The Contributing Factors to Banks Performance in Ghana: Empirical Evidence from 1996 To 2017

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Abstract:
the study used time series methodologies to examine the factors that affect banks' performance in Ghana from 1996 to 2017. The study used methodologies such as multivariate regression, generalized linear model, and granger causality to make its statistical inference. In conclusion, the study infers that there is a positive and statistically significant effect of regulatory capital to risk-weighted assets (capital adequacy ratio), bank concentration, bigger banks, credit to deposit ratio and economic growth on banks' performance in Ghana. However, the study also found that non-interest income to total income ratio has a negative and statistically significant effect on banks' performance. Evidence of causality was also found from bigger banks to return on assets and return on equity as well as bank concentration to return on assets and return on equity. In addition, capital adequacy ratio has a causal relationship with return on equity and non-interest income to total income has a causal relationship with return on assets

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

1. Introduction

Banks play a vital role in the economic development of every economy in terms of financial development to support the private sector which is an engine of growth. Moreover, banks play a pivotal role in the financial sector and the economy at large (Prince & Jiang, 2019). Rumler et al. (2010) argue that banks act as financial middlemen that perform the function of transforming savings deposits into valuable investments and manage credits in an effective and efficient manner proactively where stronger and bigger banks ensure confidence. Prior studies are of the view that the banking sector stability and performance serve as a solid rock for economic growth (Berger & Humphrey, 1997; Dobbs & Hamilton, 2006; Abu-Alkheil et al., 2012). The existence of market imperfections makes it pertinent for banks to safeguard deposits of customers against adversities due to the high financial risks exposure faced by banks (Dewatriport & Tirole, 1994; Cecchetti & Schoenholtz, 2011). Theoretically, some theories exist to buttress the main financial risks faced by banks thus the classical theories of microeconomics and the industrial organization models of banking in context as Monti-Klein framework and financial intermediation perspective. The classical theory posits that credit and liquidity risks are homogenously or closely related (Diamond & Dybvog, 1983), and the industrial organization model postulates that the assets and liabilities of banks have a close relationship or linkage with regards to liquidity and credit risk (Bryant, 1980).

The banks in Ghana have passed through adversities in recent times as a result of non-performing loans and negligence of debts, which saw the consolidation of some banks and the increase in the regulatory capital by the Bank of Ghana. The sector has suffered instability for a while which has affected the assets and performance of the banks but the timely intervention of the regulator thus Bank of Ghana with new reforms seems to be yielding good results and the banks performance are expected to boost the sector performance due to the projection of stronger economic growth (Oxford Business Group, 2019). The study's motivation stems from this turnout of events that have unfolded in the banking sector and the sudden boost in performance to examine the factors that affect the banks' performance in Ghana. The objective of the study is to examine the contributing factors to banks' performance and find out the exact relationship as well as the causality that exists between the factors and banks' performance variables.

The study contributes to the many kinds of research in the area of the determinant of banks' performance in Ghana. Even though, some researches have been conducted with regards to banks performance in Ghana (Abor, 2005; Bopkin et al., 2010; Awunyo-Vitor & Badu, 2012; Kusi et al., 2016; J. N. Doku et al., 2019), few studies concentrated on the capital adequacy ratio (Anthanagoglon et al., 2008; Caleb, 2014) as a measure of capital structure with the effect on banks performance at large hence the gap for this study. The study intends to also contribute to the argument which is surrounding the current banking sector reforms in Ghana with empirical evidence for academic perusal and policy direction.

The subsequent part of the study consists of kinds of literature review in section 2, data and methodology in section 3, empirical results, and findings' discussion in section 4 and conclusion in section 5.

2. Literature review

Banks are faced with financial risks, which are mostly opportunities to crop more returns as it is stated that high-risk assets reward high returns. With an emphasis on signaling hypothesis and bankruptcy cost hypothesis which are of the view that capital and profitability are positively related. Perhaps, risk-return hypothesis argues that the higher the risk as a result of high leverage of business will eventually lead to higher returns. In spite of this, the risk-return hypothesis posits that capital and returns are negatively related (Saona, 2011; Dietrich & Wanzenrid, 2009). Preferably, there are two main theories or hypotheses that are mostly used for the measure of banks' performance, thus structure-conduct-performance theory (SCP) and market power theory or hypothesis. The SCP theory which can be traced as far back as 1960s and further expanded in the 1970s posits that for a firm to ensure high performance the performance should be dependent on the conduct of the market in which the firm operates, where the conduct of market is also dependent on the structure of the market (Ahokpossi, 2013). The structure of the market can be determined by (number of buyers, number of sellers and barrier to entry); the conduct of the market can also be determined by (pricing behaviors, legal factors, and merger & acquisition) whiles the performance of the firm can be determined by (price, profit, and product quality). The market power theory or hypothesis posits that firms' profitability is dependent on external determinants or drivers such that firms with larger market share and well-diversified products have the power and can monopolize the market in high competition over its competitors (Ongore & Kusa, 2013).

