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Risk Mitigation and Performance of Banks in Ghana

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ABSTRACT

To maintain financial stability, banks need to recognize, assess, and mitigate potential losses, thus making risk control critical for long-term profitability as well as avoiding unexpected losses for banks. This research examines the risk mitigating factors and performance of Ghanaian domestic banks in terms of capital adequacy, bank size, bank efficiency, and profitability, along with their association with systemic risk in the bank sector, as measured by the Z-score: Insolvency Risk - (μROA) plus capital asset ratio (equity capital divided by sum of all assets further divided by the standard deviation-(ƠROA) with a higher score for banks as a measure of bank stability. The study further explores the relationship between this ratio and the explanatory variables for a sample of 11 banks operating in Ghana between 2010 and 2021. Analysis of the data using the fixed effects model shows that, profitability and bank efficiency are significant and affect the stability of banks positively. Bank size, on the other hand, is significant but negatively affect the stability of banks. Bank profitability is critical to stabilizing and protecting the banking sector from external shocks; as a result, this study suggests that, bank management apply prudent practices to profitability-driven indicators and that, the banking sector regulations be congruent with macro-prudential policies.

Keywords: Risk Mitigation, Performance, Domestic Commercial Banks

JEL classification: G1, G210, G280

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1.Introduction

Although it has been a decade and a half since the Global Financial Crisis (GFC) struck, there are still valuable lessons to be drawn (Silver, 2022). Some financial sector regulators have either deliberately ignored the application of the few drawn lessons, or not fully applied the reams of legislation to prevent a resurgence. Having seen a short-lived recovery of the global economy in the aftermath of the GFC, there is evidence pointing to familiar risks resurfacing along with new ones (Lund, Mehta, Manyika, & Goldshtein, 2018). The majority of banks still suffer capital buffer, inefficient operations, unregulated bank size, etc. (Dagher et al., 2020). This is traceable to an undue concentration on managing the repercussions of the GFC by financial sector regulators, especially in Africa, instead of designing robust strategic preventive measures relative to the financial system's safety (Xu, Hu, & Das, 2019). An eminent procyclicality of the financial sector cannot be ruled out in the near future (Conerly, 2022), if things follow the old path, because mistakes on whose shoulders the GFC rode are still noticeable (Costeiu & Neagu, 2013).

Costeiu and Neagu (2013) observed that there is a lack of synchronization between macroprudential policies and financial sector regulations as a measure to forestall unexpected external shocks. Besides this observation, several resolutions have been proposed, including the inevitable need to link financial sector regulations to macro-prudential policies (International Monetary Fund [IMF], 2021), since literature confirms that macro-prudential policies have aided the safety of the financial sector (Agenor & Pierre Da Silver, 2012; Borio, 2014). As evidence abounds, these suggestions have not been heeded, leading to reported isolated cases of financial crises across the globe: in the US (Federal Deposit Corporation, 2017); in Europe (Tassev, 2019); in Nigeria (CBN Bulletin, 2010); in Kenya (Taboi, 2017); in Ghana (Nyalatorgbi, 2019; Alnaa & Matey, 2021; Siregar, 2011; Georgieva, 2022). It is imperative that national policymakers, together with the financial sector regulators, undertake steps to ensure the financial system is adequately positioned to stand the devastating shocks of any unforeseen systemic risk that could see most banks extinct the industry. The absence of this link between macro-prudential policies and financial sector regulations made the cost of equity remain at dizzying heights relative to the return on shareholder equity in the ensuing 2007–2009 GFC (International Monetary Fund [IMF], 2017; Xu & Hu, 2019). Banks strive to mitigate the pressures on profitability through cost reductions and increases in fee income, but only in the short term (Dobler, Moretti, & Piris, 2020). According to the asset quality review [AQR] appraisal report in Ghana by BoG in 2016, high levels of non-performing loans and weak corporate governance worsened the vulnerability of most banks through increased credit taking.

2.Statement of the Problem

Besides the issues of bank size (Vinals et al., 2013; Laeven, Ratnovski & Tong, 2014; Adusei, 2015) and capital flow fluctuations (Merrouche & Nier, 2010; Demirguc-Kunt, Martinez-Peria & Tressel, 2015; Baudino, Murphy & Svoronos, 2020) that have been linked to the GFC, another regulatory concern that requires cooperative efforts with national governments is the determination of the appropriate leverage for firm operations. There is no doubt that these challenges were among the causes of the global financial crisis of 2007–2009 (Costeiu & Neagu, 2013; Xu & Hu, 2019). For instance, in Ghana, Adusei (2015) examined the impact of bank size and bank funding risk on bank stability and found a positive bank size-stability relationship. This result appears to be supported by the concentration-stability hypothesis, which suggests that an increase in bank size implies an improvement in bank profitability and, by extension, its stability. In contrast, the agency theory refutes this position by suggesting that larger bank size negatively affects bank stability because the management of organizations (agents) is parochial in their interests, and therefore any attempt to work for increased bank size is self-catered and may increase the risk-taking appetite of these institutions. In another argument on capital adequacy, Torbira and Zaagha (2016) state that for banks to be well stabilized, they must ensure they have capital buffer. Empirically, banks that are financially resourced tend to have low risk-taking behavior. From this standpoint, capital adequacy equally relates positively to bank stability. Similarly, Ghanaian domestic banks have high operational leverage and are saddled with inefficiencies, leading to their inability to make sufficient profits. These unsettled arguments about the best risk mitigating factors enjoin this study to wade in the tussle as a contribution to literation in Ghana.

