

Determinants of financial performance of Banks in Ghana

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Abstract

The research utilized time series approaches to find out the factors affecting banks' financial performance in Ghana. The study's period was from 1996 to 2019 and used techniques such as generalized linear model, multivariate regression, and granger causality to make its statistical inference. In summary, the study concludes that regulatory capital to risk-weighted assets (capital adequacy share), credit to deposit share, bank concentration share, larger banks, and economic growth all have a significantly positive impact on bank financial performance in Ghana. Non-interest income to total income share, on the other hand, has a negative and statistically significant effect on bank financial performance, according to the study. Bigger banks were found to have a causal relationship with return on equity and assets, as well as bank concentration share with return on equity and assets. Non-interest income to total income has a causal association with return on assets, and capital adequacy share has a causal association with return on equity.

Keywords: *Banks performance; regulatory capital to risk-weighted asset share; generalized linear model; multivariate regression; Ghana*

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I. Introduction

The banking sector contributes in the economic and social development of each and every economy throughout relation to financial efforts to promote the private market that is a driver of growth. Furthermore, according to Vitenu-Sackey and Hongli (2019), banking system plays an important and significant part in the financial industry as well as the economic outlook. Conversely, Rumler et al. (2010) contend that banks serve as financing intermediaries, converting funds into useful financial assets and managing funds in a strategic, efficient, and effective manner, where stronger and larger banks guarantee trust. According to previous studies, the banking sector's sustainability and financial performance serve as a stable foundation for economic growth (Abu-Alkheil et al., 2012; Dobbs & Hamilton, 2006; Berger & Humphrey, 1997). Due to the enormous financial risks that banks confront, the presence of market limitations makes it necessary for banks to protect consumer savings against adversity (Dewatriport & Tirole, 1994; Cecchetti & Schoenholtz, 2011). The Monti-Klein framework and financial intermediation perspective exist theoretically to bolster the primary financial perils confronted by banks, as do industrial organization models and classical microeconomic theories of banking. Credit and liquidity risks are homogeneously or tightly associated in the classical theory and the industrial organization model assumes that banks' liabilities and assets have a near connection or linkage in terms of credit and liquidity risk (Diamond & Dybvog, 1983; Bryant, 1980).

In recent years, Ghanaian banks have faced difficulties as a consequence of non-performing loans and debt neglect, resulting in the amalgamation of numerous commercial banks and a rise in the regulatory capital by the central bank. Apparently, the sector has been unstable for some time, affecting bank assets and performance. However, according to Oxford Business Group (2019), the regulator's timely intervention, namely the Bank of Ghana's new restructurings, appears to be attaining progressive outcomes, and the banks' financial performance is anticipated to lift the industry's performance owing to the forecasts of higher economic progress (Ding & Vitenu-Sackey, 2021). The research's purpose derives from the turn of happenings in the banking industry, as well as the abrupt increase in performance, to investigate the elements that influence bank financial performance in Ghana. The research's goal is to look into the factors that influence bank financial performance and determine the precise connection as well as the causation between the determinants and bank financial performance measures.

The study adds to the growing body of knowledge about the factors that influence bank financial performance in Ghana. Notwithstanding the fact that some scholarships have been conducted on bank financial performance in Ghana (Anthanagolon et al., 2008; J. N. Doku et al., 2019; Awunyo-Vitor & Badu, 2012; Bopkin et al., 2010), few studies have focused on the capital adequacy share (Caleb, 2014; Kusi et al., 2016;

Abor, 2005) as measurement of of capital The study also aims to add empirical evidence to the debate over Ghana's ongoing banking sector changes, which would be useful for academics and policy making.

The study's next section includes several types of literature reviews in section 2, data and methods in section 3, in section 4, discussion of empirical findings and results discussion, and in section 5, concludes the research.

II. Literature Review

According to Dietrich and Wanzenrid (2009) and Saona (2011), Banks are confronted with financial dangers, which are primarily possibilities to harvest higher profits, as high-risk assets are said to recompense high yields. With a focus on the bankruptcy cost hypothesis and the signaling hypothesis, both of which believe profitability and capital are linked. The risk-return hypothesis suggests that the greater the risk as a consequence of significant company influence, the higher the profits. Despite this, the risk-return hypothesis states that returns and capital are mutually exclusive. Market power theory or hypothesis and Structure-conduct-performance theory (SCP) are the two main theories or hypotheses that are most commonly employed to measure bank financial performance. The SCP hypothesis, which dates back to the 1960s and was further developed in the 1970s, states that a company's performance ought to be reliant on the conduct of the industry in which it functions, wherever the behaviour of the market is also based on the market structure (Ahokpossi, 2013). The market's structure can be determined by total of consumers, quantity of suppliers, and obstacle to entry; the market's behavior can also be determined by legal factors, pricing behavior, and merger & acquisition; and the firm's productivity can be ascertained by the price, product quality and profit. Ongore and Kusa (2013) elucidated that the market power theory or proposition states that a firm's productivity is determined by peripheral factors or drivers, such as market share and product diversification, and that organizations with a higher market stake and well-differentiated product portfolio have the authority to control the market in the face of fierce competition.

