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EFFECT OF CAPITAL ADEQUACY ON BANK SUSTAINABILITY: A COMPARATIVE ANALYSIS BETWEEN NIGERIA AND GHANA

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Abstract

Capital is key to the survival of any organisation of which the bank is not excluded. Although the adequacy of capital is important to financial institutions, the issue of how much capital to maintain is still a puzzle to be unravelled. The study explores the impact of capital adequacy (CAPA) on bank sustainability proxied by Z-score (BZCO). The study employed a descriptive research design. The population of the study were banks of the two West African countries. Secondary data were sourced from the World Bank database for ten years. Diagnostic and stationarity tests were conducted. Error correction model was used to evaluate the effect of the regressors on the regressed and through the aid of the statistical package E- Views 9.0. From the results, it suffices to conclude that in Nigeria, evidence of a long-run relationship between BZCO and CAPA is seen, but the short-run dynamics are weak. But for Ghana, there is no evidence of a long-run relationship, and both the short-run and long-run models show weak explanations for the period studied. The study recommends that financial institutions (banks) should endeavour to maintain capital that is sufficient for safety and sustainability.

Keywords: Capital Adequacy (CAPA), Sustainability, BZCO

Introduction

The 2008/2009 global financial crisis redirected attention to the stability of the banking sector in all countries. The banking sector's stability is of paramount importance because it provides governments with financial reserves and contributes to macroeconomic stability. Financial stability is essential in any economy since banks govern and regulate the financial system (Moyo

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et al., 2014). Commercial banks' business continuity is dependent on earning profits, whereas bank stability, particularly since the 2008 global financial crisis, has become a subject of worry for banking regulatory authorities (Abedifar et al. 2013; Tan & Floros 2012). As a result of the increasing risks that banks face, whether the case is a funding risk, a credit risk, or a liquidity risk, banking supervisory authorities have been forced to focus on bank capital adequacy and financial inclusion to protect commercial banks from bankruptcy and increase their stability.

CAMEL is a widely used framework for evaluating bank performance in the background of Asset Liability Management (ALM). The system was designed by the US Federal Deposit Insurance Corporation (FDIC) for the initial detection of problems in bank "operations" (Uzhegova, 2010). Although several bank performance evaluation models have been presented, the CAMEL framework is the most extensively used model, and it is recommended by the Basel Committee and the IMF for bank supervision. To uncover the relevant determinants of bank long-term viability, the present research focused on the first among the five bank-specific characteristics identified by the CAMEL framework.

Furthermore, the variety of research publications on the factors of financial stability is growing (Moyo, Jennifer, Boaz, Dubai Economic Council, Jacob, & Anthony, 2014; Ghenimi, Ameni, Hasna, & Mohamed, 2017; Al Salamat & Al-Kharouf, 2021). However, there is quite a few research that address the implications of enough capital on bank sustainability in two West African countries.

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Literature Review

Conceptual Framework

Capital Adequacy and Bank Sustainability

Although there is general agreement that statutory capital requirements are necessary to reduce moral hazard, the debate is still on how much capital is enough. Capital adequacy denotes the sufficiency of the extent of equity to absorb any shocks that the bank may experience (Kosmidou, Pasiouras & Floropoulos, 2004). According to Gavila et al. (2009), strongly financed banks have reduced the expense of insolvency and require less external funding, particularly in emerging nations, where supposed foreign borrowing becomes problematic. Consequently, well-capitalized banks ought to have greater earnings compared to others with little capital. Backed by the buffer theory advanced by Calem and Rob (1996), an strong link exists between adequate capital and bank stability. In the present research, capital adequacy (CAPA) was measured as bank capital to asset ratio.