3. Literature review

3.1 Theory

Credence is given to the concept of bank stability management within the internal parameters of the bank relative to the agency theory as a tool used in corporate governance (Bonazzi & Islam, 2006). Based on the definition provided by the Deutsche Bundesbank (2003), financial system stability is a situation where a financial institution led by managers controls the efficient allocation of resources, cautiously spreads credit risk, and prompt settles debt on behalf of owners [who are shareholders] (Allen & Gale, 2001).

As emphasized by Jensen (1986), under the agency theory, owners are the shareholders of corporations as well as principals, while the management and control of these corporate bodies are entrusted in the hands of persons referred to as agents. In a stylized fashion, through the strict observance and application of regulations of the financial system in congruence with macroprudential policies for financial system stability, managers act on behalf of and in the interest of shareholders (Bonazzi & Islam, 2006). Unless for a parochial interest, which is usually a fallout of the agency theory, agents are to oversee the well-functioning of these financial institutions by aligning regulatory frameworks provided by the banking authorities with macroeconomic policies.

3.2 Empirical Review

Various attempts, both theoretical and empirical, are made to analyze the risk-taking behaviours of commercial banks across the globe. A pioneering study that used the agency theory to inversely link firm size and bank stability is Jensen and Meckling's (1976). The theory's position is that managers are risk-tolerant, working to consolidate their positions rather than serve the interests of shareholders (Gibson & Eiechengreen, 2001; Fernandez, 2008; Nguyen, 2011; Adusei, 2015; Switala, Kowalska, & Malajkat, 2020). Bank size was earmarked as one cause of bank failure during the 2007–2009 GFC and has gained acceptance in banking supervision and regulation. Some sighted studies that support this agency theory position include Laeven, Ratnovski, and Tong (2014), who studied size stability with data from 52 countries and revealed that larger banks are more exposed to vulnerability than smaller banks. Repositioning the bank size-stability hypothesis, Hauner and Peiris (2008) concluded that bank size is only useful in the face of economies of large-scale operations. Kohler (2015), Beck et al. (2013b), Bertay, Demirguc-Kunt, and Huizinga (2013), and Ghosh (2014) equally established a negative relationship between bank size and bank stability. A widely held view on the inverse relationship between bank size and bank stability is that of Gonzalez (2014), Beck et al. (2013a), Nguyen et al. (2012), Berger, Klapper, and Tur-Ariss (2009), and Srairi (2013). In another development, a set of studies established an insignificant relationship between bank size and bank stability: Anginer, Demirguc-Kunt, and Zhu (2014); Ghosh (2014); Gulamhussen, Pinheiro, and Pozzolo (2014); and Williams (2014).

Conversely, the concentration-stability hypothesis contends that an increase in bank size implies an improvement in bank profitability and, by extension, its stability (Beck, Demirguc-

Kunt, & Merrouche, 2013a; Boot & Thakor, 2000; Uhde & Helmeshoff, 2009; Adusei, 2015; Krakah & Ameyaw, 2011; Salim, 2014; Flamini, Schumacher, & McDonald, 2009). Another study in Brazil that established a positive relationship between bank asset growth and bank stability is by Tabak, Gomes, and Medeiros (2015).

In another empirical study, bank profitability and risk taking (Keeley, 1990; Berger, Klapper, & Turk-Ariss, 2009) revealed that increased profitability brings about higher "charter value," thus resulting in long-term expected profitability and low risk-taking behavior by banks. In consonance with this finding, Anginer, Demirguc-Kunt, and Zhu (2014) claimed increased profitability proxied by ROA improves bank stability.

This positive relationship between bank profitability and bank stability was confirmed by Adusei's (2015) and Flamini, McDonald, and Schumacher's (2009) studies. Respectively, under the ceteris paribus hypothesis, increasing profits implies the availability of funds for daily operational obligations such as creditor demands, and with an improvement in bank profitability in the form of dividends, owners could reinvest the received dividends to strengthen the capital base of the bank and, by extension, improve firm stability.

Deferring results from a number of studies (Natalya, Ratnovski & Vlahu, 2015; cited in Xu & Hu, 2019) have contend that higher firm profitability could loosen leverage which can increase the risk-taking behaviour of banks. In which appears putting things straight, Yudistira (2003) in an earlier study found efficiency of banks to positively relate with operational cost. Gardener (2012) revealed that more technically cost-efficient banks in terms of capital risk are more stabilised than their counterparts which are less capitalised. In their working paper on bank profitability and financial stability, Xu, and Hu (2019) reported that the relationship between bank capital and bank profitability is shredded in ambiguity.

Similarly, banks that are well financially resourced tend to have low risk-taking behaviour and have less expected returns (Goddard, Molyneux & Wilson, 2004). Xu and Hu (2019) again revealed that over usage of leverage exposes the firm to higher risk. Bank stability is a function of profitability, as it avails funds for usage in the firm. In his case, Srairi (2013) states that banks with lower cost reduction efficiency are exposed to higher risk. Srairi (2013) further concludes that risk taking is positively related to bank profitability which is regarded as an instrumental for bank stability. He explains that improvement in profit levels induces higher risk taking. McClure (2019) thinks that optimum use of fixed assets in running operations of the firm has a positive result on the firm. With this positive relationship, low usage of bank's fixed assets to run operations has less exposure to risk of collapse. A bank's degree of operating leverage is a measure of its cost structure and a function of profitability (McClure, 2019).

