

Determinants of Credit Risk in Ghana

Isaac Kwabena Parry

Directorate of Internal Audit, University for Development Studies, P. O. Box TL 1350, Tamale, Ghana.

*Corresponding Author

Isaac Kwabena Parry

Directorate of Internal Audit,
University for Development
Studies, P. O. Box TL 1350,
Tamale, Ghana.

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Abstract: This study examines factors determining a bank's credit risk in Ghana, using bank-specific factors such as size, liquidity, profitability, and operational efficiency. Moreover, industry-specific factors such as finance sector expansion, inflation, and capitalization, and economic variables like inflation and GDP growth rate were also used. The study uses panel data from 23 commercial banks from 2010-2020. The study found that bank-specific determinants like bank size and operational efficiency significantly influence credit risk. However, profitability has a negative correlation, while industry-specific variables like financial sector development and capitalization positively affect credit risk. Macroeconomic variables like inflation also have a negative relationship with credit risk. Bank management should focus on these determinants to prevent NPLs and ensure proper monitoring and supervision.

Keywords: Operational Efficiency, inflation, credit risk, capitalization, profitability.

Introduction

Credit risk is the likelihood of borrowers defaulting on a loan, and it is influenced by macroeconomic, bank-specific, and industry-specific factors (Global Financial Stability Report, 2018). Banks regulate these factors to help eliminate, mitigate, and avoid bad credit risk. Credit risk is the most common bank risk, and it is affected by various factors such as industry, bank, and macroeconomic conditions.

Credit risk can have significant economic impacts, with stable financial conditions enhancing lending and high credit risk slowing banks and raising fund acquisition costs (Global Financial Stability Report, 2018). Systematic and unsystematic factors, such as inflation, GDP, and currency rate, also contribute to credit risk. Bank collapse and financial crises are widespread due to non-performing loans, leading to huge losses and possible insolvency (Naili & Lahrichi, 2022). Many empirical studies (e.g.) have examined credit risk variables for policy intervention, including poor credit rules, lending practices, bank influx, institutional capacity, variable interest rates, and unhealthy competition. In Ethiopia, credit risk is positively correlated with bank size and credit growth, according to Tehulu and Olana (2015). In Nepal, inflation and exchange rates raise credit risk, Poudel (2018), while Mpofu and Nikolaidou (2018) found that GDP growth, inflation, and domestic credit crises increase credit risk in Sub-Saharan Africa. In Ghana, credit risk variables are still being studied due to financial sector instability. Management efficiency, financial sector development, and GDP growth positively affect credit risk, while excessive government borrowings increase credit risk Di Tommaso & Thornton (2020). Amuakwa-Mensah et al. (2023) found a positive association between universal banking and credit risk in Ghana, indicating that universal banking increased credit risk.

This study aims to analyze credit risk proximate factors in Ghanaian universal banks, focusing on internal and external

variables. It advises restructuring credit, screening candidates, and instituting strict loan application processes to reduce moral hazard. Policymakers could regulate bank liquidity, enforce industry-specific determinants like capitalization, and manage macroeconomic variables like government expenditure adjustment and importation restriction to reduce credit risk. This study uses convenience sampling to analyze credit risk in Ghanaian universal banks from 2010 to 2020, focusing on internal and external variables. However, it cannot be applied to the broader financial system and has policy implications for bank stability.

2.1 Literature Review

This chapter evaluates related studies on credit risk in the Ghanaian banking industry, focusing on the loan disbursement activity of banks. Credit risk is the most common risk to bank operations, and failure to assess the loan portfolio's quality contributes to insolvency. According to Poudel (2018), credit risk is the level of variance in the value of financial instruments due to the creditworthiness of borrowers or counterparties. Credit risk is the likelihood of borrowers defaulting on a loan, and it is influenced by macroeconomic, bank-specific, and industry-specific factors (Global Financial Stability Report, 2018). The Basel Committee on Banking Supervision (BCBS) views credit risk as the probability that a loan will not be repaid, which can lead to instability and bankruptcy. According to the FDIC's "2022 Risk Review," credit risk is defined as "the risk of loss due to a borrower's failure to repay a loan or meet contractual obligations" (p. III-1). In either case, there is a reduction in the present value, increasing the insolvency of banks. Banks' assets are made up of loans and deposits as liabilities payable, and any mismatch would create liquidity risk. At a higher probability of loan default, banks must provide for doubtful loans, decreasing the bank's capital. The divesting effect of NPLs extends from the individual bank to the whole banking system. Non-performing loans (NPLs) deny banks the opportunity to make more loans and interest income, forcing

them to increase their capital adequacy or regulatory capital to write off defaulted loans.