Ogomegbunam (2023), asserted that the primary goal of any business whether large or small, is to thrive. Based on Beckman (1983), cited by Aroghene and Akpoyibo (2023), being sustainable is avoiding the occurrence of diminishing resources with the intent to continue functioning. Survival can be traced to the efficient use of resources to achieve a greater level of performance (Erhijakpor&Aroghene,2023). Since survival is associated with productivity, there exists a demand for the management of businesses to harmonise their objectives to avoid conflict. According to Imene and Udjo-Onovughakpo (2023), most firms' productivity has decreased as a result of ongoing disputes within the business. Imene (2023), also acclaimed that poor productivity and performance is as a result of inadequate evaluation systems. Throughout the present investigation, bank sustainability was measured as bank Z-score (BZCO).

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Theoretical Framework

The theory used to underpin the present study is the Tobin theory of Investment. The theory is explained as follows:

Tobin's Theory of Investment

Tobin (1958), extended Markowitz's concept by incorporating harmless investment into the analysis. This enabled portfolios to be leveraged or deleveraged along the boundary of efficiency, giving rise to the concepts in an extremely effective fund as well as the capital market line. Through leverage, portfolios of assets within the capital market line can outperform investment at the productive threshold. To Tobin (1958), the idea of a portfolio has been broadened to incorporate the notion of debt by adding a financial instrument that generates without any risk. It is conceivable to create portfolios with risk-free assets that outperform portfolios on the efficient frontier of risk-return profiles.

Empirical Review

Athanasoglou et al. (2006), concurred as well as claimed that financial achievement depends on company variables, particularly capital adequacy (CAPA), amongst many. Sufian and Chong (2008), also confirmed identical conclusions upon analyzing the effect of funding on the success of banks across the Philippines from 1990 to 2005.

Gavila and Santabarbara in 2009, utilized the panel linear regression method applying a collection comprising ten Tunisian banks spanning 1980 to 2000 to demonstrate whether financing shows considerable beneficial effects upon ROA. Finance centres around how a business employs its financial resources for maximum value (Osiegbu, Onuorah, & Nnmadi, 2010; Onuorah, 2011; Osiegbu & Onuorah, 2011).

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Khalid (2012), looked at the relationship between the condition of assets along with the operational success of the Indian individual commercial financial services sector and concluded that assets condition as well as profitability are negatively correlated. Also, in 2012, Onuorah and Ebimobowei confirmed that transparency along with governmental finance oversight support progress. Adeolu (2014) when he studied asset quality on bank performance of commercial banks in Nigeria found that asset quality had a statistically strong positive relationship and influence on bank performance. Adusei (2015), probed the relationship amid capital volatility along with confidence in banks that have been explored via the Ghanaian dataset. Based on the statistical results, firms which depend upon deposit financing possess a strong reserve strategy and are sounder. Nzoka (2015), asserted that the proportion to the entire investment resources compared to all holdings was also significant in influencing performance

Kamran et al. (2019), using selections representing Pakistan, throughout the years of 2007 through 2016, originated that creditworthiness for financial institutions depends on an upsurge in the CAPA percent. Yet, excessive CAPA percentage could have a detrimental effect on the steadiness. Daoud and Kammoun (2020), utilised 22 samples across States and reported the affirmative effect of CAPA undermines banking resilience. Onuorah, Arubayi, and Egbule (2020) addressed the vital role of managing worker relationships for acquiring an edge over rivals along with boosting efficiency. When Aroghene&Ikeora (2022), examined capital adequacy (CAPA) and other variables that affect bank stability in Nigeria from 2006-2021, they found that CAPA has a positive and insignificant effect on Z-Score. Kharabsheh and Gharaibeh (2022), explored the causes of Jordanian banking soundness and initiated that Credits towards medium-sized and small enterprises and CAPA are among the elements which produce a substantial positive and analytical influence on Jordanian commercial banks' soundness. Aroghene (2022a; 2022b; 2023c), looked at

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other issues such as board independence, audit independence, bank size, liquidity and fraud as features that influence stability apart from CAPA.

Previous research has proven that specific techniques need to be employed by firms/organisations to back up their earnings on resources, and this will further affect equitable expansion (Onuorah, 2009; Onuorah, 2010; Anayochukwu & Onuorah, 2016; Ehiedu, Onuorah, & Mbagwu, 2022; Ehiedu et al., 2022). Not all the studies are comparative. Hence, this study bridges this gap by examining the influence of capital adequacy in Nigeria and Ghana.