Paul and Yazidu (2015) used panel data procedures to explore the drivers of bank financial performance in Ghana for the period 2000–2012, taking into account some extant literature on versions of bank financial performance. They discovered that loan market share and bank financial performance have a positive association. Additionally, they discovered that banks were inefficient in their opesharens and that these ineptitudes were passed on to customers in the form of higher interest rates on loans and lower interest rates on savings. They also evaluated the patterns in their performance and, as a result, profitability, and came to the conclusion that there is a adverse trend in the banks' financial performance .

In their conclusion, George et al. (2014) deduced that total cost total income share and total liquid assets to total assets had undeviating and substantial influence on banks' financial performance in Ghana. Conversely, they believed that price increases and the unemployment level have little bearing on bank financial performance. The GMM model was used to analyze panel data from 1988 to 2011, and the economic value-added method was employed as a proxy measurement of bank financial performance. The number of workers, deposit share, overheads share, liquidity share, inflation, non-performing loans, and unemployment rate are all inconsequentially associated to banks' financial performance, according to Isaac (2015)'s study on the contributing factors of bank profitability in Ghana. From 1997 through 2014, he used random effects and pooled OLS techniques to analyze data.

Anthanagoglon et al. (2008) evaluated the domestic banks in Ghana's recapitalization and the effect on their cost-effectiveness from a sample period of 2003 to 2007 using Generalised Method of Moment assessments on 22 out of 26 banks; they established that the recapitalization had an adverse influence on bank cost-effectiveness. J. N. Doku et al. (2019) suggest in a recent study of capital structure and bank financial performance in Ghana that a rise in banks' capital to assets share, and hence capital structure, has a beneficial influence on banks' financial performance. Many studies agree with J. N. Doku et al. (2019) that increasing bank capital will place them well in the marketplace and protect them from any shocks or uncertainties that could lead to bankruptcy (Chortareas et al., 2011; Claeys & Venmet, 2008; Eriotis et al., 2002; Hutchison & Cox, 2006).

In light of this type of literature, the study's goal is to focus on other contributing elements and the capital structure to banks' financial performance in order to either backing or refute the intellectual argument around Ghana's banking reforms.

III. Data and Methodology

3.1 Data

Secondary data was gathered from the IMF's Global Financial Development database and the World Bank's WDI. The goal of the research is to look at the elements that influence bank financial performance in Ghana. However, the parameters, which include management efficiency, fund management practice, credit risk, liquidity management, and capital structure, are considered independent variables in the research. The

percentage of non-interest revenue to total income is used as a proxy for fund management practice. The credit-to-deposit share is used as a proxy for liquidity management. The share of non-performing loans to gross loans is used as a proxy for credit risk. Capital structure is measurement of two representations: capital to assets share and regulatory capital to risk-weighted assets percentage. A proxy of overhead cost to total assets is measurement of management efficiency, and capital structure is measurement of two proxies: capital to assets and. capital adequacy share (regulatory capital to risk-weighted assets percentage). Furthermore, because bank financial performance is influenced by macroeconomic foundation and bank growth factors, the study measured economic growth by using real GDP per capita, inflation, industry structure as a proxy measure of banks concentration share, and bank size as a measurement of banks total assets to regulate banks' financial performance. According to J. N. Doku et al. (2019), the sizes of banks are measured in two ways: the log of total assets denotes lesser banks (bank size) and the quadratic term or square root of size denotes larger banks (S^2). With reference to Abu-Rub, the study employed typical financial computations of performance to gauge bank financial performance, such as return on assets and return on equity (2012). Despite the fact that additional measures exist, the study proposes to employ the two variables as performance metrics owing to their widespread use.

3.2 Methodology

The research is a time series research, therefore the analysis was done using time series approaches. Unit root tests, correlation matrices, multivariate regression, generalized linear models, and granger causality tests are among the approaches employed. To begin, the study computes the variables' descriptive statistics to determine the mean, median, minimum, and maximum values. After that, in order to avoid performing a bogus analysis, the study runs unit root tests on the variables to ensure that they are stable. The Im-Pesaran and Shim - IPS (Im et al., 2003), Levin, Lin, and Chu- LLC (Levin et al., 2002), PP-Fisher, and ADF-Fisher (Maddala & Wu, 1999) tests are used to examine the stationarity amongst the variables. If the tests show that the data is stationarity, the study can move forward with its regression.

