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Kwashie, Angela Akpemada; Baidoo, Samuel Tawiah; Ayesu, Enock Kojo

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*Corresponding author: Samuel Tawiah Baidoo, Department of Economics, Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, Ghana E-mail: samueltawiahbaidoo@yahoo. com

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FINANCIAL ECONOMICS | RESEARCH ARTICLE

Investigating the impact of credit risk on financial performance of commercial banks in Ghana

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economics & finance

Angela Akpemada Kwashie¹, Samuel Tawiah Baidoo^{1,2*} and Enock Kojo Ayesu¹

Abstract: The financial performance of banks across the globe is of utmost importance to its shareholders, managers, investors, regulators, and the general public. This study therefore investigates the impact of credit risk with focus on non-performing loans on the financial performance of commercial banks in Ghana. Return on asset and economic value-added are used as measures of financial performance. Internal bank factors such as the age and size of the bank are also considered. Macroeconomic factors such as gross domestic product, inflation, and monetary policy rate are included in the analysis. Panel data spanning the period 2013 to 2018 on 15 commercial banks in Ghana is used for the analysis. The results from the random effect estimation technique show that non-performing loans have a negative impact on both measures of financial performance. Also, monetary policy rate has a negative impact on both measures of financial performance, albeit insignificant for economic valueadded measure. It is further revealed that the size of bank, age of bank, and gross domestic product have a significant positive effect on both measures of financial performance although significant for return on asset. Based on the negative relationship between non-performing loans and financial performance, it is suggested that commercial banks should adopt stringent credit risk management policies, which should also be updated regularly to guide actions and processes to granting of loans and monitoring credit risk. Furthermore, it is suggested that the value of depreciable assets pledged as collaterals to the banks should be reviewed frequently (probably annually) to reflect a decline in their value. The novelty of the present study pertains to the use of economic value-added as a financial performance measure, which previous studies have virtually ignored in the analysis of credit risk and financial performance nexus.

PUBLIC INTEREST STATEMENT

The financial performance of commercial banks across the globe is key as far as economic growth is concerned. This is so because, a vibrant and robust financial sector ensures that funds are mobilized from the surplus units and subsequently given to the deficit units to facilitate investment activities which in turn promote economic growth. This important role notwithstanding, the financial sector continues to face some challenges and the notable among them is non-performing loans which has the tendency of collapsing financial institutions. As a result, issues pertaining to non-performing loans ought to be given utmost attention. Therefore, the present study examines the potential effect of non-performing loans on the financial performance of commercial banks in Ghana. The study has indeed shown that non-performing loans impact negatively on financial performance of commercial banks. Based on this, the study sheds lights on how non-performing loans can be reduced or eliminated in Ghana to ensure vibrant financial industry to facilitate economic growth and sustainable development.





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Subjects: Economics; Finance; Corporate Finance; Banking; Credit & Credit Institutions; Risk Management; StrategicManagement

Keywords: Credit risk; financial performance; non-performing loans; economic valueadded; Ghana

1. Introduction

Banks act as profit-seeking intermediaries between borrowers and lenders in economies (Breuer et al., 2010). Commercial banks' position as financial intermediaries ensures that funds are directed into productive projects as documented by Marshal and Onyekachi (2014). The role played by commercial banks in economies is crucial and cannot be overemphasized. This is so because, governments implement monetary policies and connect the general populace by issuing of Treasury bills through commercial banks. Moreover, commercial banks also provide capital for industries through loans, for expansion purposes. All other things being equal, as companies expand their financial operations, the revenue of government increases through taxes. Generally, economies and industries perform well when there is a robust and vibrant financial sector (Baidoo & Akoto, 2019; Baidoo et al., 2020; Sakyi et al., 2021).

It is acknowledged that commercial banks mostly accept deposits and give out loans—the principal operation of commercial banks (see: Boahene et al., 2012), and also a significant source of income for the banks (see: Baidoo et al., 2019). However, in executing these important roles as financial intermediaries, commercial banks face different forms of risks. According to Amidu and Hinson (2006), risks are unlikely to be completely eliminated from commercial banks' everyday operations and as such efficient risk management strategies ought to be implemented or form part of their business models.

Credit risk is the possibility of a borrower failing to fulfil its obligations under negotiated terms (see, for example, Ogilo, 2012). Chijoriga (1997) indicates that credit risk is the costliest risk in commercial banking and has a tremendous effect relative to other threats faced by commercial banks, because it directly impedes its soundness. Between 2017 and 2019, many difficulties have befallen the financial sector in Ghana. These instabilities within the sector led to the revocation of licenses of several financial institutions (Baidoo & Akoto, 2019). Notable among the many factors that contributed to the poor performance and collapse of banks that led to the revocation of licenses of several financial institutions are non-performing loans and weak corporate governance (Baidoo et al., 2020; Bank of Ghana, 2018). Umoh (1994) attributes high rates of loan defaults in commercial banks' books to weak credit processing, external intervention in the credit process, and insufficient and/or lack of collateral, among others. The failure of commercial banks to track their credit risk impacts on their financial performance as noted by Boahene et al. (2012).