Research Methodology

To account for the effect of capital adequacy proxy by CAPA on bank sustainability proxy by BZCO among the two (2) West African countries (Nigeria & Ghana), the comparative research design was used. This design seems appropriate as it allows observation and description of the behaviour of a subject under consideration. The study population is commercial banks of Nigeria and Ghana. Secondary data collected from the World Bank database from 2012 through 2022 were employed in the study. Diagnostic and stationarity test was conducted, while the Error Correction model was adopted to evaluate the implications of the regressor on the regressand by the use of the computer software E- Views 9.0.The study adoptedAdeolu (2014)work and was modified to suit the present study.

The model is stated as :

BZCO = f(CAPA) **Eqn (1)**

BZCO = b_0+b_1CAPA+ e **Eqn (2)**

Where:

BZCO = Commercial Bank Z-Score measured as equity capital as percent of assets

Website: www.nduwjss.org.ng ISSN: 2504 – 9232 Volume 9 No. 2 (2024)

plus return as percent of assets deflated by the standard deviation of return as percent of assets.

b_0 = Intercept
b_1 = coefficient of the regressor
CAPA = capital adequacy measured as commercial bank capital to asset ratio
e = error term

Results and Discussion

The data for CAPA and BZCO of the two West African countries are accessible in Appendix 1. The results are presented and discussed as follows:

Table 1 Summary of Descriptive Statistics for Nigeria

Variables	Mean	Median	Maxi.	Mini.	Std.Dev	Skew ness	Kurtosis	Jarque-Bera Prob.
BZCO	15.8100	16.3500	18.4000	12.2000	1.8764	-0.5706	2.556287	0.731764
CAPA	8.8000	8.4000	12.4000	5.7000	2.2425	0.2406	1.733558	0.682238

Source: Eviews Extract (2023).

Table 2: Summary of Descriptive Statistics for Ghana

Variables	Mean	Median	Maximum	Minimum	Std.Dev	Skewness	Kurtosis	Jarque-Bera Prob.
BZCO	13.7500	13.9000	14.7000	12.6000	0.5759	-0.3973	2.9921	0.8767
CAPA	9.8700	9.9000	12.3000	7.7000	1.2650	0.2009	2.8747	0.9638

Source: Eviews Extract (2024).

Website: www.nduwjss.org.ng **ISSN**: 2504 – 9232 **Volume 9 No. 2 (2024)**

From Table 1, the descriptive statistics values for Nigeria showed that BZCO has a mean, maximum, minimum and std Dev. of 15.8100, 18.4000, 12.2000 and 1.8764 respectively. While CAPA showed a mean, maximum, minimum and std Dev. of 8.8000, 12.4000, 5.7000 and 2.2425 respectively The mean values display the average value for each of the variables. The range between the highest and lowest values of the data for the study period is shown in the minimum and maximum values. The standard deviation shows how the data deviates from the average score. The values for skewness of -0.5706 and 0.2406 for BZCO and CAPA showed that the former has a long tail to the left, while the latter has a long tail to the right. In the same vein, the value for the kurtosis of both variables depicts that they are platokurtic since the values are below "3". The Jarque- Bera prob. greater than 5%, shows that the data set is normally distributed.

Meanwhile, in Table 2, the descriptive statistics values for Ghana showed that BZCO has a mean, maximum, minimum and std Dev. of 13.7500, 14.7000, 12.6000 and 0.5759 respectively. While CAPA showed a mean, maximum, minimum and std Dev. of 9.8700, 12.3000, 7.7000 and 1.2650 respectively. The mean values display the average value for each of the variables. The range between the highest and lowest values of the data for the study period is shown in the minimum and maximum values. The standard deviation shows how the data deviates from the average score. The values for skewness of -0.3973 and 0.2009 for BZCO and CAPA showed that the former has a long tail to the left, while the latter has a long tail to the right. In the same vein, the value for the kurtosis of both variables depicts that they are platokurtic, while the Jarque- Bera prob, also showed that the data set is normally distributed.