In consideration of some pieces of literature on accounts of banks' performance, Paul and Yazidu (2015) examined the determinants of banks' performance in Ghana for the period of 2000 – 2012 by applying panel data methodologies. They found that there is a positive relationship between market share of loans and banks' performance. Furthermore, they found that banks were inefficient in their operations hence passed their inefficiencies to their customers through an increase in interest on loans and decreased interest on deposits. In addition, they assessed the trends in their performance thus profitability and they concluded that there is negative trend in the performance of banks within the sample period.

George et al. (2014) contributed to the subject matter and in their conclusion; they inferred that total liquid assets to total assets and total cost total income ratio have a direct and significant impact on banks' performance or profitability in Ghana. However, they also posit that inflation and unemployment rate have no significant impact on banks' performance. Their study used panel data from 1988 to 2011 and applied GMM model. Also, the value-added economic approach was used as proxy measure of banks' performance.

Isaac (2015) concluded from his study on the determinants of banks' profitability in Ghana that determinants of banks' performance such as the number of employees, deposit ratio, overheads ratio, liquidity ratio, non-performing loans, inflation, and unemployment rate are insignificantly related to banks' performance or profitability. His study employed the methodologies of random effects and pooled OLS on data from 1997 to 2014.

With much emphasis on the recapitalization of the banks in Ghana, Anthanagoglon et al. (2008) studied the recapitalization of Ghanaian banks and the impact on their profitability from 2003 to 2007 by applying GMM estimations on 22 banks out of 26; they concluded that the recapitalization had a negative impact on banks profitability. In a recent study of capital structure and bank performance in Ghana; J. N. Doku et al. (2019) argue that an increase in banks' capital to assets ratio, thus capital structure has positive impact on banks' performance. Many studies share similar opinion with (J. N. Doku et al. 2019) that the increase in capital of banks will position them well in the market and also stand against any uncertainties or shocks that may arise to result in insolvency (Eriotis et al., 2002; Hutchison & Cox, 2006; Claeya & Venmet, 2008; Chortareas et al., 2011).

In view of these kinds of literature, the study intends to center its objective on the capital structure and other contributing factors to banks' performance to either support the intellectual argument surrounding the banking sector reforms in Ghana.

3. Data and Methodology

3.1 Data

The study used secondary data sourced from the World Bank's World Development Indicators and World Bank Global financial development database. The study intends to examine the factors that affect banks' performance in Ghana. However, the factors are considered as the independent variables of the study and the factors are; fund management practice, management efficiency, liquidity management, credit risk, and capital structure. Fund management practice is measured by proxy of non-interest income to total income percentage, Liquidity management is measured by proxy of credit to deposit ratio, Credit risk is measured by proxy of non-performing loans to gross loans percentage, Management efficiency is measured by proxy of overhead cost to total assets and capital structure is measured by two proxies thus capital to assets ratio and regulatory capital to risk-weighted assets percentage (capital adequacy ratio). Moreover, since banks performance is as a result of macroeconomic performance and bank growth determinants, the study employed real gross domestic product per capita to measure economic growth, inflation, banks concentration percentage as a proxy measure of industry structure and banks total assets as a proxy measure of banks' size to control the performance of banks. The sizes of banks were measured two-fold, thus smaller banks and bigger banks; log of total assets represents small banks (bank size) and the square root of size represents large banks ($Size^2$) in line with J. N. Doku et al. (2019). The study used the traditional financial computation of performance to measure the performance of banks thus return on assets and return on equity with reference to Abu-Rub (2012). Even though there are other measures, but the study intends to use the two variables as a measure of performance due to their popularly used.

3.2 Methodology

The study is a time series study hence it used time series methodologies to perform its analysis. The methodologies used are; unit root tests, correlation matrix, multivariate regression, generalized linear model and granger causality test. Firstly, the study computes the descriptive statistics of the variables to ascertain the mean, median, minimum and maximum values of the variables. Subsequently, in order not to perform a sham regression, the study then performs unit root tests for the variables to ascertain the stationary of the variables. The null hypothesis of the unit root tests posits that there is an evidence of unit root in the variables; the study, in this case, uses the tests of Im-Pesaran (Im et al., 2003), Levin, Lin & Chu (Levin et al., 2002), ADF-Fisher and PP-Fisher (Maddala &Wu, 1999) to investigate the stationary among the variables. If the tests confirm stationary then it paves the way for the study to perform its regression.

However, the study then tests for multicollinearity among the independent variables against the dependent variables since there are six independent variables considered for the study. The presence of multicollinearity

implies that the independent variables are highly correlated to the dependent variables; hence there will be a problem of collinearity when the regression is performed. After the examination of no multicollinearity then the regression analysis becomes the next step.

The study adopts two regression methods, thus multivariate regression as the main regression method and the generalized linear model as the robust check method. However, the multivariate regression model is employed for the data analysis because there is more than one independent variable for the study. Moreover, there are many relationships that cannot sufficiently be summarized by an equation which simply linear of multiple regressions, the study then employ the use of generalized linear model which has the ability to predict responses for dependent variables with discrete or continuous distribution also linear relationship and for dependent variables which are not related linearly to the independent variables.

Finally, the granger causality test is performed to ascertain the direction of causality among the variables, in particular, the independent variables and the dependent variables. Two directions of causalities are expected, thus unidirectional and bidirectional causality. Moreover, the null hypothesis of the granger causality test posits that none of the variables granger causes each other.