In the Ghanaian context, many commercial banks have provided loans and advances that they are not able to recoup and this has resulted in a considerable rise in loan defaults. This has subsequently turned into a distressing state for commercial banks. From August 2017 to 2019, the banking sector has been in the public domain. The problems in the banking industry were mainly due to credit risk, primarily, non-performing loans and weak corporate governance (Bank of Ghana, 2018). Data from the Bank of Ghana indicate a growing spike in non-performing loans. Non-performing loans (NPLs) rose from GHS 4.4 billion in December 2015 to GHS 6.2 billion in December 2016, indicating a 17.3% NPL ratio (Bank of Ghana, 2017). In comparison, the NPLs subsequently increased to GHS 8.58 billion in December 2017 from GHS 6.2 billion in 2016 (Bank of Ghana, 2018). A loan write-off directive was released by the central bank in June 2018 to save the industry's large non-performing loans. Despite this directive, non-performing loans were estimated at GHS 6.65 billion for 2018, which was still very high (Bank of Ghana, 2019). This means that the impact of credit risk on the financial capabilities of banks cannot be undermined.

Given what is expounded, commercial banks face the possibility of losing a share or all the loans disbursed in addition to credit facility charges. This will subsequently affect the net profits and capital of the banks. Poor credit risk management affects the ability of banks to conduct their operations and this can lead to customer mistrust as documented by Baidoo and Akoto (2019). Therefore, given the enormity of credit risk, it is incumbent on stakeholders to ensure execution of successful credit risk policies and also monitor them from the origination stage of the loan to the recovery stage. Again, commercial banks will need to adopt rigorous risk control practices and integrate them to ease the consequences of credit risk on their financial performance. These need to be guided by empirical research and hence why the present study is essential.

The study makes some contributions to literature and knowledge as far as the credit risk and financial performance of commercial banks are concerned. More importantly, this study is executed after the roll-out of Pillar I of Basel I and II by bank of Ghana that focuses on credit, market, and operational risks. It is also after bank of Ghana's adoption of the International Financial Reporting Standards (IFRS) 9 to be applied by banks in Ghana for the impairment and provision of credit losses. Therefore, the outcome of the study would be of great importance to policymakers, bank workers, bank executives, board members, and financial investors, among others. This is because, it would help these group of individuals to take proactive measures to mitigate credit risk. Furthermore, the findings would aid policymakers in developing correct structures to safeguard the financial performance of the banking industry. This would then ensure that the banking industry is robust and vibrant in order to continue its important role of expediting economic growth. Finally, the present study uses an important financial performance measure—economic value-added—which previous studies have not considered in the analysis of credit risk and financial performance nexus.

The remainder of the paper proceeds as follows: What follows is the literature review and the next is the empirical methodology. The fourth section presents the results and discussion and the final section provides conclusions and policy implications of the study.

2. Literature review

The theoretical and empirical literature underpinning this study are discussed under this section. The theoretical literature the study considers includes the theory of information asymmetry, theory of moral hazard and adverse selection, loan pricing theory, and agency theory. The ensuing paragraphs provide a brief discussion on these theories and subsequently review of existing related empirical literature.

Stiglitz (2002) defines information asymmetry as a situation where one party to an economic transaction possesses more information than the other party. Spence (1973) proposes a more realistic assumption to back the theory of asymmetric information. He opines that one party often has better knowledge in a deal than the other party. It is common for a borrower to know more than the lender about their ability to repay a loan received. Similarly, the seller of a product is more aware of the quality of the product than the buyer. A company's directors know more about the company's actual performance than the shareholders. Also, policyholders are more conscious of their exposure than the insurance provider. Kane and Malkiel (1965) and Fama (1985) are of the view that a bank can only know about the characteristics of a borrower if it grants more loans to the borrower than if it relies on the borrower's details. It is simpler for a bank to estimate a borrower's risk of default based on historical evidence. Information asymmetry may lead to the bank, giving out bad loans even at the initiation stage of the loan process. The presence of asymmetric information may result in banks' financial performance ultimately impacted by credit risk.

Information asymmetry is closely linked to moral hazard and adverse selection. Moral hazard and adverse selection are general concepts used in finance and risk management to characterize circumstances where there is a disadvantage to one party involved in a transaction. Moral hazard occurs where asymmetric information arises between parties engaged in a contract. That is, when there is a change in one party's behaviour after signing the contract. However, with adverse selection, asymmetric information between both parties is non-existent or is open to one party only. The existence of asymmetric information makes it difficult for the parties to make the right decisions about the risk of the potential contract.

This theory is essential for many economic interactions. Most contracts feature both adverse selection and moral hazards, and loan contracts are no exception. Borrowers often have more accurate information about their ability to repay a loan but may only give information that will favour them in the loan application process. According to Akerlof (1970), moral hazard is evident in the actions of both the lender and borrower, which may lead to a competitive bias and reduce the quality of products and services provided. Krugman (2009) defines a moral hazard as a scenario where one party chooses how much risk to take with the expectation that the other party must bear the cost should event not go as planned. Information asymmetry is the root cause of moral hazard and adverse selection. Gladwell (2005) indicates that the theory of moral hazard and adverse selection has a major effect on banks and may lead to lower profits, lower liquidity, and higher pricing of loans. Moral hazard and adverse selection can result in borrowers not repaying loans, and this can cause a substantial increase in credit risk and thus impact on bank's financial performance.