Website: www.nduwjss.org.ng ISSN: 2504 – 9232 Volume 9 No. 2 (2024)

Table 3: Heteroskedasticity Test: Breusch-Pagan-Godfrey for Nigeria

F-statistic	0.298230	Prob. F(1,8)	0.5999
Obs*R-squared	0.359390	Prob. Chi-Square(1)	0.5488
Scaled explained SS	0.132735	Prob. Chi-Square(1)	0.7156

Source: Eviews Extract (2024).

Table 4: Heteroskedasticity Test: Breusch-Pagan-Godfrey for Ghana

F-statistic	0.486526	Prob. F(1,8)	0.5052
Obs*R-squared	0.573292	Prob. Chi-Square(1)	0.4490
Scaled explained SS	0.267662	Prob. Chi-Square(1)	0.6049

Source: Eviews Extract (2024).

The Prob. Chi-square (2) value greater than 0.05 indicated that the variables of the study are homoscedastic. Hence, the assumption of heteroskedascity of the variables is therefore refuted for the variables both for Nigeria and Ghana.

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Table 5: Summary of Unit Root Test

Variables	T-Statistics	Order of Intergration	Probability	Decision
BZCO	0.632159	1(0)	0.9788	**Non-Stationary**
CAPA	-0.476525	1(0)	0.8474	**Non-Stationary**
@ First Difference				
BZCO	-5.227391	1(1)	0.0181	**Stationary**
CAPA	-7.492577	1(1)	0.0005	**Stationary**

Source: Eviews Extract (2024).

Table 6: Summary of Unit Root Test

Variables	T-Statistics	Order of Intergration	Probability	Decision
BZCO	-2.702933	1(0)	0.1102	**Non-Stationary**
CAPA	-1.602054	1(0)	0.4418	**Non-Stationary**
@ First Difference				
BZCO	-5.091490	1(1)	0.0055	**Stationary**
CAPA	-2.989853	1(1)	0.0083	**Stationary**

Source: Eviews Extract (2024).

Website: www.nduwjss.org.ng ISSN: 2504 – 9232 Volume 9 No. 2 (2024)

From Tables 5 and 6, it is obvious that at this level, the data for BZCO and CAPA are non-stationary but became stationary at first difference.

Table 7: Summary of Johansen Cointegration Test

Country	Test Type	Hypothesized No. of CE(s)	Eigenvalue	Test Statistic	Critical Value (0.05)	p-Value	Conclusion
Nigeria	Trace Test	None	0.896647	18.76058	15.49471	0.0155	1 Cointegrating Equation
		At most 1	0.072695	0.603779	3.841466	0.4371	No Further Cointegration
	Maximum Eigenvalue	None	0.896647	18.15680	14.26460	0.0115	1 Cointegrating Equation
		At most 1	0.072695	0.603779	3.841466	0.4371	No Further Cointegration
Ghana	Trace Test	None	0.609119	8.576240	15.49471	0.4060	No Cointegration
		At most 1	0.124252	1.061416	3.841466	0.3029	No Cointegration
	Maximum Eigenvalue	None	0.609119	7.514824	14.26460	0.4302	No Cointegration
		At most 1	0.124252	1.061416	3.841466	0.3029	No Cointegration

Source: Eviews Extract (2024).

From the Nigeria Johansen Cointegration Test, the trace statistic (18.76) is greater than the 5% critical value (15.49) with a p-value of 0.0155. This indicates rejection of the null hypothesis, meaning that there is at least one cointegrating equation. At most 1, the trace statistic (0.60) is less than the 5% critical value (3.84) with a p-value of 0.4371, indicating no additional cointegrating equations. Also, the Maximum Eigenvalue statistic (18.16) is greater than the 5% critical value (14.26) with a p-value of 0.0115, indicating one cointegrating equation. At most 1, the max-eigenvalue statistic (0.60) is less than the 5% critical value (3.84) with a p-value of 0.4371,

Website: www.nduwjss.org.ng **ISSN**: 2504 – 9232 **Volume 9 No. 2 (2024)**

indicating no additional cointegrating equations. From both results, there is one cointegrating equation, suggesting a long-run relationship between the variables BZCO and CAPA.