3.3 Model specification

The study's econometric model can be specified as follows:

$$\boldsymbol{Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 \ldots\ldots + \beta_k X_k + \mathcal{E}} \quad (1)$$

In the equation (1), Y represents the dependent variable, β_0 represents regression coefficient of the intercept, $\beta_1 X_1 \rightarrow \beta_K X_k$ represents the coefficients and the regressors, predictors or independent variables and Ɛ represents the error term or disturbance that cannot be estimated for by the independent variables. The variables were transformed into their natural logarithm to avoid fluctuations in the data series and the model for the study can now be written as:

$$Lnroa = \beta_0 + \beta_1 \begin{pmatrix} lncreditrisk \\ lnliquidity \\ lnfundmgtpract \\ lnmgteff \\ lnregcapstruct \\ lncapstruct \end{pmatrix} + \beta_2 (lnbc) + \beta_3 (lnbanksize) + \beta_4 (size^2) + \beta_5 (lngdppc) + \beta_6 (lninf) + Ɛ \quad (2)$$

$$Lnroe = \beta_0 + \beta_1 \begin{pmatrix} lncreditrisk \\ lnliquidity \\ lnfundmgtpract \\ lnmgteff \\ lnregcapstruct \\ lncapstruct \end{pmatrix} + \beta_2 (lnbc) + \beta_3 (lnbanksize) + \beta_4 (size^2) + \beta_5 (lngdppc) + \beta_6 (lninf) + Ɛ \quad (3)$$

In the equations above (2 &3), lnroe and lnroa are the dependent variables and they represent log of return on assets and log of return on equity respectively, lncreditrisk represents non-performing loans to gross loans percentage (credit risk), lnliquidity represents total credit to total deposits ratio (liquidity management),

lnfundmgtpract (fund management practice) represents non-interest income to total income ratio, lnmgteff thus management efficiency represents overhead costs to total assets ratio, lnregucapstruct thus capital structure represents regulatory capital to risk-weighted assets ratio and capstruct thus capital to assets ratio also represents capital structure, lnbc represents banks concentration (industry structure), lnbanksize represents total assets (small banks), $size^2$ represents big banks, lngdppc represents economic growth hence real gross domestic per capita and lninf represents inflation. β_0 represents the intercept and ε represents the error term.

4. Empirical results and findings discussion

4.1 Descriptive statistics

Table 1 reports the descriptive statistics of the variables and from the table it can be reported that the average growth in profit of the banks were 1.370% and 3.583% annually with a minimum of 0.314% and 2.465% as well as a maximum of 2.164% and 4.541 respectively for the period of 1996 to 2017. However, Ghana recorded an average economic growth of 7.097% yearly with a minimum growth rate of 6.807% and a maximum rate of 7.471% between the period of 1996 and 2017. Banks' liquidity grew at an average rate of 4.159% with a minimum rate of 3.661% and a maximum of 4.403%. The capital structure of banks grew at an average rate of 2.053% annually with a minimum rate of 0.000% and a maximum rate of 2.693 using capital to assets ratio as a measure. By considering regulatory capital to risk-weighted assets are a measured of capital structure then banks' capital structure grew at an average rate of 2.475 with a minimum rate of 0.000% and a maximum rate of 2.951%. Banks' credit risk showed an average growth rate of 2.371% annually with a minimum rate of 0.000% and a maximum of 3.122%. The management efficiency of banks as a measure of overhead costs to total assets showed an average growth rate of 1.941% with a minimum rate of 1.358% and maximum rate of 2.274% annually. Banks' fund management practice as a measure of non-interest income to total income showed an average growth rate of 3.564% annually with a minimum rate of 3.391% and a maximum of 2.274% from 1996 to 2017. Inflation showed an average growth rate of 2.762%, with a minimum growth rate of 1.964% and maximum rate of 3.841% from 1996 to 2017. Banks' size grew at an annual average rate of 2.812% with minimum rate of 1.222% and maximum rate of 3.320%. Finally, banks concentration, which measures the use of a single account by banks for their investments and other operational activities showed banks concentration increased an average rate of 4.144% with a minimum rate of 3.482% and maximum rate of 4.605%. The Skewness test of the variables confirms that majority of the variables are negatively skewed hence mass of the distribution is on the left side. Again, the Kurtosis test also confirms that the distribution is positive and leptokurtic, thus very tall. Moreover, Jarque-Bera test confirms that majority of the variables are in a normal distribution. The standard deviations are homogenous in nature.