Furthermore, what determines the price of a loan are the actual cost of the loan, profit, and risk premium. The loan pricing theory suggests that banks consistently fix extreme lending rates. According to Stiglitz and Weiss (1981), the problem of moral hazard, adverse selection, and asymmetric information should be taken into consideration when setting loan rates to ensure interest income maximisation. Chodecal (2004) reports that after obtaining loans and advances, most borrowers develop moral hazard habits by engaging in riskier ventures. The pricing of a loan affects the overall volume of loans that will be disbursed. Without conducting proper due diligence to assess moral hazard behaviors, risky loans will be priced lower than they ought to and therefore raise credit risk should loan default occur. High lending rates can cause an adverse selection problem—attracting risk-averse borrowers only. This may lead to a reduction in loan portfolio diversification and increase concentration within a customer base, which can also significantly increase credit risk.

Last but not least, the agency theory indicates that there are conflicts of interest between bank shareholders and management. Unfortunately, these conflicts of interest incur agency costs to the bank. Aside from agency costs, the theory suggests that conflicts of interest exist because of the principal-agent arrangement between debtors and shareholders of commercial banks. The credit risk between commercial banks and their debtors rises when shareholders get involved in the financing of investments. Banks will make tremendous gains from the success of these risky financial investments. The credit risk loss of these investments, however, is entirely borne by the bank and affects its financial performance.

On the empirical front, some studies have also been conducted. For instance, Boahene et al. (2012) examine the link between banks' profitability and credit risk in Ghana. The study shows a significant positive relationship between profitability and credit risk measured by net charge-off rate, pre-provision profit as a proportion of overall new loans and advances and non-performing loan rate. A positive relationship is also revealed between profitability, bank growth, bank depth capital, and bank size. Similarly on Ghana, using return on asset (ROA) and return on equity (ROE) as measures of financial performance and capital adequacy ratio and non-performing loans as measures of credit risk, Akotey and Afriyie (2013) reveal a significant positive relationship between banks' profitability and credit risk. Also, Marshal and Onyekachi (2014) investigate the relationship between credit risk and performance of selected banks in Nigeria. The results show that bank performance and non-performing loans to loan advances are positively related. In a related study, Samuel (2015) assesses the influence credit risk has on commercial banks' performance in Nigeria. The findings reveal that credit risk has a significant negative effect on the performance of banks. Also, loans and advances to total deposit are revealed to have a negative effect on banks'

performance. A similar result is obtained by Ebenezer and Omar (2016), also for Nigeria. Again, Noman et al. (2015) reveal that credit risk impacts negatively on financial performance of banks in Bangladesh. The study measures financial performance using return on asset, return on equity and net income margin. Credit risk is measured using capital adequacy ratio, loan loss ratio to gross loans, non-performing loans to gross loans and loan loss ratio to non-performing loans.

Furthermore, Kutum (2015) investigates the relationship between credit risk and profitability of banks. The results indicate that the effect of non-performing loans to total loans and advances on profitability (measured by return on asset) is positive. It is also observed that bank size and profitability are positively related. Saeed and Zahid (2016) investigate the influence of credit risk on commercial banks' profitability in the United Kingdom. Profitability is measured using return on asset and return on equity, whereas credit risk is proxied by impairments and non-performing loans. The results show that there is a positive relationship between credit risk measures and the profitability indicators. Rwayitare et al. (2016) also show that credit risk (measured by capital adequacy ratio, non-performing loans, and loan loss provision) has a negative effect on banks' profitability (measured by net profit margin, return on equity and return on asset). The results further indicate that macroeconomic variables such as consumer price index, gross domestic product, and interest rate have negative effect on profitability. In a related study, Bhattarai (2016) reveals that banks' performance is negatively impacted by the non-performing loan ratio. Cost per loan assets has a positive impact on banks' performance. Bank size is revealed to have a positive relationship with banks' performance. However, the effect of capital adequacy ratio and cash reserve are insignificant.

In Eritrea, Embaye et al. (2017) show that loans and advances ratio and non-performing loans have a significant negative effect on banks' financial performance measured by return on asset. The study also shows that there is a negative relationship between credit risk (measured by capital adequacy ratio) and financial performance. Also, Araka et al. (2018) reveal that interest rate regulations contribute to non-performing loans which in turn impacts negatively on the financial performance of commercial banks in Kenya. Furthermore, Oketch et al. (2018) show that the relationship between banks' performance and non-performing loan ratio is negative and significant. The study further indicates that the effect of loan loss default, capital adequacy ratio, and loan loss provision are insignificant.