The annual gross domestic product (GDP) per capita is a measure of a country's economic development (in terms of US dollars). This measure, according to La Porta et al. (2002), also captures a country's overall institutional quality. In general, poorer countries have a weaker governance structure (Srairi, 2013). Risk is lower in countries with a higher GDP per capita. Macroeconomic factors have been employed as control variables in previous research by Sufian & Habibullah (2012), Köhler (2014), Bourkhis & Nabi (2013), and Čihák and Hesse (2007) to explain changes in the response variable. According to Soedamono, Machrouh, and Tarazi (2011), improved economic growth (GDP) can positively impact bank stability, resulting in more stable bank circumstances. Countries with high inflation will have less financial intermediation which destabilises the financial system (Boyd et al. 2001). While there is evidence of lower inflation increasing the amount of bank assets and hence reducing the quantity of credit risks, higher inflation can have a negative influence on existing borrowers' incomes, lowering the quality of loans that have already been granted. According to Akram and Eitrheim (2008), price volatility can lead to high interest rates, which reduces the financial sector's stability. Inflation and financial stability have a nonlinear negative relationship (Boyd et al., 2001).

4. Methods and model specifications

This study dwells on the risk-taking behaviours of domestic commercial banks in Ghana using the Return on Assets Z-score as a measure of risk-taking behaviour, further proxied by bank stability [BSTAB] (e.g., Kohler, 2015; Tabak et al, 2015; Ghosh, 2014; Less & Hsieh, 2014). In order to justify our findings, published financials of eleven (11) selected domestic commercial banks were used for the period 2010-2021.

4.1 Theoretical model

Following Kohler's (2015; Tabak et al, 2015; Ghosh, 2014; Less & Hsieh, 2014) Z-score model, this current study adopts it with slight modifications in the empirical model.

$$Z - Score_{it} = \frac{ROA_{it} + CAR_{it}}{SDROA_{ip}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where:

ROA= Return on Assets of each sampled bank

CAR = Capital Adequacy Ratio of each selected bank

SDROA = Standard Deviation of ROA of each bank in the sample

it= Signifies the a given bank 'i' at time 't'

p= Denotes the sample frame period over which computations are done.

4.2 Variable definition

Table 1: Definition of Variables

Variables	Definition / Measurement
RESPONSE VARIABLES	
Z-score	Insolvency Risk - (µROA) plus capital asset ratio (equity capital divided by sum of all assets further divided by the standard deviation – (ƠROA)
EXPLANATORY VARIABLES SIZE EFFICIENCY	 Logarithm of Total Assets Cost to Income Ratio
OPERATING LEVERAGE PROFITABILITY (ROA) CAPITAL ADEQUACY RATIO CONTROL VARIABLES INFLATION GROSS DOMESTIC PRODUCT (GDP)	Ratio of Fixed Asset to Total Asset Net Income to Total Assets Tier 1 Capital divided by Total Assets Annual Percentage Increase in Cost of Living as Measured by Consumer Price Index

	Annual Growth Rate of GDP in Constant Basic Producers' or Purchasers' Prices Divided by Corresponding Population

Note: Unless otherwise stated, all variables are transformed into their log form to deal with issues of high skewness of some of the variables for a normalized dataset.

4.3 Empirical model

$$BSTAB_{i,t} = B_0 + B_1(RROA_{i,t}) + B_2(BEFEC_{i,t}) + B_3(BOPRISK_{i,t}) + B_4(BSIZE_{i,t}) + B_5(BCAPAR_{i,t}) + B_6(INFLR_{i,t}) + (GDP_{i,t}) + \epsilon_{i,t} \ldots\ldots\ldots\ldots (2)$$

$$\mathrm{ROA}_{i,t} = \mathrm{a}_0 + \mathrm{a}_1\,\mathrm{CRIS} + \mathrm{z}_{i,t} \ldots\ldots\ldots\ldots (3)$$

Equation (2) is the structural equation while equation (3) is the reduced form.

Where: $BSTAB_{i,t} =$ Represents the Z-Score which is a measure of Bank Stability or Risk taking behaviour for bank *i* at time *t*, $RROA_{i,t}$ = Bank Risk Adjusted ROA, $BSIZE_{i,t}$ = Bank Size (Proxied by total assets), $BEFFEC_{i,t}$ = Bank Efficiency, $BOPRISK_{i,t}$ = Bank Operational Risk, $BCAPAR_{i,t}$ = Bank Capital Adequacy Ratio, $GDP_{i,t}$ = Gross Domestic Product, INFLR = Inflation Rate (Proxied by Annual Rate of Inflation), $\boldsymbol{CRIS_{i,t}}$ = Credit Risk (Instrumental Variable), $ß_0 = Constant$ and $ß_1$ to $ß_6$ = Coefficients of respective independent and control variables in the study. This study used $BSTAB_{i,t}$,as proxies for bank stability *i* at time *t*.

4.3.1 Justification for the Hausman Test, Fixed Effects and Random Effects Models

Since the study used a longitudinal dataset, there was the need to specify the ideal model and to help identify which model presents researchers with unbiased results, so issues of spurious regression do not crop up. The Hausman Test was useful in this instance to choose between the fixed and the random effects models. The pooled OLS model was already ruled out since it is bedeviled with challenges of homogeneity across sections by pooling all longitudinal data together as though they are identical (Bell, Firbrother, & Jones, 2019; Ogunniyi, Ounlola, & Alatise, 2021). The challenge here is that banks and year by year data are not identical. And since conditions affecting variables of study cannot be the same across banks, researchers were left with the option of using either the FE or the RE Models.

$$\boldsymbol{BSTAB_{i,t}} = ß_0 + ß_1(\boldsymbol{ROA_{i,t}}) + ß_2(\boldsymbol{BEFEC_{i,t}}) + ß_3(\boldsymbol{BOPRISK_{i,t}}) + ß_4(\boldsymbol{BSIZE_{i,t}}) + ß_4(\boldsymbol{CAPAR_{i,t}}) + ß_5(\boldsymbol{INFLR_{i,t}}) + ß_6(\boldsymbol{GDP_{i,t}}) + \varepsilon_{i,t} \ldots\ldots\ldots\ldots (2)$$

Where: $\mathrm{BSTAB}_{i,t}$ is the dependent variable, then $\boldsymbol{\lambda_{i,}}$ $\boldsymbol{a}$nd $\boldsymbol{\lambda_{,t}}$ are bank level variable and time invariant effect attached to coefficients and independent variables/control variables through the equations. Thus, vector $\lambda_{i,t}$ of the regressors (i)….1….6 and (t)….n. $\lambda_{i,}$….ε are scalar vector of coefficients.