However, because there are six independent factors in the investigation, the study checks for collinearity among the dependent variables alongside the independent variables. Because the independent variables are significantly correlated with the dependent variables in the presence of multicollinearity, there will be a collinearity problem when the regression is run. After determining that there is no multicollinearity, regression analysis is the next step.

Multivariate regression is used as the main regression approach, and a generalized linear model is used as the robustness check technique in this work. Nevertheless, because there are multiple independent variables in the investigation, the multivariate regression model is used for data analysis. Furthermore, many associations cannot be adequately abridged by an equation that is essentially linear of multiple regressions. As a result, the research employs the usage of a GLM, which has the way to estimate feedback for dependent variables with continuous or discrete dispersion, as well as for independent variables that are not linked to the dependent variables linearly.

Lastly, the granger causality test is used to determine the causal path between the variables, specifically the dependent and independent variables. Unidirectional and bidirectional causality are expected as a result of the two orientations of causality. Furthermore, the granger causality test's null hypothesis states that no variable granger causes another.

3.3 Model specification

The model for the study can be written as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k + \mathcal{E} \tag{1}$$

In the above equation (1), Y denotes the dependent variable, β_0 denotes parameter coefficient of the intercept, $\beta_1 X_1 \rightarrow \beta_k X_k$ denotes the regressors' coefficients and the predicting variables and \mathcal{E} denotes the disturbance or error term that could not be identified by the independent variables in the model. To eliminate data series oscillations, the variables were transformed into their natural logarithms, and the study's model may now be expressed as:

$$Lnra = \beta_0 + \beta_1 \begin{pmatrix} lncr \\ lnld \\ lnfm \\ lnmeff \\ lnrcs \\ lnscs \end{pmatrix} + \beta_2 (lnbc) + \beta_3 (lns) + \beta_4 (s^2) + \beta_5 (lngpc) + \beta_6 (lnif) + \mathcal{E} \tag{2}$$

$$Lnre = \beta_0 + \beta_1 \begin{pmatrix} lncr \\ lnld \\ lnfm \\ lnmeff \\ lnrcs \\ lnscs \end{pmatrix} + \beta_2 (lnbc) + \beta_3 (lns) + \beta_4 (s^2) + \beta_5 (lngpc) + \beta_6 (lnif) + \varepsilon \tag{3}$$

In the above equations (2 & 3), the dependent variables are Lnre and Lnra and they denote log of log of return on equity and assets respectively, lnfm (fund management practice) denotes non-interest income to total income share, lncr denotes credit risk thus non-performing loans to gross loans share, lnmeff denotes overhead costs to total assets share representing management efficiency, lnld denotes liquidity management representing total credit to total deposits share, lnfm denotes non-interest income to total income share representing fund management practice, lnscs thus capital to assets share also denotes capital structure and lnrcs thus capital structure denotes regulatory capital to risk-weighted assets share, s² denotes big banks, lnbs denotes total assets (small banks), lngpc denotes economic growth therefore real gross domestic per capita, lnbc denotes banks concentsharen (industry structure) and lnif denotes inflation. β₀ denotes the constant term and ε denotes the stochastic error term.

IV. Empirical findings and discussion

4.1 Descriptive statistics

Table 1 accounts for the variables’ descriptive statistics. To report on the financial performance of banks in Ghana, it was witnessed that during the study period, return on assets of banks skyrocketed by 2.33% annually on the average as the return on equity also increased 4.183% yearly. However, the two battery of variables had standard deviation of 0.332% and 0.447% annually. The Skewness test of the variables denotes that the bulk of the variables are skewed negatively, indicating that the majority of the variables are on the left side of the distribution. The Kurtosis test denotes that the distribution is leptokurtic and positive, indicating that it is extremely tall. Furthermore, the Jarque-Bera test reveals that the bulk of the variables are distributed normally. The standard deviations are all the same size.