Despoina and Konstantinos (2018) classify loans into five categories: written-off or loss loans, doubtful loans, standard loans, special attention loans, and substandard loans. In conclusion, credit risk is a significant concern for banks in Ghana, with its impact on the banking industry and the ability to generate revenue and interest income. Mpofo (2018) highlights the importance of credit risk factors in banks, which are specific to banks and under the control of their management. Factors such as ownership structure, size, operational efficiency, management quality assets quality, and liquidity are identified in the literature. Foreign-owned banks are likely to make more revenue and increased liquidity than locally-owned banks due to differences in sizes. Management efficiency and profitability are positively and significantly relate to liquidity. Mpofo (2018) opines that precautionary credit policies during high credit demand periods reduce credit risks. Efficient management can choose a high-quality assets and loan portfolio that generates profit and reduces risk. Low asset quality fueled by high NPLs reduces banks' profit, while large loans to assets ratio led to higher profitability. Poorly monitored managers may choose short-term profits over long-term negative consequences, leading to overextension of credit to maximize utility.

Industry-specific variables affecting credit risk include bank concentration and bank competition. Strong competition forces banks to relax some of the rules of effective management, and excessive risk-taking conduct is affected by competition and the

fight over market share. Banks in highly concentrated markets achieve higher profits because market power leads to monopolistic profit. The importance of macroeconomic policies is explained by Garr (2013) who observes that banks are more likely to make lending blunders during upturns than during recessions. A recent study by Yao et al. (2018) analyzed the impact of bank-specific, industry-specific, and macroeconomic variables on the profitability of banks in Pakistan. The study found that a favorable macroeconomic environment positively impacts profitability. Oluwaseun Olabisi Onafowokan and Olufemi Adewale Adegboye (2019). state that "the level of credit risk in the banking system is influenced by macroeconomic factors such as inflation, GDP growth rate, and interest rate". Empirical evidence suggests that loan problems of banks are closely related to economic activity. Banks anticipate that in the occurrence of a recession, households and firms will face liquidity shortages, which raises the likelihood of delays in their financial obligations.

The provision of banking services in Ghana dates back to the 19th century when the first bank, British Bank of West Africa, established an office in Accra in 1896. The sector of banking in Ghana has been through various reformations to make the sector competitive. The Banking Law 1989 (PNDCL 225) was introduced in 1989 to state minimum capital requirements for local and foreign banks and handed the authority to the Bank of Ghana to supervise banks in Ghana. As of January 2023, there are 23 licensed banks in performance in Ghana. Table 1 The major banking development and, or reforms since 2002.

Years	Reforms
2002	The Banking Act 612 was signed into law
2003	The introduction of the prime rate as the policy rate
2004	Banking Act 2004 (Act 723) replaced the Banking Law 1989 (PNDCL225)
2006	The abolishment of the 15% primary reserve requirement
2007	Banking Law (Amendment) Act 2007 (Act 726) was passed into law
2007	Re-denomination of the cedi – ₵10,000 = GH₵1
2008	The introduction of the biometric smart card (E-zwitch card)
2008	Universal banks were asked by BOG to recapitalize
2009	Implementation of the BOG's minimum capital requirement of GH₵60
2010	Foreign banks were given a deadline to meet minimum stated the capital
2012	The banks met the recapitalization requirement
2013	Recapitalization of GH₵120 million for new entrants was introduced
2017	2017: BOG's imposition of the new capital requirement of GHs 400 million on commercial banks.
2018	23 Bank met the minimum capital requirement
2019	34 Rural and Community banks were liquidated on capital deficiencies
2019	Assessment on recapitalization shows a positive impact of some bank key indicators