The FE Model recognises that individual datasets by bank or year to year data do not obey the concept of homogeneity and therefore, it observes and treats heterogenous characteristics across bank type dataset (Bell et al., 2019; Ogunniyi et al., 2021). This is made possible by accounting for the unobserved characteristics in the pooled OLS. Thus, it accepts the fact that individual banks have different prevailing conditions within their respective institutions through sectional intercepts (Ferdaous, 2016; cited in Ogunniyi et al., 2021).

In fact, under the random effect model, the issues of time-variant variables are not accounted for. Thus, variables are perceived as being time-invariant and so are not expected to change in values over time which is quite uncharacteristic of variables.

4.3.2 Hausman test

As stated earlier, with all the forgone windy statistical analysis about the appropriateness of the pooled, fixed, or random effects models, decision on whether the use the fixed or random effects model is appropriate is the exclusive preserve of the Hausman Test criterion selection. Hausman (1978) theoretically and empirically opined that the use of either the FE or the RE depends on the test results and therefore he came out with the method of the null (H_O) hypothesis and the alternative (H_a) hypothesis as follows:

H_O: Random Effect Model is appropriate (null hypothesis)

H_a : Fixed Effect Model is appropriate (alternative hypothesis)

The idea behind this proposition is that the null hypothesis should not be rejected if the Hausman Test results has a p -value of more than 0.05 (5%), otherwise (p -value less than 0.05) the alternative hypothesis that says the fixed effects model is appropriate is the preferred model.

And so, the Hausman Test was used to arrive at the usage of the fixed effect model in Tables 6 and 7.

5. Results and Discussion

The study carried couple of tests to clarify issues of heteroskedasticity and multi-collinearity. As observed in Table 2, STATA 14 was used to run Breusch-Pagan / Cook-Weisberg test for heteroskedasticity to make sure the model used is free from external influences over independence of regressor variables. Thus, the test was carried to ascertain the independent behaviours of regressors. Heteroscedasticity tests imply the two hypotheses listed below.

The data is homoscedastic when the following holds:

$H_O =$ is true (p - value > 0.05)

Therefore, the null hypothesis should not be rejected.

$H_a =$ is true (p - value < 0.05),

According to Ha (alternative hypothesis) results should be rejected if the p-value associated with a heteroscedasticity test is less than a specific threshold (0.05, for example), we conclude that the data is significantly heteroscedastic.

Table 2: Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Source	chi^2	df	Prob.
Heteroskedasticity	58.15	44	0.0749
Skewness	8.46	8	0.3897
Kurtosis	2.97	1	0.0846
Total	69.58	53	0.0629

H_O: Constant variance
Variables: fitted values of Z-Score
$chi^2(1) = 0.00$
Prob > chi^2 = 0.9952
White's test for verification
H_O: homoskedasticity
Against:
H_a: unrestricted heteroskedasticity
chi^2 (44) = 58.15

Prob > chi^2 = 0.0749

From the two tests, the results show the null hypothesis should not be rejected. Similarly, test for the Variance Inflation Factor (VIF) was conducted. In least squares regression models, variance inflation factors are used to calculate the correlation between independent variables. Multicollinearity is the statistical term for this type of association. Excessive multicollinearity can throw off results of the regression models (see Table 3)

Table 3: Variance Inflation Factor Results

Variable	VIF	1/VIF
GDP	1.59	0.62983
BOPRISK	1.43	0.69930
ROA	1.37	0.72993
BSIZE	1.35	0.74074
BEFEC	1.29	0.77519
CAPAR	1.21	0.82644
INFLR	1.09	0.91743
Mean VIF	1.35	

Table 4: Run Summary and Analysis of Variance

Item		Value
Number of Focus Regressors		7
R - Square		0.7210
Adjusted R - Square		0.6682
F –Ratio	(7, 33)	44.02 ***
Durbin Watson Test		1.330

Source: Computer from Financials of Selected Banks (2020)
***Significant at 1%

It is observed from Table 4 that R^2 is about 72 percent, signifying a good fit. This means the focus regressor variables (explanatory variables) combined in this model explain 72 percent of bank risk taking behaviours. Similarly, the Durbin-Watson test reported a figure of 1.33 implying a weak autocorrelation among sampled variables. Besides, being less than 2.0 points to a significant positive autocorrelation. The F-Statistic result gives an indication that all the focus regressor variables contribute to influence the risk-taking behaviour of an average bank.

5.1 Test for appropriate usage of model

Table 5: Hausman Test Results

Variable	Coefficient (b) Fixed	(B) Random	(b-B) Difference
ROA	0.302	0.261	0.041
BSIZE	-0.066	-0.090	0.246
BOPLEV	0.044	-0.138	0.181
EFFE	-0.016	0.005	-0.021
CAPAR	-0.248	0.876	-1.124
GDP	-2.388	-3.266	0.878

INFLA	2.488	2.658	-0.170

Chi^2 (7) = (b-B)'[(V_b-V_B) ^ (-1)] (b-B) = 263.19

Prob > (Chi^2) =0.0000

(V_b-V_B is not positive definite)

To establish the appropriate model to be used to determine the risk-taking behaviours and bank performance, we employed the Hausman Test. The test has the null hypothesis being in favour of the random effects model; that the difference in coefficients of fixed effects and random effects models is not significant whilst the alternative hypothesis (Fixed Effects) holds a contrary view; difference is significant and therefore the fixed effects model is appropriate (see Greene, 2003). Table 5 gives a tabular picture of this argument. A *p*–value less than the alpha value of 0.05 after the test is run is in favour of the fixed effects model and vice visa. It is realised from Table 5 that the *p*-value is less than the alpha value of 0.05 (Prob > (Chi^2) = 0.0000). Per these results, the fixed effects model was found to be appropriate for analysis.