In a related study, Ekinci and Poyraz (2019) show that the relationship between non-performing loans and return on asset as well as return on equity is negative. Herath et al. (2021) assess the impact of credit risk on the profitability of the banking sector in Sri Lanka. The study findsthat non-performing loans impact negatively on return on assets. However, the net charge-off ratio and the loan-to-deposit ratio are revealed to be insignificant in explaining the profitability of banks in Sri Lanka. The study further indicates that capital adequacy ratio has positive relationship with returns on assets. Furthermore, a study by Smarika and Sangeetha (2021) indicates that there is a significant negative relationship between non-performing assets and return on equity for commercial banks in India. The study, however, reveals that there is an insignificant relationship between capital adequacy ratio and return on equity. Similarly, Kaimu and Muba (2021) reveal that non-performing loans impact negative relationship between non-performing loans, capital adequacy ratio, and financial performance of commercial banks in Bangladesh. However, the relationship between loans-to-deposit ratio and financial performance of commercial banks is revealed to be positive.

From the review of the related literature, it is observed that bank performance has been measured using return on assets, return on equity and net interest margin. Also, various measures of credit risk have been used by past studies. However, the predominant measures are the capital adequacy ratio and non-performing loans ratio. Bank size, management performance, and macro-economic variables, such as gross domestic product and inflation have also been used to explain

the performance of banks. Again, it is observed that studies in Ghana are few and also the findings differ from one another. More importantly, this study incorporates an important financial performance measure—economic value-added which past studies have virtually ignored.

Based on the theoretical and empirical reviews, the study tests the following hypothesis:

Non-performing loans impact negatively on financial performance of commercial banks.

3. Empirical methodology

This section focuses on the methods that are used in achieving the objective of the study investigating the impact of credit risk on the financial performance of commercial banks in Ghana. It specifically presents the model specification, variable description, and estimation strategy.

3.1. Data type and sources of data

The study utilizes secondary data from 15 commercial banks in Ghana for the period 2013 to 2018. The chosen banks and the time period for the present study are due to data availability. Bank-level data—return on asset, economic value-added, non-performing loans ratio, capital adequacy ratio, loans and advances ratio, size and age of banks are obtained from the annual financial statements of the selected banks. Data on monetary policy rate are obtained from Bank of Ghana database, whereas those of gross domestic product and inflation are sourced from Ghana Statistical Service database. Moreover, this study focuses on Ghana because of the challenges the financial sector of the economy has gone through over the years, especially between 2017 and 2019 as highlighted earlier under section 1.

3.2. Model specification

The study specifies a panel model for estimation following Boahene et al. (2012). Panel estimation technique is appropriate following the panel nature of the data and also, it takes into consideration the heterogeneity among the individual banks. The equation is specified as follows:

$$FP_{it} = \beta_0 + \beta_1 NPL_{it} + \beta_2 CAR_{it} + \beta_3 LAR_{it} + \beta_4 SIZE_{it} + \beta_5 AGE_{it} + \beta_6 GDP_{it} + \beta_7 INF_{it} + \beta_8 MPR_{it} + u_i + \varepsilon_{it}$$
(1)

where FP represents financial performance and it is measured by return on asset (ROA) and economic value-added (EVA) and NPL, CAR, and LAR denote non-performing loans, capital adequacy ratio, and loans and advances ratio. Again, SIZE, AGE, GDP, INF, and MPR denote banks' size, the age of bank (years of existence), gross domestic product, inflation, and monetary policy rate, respectively. β_0 is the intercept, β_i s (i = 1, 2, 3, ..., 8) are the coefficients of the respective explanatory variables to be estimated and ϵ is the error term. i and t denote the ith bank in year t and u_i is the individual specific effect which is constant over time.

3.3. Variable description, measurement, and expected sign

The dependent variable—financial performance—in this study is measured by return on asset and economic value-added. This study uses these indicators because of their advantages over other measures such as the return on equity (ROE), and net interest margin (NIM). For instance, the use of ROE and NIM has been criticized for not explaining the extent to which management maximizes shareholders' wealth (Kadar & Rikumahu, 2018). According to Sinkey (1992), ROA is best for evaluating the performance of commercial banks because it takes into consideration differences due to financial leverage and avoids distortions. Sinkey further adds that EVA offers better information to bank management to influence their decisions which may contribute to the development of the largest shareholder wealth. The Stern Stewart Corporation (Stern & Shew, 1995) notes that EVA is the best and most realistic measure of performance as it is more accurate in estimating an organization's actual economic profit.

Return on assets is a financial performance proxy used to show earnings from how a bank's assets are used over a given time frame. ROA shows the proportion of how profitably the bank's assets are used in income generation. It is a portion of a company's income to its total assets. It shows how effective the performance of the banks' management is regarding profit generation from limited resources.

The Stern Stewart Corporation introduced the economic value added (EVA) as a full yardstick for measuring the performance of an organization. Stern Steward & Co in 1982 describes EVA as a financial performance indicator that is directly related to shareholders capital formation (see: Stern & Shew, 1995). It is further suggested that EVA stands out as the single strongest assetbuilding predictor and is almost 50% stronger than other accounting-based metrics. It is calculated from the variance of net operating profit after tax (NOPAT) and the opportunity cost of invested capital.

