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Credit Risk Management as a Good Measure of Financial Performance of Banks in Ghana

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Abstract
Banks are exposed to several forms of risks that affect their performance. The main objective of banking management is to maximize wealth. In efforts to realize this goal managers and shareholders should evaluate the cash flows and risks to direct its financial resources in different areas of use. This paper aims to investigate the effect of credit risk management (CRM) on financial performance (FP) of banks in Ghana. The indicators used in the study are CRM, bank credit (BC), liquidity risk (LR) and capital risk (CR) are regressed on FP. The CADF and CIPS panel unit root tests report that, the variables are non-stationary at their levels but become stationary at their first difference. The Westerlund-Edgerton panel bootstrap cointegration test show that, the variables are cointegrated and hence possess a structural long-run relationship. Also the Granger causality through the ARDL model show; (1) A two-way causality between bank credit and FP in the long-period and short-period; (2) A positive and significant one-way cause running from liquidity to FP, a one-way causality between capital risk and FP, lastly one-way causality in the long-period for LR and bank credit are evidenced; (3) The ARDL framework is evidenced to be very significantly effective to the application of Granger causativeness test.
Keywords: bank credit; credit risk management; financial performance; liquidity risk.
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1.INTRODUCTION

Banks are exposed to various types of risks, that affect their performance and activity in their efforts to attain profitability. Credit risk is one of the most challenging risks that banks manage on daily basis. The management of credit risk affect a bank's profitability (Li and Zou, 2014). Musyoki and Kadubo (2012) suggest that the global banking industry has made improvement in credit risk management. Until the early 1990s, credit risk assessment was generally limited to individual loan reviews, as banks maintained most of the loan proceedings in their books until maturity. Today, credit risk management incorporates both loan reviews and portfolio analysis. Furthermore, the growth of new technologies for risk analysis has allowed many banks to move away from the traditional bookkeeping and maintain credit practice in favor of a more innovative approach. Much more than in the past, today's banks can manage and control concentrations of debtors and portfolios, maturities and loans, and even eliminate problematic assets before they generate losses. According to Cuthbertson et al. (2007), risk management technology has been very popular in recent years. Through the adoption of technology banks are able to banks to classify, evaluate, resolve and reduce risk in a way that was not possible ten years ago.

Hakim and Neaime (2001) examined the effect of liquidity, credit, and capital on bank performance in banks in Egypt and Lebanon. Their finding is positive concerning the risk manage practices by banks in both countries. Gakure et al. (2012) examine the effect of credit risk management analysis on banking performance. They conclude that financial risks in banking organizations can result in the imposition of constraints on the ability of banks to meet their business goals. Also, private banks are more likely to apply credit risk management policies than state-owned banks. Musyoki and Kadubo (2012) assess various parameters pertinent to credit risk management as it is crucial to the financial performance of banks. They conclude that their parameters used in the study had a negative impact on a banks' financial performance; Nawaz et al. (2012) reveal that credit risk management had a strong influence on profitability. They recommend that management should be cautious in setting up a credit policy that might not negatively affect profitability.

Many studies have also been conducted on the importance of credit risk management on financial profitability. According to Makkar and Singh (2013), financial profitability is measured by correctly establishing the association between balance sheet items and the income statement. The process of establishing a relevant association is called financial analysis, which consists of calculating financial ratios. Ongore and Kusa (2013) postulate that Return on Assets (ROA) is one of the key ratios that indicate the profitability of a bank. It measures the ability of the bank's management to generate income using the assets of the company at its disposal (Booyens et al., 2018). Another related ratio is the return on equity (ROE), which measures the amount of earnings a company earns relative to the total equity invested or recorded in the balance sheet. This is the rate of return for shareholders or the percentage

return on each unit of capital invested in the bank (Booyens et al., 2018). A company with a high return on equity is more likely to generate cash internally (Ongore and Kusa, 2013).

Kalluci (2011) study the ROA and the ROE and reveal that while they differ from each other and express different things, they remain the two main indicators of management effectiveness to generate revenue from the funds invested by the shareholders and the total investments made. One of the reasons given is that the ROE gives no indication of the financing of the debt bank, unlike the ROA (Kalluci, 2011). The ROE therefore gives a limited insight into the profitability and performance of the bank (Hanweck and Kilcollin, 1984).