Table 6: OLS Regression Results: Fixed Effects Model

	Fixed Effect				Random Effect			
Z-Score	Coeff	Std. Err	t-test	prob	Coeff	Std. Err	z-test	prob.
ROA	0.302	0.022	13.52	0.000	0.261	0.031	8.35	0.000
BEFEC	-0.016	0.006	-2.56	0.001	0.005	0.007	0.74	0.461
BOPRISK	0.044	0.055	0.80	0.431	-0.138	0.057	-2.42	0.015
BSIZE	-0.066	0.064	-1.03	0.015	-0.090	0.094	-0.95	0.345
CAPAR	-0.248	0.420	-0.59	0.561	0.876	0.068	1.44	0.150
INFLR	2.488	2.859	0.87	0.390	2.658	2.920	0.91	0.361
GDP	-2.388	1.349	-1.77	0.083	-3.266	1.388	-2.36	0.181
Const.	0.480	0.960	0.500	0.619	-0.255	1.214	-0.21	0.831
R-sq Overall		0.594			R-square Overall			
F(7,33)		44.02			Wald-Chi-sq (7)		95.62	
Pro>F		0.0307			Prob>Chi-sq		0.000	
No.		132			No.		132	

Hausman Test = 263.19 (Prob > chi^2 = 0.0307)

Wald chi^2 (7) = 95.62

Table 6 presents regression results on bank risk-taking behaviours which is proxied by bank stability. Although Adusei's (2015) study that used ROA as one of the determinants of bank stability established a positive but insignificant relationship with bank stability, it resonates with this current study's finding (Table 6) which indicates a statistically positive relationship between profitability (ROA) and bank stability. Impliedly, increasing profitability (ROA) means improvement in bank stability. This finding agrees with Adusei's (2015) findings that under the Ceteris Paribus situation, increase profits mean availability of funds to meet daily operational and contingent expenses. Similarly, an increase in bank profit translates into high dividends to shareholders or as an improvement in equity capital through reinvestment of undistributed dividends (Flamini, McDonald & Schumachester 2009; Adusei, 2015). Several other studies have reported similar results (Anginer et al, 2014; Keeley, 1990; Berger et al, 2009)

A number of studies (Kohler, 2015; Beck et al, 2013b; Agoraki et al, 2011; Bertay et al, 2013; and Ghosh, 2014) have found a negative relationship between bank size and bank stability. Confirming the position of the agency theory which says larger sized banks in certain instances serve as a source of conflict between firm owners and managers. This is seen where managers who serve as agents to shareholders become overly concern about consolidating their position and personal interest. The second argument against larger bank size is the research and development initial cost associated with larger firms thereby affecting profitability. Our findings (Table 6) point to a similar story; Z-score which measures bank stability has a statistically negative correlation with bank size, rejecting the believe that increasing the bank size could improve bank stability (Gonzalez, 2014; Beck et al, 2013a; Nguyen et al, 2012; Berger et al, 2009; and Srairi, 2013; Adusei, 2015). It is concluded that bank size is useful in the face of economies of large-scale operations. These findings also contradict concentration-stability hypothesis that sees growth in bank assets as an improvement in bank stability (Boot & Thakor, 2000; Uhde & Helmeshoff, 2009).

One other relevant area was the relationship between bank operational leverage (operational risk) and bank stability (BOPLEV). BOPLEV insignificantly influences bank risk mitigation positively. The study tested the ability of an average domestic bank to generate high revenue with comparatively low fixed cost. Table 6 reports a positive but insignificant association between OPLEV and bank risk taking. Although the established relationship is one of insignificance, it highlights the urge by an average Ghanaian domestic bank to take in more risk with improvement in profitability. One of the key studies in the global banking sector closely monitored is that of Srairi (2013) who reports that an average bank’s risk taking is positively related to improved profit levels. Since the results of this current study point to a positive relationship, low usage of bank’s fixed assets to run operations has less exposure to risk of collapse and vice versa. A bank’s degree of operating leverage is a measure of its cost structure and a function of profitability (McClure 2019). By implication, banks with a high operational leverage are vulnerable to sharp economic swings and turn not to be credit worthy (McClure, 2019).

Banks can only decrease financial fragility by a reduction in excessive credit risk. Cost-to-income referred to, here as bank efficiency (BEFFEC) had a statistically significant but negative impact on bank stability (Table 6). This revelation explains the practicality that when costs of operations go up, income deteriorates thereby exposing banks to greater fragility. This is in line with the empirical evidence of Yudistira (2003) who concluded that bank efficiency is technically and statistically positive with low operational cost and by extension stability.

Similarly, this study finds that the relationship between capital adequacy ratio and bank stability is negatively insignificant. Thus, the appetite to take in more credit increases with adequate operational capital, implying that there is the readiness to repay with adequate capital. These findings contradict those of Goddard et al. (2004), who see well capitalised banks to have lower appetite to go in for credit or give out credit without cognizance to liquidity implications, hence not much exposed to fragility and tend to have low risk-taking behaviour and have less expected returns respectively.