With regard to the independent variables, non-performing loans are critical indicator of credit risk in commercial banks. Non-performing loans are measured by the percentage of loan defaults against the aggregate volume of the bank's loans. This study expects non-performing loans to affect banks' financial performance negatively. This is because, a higher non-performing loan implies that a higher percentage of loans disbursed are not recouped and this apparently impacts on the financial performance of the bank negatively. Results from Embaye et al. (2017), Oketch et al. (2018), Ekinci and Poyraz (2019), Herath et al. (2021), and Yeasin (2022) have indicated a negative relationship between non-performing loans and financial performance of commercial banks. Capital adequacy ratio is the proportion of the bank's available resources to its riskweighted credit exposures. It also refers to the bank's holdings of equity capital and other securities as buffers against volatile assets. Through its effort to control capital adequacy globally, the Basel Committee on Banking Supervision (BCBS) expects internationally operating banks to have a capital adequacy ratio of at least 8%. However, for commercial banks in Ghana, the minimum threshold as set by the Bank of Ghana is 10%. The capital adequacy ratio measures the financial ability of a bank which is tracked continuously by regulators. Theoretically, banks with a sound capital adequacy ratio have excellent financial performance. A bank with a reliable capital adequacy ratio may bear any losses and prevent insolvency. This study expects the relationship between capital adequacy ratio and banks' performance to be positive as revealed in studies by Embaye et al. (2017), Herath et al. (2021), and Kaimu and Muba (2021). Loans and advances ratio is widely used to determine the liquidity of a bank by contrasting its total loans to total deposits. It shows a bank's ability to satisfy its customers' lending demands and withdrawal needs. It also indicates how banks can obtain sufficient funds to convert its assets to cash quickly. Loans and advances ratio helps investors to assess if a bank is being managed effectively. This is based on the commercial loan theory assertion that a bank that is more liquid will reduce the risk of insolvency, and this improves performance. Therefore, loans and advances ratio is expected to impact the financial performance of banks positively. Studies such as Boahene et al. (2012) and Marshal and Onyekachi (2014) have also indicated a positive relationship between loans and advances and financial performance of commercial banks.

Bank size is measured as the natural logarithm of the bank's total assets. Bank size is widely used in the financial sector to indicate possible economies or diseconomies of scale. The study expects bank size to influence banks' financial performance positively. This is because, bigger banks are asserted to benefit from economies of scale and prospects for diversification and this enhances their performance. Age is measured by how long a bank has been in existence. It also indicates the experience of the bank. The relationship between age and banks' financial performance is expected to be positive as indicated in studies by Boahene et al. (2012), Bhattarai (2016) and Kutum (2015). This stems from the assumption that older banks have more credit risk management expertise and therefore reduce the negative impact on their financial performance. This is supported by the moral hazard and adverse selection and in turn reduce credit defaults. All

other things being equal, older banks will have more historical data to assess prospective borrowers as compared to newer banks. Gross domestic product (GDP) is the monetary value of all goods and services produced in an economy over a period of time. The study expects the effect of GDP on the financial performance of banks to be positive. This result is also evident in the study conducted by Rwayitare et al. (2016). Generally, banks perform better during an economic expansion. All other things being equal, a rise in GDP will lead to a higher demand for loans and higher deposits and this is likely to enhance the financial performance of the banks. Inflation is the persistent rise in the general price levels of goods and services. Consumer price index is used as a measure of inflation in this study. The study expects inflation and the financial performance of banks to be positively related. This is because, a surge in inflation rates could lead to a rise in interest rates as well. A rise in interest rates causes banks to anticipate an increase in their financial performance by giving out more loan facilities at these high-interest rates. Monetary policy rate is the rate at which the central bank lends loans to commercial banks. If the monetary policy rate is high, then the interest rate offered by commercial banks will also be higher, all other things being equal. The study expects the relationship between monetary policy rate and the financial performance to be negative. This is because high-interest rates result in high loan losses and vice versa. High interest rates might also lead to a reduction in loan demand, thereby having a negative impact on the financial performance of the bank. High lending rates can cause an adverse selection problem—attracting risk-averse borrowers only, which is also likely to increase credit risk.

3.4. Estimation strategy

In estimating Equation (1), the study employs the Hausman specification test to choose between the fixed effect and random effect. The null hypothesis of the Hausman test states that the random effect is appropriate, and the alternative hypothesis suggests that the fixed effect is appropriate. Therefore, the null hypothesis is rejected if the test statistic is significant at the conventional significance level (5%) implying that a fixed effect estimator is appropriate. On the other hand, if the test statistic is insignificant, then the null hypothesis is not rejected indicating the appropriateness of the random effect estimator.