Source: Bank of Ghana

2.2 Studies on Credit Risk Determinants from Developed and Undeveloped Countries

The novel study by Pondel (...) on credit risk has been instrumental in understanding the factors that contribute to credit risk. His studies have shown that loan loss, risk investment finance, regulatory capital, debt ratio, bank size, regulatory capital, earnings management, and liquidity are all determinants of credit risk. In India, Goswami (2022) found that GDP growth, operating expenses, and bank size increase credit risk. Ahmad and Ariff (2017) demonstrated that leverage affects credit risk. Ali and Daly (2017) found that GDP and loan rate affect credit risk in Brazil.

The study conducted by Gila-Gourgoura and Nikolaidou (2017) examined credit risk indicators in the Spanish banking sector by analysing bank data over the period of 1997 to 2015. The study's findings indicated that credit risk is influenced by inflation, bank size, and interest rate. The study conducted by Lu and Zongqi (2016) investigated Chinese credit risk indicators through the use of GMM models. The findings of their research revealed a negative association between inflation and credit risk. In their study, Tehulu and Olana (2015) conducted an examination of the credit risk characteristics in Ethiopia. The study focused on a sample of 10 banks spanning the period from 2007 to 2011. The findings of the study revealed that both bank size and loan growth have a significant impact on credit risk. The study conducted by Adjei (2018) investigated the credit risk of banks in Benin over a period of ten years, from 2004 to 2013. The findings of the study revealed that credit risk is influenced by the growth of the country's GDP and fluctuations in interest rates. In their study, Mpofu and Nikolaidou (2018) conducted an analysis of credit risk macroeconomic determinants across 22 Sub-Saharan nations. Their findings indicate that there is a negative relationship between GDP growth and credit risk. Asiedu (2015) examined Ghanaian credit risk management, identifying weak credit officer training, financial analysis, asset quality, market risk, liquidity, and corporate governance as credit risk management concerns. The study found that mitigation measures such as lowering loan interest, asset diversification, loan covenants, and monitoring are effective in addressing these concerns. Ibrahim (2016) also examined Ghanaian bank-specific and macroeconomic credit risk factors using 2010-2015 bank data and OLS, found that bank size, interest rate, and GDP significantly affect credit.

3.1 Research Design

An explanatory study design aims to establish a causal link between elements using quantitative and explanatory research. This study uses descriptive methods to describe and explain current phenomena, a step towards exploratory or explanatory research. The analysis uses panel secondary data from selected banks' annual reports, industry-specific factors, and macroeconomic variables from the Bank of Ghana and Ghana Statistical Services websites. The data is from 2010-2020, and the study uses purposive sampling to determine the sample size. The data is accessible, inexpensive, and readily sourced, as primary data is not objectively measured. The study selected 13 universal banks for over 10 years, ensuring the study's focus on transformational change over time. Table 2 lists the sampled banks for the study.

Table 2 Names of Banks used for the Study

GCB BANK PLC	FIDELITY BANK
FBN BANK GHANA LIMITED	FIRST ATLANTIC BANK
CAL BANK	CONSOLIDATED BANK OF GHANA
ECOBANK	AGRICULTURAL DEVELOPMENT BANK
GTBANK	FIRST NATIONAL BANK GHANA
NATIONAL INVESTMENT BANK (NIB)	OMNIBSIC BANK GHANA LIMITED
UNIVERSAL MERCHANT BANK (UMB)	REPUBLIC BANK GHANA LIMITED
ABSA BANK GHANA LIMITED	PRUDENTIAL BANK LIMITED
SOCIETE GENERAL	ZENITH BANK LIMITED
ACCESS BANK	GUARANTEE TRUST BANK
REPUBLIC BANK	
STANDARD CHARTERED BANK	
STANBIC BANK	

Source: Bank of Ghana

3.2 Estimation Technique

The panel fixed effect approaches were employed in this investigation. The problems with the Pooled Regression model, which presume that the intercepts and slopes in the PR model do not change for all i and t, are resolved by the Fixed Effect (FE) Model. On the presumption that, given a constant slope, the intercept term differs over cross-section units and time, the FE model is constructed. In its simplified form, the FE model is written as:

$$Y_{it} = X'_{it} \beta + Z_t \alpha + \varepsilon_{it}$$

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In this equation, Y_{it} is the dependent variable for individual i at time t , X_{it} is a vector of explanatory variables for individual i at time t , β is a vector of coefficients, Z_i is a vector of individual-specific variables that are constant over time, α is a vector of coefficients for the individual-specific variables, and ε_{it} is the error term.