5.2 Checks for robustness

Two-stage least square

Having reported the results in Table 6, researchers further needed to determine if there were unobserved factors that could throw off-gear results of the OLS estimator. This followed the results of some studies (Xu, Hu, & Das, 2019; Fiordelisi & Mare, 2013; Diaconu & Oanea, 2015) that believe bank performance could pose an endogeneity problem due to its ability to influence risk-taking behaviours of certain banks. As a result, few tests were conducted and indeed issues of endogeneity were established. This problem was solved by employing credit risk (CRIS; measured as the ratio of total loans to total assets (see Matey, 2021) as an instrumental variable (IV) since it correlated with bank performance [ROA] (note: but not so with risk-taking behaviours of some banks).

Table 7: Regression Results with the Instrumental Variable: Fixed Effects Model

	Fixed Effect				Random Effect			
Z-Score	Coeff	Std. Err	t-test	prob	Coeff	Std. Err	z-test	prob.
ROA	0.212	0.031	6.84	0.000	0.121	0.031	3.90	0.000
BEFEC	-0.003	0.005	-0.56	0.002	0.073	0.007	10.43	0.401
BOPRISK	0.031	0.052	0.59	0.441	-0.138	0.057	-2.42	0.011
BSIZE	-0.061	0.055	-1.11	0.017	-0.192	0.094	-2.04	0.088
CAPAR	-0.011	0.422	-0.02	0.661	0.153	0.068	2.25	0.270
INFLR	1.008	2.666	0.38	0.374	1.668	2.920	0.571	0.322
GDP	-3.701	1.103	-3.36	0.077	-0.966	1.388	-0.696	0.281
Const.	0.331	0.660	0.502	0.019	-1.255	1.214	-1.034	0.099
R-sq Overall		0.5041			R-square Overall			
F(7,33)		44.04			Wald-Chi-sq (7)		93.22	
Pro>F		0.000			Prob>Chi-sq		0.047	
No.		132			No.		132	

Hausman Test of Endogeneity= 17.964**

A study by Oduro et al (2019; Sinkey, 1992) finds that increased bank credit risk inversely affects corporate performance. Having identified the instrumental variable, as can be inferred in the reduced equation (3), this was re-estimated using the two-stage least square (2-SLS) regression which aided the performance of the Hausman test against the earlier estimates of the OLS to control for endogeneity (see Srairi, 2013). Table 7 shows estimates of the 2SLS regression in which risk-taking is proxied by the Z-Score. The Hausman test of endogeneity openly shows that the IV estimates on bank performance (measured by ROA) are relatively larger (in coefficients) than the OLS coefficients although the OLS is regarded a more robust test. By implication, the results suggest that earlier OSL estimates without the IV were biased and by extension did not give a true reflection of bank performance and bank risk-taking behaviours.

6. Conclusion and recommendations

Modest efforts are made at contributing to extant literature on factors that influence bank risk taking behaviour in Ghana's bank industry. The results, as established from the analysis, are consistent with those of other countries as pointed in the literature with cost management (better operating efficiency), profitability management (better focus on generating profits), and considerations for better management (in terms of reducing agency costs for larger banks) which are important for regulators to examine in determining the solvency risk of individual banks.

The implication here is that banks expend more on fixed costs relative to variable costs, which exposes them to fragility. Bank instability is caused by varied bank level factors. The argument that reducing bank size will help stabilise the sector is disputed by this current study. Besides, the issue of bank efficiency relates to the ability of banks to efficiently use a given level of financial resources relative to high returns reduces their exposure to future credit challenges.

It is realised that bank profitability plays a central role in stabilizing the bank, and based on this realization, we recommend that bank management give prudent practices to profitability indicators such as ROA. The availability of funds in the organisation implies the ability to run the daily operations smoothly and to readily oblige creditor demands. The other area that needs attention is the capital adequacy requirements. Sufficient bank capital serves as a shock absorber, although this study found an insignificant negative relationship. To avert the impending financial sector crisis, bank regulatory policies should be aligned with macro prudential policies.

Future research could look more closely at other aspects of bank management that are not captured in traditional models as variables including liquidity risk (% net loans & leases to assets; % of core insured deposits), credit risk (% net loans losses to total loans, earnings to net losses; % of more risky types of loans, such as construction & development loans), and interest rate risk (% change in NIM each year), net 1 and 3 year positions—(long-term assets less long-term liabilities). This is evident in the recent bank failures, such as in the U.S. for Signature Bank and Silicon Valley Bank, liquidity and interest-rate risk variables were key variables that affected their likelihood for insolvency.

REFERENCES

Adusei, M. (2015). *The impact of bank size and funding risk on bank stability. Cogent Economics & Finance, 3*(1). https://doi.org/10.1080/23322039.2015.111148

Adusei, M. (2015). Bank profitability: Insights from the rural banking industry in Ghana, *Cogent Economics & Finance, 3*(1). https://doi.org/10.1080/23322039.2015.1078270

Agénor, P.R., & Pereira da Silva, L. A. (2012). Macroeconomic stability, financial stability, and monetary policy rules. *International Finance, 15*(2), 205-224. https://doi.org/10.1111/j.1468-2362.2012.01302.x

Allen, F., & Gale, D. (2000). Comparing financial systems. MIT Press, Cambridge and London. http://mitpress.mit.edu/9780262511254/comparing-financial-systems/

Alnaa, S.E., & Matey, J. (2021). Financial performance of merged and distressed banks in Ghana. *Journal of International Finance and Economics, 21*(3), 35-47. https://doi.org/10.18374/JIFE-21-3.3

Anginer, D., Demirguc-Kunt, A., & Zhu, M. (2014). How does deposit insurance affect bank risk? Evidence from the recent crisis. *Journal of Banking and Finance,* 48, 312-321. http://doi.org/10.1016/j.jbankfin.2013.09.013