Table 1 Descriptive statistics of variables

	lnroa	lnroe	size2	lnbc	lnbanksize	lngdppc	lninf
Mean	1.370	3.583	1.669	4.144	2.812	7.097	2.762
Median	1.356	3.620	1.703	4.278	2.901	7.037	2.706
Maximum	2.164	4.541	1.822	4.605	3.320	7.471	3.841
Minimum	0.314	2.465	1.105	3.482	1.222	6.807	1.964
Std. Dev.	0.432	0.547	0.169	0.480	0.510	0.228	0.451
Skewness	-0.329	-0.150	-1.964	-0.198	-1.625	0.355	0.595
Kurtosis	3.176	2.113	6.959	1.235	5.615	1.609	2.987
Jarque-Bera	0.426	0.804	28.512	2.999	15.949	2.237	1.297
Probability	0.808	0.669	0.000	0.223	0.000	0.327	0.523
Observations	22	22	22	22	22	22	22
	lnliquidity	lncreditrisk	lncapstruct	lnfundmgtpract	lnmgteff	lnregcapstruct	
Mean	4.159	2.371	2.053	3.564	1.941	2.475	
Median	4.207	2.598	2.493	3.569	1.968	2.757	
Maximum	4.403	3.122	2.693	3.730	2.274	2.951	
Minimum	3.661	0.000	0.000	3.391	1.358	0.000	
Std. Dev.	0.168	0.828	1.006	0.084	0.212	0.825	
Skewness	-1.460	-2.191	-1.544	-0.397	-0.945	-2.564	
Kurtosis	4.980	6.820	3.523	3.079	3.982	8.113	
Jarque-Bera	11.410	30.973	8.997	0.584	4.159	48.075	
Probability	0.003	0.000	0.011	0.747	0.125	0.000	
Observations	22	22	22	22	22	22	

4.2 Unit root tests

The study performed a group unit root test for the variables to reveal the stationary status of the variables hence the rejection of the null hypothesis. Table 2 displays the results of the unit root test and it can be reported that in level form all the variables were stationary in all the tests except the test with Levin, Lin & Chu, which confirmed unit root. Subsequently, the tests were performed again at the first difference to confirm whether the variables will be stationary in all the tests. Eventually, at first difference the study could confirm that all variables are stationary and there is no evidence of unit roots hence, the null hypothesis that there is unit root in the variables is rejected.

Table 2 Unit root tests

Group unit root test: Summary Method	Statistic	Prob.**	Sig.	Obs
Level form				
Levin, Lin & Chu t*	-0.954	0.170		262
Im, Pesaran and Shin W-stat	-5.294	0.000	***	262
ADF - Fisher Chi-square	86.184	0.000	***	262
PP - Fisher Chi-square	127.941	0.000	***	273
First Difference				
Levin, Lin & Chu t*	-10.139	0.000	***	253
Im, Pesaran and Shin W-stat	-12.743	0.000	***	253
ADF - Fisher Chi-square	183.895	0.000	***	253
PP - Fisher Chi-square	405.616	0.000	***	260

Note: *** indicates 1% significance level

4.3 Correlation matrix

The study computed the correlation matrix to ascertain the correlation between the independent variables and the dependent variables, also to check for multicollinearity among the independent variables. Table 3 exhibits the results of the correlation matrix and the results confirm that there is no multicollinearity among the independent variable as the rule of thumb posits that two of the independent variables should not have a coefficient above +/-0.70 as they can be recognized as high correlation with the dependent variables. From all indications, the highest correlation coefficient can be reported as -0.627; therefore, there is no multicollinearity. However, the independent variables showed both positive and negative correlations with the dependent variables. It can be reported that lnliquidity, lncapstruct, lnregcapstruct, size2, lnbanksize and lngdppc have negative and significant correlation with both lnroa and lnroe. Meanwhile, lnbc has positive and significant correlation with both lnroa and lnroe, but lncreditrisk, lnfundmgtpract and lnmgteff have negative and insignificant correlation with both lnroa and lnroe. In addition, lninf has a positive but insignificant correlation with both lnroa and lnroe.

Table 3 Correlation matrix

Correlation	lnroa	lnroe	lnliquidity	lncreditrisk	lncapstruct	lnfmgtpract	lnmgteff
lnroa	1						
lnroe	0.931***	1					
lnliquidity	-0.494**	-0.440**	1				
lncredit risk	-0.303	-0.293	0.636**	1			
lncapstruct	-0.540**	-0.517**	0.485**	0.703***	1		
lnfundmgtpract	-0.223	-0.119	0.199	0.251	0.169	1	
lnmgeteff	-0.023	-0.113	-0.106	0.116	-0.174	-0.171	1
lnregcapstruct	-0.441**	-0.497**	0.815***	0.889***	0.644***	0.176	0.208
$size^2$	-0.599**	-0.690***	0.824***	0.741***	0.659***	0.262	0.062
lnbc	0.618**	0.835***	-0.360*	-0.237	-0.515**	0.089	-0.028
lnbanksize	-0.627**	-0.731***	0.808***	0.714***	0.658***	0.229	0.070
lngdppc	-0.492**	-0.742***	0.400*	0.333	0.469**	0.003	0.028
lninf	0.195	0.374*	-0.365*	-0.452**	-0.335	-0.022	-0.244

	lnregcapstruct	$size^2$	lnbc	lnbanksize	lngdppc	lninf
lnregcapstruct	1					
$size^2$	0.911***	1				
lnbc	-0.482**	-0.701***	1			
lnbanksize	0.897***	0.997***	-0.749***	1		
lngdppc	0.561**	0.749***	-0.958***	0.791***	1	
lninf	-0.661***	-0.634**	0.464**	-0.622**	-0.515**	1