Naceur and Goaied (2001) identify profitability performance as an important indicator of a bank's future profitability. High earnings performance indicates that the market assumes lower earnings growth in the future and low earnings performance indicates that the market is expecting strong earnings growth over the long time. Murerwa (2015) identify two levels of financial profitability; (1) Endogenous refers to the profitability factors that can be influenced by the bank's management decisions. (2) Exogenous factors represent profitability independent of the influence of the bank.

The studies discussed above mostly investigated the impact of credit risk management on the FP of banks using different measurement variables. ROA is used as a proxy for financial profitability among 15 commercial banks in Ghana from 2007-2017 in this study. Also, there exist a number of studies that examine the effect of credit risk on financial profitability. These studies often use econometric methods that assume cross-sectional independence and heterogeneity. Unlike other studies, we employ second generation econometric tools to achieve the aforesaid objectives as contrasting to the mainstream of the state-of-the-art which use first generation tests that fail to consider both issues that may exist in the panel data.

2.The model

2.1 *Households*

The model outlined in this paper represents a small open economy. The employed framework is a variant of Brzoza-Brzezina and Makarski (2011) with the banking sector of Gambacorta and Signoretti (2014). The model operates with two types of financial frictions, a collateral constraint imposed on entrepreneurs introduced in line with Iacoviello (2005) and a constraint on the amount of bank leverage as in Gerali et al. (2010). It also includes two sources of inefficiencies nominal rigidities in the form of a Calvo (1983) pricing scheme with inflation indexation and the quadratic adjustment costs à la Rotemberg (1982).

The model functions with two types of mediators: households and entrepreneurs. Households consume, supply labour and make deposits in commercial banks. Entrepreneurs consume, borrow funds from commercial banks and use them in a production process where labour supply and physical capital are combined to produce the wholesale goods. Entrepreneurs also face capital utilization. Domestic and exporting retailers buy the wholesale goods, differentiate them at no cost and resell them in domestic and foreign goods markets. Importing retailers import goods produced in the foreign economy. Since retailers possess some degree of power in a price-setting scheme, the law of one price does not hold necessarily. Commercial banks collect deposits from households and provide loans to entrepreneurs at given interest rates. The central bank sets its main policy interest rate to influence conditions in the financial as well as the real side of the economy. The foreign sector is represented by three variables (inflation, interest rate and output) and it is modelled as simple independent AR processes.

Each household chooses consumption ${c_t}^H$, labour supply l_t, deposits $d_t$and foreign bonds ${b_t}^*$ in order to maximize the expected utility (1) with respect to the budget constraint (2)

$$E_0 \sum_{t=0}^{\infty} {\beta_t}^H \left({a_t}^c \log({c_t}^H(i) - {ic^H}_{t-1}) - \frac{{i_t(i)}^{1+\emptyset}}{1+\emptyset} \right)$$

$${c_t}^H(i) + d_t(i) + e_t {b_t}^* \leq w_t i_t + \frac{(1+r_{t-1})d_{t-1}(i)}{\pi_t} + \frac{(1+r_{t-1})(1+f_{t-1})e_t {b^*}_{t-1}}{\pi_t} T_t(i)$$

where β_H *is* the discount factor of households, ${ic^H}_{t-1}$ is the external habit stock with i being a parameter characterizing the degree of habit persistence and ϕ is the inverse of the Frisch wage elasticity of labour supply. Preferences are subject to a disturbance affecting consumption ${a_t}^c \cdot \pi_t = \frac{p_t}{p_{t-1}}$ is the nominal exchange rate, w_t is the real wage earned by households, r_t is the net nominal interest rate on deposit, $(1 + {r_t}^*)(1 + f_t)$ is a risk adjusted net nominal return paid on foreign bonds denominated in foreign currency, and T_t represents a lump-sum transfer that includes profits from the ownership of domestic retailers, importing retailers and capital goods producers.