The reliability of the results depends on the assumption that the estimation is free from econometric problems, such as heteroscedasticity and autocorrelation. This is because it is documented that the volatilities of most economic and financial data differ with time. Heteroscedasticity is observed in panel datasets when the variance in error term is not constant over time. Autocorrelation, however, exists when the correlation between the error terms in different periods is not zero. To address these issues, the Breusch–Godfrey test and the Breusch–Pagan test are employed to check for the presence or otherwise of autocorrelation and heteroscedasticity, respectively. In these tests, the null hypothesis that states the absence of autocorrelation and heteroscedasticity is tested against the alternative hypothesis, which indicates the presence of these problems. The null hypothesis is then rejected (not rejected) if the test statistics of these tests is significant (insignificant) at 5% level.

4. Results and discussion

This section presents the empirical results, and it is divided into four sub-sections. The first section focuses on the descriptive analysis. The second and third sections present the Hausman specification test and regression results, respectively. The final section is devoted to the diagnostic test results.

4.1. Descriptive analysis

The summary of the descriptive statistics of the variables used in the study is reported in Table 1. Also, in order to ensure that the results obtained are not influenced by multicollinearity issue, the correlation analysis for the two dependent variables (economic value-added [EVA] and return on asset [ROA]) and the independent variables is examined and the results are reported in Table 2.

Table 1. Summ	e 1. Summary of descriptive statistics					
Variable	Mean	Median	Maximum	Minimum	Standard Deviation	
ROA	0.0449	0.0489	0.1100	-0.0368	0.0294	
EVA	5.7065	11.3822	18.9849	-17.0782	12.0922	
NPL	0.1710	0.1400	0.7200	0.0220	0.1238	
LAR	0.5628	0.5489	1.2276	0.1881	0.2263	
CAR	0.2318	0.2102	1.9034	0.0826	0.1937	
SIZE	17.5225	15.5898	22.4411	13.8068	3.0592	
AGE	3.3487	3.1781	4.8203	2.3979	0.7596	
GDP	0.0503	0.0485	0.0810	0.0220	0.0230	
INF	0.1401	0.1398	0.1746	0.0980	0.2907	
MPR	0.2065	0.2065	0.2600	0.1600	0.0362	

Source: Authors' estimation

Table 2. Correlation analysis results									
Economic Value-	iconomic Value-Added (EVA)								
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) EVA	1.000								
(2) NPL	-0.214	1.000							
(3) LAR	0.122	-0.285	1.000						
(4) CAR	-0.111	-0.082	-0.298	1.000					
(5) SIZE	0.232	-0.036	-0.252	0.190	1.000				
(6) AGE	0.196	0.174	0.139	-0.055	-0.389	1.000			
(7) GDP	-0.02	0.049	-0.228	0.158	0.062	-0.000	1.000		
(8) INF	0.015	-0.012	0.194	-0.255	-0.058	-0.000	-0.446	1.000	
(9) MPR	-0.078	0.187	-0.104	-0.127	0.006	-0.000	-0.479	0.379	1.000
Return on Asset (R	OA)								
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) ROA	1.000								
(2) NPL	-0.205	1.000							
(3) LAR	0.018	-0.285	1.000						
(4) CAR	0.005	-0.082	-0.298	1000					
(5) SIZE	0.070	-0.036	-0.252	0.19	1.000				
(6) AGE	0.192	0.174	0.139	-0.055	-0.389	1.000			
(7) GDP	0.098	0.049	-0.228	0.158	0.062	-0.000	1.000		
(8) INF	-0.094	-0.012	0.194	-0.255	-0.058	-0.000	-0.446	1.000	
(9) MPR	-0.206	0.187	-0.104	-0.127	0.006	-0.000	-0.479	0.379	1.000

Source: Authors' estimation

It is observed from Table 1 that that economic value-added measure (EVA) has a higher mean, median, maximum and standard deviation figures relative to return on assets (ROA). This is an excellent stride for both investors and shareholders. This means that banks in Ghana create actual wealth for investors and shareholders. This therefore translates into increased dividend payments and inherently affects the market value of their shares. Non-performing loans, loans, and advances ratio and capital adequacy ratio have maximum values (minimum values) of 0.720 (0.022), 1.227 (0.188), and 1.903 (0.083), respectively, with mean values of 0.171, 0.563, and 0.232

correspondingly. Furthermore, it is observed from Table 2 that multicollinearity is not an issue in the present study. This is because, all the correlation coefficients are less than 0.5. These values are also less than the rule of thumb value of 0.8 which indicates a severe multicollinearity problem.

4.2. Hausman specification test

The Hausman specification test is conducted to choose between fixed effect and random effect estimators in terms of appropriateness. The results are reported in Table 3 (return on asset [ROA] Model) and Table 4 (economic value-added [EVA] Model).

From Table 3 and Table 4, it is observed that the test statistics (chi-square statistics) are statistically insignificant given the probability values of 0.961 (ROA Model) and 0.885 (EVA Model), hence the non-rejection of the null hypothesis. This means that the random effect estimator is deemed appropriate for the present analysis.