Note: *** indicates 1% significance level, ** indicates 5% significance level, * indicates 10% significance level. Lnregcapstruct represents capital structure as refers to capital adequacy ratio, lncapstruct represents capital structure refers to capital to assets ratio, lnliquidity refers credit to deposit ratio, lnfundmgtpract refers to non-interest income, lnmgteff refers to overheads to assets ratio, lncreditrisk refers to non-performing loans to total gross loans ratio, lnbc refers to banks concentration, lnbanksize represents log of total assets, $size^2$ represents bigger banks refers to square root of lnbanksize, lninf refers inflation rate, lngddpc represents economic growth refers to gross domestic product per capita

4.4 Multivariate regression results using return on assets as the dependent variable

The study's objective to examine the factors that affect banks' performance was pursued by applying multivariate regression and table 4 displays the results. According to the table, capital structure as a measure by regulatory capital to risk-weighted assets (lnregcapstruct) has positive and statistically significant effect on banks performance (lnroa) which confirms that an increase in the regulatory capital to risk-weighted assets will

lead to an increase in banks performance but capital to assets ratio also as a measure of capital structure (lncapstruct) has insignificant effect on banks performance (lnroa). In this regard, an effort by banks to increase their capital in their own way has no effect on their performance, but the increase in regulatory capital by the banking sector regulator has a positive effect on banks' performance. This result supports the initiative and reforms that the central bank of Ghana took to recapitalized all commercial banks in the country. It is evidenced that recapitalization will lead to buoyant economic growth with stronger function of all the sectors due to the fresh injection of capital by banks that are significant (Okpala, 2013; J. N. Doku, 2019). Liquidity management as a measure of credit to deposit ratio has an insignificant effect on banks' performance (lnroa). This result also supports the studies of Tirole (2011) and Acharaya et al. (2011), who are of the view that it will be prudent to regulate banks' liquidity by increasing the regulatory capital or minimum capital requirement when banks depend on the interbank market heavily. However, funds management practice of banks (lnfundmgtpract) as a measure of non-interest income to total income has negative and statistically significant effect on banks performance (lnroa) which literally means that an increase in the non-interest income to total income ratio will lead to a decrease in banks performance in support of literature of J.N. Doku et al. (2019). In other words, the results confirm that practically banks over the years have been investing in assets that do not earn them interests to boost their profitability. The credit risk as a measure of non-performing loans to total gross loans (lncreditrisk) has insignificant effect on banks' performance (lnroa) in line with the research of Isaac (2015). Consequently, the management efficiency of banks (lnmgteff) as measure of overhead costs to total assets has an insignificant effect on banks' performance (lnroa) in support of Isaac (2015). By considering the control variables, the study finds that smaller the size of banks assets has negative and statistically significant effect on banks performance and the bigger the size of banks assets has positive and statistically significant effect on banks performance in agreement with Bikker and Hu (2002) and J. N. Doku et al. (2019). Again, this result supports the initiative of the central bank of Ghana to consolidate some commercial banks to become bigger in size in terms of assets to positively affect their performances. Banks concentration (lnbc) as a proxy measure of industry structure has positive and statistically significant effect on banks' performance (lnroa). Perhaps, an increase in the concentration of banks will lead to an increase in banks' performance. The economic performance of a country contributes one way or the other to the performance of banks. Perhaps, the stronger the macroeconomic fundamentals, the stronger banks' performance hence, the results in table 4 and 5 confirm positive and statistically significant effect of economic growth (lngdppc) on banks' performance (lnroa & lnroe). Inflation seems not to have an effect on banks' performance because the results in table 4 and 5 confirm an insignificant coefficient. Therefore, an increase or decrease in inflation does not affect banks' performance in any way in support of literature of George et al. (2014), Teker et al. (2011) and Popa et al. (2009).

4.5 Multivariate regression using return on equity as a dependent variable

The regression results of the analysis performed using return on equity (lnroe) as the dependent variable report the same results as the use of return on assets as the dependent variable (lnroa). The only difference stems from liquidity management (lnliquidity), thus credit to deposit ration, which showed a positive and statistically significant effect on banks' performance (lnroe) as against insignificant effect by using return on assets (lnroa) as dependent variable (See table 4 and 5). This result confirms that banks in Ghana are short term liquid oriented hence they capitalized on short term deposits to increase their profitability.

Table 4 Multivariate regression with lnroa as dependent variable

Dependent variable - lnroa						
	1	2	3	4	5	6
lnbanksize	-10.93	-7.76	-9.17	-10.43	-8.98	-7.44
	(-3.17)**	(-2.40)**	(-2.80)**	(-4.62)***	(-2.59)**	(-2.43)**
size2	27.17	20.17	22.82	28.37	23.55	19.77
	(2.94)**	(2.18)**	(2.55)**	(4.40)***	(2.39)**	(2.21)**
lngdppc	3.58	3.50	3.93	4.22	3.70	3.55
	(4.48)***	(3.79)**	(4.47)***	(6.86)***	(4.27)***	(4.04)***
lninf	0.10	-0.07	-0.12	0.09	-0.00	-0.07
	(0.54)	(-0.40)	(-0.76)	(0.72)	(-0.02)	(-0.45)
lnbc	0.45	0.95	0.84	1.16	0.90	0.93
	(0.84)	(1.85)*	(1.79)*	(3.60)**	(1.89)*	(1.84)*
lnregcapstruct	0.37					
	(1.77)*					
lncapstruct		-0.02				
		(-0.28)				
lnliquidity			0.94			
			(1.25)			
lnfundmgtpract				-2.16		
				(-4.19)***		
lnmgteff					0.25	
					(0.89)	
lncreditrisk						0.05
						(0.40)
constant	-41.70	-39.04	-45.82	-43.94	-43.09	-38.82
	(-4.67)***	(-4.00)***	(-4.33)***	(-6.57)***	(-4.16)***	(-3.98)***
R-squared	0.82	0.78	0.80	0.90	0.79	0.79
F-statistics	11.45***	9.09***	10.24***	22.53***	9.64***	9.15***