3.3 Model Specification

The study uses a panel fixed effect model. The study presents credit risk as a vector of bank-level, industry-level, and macroeconomic variables as used in a similar study by Gar- Kwashir (2013). The study adopts the model of Gar-Kwashir (2013) who establishes that credit risk is influenced by factors internal to the bank, internal to the industry and external to the bank and the industry. The model is stated as:

$$CR_{it} = \beta_0 + \sum \varphi_j X_{jit}^F + \sum \psi_j X_{jit}^I + \sum \gamma_j X_{jit}^M + \varepsilon_{it} \dots \dots \dots (2)$$

Where CR presents credit Risk; X^F represents bank-specific variables; X^I represents industry-level variables; X^M represents macroeconomic variables.

To address the objectives of the study, the model is specified as:

$$CR_{it} = \beta_0 + \beta_1 BS_{it} + \beta_2 OE_{it} + \beta_3 PROF_{it} + \beta_4 LIQ_{it} + \beta_5 FSD_{it} + \beta_6 CONS_{it} + \beta_7 INF_{it} + \beta_8 GDPGR_{it} + \beta_9 CAP_{it} + e_{it} \quad (3)$$

Where CR denotes Credit Risk. The bank-specific variables are: BS = Bank Size, OE = Operational Efficiency, PROF = profitability and LIQ = Liquidity

The industry-level variables are: FSD = Financial Sector Development, CONS = Banking concentration, CAP = Capitalization. The macroeconomic variables are: INF = Inflation, measured by the Consumer price index, GDPGR = GDP Growth Rate, measured by the average income level of the population.

3.4 Variable Description and Measurement

The study explores credit risk using bank-specific, industry-specific, and macroeconomic variables. It reveals a negative correlation between credit risk and Hirschman-Herfindahl Index (HHI) banking concentration, with low-capitalized, small, and low-liquid banks more unstable in low-concentration markets. The ratio of bank assets to GDP assesses financial sector development, with strong financial institutions leading to more stable banking systems. Economic growth significantly affects credit risk, and high inflation raises credit defaults due to business performance to repay loans.

Table 3 Description of variables

Variables	Description	Formula	Citations
Dependent			
Credit risk	Non- performing Loans	Net Loan/Total Loan	Fernandez et al. (2016)
Independent Variables			
Bank-specific factors			
	Liquidity	Total Loan/Total Deposit	Waeobborheem and Sukr (2015)
	Operational Efficiency	Expense/Income	Altunabaeet al. (2017)
	Bank Size	Natural Logarithm of Total Assets	Adusei (2015)
	Profitability	Earning after Tax/Total Equity	Adusei (2015)
Industry-specific factors			

Macro-economic factors	Banking concentration	Herfindah-Hirschman Index (Sum of the square of market share)	Kasman and Kasman (2015)
	Fin. Sector Development	Total Assets/GDP	Engineer et al. (2018)
	Capitalization	Total Equity/Total Assets	Rahman and Ashraf (2017)
	GDP growth rate	The growth rate of GDP	Gar (2013)
	Inflation	Yearly average of CPI	Gar (2013)

4. Analysis and Interpretation of Results

4.1 Summary Statistics of Variables

Table 4 shows that Ghana's banks have a positive mean in terms of credit risk, profitability, liquidity, operational efficiency, bank size, financial sector development, concentration, and regulatory capital ratio. The average value of NPL (Credit Risk) is 15.51, indicating that banks in Ghana incurred 15.51 per cent of non-performing loans on advanced loans. The banking industry in Ghana has generally improved in the reviewed years, with a high concentration and strong resilience to sudden shocks. Inflation rates were moderate, with an average rate of 11% and a standard deviation of 5.1%. GDP growth was 6.8%, indicating unfavourable economic activity.