Following Adolfson et al. (2008), the debt-elastic risk premium is defined as:

$$(1 + f_t) = exp\left\{-\psi^* \left(\frac{e_t {b_t}^*}{P_t GDP_t}\right)\right\} = exp\left\{-\psi^* \left(\frac{B^*}{GDP_t}\right)\right\}$$

With ${B^*}_t = \frac{e_t b_t}{p_t}$ being the real outstanding net foreign assets position of the domestic economy, GDP_t

referring to gross domestic product, and $\psi*$ being the parameter characterizing the elasticity of the risk premium. The first-order conditions for households are the labour supply equation, the Euler equation and the standard UIP condition

$$i_t{}^{\emptyset} = \frac{w_t \alpha_t}{c_t{}^H - ic^H{}_{t-1}}$$

$$(1 + r_t) = \frac{1}{\beta_H} \frac{(c^H{}_{t+1} - ic^H{}_t) a_t{}^c}{(c_t{}^H - ic^H{}_t)} \frac{(a^c{}_t)}{a^c{}_{t-1}} \pi_{t+1}$$

$$\frac{(1 + r_t)}{(1 + r_t{}^*)} = \frac{q_{t+1}\pi_{t+1}}{q_t \pi^*{}_{t+1}} (1 + f_t)$$

Where $q_t = e_t \frac{p_t{}^*}{p_t}$ is the real exchange rate with p^* being the foreign price level.

2.2 *Banking Sector*

The banking sector is showed conferring to Gambacorta and Signoretti (2014), who present a basic form of the banking sector resultant by Gerali et al. (2010). Commercial banks possess certain market power in intermediation which enables them to change interest rates in response to various shocks. Banks must obey a balance-sheet condition stating that loans=deposit bank capital. Banks also face an "optimal" exogenous target for the capital-to-asset ratio (i.e. the inverse of leverage). The banking sector is composed of a continuum of commercial banks indexed by $j \in (0, 1)$. Each commercial bank consists of two units wholesale and retail. The role of the wholesale unit is to collect deposits from households and to issue wholesale loans. The retail unit purchases wholesale loans, differentiates them and resells them to entrepreneurs

2.3 *Wholesale Unit*

The wholesale unit of each bank operates under perfect competition. The wholesale unit obtains deposits d_t from households at the interest rate set by the central bank r_t and issues loans b_t at the net wholesale rate $r_t{}^{wb}$. The balance sheet of the wholesale branch consists of bank capital $K_t{}^B$ and deposits d_t on the liability side, while on the asset side can be found loans b_t. Commercial banks face an optimal value of the capital-to-asset ratio v^B with the quadratic adjustment costs parameterized by κ^B. Bank capital evolves according to

$$\pi_t K_t{}^B = (1 - \delta^B) \frac{K_{t-1}{}^B}{a_t{}^B} + J_t{}^B$$

where δ^B is the depreciation rate representing the cost for managing the commercial banks capital position $J_t{}^B$ represents overall profits as outlined by equation **(7)** and $a_t{}^B$ is a disturbance term.

The wholesale unit chooses the optimal level of deposit d_t and loans b_t in order to maximize profits

$$r_t{}^{wb} b_t(j) - r_t d_t(j) - \frac{k^B}{2} \left(\frac{K_t{}^B(j)}{b_t(j)} - v^B \right)^2 K_t{}^B(j) \tag{8}$$

With respect to the balance-sheet constraint $b_t = k_t{}^B$. The first order condition defines the wholesale interest rate on loans

$$r_t{}^{wb} = r_t - k^B \left(\frac{K_t{}^B}{b_t} - v^B \right) \left(\frac{K_t{}^B}{b_t} \right)^2 \tag{9}$$

2.4 *Retail unit*

The retail units operate in a monopolistically competitive market. Each retail unit purchases wholesale loans from the wholesale unit, differentiates them at no cost and resells them to entrepreneurs. It is assumed that the retail unit applies constant

$$\frac{r_t{}^b}{a^{rb}{}_t} = r_t - k^B \left(\frac{K_t{}^B}{b_t} - v^B \right) \left(\frac{K_t{}^B}{b_t} \right) + \mu^B \tag{10}$$

where $\frac{r_t{}^b}{a^{rb}{}_t}$ is the disturbance on the interest rate on loans. Banks profits combine all partial net earnings. Aggregate bank profits are given by

$$j_t{}^B = r_t{}^b b_t - r_t d_t - \frac{k^B}{2} \left(\frac{K_t{}^B}{b_t} - v^B \right) K^b{}_t \tag{11}$$

2.5 *Central Bank*

In the baseline scenario, monetary policy of the central bank is characterized by the strict inflation targeting regime in which the central bank adjusts the policy rate, r_t, in response to deviations of inflation π_t from its steady-state value. The monetary policy rule takes the form.

$$(1 + r_t) = (1 + r)^{(i-er)}(1 + r_{t-1})^{er}\left(\frac{\pi_t}{\pi}\right)^{e\pi(1-er)} a^r{}_t \quad (12)$$

where e^r depicts monetary policy inertia, eπ is a weight assigned to inflation and $a^r{}_t$ is the disturbance to the policy interest rate.