Whereas, for Ghana, the Trace and Maximum Eigenvalue statistics indicate no cointegration at the 0.05 level, as all statistics are below their critical values with high p-values. This suggests no long-run relationship between the variables BZCO and CAPA for Ghana.

Website: www.nduwjss.org.ng ISSN: 2504 – 9232 Volume 9 No. 2 (2024)

Table 8: Summary of Error Correction Model Test for Nigeria

Test Type	Variable	Coefficient	Std. Error	t-Statistic	Prob.	Conclusion
Augmented Dickey-Fuller		-2.115220	-	-	0.2432	The ECM has a unit root; the null hypothesis is not rejected.
	Short Run ECM					
	C	-0.289870	0.589469	-0.491749	0.6404	Insignificant constant term.
	D(CAPA)	0.341171	0.335725	1.016221	0.3487	Insignificant short-term relationship.
	ECM(-1)	-0.723929	0.488112	-1.483120	0.1886	ECM is not statistically ; weak adjustment to long-run equilibrium.
	Long Run Test					
	C	0.000000	1.56E-16	0.000000	1.0000	Insignificant constant
	D(BZCO-1)	1.000000	1.06E-16	9.43E+15	0.0000	Perfectly significant long-term relationship with lagged BZCO.
	D(CAPA-1)	-8.16E-17	9.44E-17	-0.864589	0.4268	Insignificant long-term relationship with lagged CAPA.
	ECM(-1)	2.23E-16	1.48E-16	1.503354	0.1931	ECM is not statistically significant; adjustment to long-run equilibrium is not significant.

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Goodness-of-Fit & Model Statistics	R-squared	1.000000	-	-	-	Perfect fit, but with the possibility of overfitting due to the small sample size.
	Adjusted R-squared	1.000000	-	-	-	
	S.E. of Regression	4.18E-16	-	-	-	Very small standard error, indicating a potential overfit.
	Durbin-Watson Stat	1.567563	-	-	-	Indicates no significant autocorrelation in residuals.

Source: Eviews Extract (2024).

From the error correction model Table for Nigeria, D(CAPA) has a coefficient (0.3412) that suggests a positive short-run impact of CAPA on BZCO, but with a high p-value (0.3487), it's not statistically significant. ECM (-1) coefficient (-0.7239) negative, indicating that deviations from the long-run equilibrium are corrected in the short run. However, the p-value (0.1886) is greater than 0.05, implying that the error correction term is not statistically significant. The ECM suggests a slow adjustment to equilibrium, but the lack of significance indicates weak evidence of short-term relationships between the variables.

The short-run model shows R-squared (0.2791). it indicates that about 27.91% of the variation in the dependent variable (D(BZCO)) is explained by the model, which is relatively low. F-statistic (1.1617, p-value 0.3746): Indicates that the model is not statistically significant as a whole. The short-run model suggests weak explanatory power and insignificant relationships between the variables. Similarly, in the long run, the D(BZCO-1) coefficient of 1.0000 indicates a perfect lagged effect of BZCO on itself, but the other variables, including D(CAPA-1) and ECM(-1), are

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not statistically significant. R-squared (1.0000): This unusually high R-squared suggests potential overfitting.