Table 1 Descriptive statistics of variables

	lnra	lnre	s ²	lnbc	lnbs	lngpc	lnif
Mean	2.330	4.183	2.469	3.174	3.712	8.087	3.752
Median	2.256	2.520	2.603	3.178	3.801	8.027	3.606
Max value	3.154	3.441	2.722	3.505	4.220	8.371	4.741
Min value	0.214	1.365	2.005	2.382	0.122	5.707	2.864
SD	0.332	0.447	0.159	0.380	0.410	0.128	0.351
Skew	-0.229	-0.140	-2.864	-0.188	-2.525	0.255	0.495
Kurtosis	4.166	1.103	5.859	2.225	4.515	2.509	1.887
Jarque-Bera	1.416	0.704	27.572	3.899	14.849	3.137	2.197
Prob.	0.708	0.569	0.001	0.123	0.001	0.227	0.423
Obs.	24	24	24	24	24	24	24

	lnld	lncr	lnscs	lnfm	lnmeff	lnrcs
Mean	5.149	3.361	3.043	4.554	2.931	3.465
Median	5.107	3.498	3.393	4.469	2.868	3.657
Max value	5.303	4.112	3.593	4.630	3.264	3.851
Min vsalue	4.561	1.000	1.000	4.291	2.348	1.000
SD	0.158	1.728	2.005	1.074	1.112	1.725
Skew	-2.450	-3.181	-2.444	-1.387	-1.845	-3.554
Kurtosis	5.970	7.720	4.423	4.069	4.972	9.103
Jarque-Bera	12.310	31.873	9.897	1.574	5.149	49.065
Prob.	0.002	0.010	0.021	0.647	0.115	0.010

Obs.	24	24	24	24	24	24
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4.2 Unit root tests

The research used a unit root test to identify the variables' stationarity status, which resulted in the null hypothesis being rejected. Table 2 shows the unit root test results, and can be seen that all of the variables were stationarity in level form in all of the tests excluding the one with Levin, Lin, and Chu, which established unit root. Furthermore, the unit root tests were then repeated at the first difference to ensure that the variables were stationarity in all of the tests. Finally, the analysis could establish that all variables are stationarity and that there is no indication of unit roots, therefore the null hypothesis that the variables have unit roots is rejected.

Table 2 Unit root tests

Method	Statistic	Prob.**	Sig.	Obs
Level form				
LLC	-0.854	0.160		262
IPS	-5.274	0.000	***	262
ADF	85.184	0.000	***	262
PP	117.941	0.000	***	273
First Difference				
LLC	-10.129	0.000	***	253
IPS	-12.643	0.000	***	253
ADF	173.875	0.000	***	253
PP	405.606	0.001	***	260

Note: *** denotes 1% significance level

4.3 Correlation matrix

The correlation matrix was generated in order to determine the correlation amid the independent and dependent variables, as well as to investigate for multicollinearity among the independent variables. The outcomes of the correlation matrix are displayed in Table 3, which show that there is no multicollinearity amongst the independent variables. According to the rule of thumb, two independent variables ought not to have a figure greater than +/-0.70 (Hongli & Vitenu-Sackey, 2019c, 2020a; Ding & Vitenu-Sackey, 2021; Vitenu-Sackey & Alhassan, 2019; Vitenu-Sackey, 2020c) because they can be identified as having a great correlation link with the dependent variables. According to all evidence, the maximum correlation magnitude and sign of the coefficient is -0.617, indicating that there is no multicollinearity. However, there were both positive and negative correlations between the independent variables and the dependent variables. Lnld, lnrcs, s2, lnbs, and lngpc have been found to have a negative and substantial connection with both lnra and lnre. lnbc, on the other hand, has a positive and significant connection with both lnra and lnre, whereas lnrc, lnfm, and lnmfef have a negative and negligible association with both lnra and lnre. Furthermore, both lnra and lnre have a positive but small connection with lnif.

Table 3 Correlation matrix

Correlation	lnra	lnre	lnld	lnrc	lnrcs	lnfm	lnmfef
lnra	1						
lnre	0.831***	1					
lnld	-0.474**	-0.420**	1				
lnrc	-0.203	-0.263	0.536**	1			
lnrcs	-0.440**	-0.417**	0.385**	0.603***	1		
lnfm	-0.213	-0.109	0.189	0.241	0.159	1	
lnmfef	-0.013	-0.103	-0.116	0.106	-0.164	-0.161	1
lnrcs	-0.341**	-0.297**	0.715***	0.879***	0.634***	0.166	0.207
s ²	-0.579**	-0.490***	0.724***	0.731***	0.649***	0.252	0.052
lnbc	0.608**	0.815***	-0.260*	-0.227	-0.505**	0.079	-0.027
lnbs	-0.617**	-0.631***	0.708***	0.614***	0.648***	0.219	0.060
lngpc	-0.482**	-0.542***	0.300*	0.323	0.459**	0.002	0.025

lnif	0.185	0.274*	-0.265*	-0.442**	-0.325	-0.012	-0.214
	lnrcs	s ²	lnbc	lnbs	lngpc	lnif	
lnrcs	1						
s ²	0.811***	1					
lnbc	-0.282**	-0.601***	1				
lnbs	0.697***	0.897***	-0.719***	1			
lngpc	0.461**	0.759***	-0.938***	0.771***	1		
lnif	-0.361***	-0.654**	0.444**	-0.612**	-0.575**	1	