3.Data and Econometric methods

The studies by(Kaaya and Pastory, 2013; Makkar and Singh, 2013; Nawaz et al., 2012) have investigated the impact of credit risk management on the PF in the banking regulatory framework in which CRM indicators are regressed on the financial performance of banks. First, the direction of the fixed factors was confirmed. A cointegration test by Pedroni and Kao was used to determine if there exists an association between the investigated factors, where in FP endogenous and CRM remained exogenous. In addition, a Granger causality test decides to expand the panel if there is an association between the factors. This document uses a quantifiable system and uses a secondary data source from bank of Ghana. This examination utilizes a panel time series information to research on the impact of CRM on FP for 15 banks in Ghana covering the period 2007 to 2017 for the factors which incorporate C, LR, and CR. The information with detail to the aforesaid factors were accomplished from the surveyed reports of the 15 banks in Ghana. The bank of Ghana requires all banks to distribute their evaluated report freely on a yearly premise. The information per every factor was converted into common logarithm in order to derive the parameter estimations with regards to the definitiveness of the reliant variable (CRM). The banks for this investigation includes Ecobank Ghana Limited, Access Bank Ghana Limited, Agricultural Development Bank (ADB), Ghana Commercial Bank (GCB), Barclays Bank Ghana Limited, Fidelity Bank Ghana Limited, UT Bank Limited, Sahel Sahara Bank Limited, Guarantee Trust Bank Limited, Universal Merchant Bank Limited, HFC Bank Ghana Limited, First Atlantic Bank Ghana Limited, National Investment Bank Ghana Limited, First National Bank Limited, and Cal Bank Limited. These are the biggest banks and added to over partial of the financial framework resource and have been appraised by the degree. Results from the information were brought forth utilizing EVIEWS 9.0 and STATA 13.0 together with SPSS 20.0. Table 1 shows the outline of the informational index while the engaging measurements (mean, standard deviation, skewness, and kurtosis) of the different factors incorporated into the panel time's series information are delineated in Table 2. Table 1 delineates the profile of the aforementioned factors (all in common logarithm from 2007-2017).

Table 1: Data set

Variable	Definition	**Source**
FP	Financial performance of Banks	Bank of Ghana
BC	Bank Credit	Bank of Ghana
LR	Liquidity risk	Bank of Ghana
CR	Capital risk	Bank of Ghana

1.1 *Descriptive statistics*

Summary of Table 2 demonstrates the graphic indicators for the factors Financial Performance, bank credit, Liquidity risk and capital risk separately. Every one of the factors from Table 2, as expressed as of now are changed over into a characteristic logarithm. Engagingly, Table 2 uncovers that, for the sample of banks utilized in the investigation, FP, C, and CR on the normal are 14.361%, 10.007 and 10.751 with a standard deviation of 0.414, 1.374 and 1.395 individually, which are genuinely enormous contrasted with the mean and standard deviation of LR (M=9.580 SD=1.395). LR with the most elevated standard deviation estimation of 1.395, implying that LR influence FP of banks in Ghana. With respect to the skewness, every one of the factors is adversely skewed, complimenting to one side when contrasted with the ordinary estimation. With respect to the kurtosis, FP and LR are over the ordinary esteem demonstrating the sharp to be leptokurtic whiles the sharp of bank Credit and Capital risk are mesokurtic since they have their individual kurtosis to be roughly 3. For an arrangement to be distributed the skewness and kurtosis should around be 0 and 3 individually. In this manner, the primary end from the shape statistics is that every one of these indicators financial performance, credit, liquidity risk and capital risk cannot be affirmed to be ordinarily distributed. This is in agreement with the JB-TEST which delineate that, there is an adequate affirmation to reject the typicality null theory for all the indicators.

Table 2: Descriptive statistics.