Table 9: Summary of Error Correction Model Test for Ghana

Test Type	Variable	Coefficient	Std. Error	t-Statistic	Prob.	Conclusion
Augmented Dickey-Fuller		--2.383541	-	-	0.2432	The ECM has a unit root; the null hypothesis is not rejected.
	Short Run ECM					
	C	0.046013	0.230477	0.199644	0.8484	Insignificant constant term.
	D(CAPA)	0.109964	0.190552	0.577078	0.5849	Insignificant short-term relationship.
	ECM(-1)	-0.892054	0.506576	-1.760947	0.1287	ECM is not statistically significant; weak adjustment to long-run equilibrium.
	Long Run Test					
	C	-1.85E-17	1.27E-16	-0.145944	0.8897	Insignificant constant term.
	D(BZCO-1)	1.000000	2.24E-16	4.47E+15	0.0000	Perfectly significant long-term relationship with lagged BZCO.
	D(CAPA-1)	-2.70E-17	1.07E-16	-0.251998	0.8111	Insignificant long-term relationship with lagged CAPA.
	ECM(-1)	2.23E-16	1.48E-16	1.503354	0.1931	ECM is not statistically significant; adjustment to

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						long-run equilibrium is not significant.
Goodness-of-Fit & Model Statistics	R-squared	1.000000	-	-	-	Perfect fit, but with the possibility of overfitting due to the small sample size.
	Adjusted R-squared	1.000000	-	-	-	
	S.E. of Regression	3.64E-16	-	-	-	Very small standard error, indicating a potential overfit.
	Durbin-Watson Stat	1.833561	-	-	-	Indicates no significant autocorrelation in residuals.

Source: Eviews Extract (2024).

Also, from the ECM Table 9, D(CAPA) has a coefficient (0.1100) which indicates a positive but insignificant short-run effect of CAPA on BZCO. The ECM (-1) coefficient (-0.8921) is negative, indicating correction towards long-run equilibrium, but with a p-value (0.1287) that is not statistically significant. Similar to Nigeria, the ECM suggests adjustment towards equilibrium, but with weak short-run dynamics.

The short-run model shows R-squared (0.5450). It indicates that about 54.5% of the variation in D(BZCO) is explained by the model, which is moderate. F-statistic (3.5941, p-value 0.0942). The short-run model for Ghana has moderate explanatory power but lacks strong evidence of significant relationships between the variables. Similarly, in the long run D(BZCO-1) coefficient of 1.0000 is similar to Nigeria, indicating a strong autoregressive relationship. R-squared (1.0000):

Website: www.nduwjss.org.ng ISSN: 2504 – 9232 Volume 9 No. 2 (2024)

Again, this suggests potential overfitting. Like Nigeria, the long-run model for Ghana suggests a strong autoregressive relationship.

Conclusion and Recommendation

The study compared whether or not CAPA has an impact on BZCO in both Nigeria and Ghana for the period studied. From the ECM test, for Nigeria, there is evidence of a long-run relationship between BZCO and CAPA, but the short-run dynamics are weak. But for Ghana, there is no evidence of a long-run relationship, and both the short-run and long-run models show weak explanatory power. The researchers recommend that since CAPA has a meaningful influence on BZCO, financial institutions (banks) should endeavour to maintain capital that is sufficient for safety and performance. Likewise, since the coefficient of determination of the model for the data of both countries is low, further studies should incorporate other bank-specific variables that can influence BZCO.

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APPENDIX 1

Below are the data obtained from the World Bank development indicators for each of the study variable for 10 years each

Data for Nigeria

YEAR	BZCO (%)	YEAR	CAPA
2012	17.8	2013	10.4
2013	16.3	2014	12.4
2014	16.4	2015	10.4
2015	16.8	2016	11.4
2016	16.4	2017	7.2
2017	18.4	2018	8.8
2018	14.8	2019	8
2019	15.4	2020	6.9
2020	13.6	2021	6.8
2021	12.2	2022	5.7

Data for Ghana

YEAR	BZCO (%)	YEAR	CAPA
2012	13.4	2013	10
2013	14.7	2014	10.6
2014	13.4	2015	10.5
2015	13.4	2016	9.2
2016	12.6	2017	8.9
2017	13.9	2018	12.3
2018	13.9	2019	10.7
2019	14.1	2020	9.8
2020	14.2	2021	9
2021	13.9	2022	7.7