4.3. Regression results

Following the Hausman test, the random effect estimation regarding the effect of non-performing loans on the financial performance of commercial banks is estimated, and the results are reported in Table 5—results from both the ROA and EVA models are reported. It is observed that non-performing loans have a negative effect on both return on asset and economic value-added which

Table 3. Hausman spe	Table 3. Hausman specification test results (ROA Model)					
Test Summary	Chi-square Statistics	Chi-square d.f	Probability			
Cross-section	1.9796	7	0.9610			
· · · · · · · ·	·					

Source: Authors' estimation

Table 4. Hausman spe	isman specification test results (EVA Model)				
Test Summary	Chi-square Statistics	Chi-square d.f	Probability		
Cross-section	1.1208	7	0.8849		

Source: Authors' estimation

Table 5. Effec	Table 5. Effect of credit risk on financial performance results							
	ROA Model				EVA Model			
Variable	Coefficient	Std. Error	Prob.	Coefficient	Std. Error	Prob.		
Constant	-0.0489	0.0562	0.3844	-9.2839	0.2157	0.0661		
NPL	-0.0284	0.0250	0.1567	-17.4785	0.8367	0.0367		
LAR	0.0121	0.0164	0.4615	3.5086	0.5609	0.5316		
CAR	0.0025	0.0138	0.8521	-11.5735	0.4533	0.0107		
SIZE	0.0016	0.0017	0.2347	0.4346	0.6254	0.0487		
AGE	0.0102	0.0088	0.0244	3.9913	0.3929	0.3097		
GDP	0.4577	0.2063	0.0265	15.5104	0.3219	0.8177		
INF	0.5269	0.2648	0.0467	22.5929	0.7027	0.7967		
MPR	-0.3304	0.1375	0.0163	-29.9483	0.8031	0.5132		
R-Squared	0.7557			0.6837				
Adj. R-Squared	0.7083			0.6170				
Chi-Squared	22.2793		0.0044	23.3362		0.0029		

Source: Authors' estimation

is consistent with the a priori expectation, but statistically significant for the latter. Specifically, the coefficients show that a 1% rise (fall) in non-performing loans leads to 0.03% and 17.48% reduction (rise) in return on asset and economic value added, respectively. The reason for the negative effect can be attributed to high-interest rates set by banks on loans disbursed. As a result, customers are likely not to reimburse loans, and this causes banks to make higher provisions for bad loans which tend to affect their profit and financial performance negatively. This finding is consistent with prior studies by Ebenezer and Omar (2016), Rwayitare et al. (2016), Embaye et al. (2017), Oketch et al. (2018), Ekinci and Poyraz (2019), Herath et al. (2021), and Yeasin (2022).

Also, consistent with the a priori expectation, the results reveal a positive but insignificant relationship between loans and advances ratio and both measures of financial performance (return on asset and economic value-added). The coefficients indicate that a 1% increase (decrease) in loans and advances ratio results in 0.01% and 3.51% increase (decrease) in return on asset and economic value-added, respectively. Though insignificant, the implication is that a high loans and advances signals the ability of the bank to obtain adequate funds to convert its assets to cash quickly. A bank that is more liquid can reduce the risk of insolvency and, therefore, will be able to prevent any negative impact on its financial performance. Boahene et al. (2012) and Marshal and Onyekachi (2014) have also reported a similar finding for loans and advances ratio and financial performance of banks.

Furthermore, it is revealed that there is a positive but insignificant relationship between capital adequacy ratio and return on asset and a significant negative relationship between capital adequacy ratio and economic value-added. Specifically, the coefficients show that a 1% rise in capital adequacy ratio causes return on asset to increase by 0.003% and economic value-added to also reduce by 11.57%. Though not significant, the positive relationship between capital adequacy ratio and return on asset is consistent with the expected sign and it is also plausible because, banks with a sound or higher capital adequacy ratio have excellent financial performance as documented by Embaye et al. (2017), Herath et al. (2021), and Kaimu and Muba (2021). However, the significant negative relationship between capital adequacy ratio and economic value-added is contrary to the a priori expectation. Commercial banks' dependence on equity capital as a means of finance could be a plausible reason for this negative outcome obtained. Studies by Noman et al. (2015), Smarika and Sangeetha (2021), and Yeasin (2022) also report a similar finding.

Regarding the control variables, the results from both return on asset and economic valueadded estimations show a consistent outcome. The study reveals that there is a positive relationship between bank size, age, gross domestic product, inflation, and the financial performance measures—return on asset and economic value-added. The effect of monetary policy rate on return on asset and economic value-added is negative. These findings are also consistent with the a priori expectation.

Specifically, the study reveals that a 1% increase (decrease) in bank size causes return on asset and economic value-added to increase (decrease) by 0.002% and 0.43% respectively. However, the relationship is insignificant for return on asset. The implication of the finding is that an increase in bank size enhances the financial performance of commercial banks in Ghana. Larger banks have adequate data and resources to support their lending decisions, hence, in a better position to manage credit risk effectively. This then improves its financial performance over the long term. This outcome confirms the findings by Boahene et al. (2012) and Kutum (2015). With regard to age and financial performance, the study shows that increasing (decreasing) the former by 1% raises (reduces) the financial performance by 0.01% and 3.99%, respectively for return on asset and economic value-added (albeit insignificant for economic value-added). This means that older banks leverage their expertise and experience to manage credit risk, hence, improving financial performance.