Note: *** indicates 1% significance level, ** indicates 5% significance level, * indicates 10% significance level. T-statistics are in parentheses. Lnregcapstruct represents capital structure as refers to capital adequacy ratio, lncapstruct represents capital structure refers to capital to assets ratio, lnliquidity refers credit to deposit ratio, lnfundmgtpract refers to non-interest income, lnmgteff refers to overheads to assets ratio, lncreditrisk refers to non-performing loans to total gross loans ratio, lnbc refers to banks concentration, lnbanksize represents log of total assets, size^2 represents bigger banks refers to square root of lnbanksize, lninf refers inflation rate, lngddpc represents economic growth refers to gross domestic product per capita

Table 5 Multivariate regression using return on equity as the dependent variable

Dependent variable - lnroe

	1	2	3	4	5	6
lnbanksize	-12.01	-7.99	-10.58	-11.02	-8.47	-8.40
	(-3.57)**	(-2.46)**	(-3.44)**	(-4.77)***	(-2.37)**	(-2.63)**
size2	30.52	21.14	26.75	30.58	22.63	22.12
	(3.38)**	(2.28)**	(3.18)**	(4.63)***	(2.23)**	(2.46)**
lngdppc	2.84	2.94	3.36	3.48	2.87	2.81
	(3.64)**	(3.17)**	(4.06)***	(5.52)***	(3.22)**	(3.18)**
lninf	0.27	0.06	0.01	0.24	0.09	0.08
	(1.55)	(0.38)	(0.04)	(1.94)*	(0.48)	(0.47)
lnbc	0.44	1.14	0.82	1.22	1.05	0.98
	(0.85)	(2.21)**	(1.86)*	(3.71)**	(2.15)**	(1.93)*
lnregcapstruct	0.42					
	(2.07)**					
lncapstruct		0.02				
		(0.32)				
lnliquidity			1.41			
			(2.00)*			
lnfundmgtpract				-2.14		
				(-4.05)***		
lnmgteff					0.05	
					(0.17)	
lncreditrisk						0.06
						(0.49)
constant	-37.36	-35.07	-44.37	-39.23	-35.43	-34.04
	(-4.28)***	(-3.58)**	(-4.46)***	(-5.73)***	(-3.32)**	(-3.48)**
R-squared	0.89	0.86	0.89	0.93	0.86	0.87
F-statistics	20.93***	15.87***	20.60***	35.73***	15.78***	16.04***

Note: *** indicates 1% significance level, ** indicates 5% significance level, * indicates 10% significance level. T-statistics are in parentheses. Lnregcapstruct represents capital structure as refers to capital adequacy ratio, lncapstruct represents capital structure refers to capital to assets ratio, lnliquidity refers credit to deposit ratio, lnfundmgtpract refers to non-interest income, lnmgteff refers to overheads to assets ratio, lncreditrisk refers to non-performing loans to total gross loans ratio, lnbc refers to banks concentration, lnbanksize represents log of total assets, $size^2$ represents bigger banks refers to square root of lnbanksize, lninf refers inflation rate, lngddpc represents economic growth refers to gross domestic product per capita

4.6 Robust check: Generalized linear model

The analysis results displayed in Tables 6 and 7 highlights the robustness check of the study's regression model thus multivariate regression. From the results, it can be concluded that the coefficients and statistically significant effects of the independent variables on the dependent variables are virtually the same confirming the appropriateness of the model used. The r-squared of the multivariate regression model was highly good as well as the F-statistics which showed 1% significance across all the models constructed for the study (see Table 4 and 5). Therefore, the results produced by the two models are statistically good for the study's inference.

Table 6 Robust check: Generalized linear model (lnroa)

Dependent variable - lnroa						
	1	2	3	4	5	6
lnbanksize	-10.93	-7.76	-9.17	-10.43	-8.98	-7.74
	(-3.17)**	(-2.40)**	(-2.80)**	(-4.62)***	(-2.59)**	(-2.43)**
size2	27.17	20.17	22.82	28.37	23.55	19.77
	(2.94)**	(2.18)**	(2.55)**	(4.40)***	(2.39)**	(2.21)**
lngdppc	3.58	3.50	3.93	4.22	3.70	3.55
	(4.48)***	(3.79)***	(4.47)***	(6.86)***	(4.27)***	(4.04)***
lninf	0.10	-0.07	-0.12	0.09	-0.04	-0.07
	(0.54)	(-0.40)	(-0.76)	(0.72)	(-0.02)	(-0.45)
lnbc	0.45	0.95	0.84	1.16	0.90	0.93
	(0.84)	(1.85)*	(1.79)*	(3.60)***	(1.89)**	(1.84)*
lnregcapstruct	0.37					
	(1.77)*					
lncapstruct		-0.02				
		(-0.28)				
lnliquidity			0.94			
			(1.25)			
lnfundmgtpract				-2.16		
				(-4.19)***		
lnmgteff					0.25	
					(0.89)	
lncreditrisk						0.05
						(0.40)
constant	-41.70	-39.04	-45.82	-43.94	-43.09	-38.82
	(-4.67)***	(-4.00)***	(-4.33)***	(-6.57)***	(-4.16)***	(-3.98)***