Statistic	FP	C	LR	CR
Mean	14.361	10.077	9.580	10.751
Median	14.420	10.218	9.755	10.920
Std. Dev.	0.414	1.374	1.395	0.973
Skewness	-0.370	-0.668	-0.625	-0.602
Kurtosis	3.553	2.735	3.106	2.878
Jarque-Bera (JB) test value	5.862*	12.771***	10853***	10.093***
Probability of JB	0.053	0.001	0.004	0.006
Observation	165	165	165	165

Note: *, **, ***indicates the rejection of the Jarque-Bera (JB) null hypothesis of normality at 1%, 5%, and 10% percent significance level.

3.2 *Correlation analysis and multicollinearity test*

The results from Table 3 indicate that the arrangement of the factors (bank credit, Liquidity risk and capital risk) have a factual momentous positive connection with FP, the VIF and pairwise connection among the arrangement of indicators gives an assorted variety of measures for surveying the problem of multicollinearity in a numerous relapse diagnostic. Multicollinearity is contamination of one of the desires for relapse investigation. (Dormann et al., 2013) proposed a strategy for diagnosing and identifying multicollinearity. Table 3 gives the indication that, there is no existence of multicolinearity among the explanatory variables since the Tolerance values are not less than 0.2 and VIF values are far less than 5. This therefore implies that; the aforementioned variables are actually independent of each other and hence can be considered as independent variables and assumed to have effect on financial profitability. The results determine that credit has a moderate positive association with FP (r=0.582, P<0.000). This infers a rate increment in bank credit compares to an ascent increase in FP considered for the examination. Essentially, LR (r=0.552, P<0.000) and CR(r=0.689, P<0.000) have a measurably moderate association on FP. The outcomes likewise infer that LR has a moderate positive association with credit (r=0.904, P<0.000) and CR has a moderate association with credit (r=0.644, P<0.000). Additionally, credit risk from the outcomes likewise demonstrates a moderate positive association with LR (r=0.567, P<0.01).

Table 3: Results of correlation test and multicollinearity test.

Variables		FP	BC	LR	CR	Tolerance	VIF
FP	Pearson correlation	1					
	Sig (2-tailed)						
BC	Pearson correlation	0.582***	1			0.200	0.011
	Sig (2-tailed)	0.000					
LR	Pearson correlation	0.552***	0.904***	1		0.200	0.028
	Sig (2-tailed)	0.000	0.000				
CR	Pearson correlation	0.689***	0.644***	0.567***		0.553	0.009
	Sig (2-tailed)	0.000	0.000	0.000	1		

Note: ***indicates the significance at 1%. The statistical significance or insignificance at 1% level refers to sample evidence which allows the researcher to reject or not to reject the null hypothesis with a probability of type 1 error of 1%.

3.3 *Empirical results and Discussions*

3.3.1 *Cross-sectional independence test*

Both CD_P-test and the CD_{LMadj} test are utilized to research variable in other to investigate whether panel time series data has cross-sectional conditions. The results from the previously mentioned cross-sectional reliance tests are classified in Table 4. Signifying to the related likelihood values, the invalid assumption of cross-sectional independence for credit, liquidity risk and capital risk is rejected. This, consequently, gives the suggestion that the panel time's series data which incorporates the factors has cross-sectional independence. Moreover, in advancement to the homogeneity test utilizing by (Dogan & Seker, 2016a), the findings uncover that the null theory of homogeneity is rejected at 1% level showing that, the slope coefficients are heterogeneous over every cross-area. The paper agrees that the measurement in the panel time's series data including the factors under discussion show cross-sectional conditions and heterogeneity. Henceforth this paper in the accompanying stage utilizes the CIPS and CADF panel unit root test in the resulting segment to research the incorporation properties of the factors.

Table 4: Cross-sectional dependence test.

Variable	Cross-sectional dependence test			
	CD_P-test	p-value	CD_{LMadj} test	p-value
FP	30.906***	0.000	57.079***	0.000
BC	32.440***	0.000	63.643***	0.000
LR	30.954***	0.000	57.709***	0.000
CR	32.465***	0.000	63.781***	0.000

Note: *** represents the rejection of the null hypothesis at a 1% level of significance. The CD_P-test of (Pesaran, 2004) and CD_{LMadj} test of (Pesaran & Yamagata, 2008) tests the null hypothesis cross-sectional independence.