Baudino, P., Murphy, D., & Svoronos, J. (2020). The banking crisis in Ireland. FSI crisis management series No. 2. *Bank for International Settlements*. https://www.bis.org/fsi/fsicms2.pdf

Beck, T., Demirguc-Kunt, A., & Merrouche, O. (2013a). Islamic vs. conventional banking: Business model, efficiency, and stability. *Journal of Banking and Finance, 37,* 433-447. http://doi.org/10.1016/j.jbankfin.2012.09.016

Beck, T., Jonghe, O.D., & Schepens, G. (2013b). Bank competition and stability: Cross country heterogeneity. *Journal of Financial Intermediation, 22*(2), 218-244. http://hdl.handle.net/1854/LU-3060572

Berger, A. N., Klapper, L. F., & Turk-Ariss, R. (2009). Bank competition and financial stability. *Journal of Financial Services Research 35*(2), 99-118. https://doi.org/10.1007/s10693-008-0050-7

Bertay, A.C., Demirguc-Kunt, A., & Huizinga, H. (2013). Do we need big banks? Evidence on performance, strategy, and market discipline. *Journal of Financial Intermediation,* 22(4), 532-558.

Bonazzi, L., & Islam, S. M. N. (2007). Agency theory and corporate governance. Journal of Modelling in Management, *2*(1), 7–23. https://doi.org/10.1108/17465660710733022

Boot, A., & Thakor, A. (2000). Can relationship banking survive competition? *T*he Journal of Finance, 55, 679–713. https://doi.org/10.1111/jofi.2000.55.issue-2

Borio, C. (2014, January). Monetary policy and financial stability: what role in prevention and recovery? Monetary and Economic Department. BIS Working Paper Series (No. 440). https://www.bis.org/publ/work440.htm

Bourke, P. (1989). Concentration and other determinants of bank profitability in Europe, North America and Australia. *Journal of Banking and Finance*, *13*(1), 65-79. https://doi.org/10.1016/0378-4266(89)90020-4

CBN Bulletin. (2010). Annual report bullion; January-march. https://www.cbn.gov.ng/documents/bullion.asp

Clemens, M. A., & Kremer, M. (2016). The new role for the World Bank. *Journal of Economic Perspectives, 30*(1), 53-76. https://www. aeaweb.org/articles?id=10.1257/jep.30.1.53

Conerly, B. (2022). *The recession will begin late 2023 or early 2024.* https://www.forbes.com/sites/billconerly/2022/11/01/the-recession-will-begin-late 2023-or-early-2024/?sh=21da491add8b

Costeiu A.A., & Neagu F. (2013, September). *Bridging the banking sector with the real economy financial stability perspective*, European Central Bank. Working Paper Series (1592). https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1592.pdf

Dagher, J., Dell'Ariccia, G., Laeven, L., Ratnovski, M.L., & Tong, M.H. (2020). Bank capital: A seawall approach. *International Journal of Central Banking, 16*, 249-291. https://www.ijcb.org/journal/ijcb20q1a7.pdf

Demirguc-Kunt, A., Martinez-Peria, M., & Tressel, T. (2015). The Impact of the Global Financial Crisis on Firms Capital Structure**.** *World Bank eLibrary***.** https://doi.org/10.1596/1813-9450-7522

Doble, M., Moretti, M., & Piris. A. (2020). Managing systemic banking crises: new lessons and lessons relearned. IMF. https://www.imf.org//media/Files/Publications/DP/2020/English/MSFCEA.ashx

Deutsche Bundesbank (2003). *Report on the stability of the German financial system*. Monthly report, December. https://www.bundesbank.de/resource/blob/706378/d2cd736eb56e642772a9422812463 d3c/mL/2003-12-stability-data.pdf

Drehmann, M., & Nikolaou, K. (2010). Funding liquidity risk: Definition and measurement (BIS Working Papers, No.316). *Bank for International Settlements,* Retrieved from http://www.bis.org/publ/work316.htm

Federal Deposit Insurance Corporation (2017). U.S. bank fails for the first time since 2017. https://www.fdic.gov

Flamini, V., McDonald, C., & Schumacher, L. (2009). *The determinants of commercial bank profitability in Sub-Sahara Africa.* pp. 1–32, *IMF* Working Papers Series, WP/09/15. Retrieved from http://www.imf.org/external/pubs/+/wp/2009/wp0915.pdf

Gadzo, S. G., Kportorgbi, H. K., & Gatsi, J. G. (2019). Credit risk and operational risk on financial performance of universal banks in Ghana: A partial least squared structural equation model (PLS SEM) approach. *Cogent Economics & Finance, 7,* 1589406. https://doi.org/10.1080/23322039.2019.1589406

Gardener, E., Molyneux, P. & Nguyen-Linh, H. (2012). Determinants of efficiency in Southeast Asian banking. *The Service Industries Journal, 31*(16), 2693-2719. https://doi.org/10.26905/jkdp.v22i3.2094

Ghana Banking Survey *(*2018). *Having secured the new capital*; what next for banks? https://www.pwc.com/gh

Ghosh, S. (2014). Risk, capital, and financial crisis: evidence for GCC banks. *Borsa Istanbul Review, 14*(3), 145-157. https://doi.org/10.1016/j.bir.2014.06.003

Goddard, J., P. Molyneux, P., & Wilson, J. O. (2004). Dynamics of growth and profitability in banking. *Journal of Money, Credit and Banking 36*(6), 1069-1090. https://doi.org/10.1353/mcb.2005.0015

Greene, W.H. (2003). *Fixed and random effects in stochastic frontier model*. Working Paper No. 0216. Department of Economics, Stern School of Business, New York University. https://pages.stern.nyu.edu/~wgreene/fixedandrandomeffects.pdf

Gulamhussen, M. A., Pinheiro, C., & Pozzolo, A. F. (2014). International diversification and risk of multinational banks: Evidence from the pre-crisis period. *Journal of Financial Stability, 13*, 30-43. https://doi.org/10.1016/j.jfs.2014.02.007

Hauner, D., & Peiris, S. J. (2008). Banking efficiency and competition in low-income countries: The case of Uganda. *Applied Economics, 40(21), 2703-2720.* https://doi.org/10.1080/00036840600972456

IMF. (2017, October). Is growth at risk? .Global financial stability report October 2017: https://www.imf.org/en/Publications/GFSR/Issues/2017/09/27/global-financial stability-report-october-2017.