Note: *** indicates 1% significance level, ** indicates 5% significance level, * indicates 10% significance level. Z-statistics are in parentheses. Lnregcapstruct represents capital structure as refers to capital adequacy ratio, lncapstruct represents capital structure refers to capital to assets ratio, lnliquidity refers credit to deposit ratio, lnfundmgtpract refers to non-interest income, lnmgteff refers to overheads to assets ratio, lncreditrisk refers to non-performing loans to total gross loans ratio, lnbc refers to banks concentration, lnbanksize represents log of total assets, $size^2$ represents bigger banks refers to square root of lnbanksize, lninf refers inflation rate, lngddpc represents economic growth refers to gross domestic product per capita

Table 7 Robust check: Generalized linear model (lnroe)

Dependent variable - lnroe						
	1	2	3	4	5	6
lnbanksize	-12.01	-7.99	-10.58	-11.02	-8.47	-8.40
	(-3.57)***	(-2.46)**	(-3.44)***	(-4.77)***	(-2.37)**	(-2.63)**
size2	30.52	21.14	26.74	30.58	22.63	22.12
	(3.38)***	(2.28)**	(3.18)***	(4.63)***	(2.23)**	(2.46)**
lngdppc	2.84	2.94	3.36	3.48	2.87	2.81
	(3.64)***	(3.17)**	(4.05)***	(5.52)***	(3.22)***	(3.18)***
lninf	0.27	0.06	0.01	0.24	0.09	0.08
	(1.55)	(0.38)	(0.04)	(1.94)**	(0.48)	(0.47)
lnbc	0.44	1.14	0.82	1.22	1.05	0.98
	(0.85)	(2.21)**	(1.85)*	(3.71)***	(2.15)**	(1.93)**
lnregcapstruct	0.42					
	(2.07)**					
lncapstruct		0.02				
		(0.32)				
lnliquidity			1.41			
			(2.00)**			
lnfundmgtpract				-2.14		
				(-4.05)***		
lnmgteff					0.05	
					(0.17)	
lncreditrisk						0.06
						(0.49)
constant	-30.36	-35.07	-44.37	-39.23	-35.43	-34.04
	(-4.28)***	(-3.58)***	(-4.46)***	(-5.73)***	(-3.32)***	(-3.48)***

Note: *** indicates 1% significance level, ** indicates 5% significance level, * indicates 10% significance level. Z-statistics are in parentheses. Lnregcapstruct represents capital structure as refers to capital adequacy ratio, lncapstruct represents capital structure refers to capital to assets ratio, lnliquidity refers credit to deposit ratio, lnfundmgtpract refers to non-interest income, lnmgteff refers to overheads to assets ratio, lncreditrisk refers to non-performing loans to total gross loans ratio, lnbc refers to banks concentration, lnbanksize represents log of total assets, $size^2$ represents bigger banks refers to square root of lnbanksize, lninf refers inflation rate, lngddpc represents economic growth refers to gross domestic product per capita

4.7 Granger causality test

Table 8 presents the results of the granger causality test performed in relation to the objective to ascertain the direction of causality among the variables either unidirectional or bidirectional. From the table, there is evidence of bidirectional causality or linkage between $size^2$↔lnliquidity. This direction of causality means that a variation or change in one variable causes a change in the other variable in the same direction vice versa. However, the study can also report evidence of unidirectional causality or linkage; lnfundmgtpract→lnroa, $size^2$→lnroa, lnbc→lnroa, lnroa→lngdppc, lnroe→lnregcapstruct, $size^2$→lnroe, lnbc→lnroe, banksize→lnroe, lnroe→lngdppc, lnroe→lninf, lnmgteff→lnliquidity, lnregcapstruct→lnliquidity, lninf→lnliquidity, capstruct→lncreditrisk, lncreditrisk→fundmgtpract, lnmgteff→lncreditrisk, lnregcaptstruct→lncreditrisk, lninf→lncreditrisk, lnfundmgtpract→lncapstruct, lncapstruct→lnmgteff, lncapstruct→lnbc, $size^2$→lnfundmgtpract, lnbanksize→lnfundmgtpract, lnmgteff→lnbanksize, lnmgteff→$size^2$, $size^2$→lnregcapstruct, lnbc→lnregcapstruct, lnbanksize→lnregcapstruct, lngdppc→lnregcapstruct,

lngdppc→size^2, lninf→size^2, lngdppc→lnbanksize, lninf→lnbanksize and lngddpc→lninf. The unidirectional causality or linkage expressed means that a change or variation in the first variable causes the latter but not vice versa. Undoubtedly, the study rejects the null hypothesis that there is no granger causality among the dependent and independent variables. The study has observed some causal relationships which it deems them as very pertinent, thus the granger causality of bank concentration to both return on assets and return on equity as well as size^2 (bigger banks) to both return on assets and return on equity. This affirms the results of the regressions (see table 4, 5, 6 and 7) that bank concentration has a positive effect on banks' performance and bigger banks also have the leverage and efficiency to impact their performance.