Table 4. Descriptive statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
Credit Risk Variable					
Non-Performing Loans	130	15.518	3.219	10.98	21.59
Bank-specific factors					
Profitability	130	19.150	24.427	-47.77	192.446
Liquidity	130	.696	.230	0	1.34
Operational Efficiency	130	.002	.015	-.005	.160
Bank Size	130	6.470	.614	4.594	8.061
Industry-specific factors					
Fin. Sector Development	130	89.829	263.343	.130	1750.1
Concentration	130	.647	0	.064	.064
Regulatory capital ratio	130	.298	.430	.044	3.612
Macro-economic factors					
GDP growth Rate	130	6.833	3.504	2.2	14
Inflation	130	11.022	5.183	0	17.7

Table 5 Diagnostic test

Shapiro-Wilk W test	Prob>z	0.000
BP/CW Hetttest	chi2(1)	0.18
	Prob>	0.2774
Durbin-Watson d-statistic		2.0
Hausman (b-B)'[(V _b -V _B) ^ (-1)] (b-B)	chi2(2)	0.09
	Prob>chi2	0.04583

Source: Research data 2021

Table 5 shows a Shapiro test result of 0.00, indicating non-normal distribution. Durbin Watson's autocorrelation test yields 2.0, rejecting the null hypothesis of no first-order autocorrelation. The Breusch-Pagan/Cook-Weisberg test for heteroscedasticity does not reject the constant variance null hypothesis, with an insignificant p-value of 0.27.

4.2 Correlation Matrix

Correlation tests multicollinearity among variables, assuming linearity between independent variables. A variable with a correlation coefficient greater than 0.70 or less than -0.70 is considered multicollinearity.

Table 5 Correlation

Var.	CR	PRO	OE	SIZE	LIQ	CAP	CON	FSD	GGR	INF
CR	1									
PRO	-0.2	1								
OE	0.06	0.01	1							
SIZE	0.11	-0.18	0.27	1						
LIQ	0.03	0.09	-0.01	-0.03	1					
CAP	0.13	-0.05	-0.04	-0.22	0.07	1				
CON	0.06	-0.06	-0.01	-0.16	0.40	0.001	1			
FSD	-0.02	-0.06	0.63*	0.69*	-0.8*	-0.05	-0.03	1		
GGR	0.06	0.17	0.01	-0.04	-0.07	0.02	-0.02	0.06	1	
INF	-0.03	-0.07	-0.04	0.1	0.16	0.02	-0.015	-0.5.	-0.53	1

Source: Research data, 2021

Table 5 shows weak multicollinearity issues, except for financial sector development and operational efficiency, and bank size development ease of doing business and governance index, with coefficients below 0.7, (Kennedy, 2008). indicating serious multicollinearity problems.

4.4 Bank-specific Determinants of Credit Risk

Table 6 Bank-Specific Determinants of Credit Risk in Ghanaian Universal Banks

Variables	Credit Risk (NPL)			
	B	Std. Error	t-Stats	Prob.
Bank-specific				
Profitability	-0.2	0.11	-1.89	0.06*
Liquidity	0.27	1.19	0.23	0.81
Bank Size	3.04	0.78	3.88	0.000***
Operational Efficiency	63.43	24.62	2.58	0.011***
C	1.273	5.405	-0.24	0.814
Adjusted R ²	0.2421			
S.E. of regression	2.802			
F-statistic	5.27			
Prob.	0.00			
Durbin-Watson stat	1.2			

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$ denotes 10%, 5% and 1% significance levels respectively.

Table 6 shows a moderately satisfactory model with an R-squared of 29, indicating a 29% clearness of dependent variables. F-statistics of 5.27 indicate joint influence on long-term credit risk, with no correlation.

Table 6 reveals that profitability, bank size, and operations significantly impact credit risk at 10%, 1%, and 1% levels. Liquidity is insignificant, but liquidity, bank size, and operational efficiency have positive effects (Gar, 2013; Salike and Ao, 2017). Larger banks have better risk management strategies, leading to superior loan portfolios. This contradicts Ali and Puah's (2018) claim that large banks have higher systematic risk due to excess capital for investment and customer loans.