Note: * denotes 10% level of significance
 ** denotes 5% level of significance
 *** denotes 1% level of significance

4.4 Long run parameter estimations

The research's goal of examining the elements that influence bank financial performance was achieved through the use of multivariate regression, as shown in table 4. From the table, banks' capital structure as measurement of regulatory capital to risk-weighted assets (lnrcs) has a significant progressive influence on bank financial performance (lnra), indicating that a surge in regulatory capital to risk-weighted assets will result in higher in bank financial performance. However, the capital to assets share as measurement of capital structure (lnbs) has no influence on banks' financial performance (lnra). In view of this context, banks' efforts to raise capital on their own have no influence on their performance, however the banking sector regulator's rise in regulatory capital has a favorable impact on banks' financial performance. This result backs with the central bank of Ghana's initiative and measures to recapitalize all retail and wholesale banks in the nation. It has been demonstrated that recapitalization would likely result in brisk economic growth and improved task across all sectors as a result of considerable new capital injections by banks (Okpala, 2013; J. N. Doku, 2019). Bank financial performance is unaffected by liquidity management as the extent of credit to deposit share. This finding backs with the findings of Acharaya et al. (2011) and Tirole (2011), who believe that when banks rely substantially on the interbank market, it is prudent to restrict their liquidity by escalating minimum or regulatory capital requirements. However, banks' funds management practice (lnfm) regarding the degree of non-interest income to total income has an adverse and substantial consequence on banks' financial performance (lnra), which exactly means that a rise in the non-interest income to total revenue share will result in a decline banks' financial performance, corroborating J.N. Doku et al (2019); Ding et al. (2021). To put it another way, the findings demonstrate that, over time, banks have been advancing in resources that do not give them income in order to enhance their financial performance. According to Isaac's (2015) research, credit risk as a metric of non-performing loans to total gross loans (lnrc) has no influence on bank financial performance (lnra). As a result, in support of Boateng and Vitenu-Sackey (2019), bank management efficiency (lnmef) as a metric of overhead costs to total assets has no consequence on bank financial performance (lnra). According to J. N. Doku et al. (2019), Vitenu-Sackey and Hongli (2019a) and Bikker and Hu (2002), the lesser the size of a bank's assets has an adverse and substantial influence on bank financial performance, whereas the larger the size of a bank's assets has a progressive and substantial end product on bank financial performance. The outcome supports the Ghanaian central bank's effort which saw the consolidation of multiple commercial banks in order to enhance asset size and thereby improve performance. Moreover, bank concentsharen (lnbc) has a progressive significant effect on bank financial performance as a proxy indicator of industry structure (lnra). Perhaps a rise in bank concentsharen will result in an improvement in bank financial performance. The economic performance of a country influences the performance of banks in one way or another. The results in tables 4 and 5 indicate a significant positive effect of economic growth (lngpc) on bank financial performance, implying that the greater the macroeconomic fundamentals, the greater the banks' financial performance (lnra & lnre). Because the data in tables 4 and 5 endorse an inconsequential coefficient, inflation appears to have no effect on bank financial performance. As a result, an increase or decrease in inflation has no effect on bank financial performance in consistent with Vitenu-Sackey and Hongli (2020b), George et al. (2014), Popa et al. (2009), and Teker et al. (2011) studies.

Table 4 Long run estimations

DV - lnra	1	2	3	4	5	6
lnbs	-11.93 (-3.27)**	-7.86 (-2.41)**	-9.27 (-2.90)**	-10.53 (-4.52)***	-8.88 (-2.49)**	-7.54 (-2.47)**
s ²	28.17	21.17	23.82	29.37	24.55	18.77