Table 8 Granger causality test

Null Hypothesis:	Obs	F-Statistic	Prob.	
lnfundmgtprac does not granger cause lnroa	20	4.185	0.036	**
size2 does not granger cause lnroa	20	2.762	0.095	*
lnbc does not granger cause lnroa	20	3.638	0.052	**
lnbanksize does not granger cause lnroa	20	2.805	0.092	*
lnroa does not granger cause lngdppc	20	6.480	0.009	**
lnroe does not granger cause lnregcapstruct	20	6.372	0.010	**
size2 does not granger cause lnroe	20	4.484	0.030	**
lnbc does not granger cause lnroe	20	3.950	0.042	**
lnbanksize does not granger cause lnroe	20	4.438	0.031	**
lnroe does not granger cause lngdppc	20	10.625	0.001	***
lnroe does not granger cause lninf	20	2.885	0.087	*
lnmgteff does not granger cause lnliquidity	20	3.354	0.063	*
lnregcapstruct does not granger cause lnliquidity	20	13.562	0.000	***
size2 does not granger cause lnliquidity	20	3.621	0.052	**
lnliquidity does not granger cause size2	20	4.085	0.038	**
lnliquidity does not granger cause lnbanksize	20	4.055	0.039	**
lninf does not granger cause lnliquidity	20	7.405	0.006	**
lncapstruct does not granger cause lncreditrisk	20	10.163	0.002	**
lncreditrisk does not granger cause lnfundmgtprac	20	2.803	0.092	*
lnmgteff does not granger cause lncreditrisk	20	4.359	0.032	**
lnregcapstruct does not granger cause lncreditrisk	20	15.957	0.000	***
lninf does not granger cause lncreditrisk	20	5.991	0.012	**
lnfmgtprac does not granger cause lncapstruct	20	8.048	0.004	**
lncapstruct does not granger cause lnmgteff	20	3.045	0.078	*
lncapstruct does not granger cause lnbc	20	3.830	0.045	**
size2 does not granger cause lnfundmgtprac	20	14.349	0.000	***
lnbanksize does not granger cause lnfundmgtprac	20	12.211	0.001	***
lnmgteff does not granger cause size2	20	4.110	0.038	**
lnmgteff does not granger cause lnbanksize	20	3.918	0.043	**
size2 does not granger cause lnregcapstruct	20	6.959	0.007	**
lnbc does not granger cause lnregcapstruct	20	5.722	0.014	**
lnbanksize does not granger cause lnregcapstruct	20	6.864	0.008	**
lngdppc does not granger cause lnregcapstruct	20	7.197	0.006	**
lngdppc does not granger cause size2	20	3.828	0.045	**
lninf does not granger cause size2	20	6.314	0.010	**

lngdppc does not granger cause lnbanksize	20	5.152	0.020	**
lninf does not granger cause lnbanksize	20	5.484	0.016	**
lngdppc does not granger cause lninf	20	4.088	0.038	**

Note: *** indicates 1% significance level, ** indicates 5% significance level, * indicates 10% significance level

5. Conclusion

The study used time series methodologies to examine the factors that affect banks' performance in Ghana from 1996 to 2017. The methodologies used are unit root tests, correlation matrix, multivariate regression, generalized linear model and granger causality test. The study used secondary data sourced from the World Bank's World Development Indicators and Global Financial Development Indicators Database.

The study concludes that there is a positive and statistically significant effect of bigger banks, economic growth, banks concentration, credit to deposit ratio and banks' regulatory capital to risk-weighted assets on banks' performance. On the other hand, banks' fund management practices and smaller banks have negative and statistically significant effect on banks' performance. To account for the other variables, banks' credit risk, capital to assets ratio, management efficiency, and inflation have an insignificant effect on banks' performance. The study also observed evidence of causality from the dependent to the independent variables such as fund management practice to return on assets, bigger banks to return on assets, banks concentration to return on assets, return on assets to economic growth, return on equity to banks regulatory capital to risk-weighted assets, bigger banks to return on equity, banks concentration (industry structure) to return on equity, smaller banks to return on equity, return on equity to economic growth and return on equity to inflation.

The negative effect of fund management practice by banks implies that over the sample years, banks have invested their funds into non-interest earning assets, which caused a downturn in their performance. However, a further increase in non-interest income of the banks will decrease their performance. Furthermore, an increase in the regulatory capital to risk-weighted assets of banks will lead to an increase in their performance. Contrary to these explanations, the study supports the recent banking sector reforms by the bank of Ghana to increase the regulatory or minimum capital requirement of banks and also to consolidate some banks to form bigger banks. The study recommends that henceforth the fund management practice and management efficiency of banks should be consciously considered and practices judiciously to help them yield higher productivity as well as profitability. Furthermore, more researches are encouraged to build up adequate evidence for academic discussions and policy-making direction.

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