Profitability, financial sector development, and operational efficiency impact credit risk. The finding is consistent with (Gar 2013; Mpofu, 2018) Efficient bank management employs precautionary credit policies during high-demand loan periods, reducing risk exposure, while inefficient managers increase risk for short-term profit.

The study reveals a significant negative link between profitability and credit risk, indicating a bank's capacity to take calculated risks. This contradicts Tan and Floros' (2013) study, which suggests efficiency encourages banks to take more risks. Liquidity has no significant influence on credit risk, contradicting the liquidity theory that lower liquidity lowers credit risk exposure.

4.5 Industry-Specific Determinants of Credit Risk

Table 8 Industry-specific determinants of credit risk in Ghanaian Universal Banks, (Fixed Effect)

<i>Credit Risk (NPL)</i>				
<i>Variables</i>	<i>B</i>	<i>Std. Error</i>	<i>t-Stats</i>	<i>Prob.</i>
Industry-specific				
Fin. Sec. Dev.	-0.007	0.002	-3.70	0.000***
Concentration	-7.25	20.75	-0.35	0.727
Capitalization	1.275	0.677	1.88	0.063*
C	1.273	5.405	-0.24	0.814
<i>Adjusted R²</i>	0.2421			
S.E. of regression	2.802			
F-statistic	5.27			
Prob.	0.00			
Durbin-Watson stat	1.2			
<i>Credit Risk (NPL)</i>				
<i>Variables</i>	<i>B</i>	<i>Std. Error</i>	<i>t-Stats</i>	<i>Prob.</i>
Macroeconomic				
GDPGR.	0.03	0.09	0.38	0.706
Inflation	-0.252	0.062	-4.01	0.00***
C	1.273	5.405	-0.24	0.814
<i>Adjusted R²</i>	0.2421			
S.E. of regression	2.802			
F-statistic	5.27			
Prob.	0.00			
Durbin-Watson stat	1.2			

Table 7 shows that financial sector development and bank capitalization significantly influence credit risk at 1% and 10%, respectively. Administrative culture, derived from institution quality, influences bank stability and reduces credit risk. The study

finds capitalization positively impacts credit risk, consistent with previous research suggesting higher minimum capital requirements may destabilize banks. However, bank concentration does not affect credit risk, contradicting Saif-

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$ denotes 10%, 5% and 1% significance level respectively.

Alyousfi et al.'s (2018) and Beck et al.'s (2006) findings that high bank concentration reduces banking crises.

4.6 Macroeconomic Determinants of Credit Risk

Table 8 Macroeconomic Determinants of Credit Risk in Ghanaian Universal Banks

Table 4.6 shows that inflation significantly influences credit risk at a 1% level. However, growth in GDP has no effect on credit risk. Inflation negatively impacts credit risk, contributing to disequilibrium in the credit market. Inflation can make loan repayment easier but has no substantial influence on credit risk Ahmad and Ariff, (2017) study macroeconomic environment's impact on

The chapter analyses and interprets the study's results, using mean, standard deviation, and maximum to observe variables. Results show bank size, profitability, operational efficiency, capitalization, and financial sector development significantly influence credit risk. Inflation also plays a role.

5 Conclusion and Policy Recommendation

The study explores credit risk in Ghanaian universal banks, revealing that bank size, operational efficiency, capitalization, financial sector development, and GDP growth all impact credit risk, with profitability reducing it.

The study examines the impact of bank-specific, industry-specific, and macroeconomic determinants on the credit risk of universal banks in Ghana. It found that bank size, management efficiency, financial sector development, inflation, and GDP growth jointly influence credit risk in the long run. The research concludes that bank-specific, industry-specific, and macroeconomic factors significantly influence banks' credit risk.

The study highlights the impact of GDP growth on credit risk, suggesting that efficient management and effective financial policies are crucial. However, inflation negatively affects credit risk, necessitating regulatory authorities to enforce risk management systems and detect high loan default rates.

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