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	(2.74)**	(2.28)**	(2.45)**	(4.30)***	(2.49)**	(2.11)**
lngpc	3.68	3.60	3.83	4.32	3.60	3.45
	(3.48)***	(2.79)**	(3.47)***	(5.86)***	(3.27)***	(3.04)***
lnif	0.20	-0.06	-0.11	0.08	-0.00	-0.05
	(0.53)	(-0.44)	(-0.78)	(0.62)	(-0.07)	(-0.44)
lnbc	0.48	0.75	0.85	1.36	0.80	0.83
	(0.85)	(1.86)*	(1.89)*	(3.50)**	(1.79)*	(1.74)*
lnrcst	0.39					
	(1.88)*					
lncs		-0.02				
		(-0.28)				
lnld			0.74			
			(1.25)			
lnfm				-2.86		
				(-4.19)***		
lnmef					0.38	
					(0.78)	
lnrc						0.06
						(0.20)
constant	-51.70	-49.04	-85.82	-43.94	-63.09	-31.82
	(-4.59)***	(-4.11)***	(-4.28)***	(-6.87)***	(-4.76)***	(-3.98)***
R ²	0.62	0.76	0.81	0.75	0.77	0.76
F-stat.	17.15***	10.29***	11.14***	21.43***	9.64***	9.35***

Note: * denotes 10% level of significance
 ** denotes 5% level of significance
 *** denotes 1% level of significance

4.5 Long run parameter estimations using return on equity

The analysis following are the results relying on return on equity (lnre) as the dependent variable reflect the identical outcomes as the regression outcomes of the analysis using return on assets as the dependent variable (lnra). The major distinction is credit to deposit share and liquidity management (lnld) had a significant progressive effect on bank financial performance (lnre), as opposed to an inconsequential effect when return on assets (lnra) was used as the dependent variable (table 4 and 5 provide more insight). The finding reveals that Ghanaian banks are focused on temporary liquidity, thus they used temporary deposits to boost their profits (Vitenu-Sackey, 2019a; Vitenu-Sackey & Bathuure, 2019; Vitenu-Sackey et al., 2019).

Table 5 Long run estimations using return on equity

DV - lnre	1	2	3	4	5	6
lnbs	-11.41	-4.42	-9.85	-12.62	-9.74	-6.48
	(-2.58)**	(-3.64)**	(-4.74)**	(-3.71)***	(-4.73)**	(-3.62)**
s2	25.72	11.74	25.57	31.78	12.36	23.42
	(4.83)**	(3.82)**	(4.81)**	(3.36)***	(3.32)**	(4.26)**
lngppc	2.48	3.75	4.63	4.84	3.78	1.21
	(4.46)**	(2.97)**	(3.60)***	(6.25)***	(2.32)**	(1.83)**
lninf	1.28	1.76	0.11	0.42	1.19	1.07
	(4.95)	(1.83)	(1.14)	(1.24)*	(1.08)	(0.65)
lnbc	1.23	2.74	1.28	1.73	1.75	0.27
	(0.85)	(2.21)**	(1.86)*	(3.71)**	(3.51)**	(1.93)*
lnrcs	0.42					
	(2.07)**					
lncs		0.02				

		(0.32)				
lnld			1.41 (2.00)*			
lnfmt				-2.74 (-3.05)***		
lnmgteff					0.16 (0.77)	
lncr						0.08 (0.53)
constant	-31.56 (-5.82)***	-25.08 (-7.57)**	-34.73 (-5.64)***	-26.32 (-4.37)***	-26.34 (-4.23)**	-24.24 (-7.37)**
R ²	0.86	0.76	0.87	0.85	0.68	0.77
F-stat.	31.39***	55.23***	65.75***	44.42***	42.74***	12.14***

Note: * denotes 10% level of significance
 ** denotes 5% level of significance
 *** denotes 1% level of significance

4.6 Robustness analysis

The analytical results in Tables 6 and 7 emphasize the study's regression model's robustness check, i.e. multivariate regression. The results show that the coefficients' magnitude and statistical significance of the independent variables on the dependent variables are almost identical, indicating that the model utilized is adequate. The multivariate regression model's r-squared was excellent, as were the F-stats, which demonstrated 1% significance levels athwart all analyses regarding findings (find out more in Table 4&5). As a result, the data generated by the two models are valid and sound for inference in the study.

Table 6 Generalized linear model (lnra)

DV - lnra	1	2	3	4	5	6
lnbs	-11.13 (-3.17)**	-7.76 (-2.40)**	-9.17 (-2.80)**	-10.43 (-4.62)***	-8.98 (-2.59)**	-7.74 (-2.43)**
s2	27.17 (2.94)**	20.17 (2.18)**	22.82 (2.55)**	28.37 (4.40)***	23.55 (2.39)**	19.77 (2.21)**
lngpc	2.85 (3.84)***	2.05 (2.97)***	2.39 (3.74)***	5.42 (5.68)***	2.07 (3.31)***	2.65 (3.44)***
lnif	0.70 (0.24)	-0.17 (-0.39)	-0.72 (-0.67)	0.19 (0.27)	-0.24 (-0.12)	-0.37 (-0.75)
lnbc	0.35 (0.48)	0.59 (1.58)*	0.48 (1.97)*	1.71 (2.06)***	0.91 (1.99)**	0.39 (1.48)*
lnrcs	0.73 (1.97)*					
llncs		-0.20 (-0.82)				
lnld			0.49 (1.52)			
lnfmt				-2.16 (-4.19)***		
lnmgf					0.25 (0.89)	
lncr						0.06 (0.50)
constant	-42.60 (-3.71)***	-41.40 (-4.10)***	-47.28 (-5.35)***	-45.94 (-7.75)***	-43.90 (-3.61)***	-34.28 (-4.89)***

