multicollinearity or the presence of multicollinearity is minimal. Generally, a mean VIF value of 10 or greater is cause for concern. Again, the test of selection (Hausman test) favoured the random effect estimates; hence the random effect estimation results were used for this study.

4. CONCLUSIONS AND RECOMMENDATIONS

This study empirically assessed the impact of credit risk management on profitability of commercial banks listed on the Ghana Stock exchange, using panel data drawn from 6 selected commercial banks listed on the Ghana stock exchange for the period 2007 to 2016. The results showed that the random effect model was preferred. The findings revealed that all the credit risk indicators statistically and significantly impact on the profitability of a bank except loan to assets ratio. While capital adequacy ratio and non-performing loans had positive relationship with profitability; loan loss provision ratio, was negatively related to profitability of a bank. The results of the study implies that to a large extent credit risk management affect the profitability of commercial banks and this conclusion was premised on the fact that all credit risk indicators of the banks were statistically significant in impacting on the profitability of banks. The study thus rejects the null hypothesis which states that credit risk management has no significant impact on the profitability of banks listed on the Ghana stock exchange.

This outcome thus suggests that attempts of banks to consolidate liquidity will lead to a reduction in the profitability as funds that could have been invested in profitable ventures will have to be kept in order to beef up liquidity. Capital adequacy showing a positive relationship with profitability means banks with better capital adequacy ratio communicate confidence to customers hence the willingness of customers to deposit money in those banks. Though every financial institution or bank may face one challenge or other, every bank has to manage risks efficiently to see the growth and soaring profitability they desire. The study thus recommends that banks in Ghana should keep adequate liquidity, capital levels and keep quality assets on their books since the outcome of the study suggest significant relationship between credit risk indicators and profitability.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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APPENDIX

su roe nig npl llor lar car

summary of the data

Variable	Obs	Mean	Std. Dev.	Min	Max
roe	60	.2460017	.1439151	-.274	.5
nig	60	.1026217	.0311853	.057	.194
npl	60	.1069183	.0865663	.015	.45
llor	60	.047835	.0305198	.01	.14
lar	60	.49129	.1186418	.281	.7
car	60	.18354	.0547931	.103	.33

hausman fixed random (Hausman selection test)

---- Coefficients ----

(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.	
npl	.0307794	.0529235	-.0221441	.1160848
llor	-2.862759	-2.94606	.0833012	.3201772
lar	-.2205039	-.2520339	.03153	.0606055
car	-.2928988	-.2620082	-.0308906	.1685092

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

$$\chi^2(4) = (b-B)[(V_b-V_B)^{-1}](b-B) = 0.38$$

Prob>chi2 = 0.9841

xtreg roe npl llor lar car, re robust

Random-effects GLS regression	Number of obs	=	60
Group variable: year	Number of groups	=	10
R-sq: within = 0.3371	Obs per group: min	=	6
between = 0.7216	avg	=	6.0
overall = 0.4089	max	=	6
	Wald chi2(4)	=	170.45
corr(u_i, X) = 0 (assumed)	Prob > chi2	=	0.0000

(Std. Err. adjusted for 10 clusters in year)

ro	Robust				
coe	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
npl	.0304900	.011620	2.62	0.009	.0000771 .0005327
llor	-2.94606	.8734938	-3.37	0.001	-4.658076 -1.234043
lar	-.2520339	.1638161	-1.54	0.124	-.5731075 .0690398
car	.0368059	.0031195	11.80	0.000	.0306918 .0429201
_cons	.5531786	.0942652	5.87	0.000	.3684223 .737935

```
-----+-----  
sigma_u |      0  
sigma_e | .11937146  
rho     |      0 (fraction of variance due to u_i)  
-----+-----
```

hettest
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of roe

chi2(1) = 4.97
Prob > chi2 = 0.0257

. ovtest

Ramsey RESET test using powers of the fitted values of roe
Ho: model has no omitted variables
F(3, 52) = 1.67
Prob > F = 0.1852

. estat vif

```
-----+-----  
Variable | VIF  1/VIF  
-----+-----  
npl     |  1.26  0.796708  
llor    |  1.25  0.799730  
lar     |  1.02  0.976580  
car     |  1.01  0.991000  
-----+-----  
Mean VIF |  1.13
```

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