3.3.2 *Panel unit root test*

As indicated in the methodology of this examination, CIPS and CADF panel unit root tests are utilized as an option of ordinary unit root test, for example, Breitung, IPS, and LLC panel unit root tests (Gengenbach, Palm, & Urbain, 2009). This is because of the reality the ordinary panel unit root test makes them inadequacy regarding the existences of cross-sectional independence. Most fundamentally, the CADF and CIPS unit root test produce reliable outcomes in the event of cross-sectional independence as kept up by the consequences of (Dogan, Seker, & Bulbul, 2017). Results of the CIPS and CADF test are then expressed in Table 6. The two tests illuminate that the factors under investigation are not stationary at their first difference. Therefore, this gives the sign that the factors bank credit, liquidity risk and capital risk are altogether coordinated at the same lag ($I(1)$).

Table 5: CIPS and CADF panel unit root tests

Variables	CADF				CIPS				Decision
	Levels		First difference		Levels		First difference		
	Constant	Constant and trend	Constant	Constant and trend	Constant	Constant and trend	Constant	Constant and trend	
FP	-3.190	-3.617	-3.325***	-3.911***	-1.721	-1.890	-2.251	-1.972	I(1)
CR	-1.730	-1.693	-1.726	-1.578	-1.727	-2.294	-2.657	-2.621	I(1)
LR	-1.795	-1.868	-1.745	-1.988	-1.987	-2.348	-3.020	-3.166	I(1)
CRM	-1.813	-1.680	-1.658	-2.296	-2.475	-2.379	-3.081	-2.527	I(1)

Note *** and **, and * represents the rejection of the null hypothesis at 1% and 5% and 10% level of significance respectively.

3.3.3 *Panel cointegration test*

Table 6 introduces the findings in advancement to the (Pedroni, 2004) Panel Cointegration test. Among the seven measurements from the Pedroni panel cointegration test, five proposed to the rejection of no cointegration null hypothesis. Inside this arrangement of five statistics, we discovered Panel PP and Group PP-measurement just as Panel ADF and Group ADF-statistics as progressively noteworthy and solid. Per the outcome from the Table 6, the null hypothesis of no cointegration is rejected at 5% by the Panel V-statistics while the PP-statistics for both Panel and Group alongside the ADF-statistics additionally for both Panel and Group rejects the null theory at a significant of 1%. We can, therefore, conclude that there exists a long-run connection in the midst of Financial Performance, bank credit, liquidity risk and capital risk in our sample of 15 banks.

Table 6: Results from (Pedroni, 2004) cointegration test.

Common AR coefficients (within-dimension)		
	Statistic	P-value
Panel v-statistic	1.369*	0.085
Panel rho-statistic	3.312	0.999
Panel PP-statistic	-3.674***	0.000
Panel ADF-statistic	-2.835***	0.002
Individual AR coefficient (between-dimension)		
Group rho-statistic	4.616	1.00
Group PP-statistic	-7.785***	0.000
Group ADF-statistic	-2.452***	0.007

Note: *** denotes the homogeneous coefficients at the crucial stage regressors over the cross-section using the equivalent approaches as the Pedroni cointegration test.

With respect to the results of the Kao panel cointegration test showed in **Table 7**, it is recognized that the investigated factors are cointegrated and consequently have Cointegration associations. This is on the realities that there is sufficient proof to reject the null theory of no cointegration for the elective hypothesis of cointegration at

1% significant level. On the other hand, the consequences of both the Pedroni and Kao panel cointegration tests, we reach on the nearness of cointegration between the investigated factors utilized in the examination.

Table 7: Kao cointegration test.

	t-statistic	Probability value
ADF	-1.890	0.029

***represents the rejection of the null hypothesis at the 1% significance level. The Kao panel cointegration test is based on the null hypothesis of no cointegration

Moreover, the Pedroni and Kao Cointegration tests are effective and widely utilized in writing they have their own curbs with regards to the existences of cross-sectional connections and heterogeneity. As per (Dogan & Seker, 2016b), the disappointment for a strategy for cointegration to have the option to address the issues of cross-sectional reliance and heterogeneity prompts loss of proficiency in uncovering the nearness of a long-run relationship among factors. In this way in checking for the robustness of the previous outcomes from the Pedroni and Kao Panel Cointegration test separately. The examination further utilized the Westerlund-Edgerton Panel bootstrap cointegration test. This panel cointegration test is viewed as a second era cointegration test and considers the issues of cross-sectional conditions and heterogeneity. This test also considers various measurements dependent on gathering and panel individually. Outline of findings from the Westerlund-Edgerton board bootstrap cointegration test is accounted for in Table 8**.**