Note: * denotes 10% level of significance
 ** denotes 5% level of significance

*** denotes 1% level of significance

Table 7 GLM regression analysis

DV - lnre	1	2	3	4	5	6
lnbs	-11.04 (-3.57)***	-7.99 (-2.46)**	-10.58 (-3.44)***	-11.02 (-4.77)***	-8.47 (-2.37)**	-8.40 (-2.63)**
s ²	30.52 (3.38)***	21.14 (2.28)**	26.74 (3.18)***	30.58 (4.63)***	22.63 (2.23)**	22.12 (2.46)**
lngpc	2.84 (3.64)***	2.94 (3.17)**	3.36 (4.05)***	3.48 (5.52)***	2.87 (3.22)***	2.81 (3.18)***
lninf	0.27 (1.55)	0.06 (0.38)	0.01 (0.04)	0.24 (1.94)**	0.09 (0.48)	0.08 (0.47)
lnbc	0.44 (0.85)	1.14 (2.21)**	0.82 (1.85)*	1.22 (3.71)***	1.05 (2.15)**	0.98 (1.93)**
lnrcs	0.42 (2.07)**					
lnlcs		0.02 (0.32)				
lnld			1.41 (2.00)**			
lnfm				-2.14 (-4.05)***		
lnmeff					0.05 (0.17)	
lnrc						0.06 (0.49)
constant	-31.63 (-5.82)***	-34.06 (-4.85)***	-43.73 (-3.64)***	-37.32 (-4.37)***	-45.34 (-4.23)***	-37.14 (-3.84)***

Note: * denotes 10% level of significance
 ** denotes 5% level of significance
 *** denotes 1% level of significance

4.7 Granger causality test

The summary of the granger causality test is illustrated in Table 8, which was conducted with the goal of determining whether the causation between the variables was bidirectional or unidirectional. There is confirmation of bidirectional causation or relationship amid $s2 \leftrightarrow lnld$ and the table. This path of causation implies that a disparity in the latter variable effects a change in the causal variable in the same path, and vice versa. Nevertheless, evidence of unidirectional causality or linkage can also be reported by the study; $lnfm \rightarrow lnra$, $s2 \rightarrow lnra$, $lnbc \rightarrow lnra$, $lnroa \rightarrow lngpc$, $lnroe \rightarrow lnrcs$, $lnre \rightarrow lngpc$, $s2 \rightarrow lnre$, $lnbc \rightarrow lnre$, $bs \rightarrow lnre$, $lnre \rightarrow lnif$, $lnmef \rightarrow lnld$, $lnrcs \rightarrow lnld$, $lnif \rightarrow lnld$, $cs \rightarrow lnrc$, $lnrcs \rightarrow lnmeff$, $lnrc \rightarrow lnfm$, $lnmeff \rightarrow lnrc$, $lnrcd \rightarrow lnrc$, $lninf \rightarrow lnrc$, $lnfnt \rightarrow lnrcs$, $lnlcs \rightarrow lnbc$, $lnbs \rightarrow lnfnt$, $lnmgteff \rightarrow lnbs$, $s2 \rightarrow lnfnt$, $lnmgteff \rightarrow s2$, $s2 \rightarrow lnrcs$, $lnbc \rightarrow lnrcs$, $lnbs \rightarrow lnrcs$, $lngdppc \rightarrow lnrcs$, $lngpc \rightarrow s2$, $lnif \rightarrow s2$, $lngpc \rightarrow lnbs$, $lnif \rightarrow lnbs$ and $lngpc \rightarrow lnif$. The term "unidirectional causality" refers to the fact that a variation in the initial variable effects the second but not the other way around. Clearly, the study refutes the null hypothesis that the dependent and independent variables do not have granger causality. The study discovered some causal links that it considers to be very important, such as the granger causation of bank concentsharen to both return on equity assets, as well as the granger causality of $s2$ (larger bank size) to both return on equity and assets. This supports the findings of the long run

estimations (see tables 4-7) that bank concentsharen has a favorable impact on bank financial performance as well as larger banks positively impact on bank financial performance.