Breusch-Godfrey test for serial correlation						
Model	Chi-square	Df	<i>p</i> -value			
ROA	5.4018	6	0.4934			
EVA	10.1060	6	0.1203			
Breusch-Pagan tes	t for heteroscedasticity		·			
Model	BP	df	<i>p</i> -value			
ROA	18.1780	8	0.1993			
EVA	19.5990	8	0.1196			

Source: Authors' estimation

Furthermore, it is revealed that increasing gross domestic product by 1% is associated with 0.46% and 15.51% increase for return on asset and economic value-added, respectively. This suggests that Ghanaian banks perform better during economic expansion and poorly during recession. All other things being equal, a higher gross domestic product implies more income, which tends to increase deposits and demand for loans by customers. Increase in deposits and demand for loans apparently enhances the financial performance of the banks all other things being equal. A study by Rwayitare et al. (2016) has revealed similar results. The study also indicates that when inflation rises by 1%, it causes return on asset and economic value-added to rise by 0.53% and 22.59%, respectively. This finding is plausible because, all other things being equal, an increase in inflation rates causes interest rates to rise. When interest rates increase, banks anticipate a rise in their financial performance by giving out more loan facilities to prospective borrowers at these high-interest rates. As loans advances increase, the banks are expected to earn higher profit, and, hence, improvement in financial performance. Finally, the study indicates that a 1% increase (decrease) in monetary policy rate result in 0.33% and 29.95% decline (rise) in return on asset and economic value-added, respectively. A high monetary policy rate may lead to a rise in the interest rate charged by commercial banks, all other things being equal. A rise in interest rate can lead to substantial loan defaults and reduction in loan demand which will in turn affect the financial performance of banks negatively as indicated by the study.

4.4. Diagnostic tests

As mentioned earlier, diagnostic tests are conducted, and the results are reported in Table 6.

The results from the Breusch–Godfrey test show that autocorrelation does not exist in both the return on asset (ROA) and economic value-added (EVA) models. Similarly, the Breusch–Pagan test results indicate the absence of heteroscedasticity in both ROA and EVA models. This is so because, the test statistics for both tests are insignificant at 5% level, hence the non-rejection of the null hypotheses which state that there is no serial correlation and heteroscedasticity problems in the model.

5. Conclusions and policy recommendations

This study investigates the impact of credit risk on the financial performance of commercial banks with emphasis on non-performing loans. In doing so, the study utilizes panel data from 15 commercial banks in Ghana over the period 2013 to 2018. The financial performance of the selected banks is measured using economic value-added and return on asset. Furthermore, the study includes bank size, age of bank, gross domestic product, inflation, and monetary policy rate as control variables. Following the Hausman specification test, the random effect estimator is employed for the analysis.

The study has shown that non-performing loans have a negative effect on the financial performance of the selected commercial banks. Capital adequacy ratio is also revealed to have positive (negative) effect on return on asset measure (economic value-added measure). Loans and advances ratio has positive effect on both measures of financial performance albeit insignificant. With regard to the control variables, the study has revealed that size of bank, age of bank, gross domestic product and inflation have positive effect on financial performance, whereas the effect of monetary policy rate is negative. The diagnostic tests conducted also confirm the reliability and robustness of the results obtained. Based on the findings, the study, therefore, concludes that non-performing loans are significant determinant of commercial banks' financial performance.

Based on the findings, the study has some important policy implications for the financial sector in Ghana. First, following the negative relationship between non-performing loans and financial performance, it is suggested that commercial banks should adopt stringent credit risk management policies which will be updated regularly to provide actions and processes to granting and monitoring credit risk. Similarly, the value of depreciable assets pledged as collaterals to the banks should be reviewed regularly (probably annually) to reflect a decline in their value. The commercial banks should also ensure that collateral documentation is obtained prior to disbursement and checked for accuracy and completeness. Furthermore, top management of commercial banks should, as a matter of urgency, provide training for risk management staff, especially those involved in the disbursement, monitoring, and recovery of loans. If these measures highlighted are well executed, non-performing loans will be reduced, if not totally eliminated, and the financial performance of commercial banks will be enhanced.

Last but not least, based on the positive relationship between size of bank and financial performance, it becomes imperative for commercial bank managers to be innovative and introduce more products to the markets in order to earn fees to enhance their performance. Managers of commercial banks should also broaden their operational activities by establishing more branches and investing in modern technology. Managers of commercial banks should also put measures in place to regain the trust of the Ghanaian populace in order to gain more customers which will in turn increase their deposits, and eventually, financial performance will be improved.

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Author details

Angela Akpemada Kwashie¹ Samuel Tawiah Baidoo^{1,2} E-mail: samueltawiahbaidoo@yahoo.com ORCID ID: http://orcid.org/0000-0001-5941-6308 Enock Kojo Ayesu¹

- ORCID ID: http://orcid.org/0000-0002-5916-1023
 ¹ Department of Economics, Kwame Nkrumah University
 of Science and Technology, Kumasi, Ghana.
- ² Department of Accounting and Finance, School of Business, Christian Service University College, Kumasi, Ghana

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