From the outcomes in Table 8, G_t, G_a, P_t, and P_a recorded the null assumption of cointegration considering the P-values. Considering the P-value which was attained from bootstrapped p-values (where the p-values are bootstrapped) the unacceptable assumption of no cointegration is not terminated by all cases demonstrating more grounded proof of auxiliary long-run relationship in the midst of Financial Performance, bank credit, liquidity risk and capital risk among banks in Ghana. In order to utilize (Pedroni, 1999), (Kao, 1999), (Westerlund, 2005) Panel cointegration tests, there should not be a cross-sectional reliance in a model. In spite of the fact that there is no cross-sectional reliance, following panel cointegration tests planned by (Westerlund & Edgerton, 2007b) panel cointegration test structured by (Westerlund & Edgerton, 2007b) was utilized in our examination. The test can be utilized together in instances of cross-sectional reliance and freedom. Moreover, the test permits heterogeneity among the units framing the panel. Along these lines, they are more finished than (Pedroni, 1999), (Kao, 1999), (Westerlund, 2005) tests.

Table 8: Results from (Westerlund and Edgerton, 2007a) bootstrap cointegration experiment.

Statistic	Value	Robust p-value
G_t	-2.627	0.039
G_a	-17.120	0.000
P_t	-14.062	00.000
P_a	-8.202	0.848

Note: The Westerlund-Edgerton bootstrap panel cointegration test considers the null hypothesis of no cointegration.

As determined in the previous sections, the bootstrap strategy can be utilized when there happens cross-sectional reliance in a model. In the nonexistence, the asymptotic standard conveyance is dominant. Giving to the bootstrap strategy, both the gatherings and the panel are factually unimportant. As per the asymptotic standard dissemination, both the gatherings and the panel measurements are factually significant. Hence, the unacceptable theory of no cointegration is dismissed in asymptotic conveyance despite the fact that it is not dismissed in the bootstrap technique. In our model, the consequence of the asymptotic standard conveyance is thought about since there is no cross-sectional reliance on the model. In this unique circumstance, we can make a conclusion that there is a cointegration in our model and BC, LR, and CR, are connected over the long run.

3.3.4 *Granger causality test*

Table 9 present outcomes from the Granger causality test performed in the investigation to characterize the basic long-run connection between the factors: Financial Performance (FP), bank credit, liquidity risk and capital risk. The outcomes show bi-directional causation among credit and financial performance at 1% level significant correspondingly. There is Uni-directional causation which keeps running from LR to FP measurably noteworthy at 1% level, a Uni-directional relationship in the midst of CR and FP at 1% significant dimension. On the other hand, the outcomes additionally demonstrate that LR ganger causes BC at 5% factual noteworthy and show a uni-directional association. At long last, there is no-causality running from CR to BC and CR to LR. The Granger causality test result demonstrates proof of causal relations in the midst of the indicators credit risk management and financial performance estimated with ROA affirming the theory of causal relations of Banks in Ghana.

Table 9: Granger causality test results.

hypothesis	Obs	F-statistics	P-value	Decision	Type of causality
BC-FP	150	5.463**	0.020	Reject	Bi-directional
FP-BC		5.903**	0.016	Reject	
LR-FP	150	4.285**	0.040	Reject	Uni-directional
FP-LR		0.548	0.599	Fail to reject	
CR-FP	150	8.990***	0.003	Reject	Uni-directional
FP-CR		0.883	0.348	Fail to reject	
LR-BC	150	0.611	0.435	Fail to Reject	Uni-directional
BC-LR		7.436***	0.007	Reject	
CR-BC	150	0.790	0.375	Fail to Reject	No-directional
BC-CR		0.240	0.624	Fail to reject	
CR-LR	150	0.033	0.855	Fail to reject	No-causality
LR-CR		0.593	0.442	Fail to reject	