Table 8 Granger causality test

	Obs.	F-Stat.	Prob.	
lnfm→lnra	20	4.175	0.046	**
S ² →lnra	20	2.752	0.085	*
lnbc→lnra	20	3.538	0.042	**
lnbs→lnra	20	2.705	0.082	*
lnra→lngpc	20	6.470	0.008	**
lnre→lnrcs	20	6.362	0.020	**
s2→lnre	20	4.494	0.040	**
lnbc→lnre	20	3.960	0.052	**
lnbs→lnre	20	4.448	0.041	**
lnre→lngpc	20	10.725	0.003	***
lnre→lnif	20	2.895	0.097	*
lnmef→lnld	20	3.364	0.073	*
lnrcs→lnld	20	13.572	0.000	***
s2→lnld	20	3.721	0.062	**
lnld→s2	20	4.095	0.048	**
lnld→lnbs	20	4.065	0.049	**
lnif→lnld	20	7.505	0.007	**
lncs→lnrc	20	10.463	0.005	**
lnrc→lnfm	20	2.903	0.082	*
lnmef→lnrc	20	4.459	0.042	**
lnrcs→lnrc	20	15.987	0.000	***
lnif→lnrc	20	5.891	0.022	**
lnfmgtprac→lncs	20	8.078	0.008	**
lncs→lnmgteff	20	3.035	0.098	*
lncs→lnbc	20	3.730	0.085	**
s2→lnfm	20	13.389	0.001	***
lnbs→lnfm	20	11.211	0.001	***
lnmef→s2	20	4.710	0.028	**
lnmef→lnbs	20	3.978	0.013	**
s2→lnrcs	20	6.859	0.005	**
lnbc→lnrcs	20	5.522	0.004	**
lnbs→lnrcs	20	6.814	0.002	**
lngpc→lnrcs	20	7.397	0.005	**
lngpc→s2	20	3.728	0.035	**
lnif→s2	20	6.214	0.020	**
lngpc→lnbs	20	5.162	0.030	**
lnif→lnbs	20	5.584	0.026	**
lngpc→lninf	20	4.078	0.028	**

Note: * denotes 10% level of significance
 ** denotes 5% level of significance
 *** denotes 1% level of significance

V. Conclusion

From 1996 to 2019 as the study period, the research employed time series approaches to investigate the determinants that influence bank financial performance in Ghana. Unit root tests, Pearson correlation, generalized linear model (GLM), multivariate regression, and granger causality tests are among the approaches were employed. The Global Financial Development Indicators from IMF data repository and World Bank's World Development Indicators were used to compile secondary data for the study.

The analysis shows that economic growth, larger banks, credit to deposit share, economic growth, bank concentration share, and regulatory capital to risk-weighted assets have a progressive and substantial influence on bank financial performance. Banks' fund management procedures and smaller banks, on the other hand, have a negative and statistically significant impact on bank financial performance. Capital to assets share, credit risk, inflation and managerial efficiency have little effect on bank financial performance when the other variables are taken into consideration (Xinjing et al., 2019; Hongli & Vitenu-Sackey, 2019a; Vitenu-Sackey, 2019b; Vitenu-Sackey & Hongli, 2020ab; Yushang et al., 2019). The research also witnessed confirmation of causation among the variables such as bigger bank (lnbs) to return on assets (lnra), fund management practice (lnfm) to return on assets (lnra), return on assets (lnra) to economic growth (lngpc), banks concentration share (lnbc) to return on assets (lnra), bigger banks (s^2) to return on equity (lnre), banks concentration share (lnbc) (industry structure) to return on equity (lnre), return on equity (lnre) to banks regulatory capital to risk-weighted assets (lnrcs), return on equity (lnre) to economic growth (lngpc), return on equity (lnre) to inflation (lnif) and smaller banks (lnbs) to return on equity (lnre).

The adverse consequence of bank fund management practices means that banks have spent their capital on non-interest earning assets, resulting in a decline in their financial performance during the sample years. However, if banks' non-interest income continues to rise, their financial performance would suffer. Additionally, increasing the regulatory capital to risk-weighted assets of banks is likely to improve their financial performance. In contrast to these arguments, the report backs the Bank of Ghana's recent banking sector changes, which include raising the regulatory or minimum capital requirements for banks and combining some smaller banks to establish larger banks. According to the research, banks' management efficiency and fund management techniques should be carefully evaluated and practiced prudently in the future to assist them achieve increased productivity and profitability (Boateng & Vitenu-Sackey, 2019). Furthermore, further study is urged in order to accumulate sufficient data for policy-making direction and academic debate.

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