4.Discussion

With the aim of investigating the impact of credit risk management on financial profitability of banks in Ghana, a presentation of Pesaran-Yamagata homogeneity test and Pesaran CD test disclosed the existence of heterogeneity and cross-sectional dependence among the analyzed variables. The presence of cross-sectional dependence and heterogeneity implies that changes with respect to the variable of concern in one bank is likely to affect a similar variable in other banks. Our findings per the existence of slope heterogeneity and cross-sectional dependence are generally in line with that of (Dogan & Aslan, 2017). The application of CADF and CIPS panel unit root test further showed that the analyzed variables in all panels are integrated of the same order ($I(1)$) in other words stationary. As it is important to work with stationary variables in time series regression models, this study ensured stationary variables are used in the estimation. Econometrically, working with stationary variables avoids producing spurious results. This is in agreement with findings of (Dogan & Aslan, 2017), a study in EU countries, (Dogan & Seker, 2016a) in OECD countries who employed the CADF and CIPS as well as (Asafu-Adjaye, Byrne, & Alvarez, 2016) and (Eggoh, Bangaké, & Rault, 2011) who only applied CIPS unit root test in the context of global and African countries respectively.

4.1 *Conclusions and policy recommendations.*

This study considered the effect of credit risk management on financial performance and examine the causal link amid the measurement variables (bank credit, liquidity risk and capital risk) for 15 banks in Ghana covering the period 2007 to 2017. First, considering the results from homogeneity assessment and Pesaran CD's checks, we detect the presence of heterogeneity and cross-sectional correlations for the explored data. Second, the CADF and CIPS panel unit root tests report that, the variables are non-stationary at their stages but become stationary at their first transformations. Third, the Westerlund-Edgerton panel bootstrap cointegration test show that, the variables are cointegrated and hence possess a structural long-run relationship. Forth, results from the PMG estimator through the panel ARDL model show that; (1) A two-way connectedness is verge by bank BC and FP in the long-period and short-period; (2) A positive and significant one-way cause running from liquidity to FP, a one-way cause amid capital risk and FP lastly one-way causality only in the long-period for LR and BC are evidenced; (3) The PMG estimator through the panel ARDL framework is evidenced to be very significantly effective to the application of Granger causativeness test. Though difference parameter estimates are evidenced, the results is generally consistent with that of the PMG in terms of connections.

Empirical findings of this study provide more facts to understand the connection among the variables examined and also help policymakers to design policies based on the indicators understudied. These empirical results deliberate policy recommendations in a step by step method as follows;

1. First, short-term and long-term causalities through the ARDL model discovered a two-way connectedness is verge by bank credit and FP in the long-period short-period. This depicts that, bank credit and FP are connected, an increase in BC leads to rise in FP, and whiles the increase in FP indicates positive increase in BC. Thus, as profitability increases, policymakers in Africa should develop measure to make BC policies very actual and precise.
2. A positive and significant one-way cause running from LR to FP, a one-way cause amid capital risk and FP and lastly one-way causality only in the long period for LR and credit are evidenced.

The research also revealed that credit risk management indicators included in this paper are important variables to explain financial performance of banks in Ghana. The results of the empirical analysis in this study offers the following recommendations, through which they can work to improve credit risk management and to have an effective role in the implementation of performance.

Ghanaian banks should consider, bank credit, liquidity risk and capital as important in the determination of credit risk management. For banks to design an effective system of credit risk management should establish an appropriate credit risk environment; operating under a sound credit granting process, maintaining an appropriate credit administration, involving monitoring, treatment and adequate controls over credit risk. Banks must set and develop strategies that will limit not only the credit risk exposure but to develop the performance and competitiveness of banks, and banks should develop appropriate strategies for credit risk management by conducting an assessment before granting loans to customers.

Finally, banks should consider the tender of best policy ethics, which have been the focus of collective consideration in the field of distribution of interest rates in recent years, principally owing to political insufficient rules which remain an essential source in the banking sector. The central objective of real interest rate policy is to reach the adjusted ratio of risk for banks, interest rate spread within acceptable limits. In addition, banks must manage the rules of the entire interest rate.

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APPENDIX 1

Table 10 Results from PMG estimation for the sample of all banks in Ghana

Dependent Variable	Coeff.	P-value
Long-run Coef		
FP		
BC	-0.177***	0.006
LR	0.205***	0.000
CR	0.241***	0.000
Short-run Coef		
ECT	1.116***	0.000
BC	0.148	0.262
LR	0.141	0.032
CR	0.117	0.000
Hausman	5.83	
P-value	0.1203	