IMF. (2022). Macroprudential policies to enhance financial stability in the Caucasus and Central Asia. https://www.imf.org/en/Publications/Departmental-Papers-PolicyPapers/Issues/2022/03/07/Macroprudential-Policies-to-Enhance-Financial-Stability-in-the-Caucasus-and-Central-Asia-512288 International Monetary Fund (2020). *Global financial stability report*; Markets in tCOVID-19.

Jayadey, M. (2013). Basel III implementation: issues and challenges for Indian banks. *IIMB Management Review, 25*(2), 115-130. http://doi.org/10.1016/j.iimb.2013.03.010

Jensen, M. C. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *The American Economic Review*, *76*(2), 323–329. http://www.jstor.org/stable/1818789

Jensen, M., & Meckling, W. (1976). Theory of the firm: Managerial behaviour, agency costs and ownership structure. *Journal of Financial Economics, 3*, 305–360. https://doi.org/10.1016/0304-405X(76)90026-X

Keeley, M. C. (1990). Deposit insurance, risk, and market power in banking. *The American Economic Review, 80* (5), 1183-1200. http://www.jstor.org/stable/2006769

Kindleberger, C., & Aliber, R. (2005). Manias, panics, and crashes: A history of financial crises. Palgrave Macmillan, London. https://doi.org/10.1057/9780230628045

Klein, N. (2013). *Non-performing loans in CESEE: Determinants and impact on macroeconomic performance.* International Monetary Fund Working Paper, 72, Europe. https://doi.org/10.5089/9781484318522.001

Koehn, M., & Santomero, A. M. (1980). Regulation of bank capital and portfolio risk. *The Journal of Finance, 35* (5), 1235-1244. https://doi.org/10.1111/j.1540-6261.1980.tb02206.x

Köhler, M. (2015). Which banks are more risky? The impact of business models on bank stability. *Journal of Financial Stability, 16,* 195–212. https://doi.org/10.1016/j.jfs.2014.02.005

Laeven, L., Ratnovski, L., & Tong, H. (2014). *Bank size and systemic risk: some international evidence*. International Monetary Fund, Mimeo. Retrieved from https://www.imf.org/external/pubs/ft/sdn/2014/sdn1404.pdf.

Lund, A., Mehta, A., Manyka, J., & Goldshtein, D. (2018, September). *A decade after the global financial crisis*: what has (and hasn't) changed? McKinsey & Company Briefing Note.https://www.mckinsey.com/industries/financial-services/our-insights/a-decadeafter- the-global-financial-crisis-what-has-and-hasnt-changed

McClure, B. (2019). *How operating leverage can impact a business*. https://www.investopedia.com/terms/contributor/49/

Merrouche, O., & Nier, E. (2010). *What caused the global financial crisis?: Evidence on the drivers of financial imbalances 1999-2007*. IMF Working Paper No. 10/265 (Washington, DC: International Monetary Fund).

Nakamura, E., & Steinsson, J. (2018). High-frequency identification of monetary non neutrality: The information effect. *The Quarterly Journal of Economics*, *133*(3), 1283-1330. https://doi.org/10.1093/qje/qjy004

Natalya, M., Ratnovski, L., & Vlahu, R. (2015). *Bank profitability and risk-taking*. IMF Working Paper 15/249, International Monetary Fund. https://www.imf.org/external/pubs/ft/wp/2015/wp15249.pdf

Nguyen, M., Skully, M., & Perera, S. (2012). Market power, revenue diversification and bank stability: Evidence from selected South Asian countries. *Journal of International Financial Markets, Institutions and Money*, *22*, 897-912. https://doi.org/10.1016/j.intfin.2012.05.008

Nyalatorgbi, E. (2019). Bank of Ghana closes seven banks in banking crisis: African Agenda. *Third World Network Africa*, *21*(3), 33-36. 21 (3). http://twnafrica.org/wp/2017/?p=546

Odle, M. (2014). *The global financial crisis: how did we get here and how do we move forward*. ILO Caribbean Tripartite Conference. Working Paper Series (307345). https://www.ilo.org/wcmsp5/groups/public/---americas/---ro-lima/---sro Port-of-Spain/documents/presentation/wcms_307345.pdf

Ryan, S. G. (2018). Recent research on bank financial reporting and financial stability. *Annual Review of Financial Economics*, 10. Retrieved from https://www.annualreviews.org/action/doSearch?SeriesKey=financial&AllField=bank

Samorodov, B., Azarenkova, G., Golovko, O., Oryekhova, K., & Babenko, M. (2019). Financial stability management in banks: Strategy maps. *Banks and Bank Systems*, *14*(4), 10-21. https://doi.org/10.21511/bbs.14(4).2019.02

Silver, C. (2022). Over 10 years later, lessons from the 2008 financial crisis. Retrieved https://www.investopedia.com/news/10-years-later-lessons-financial-crisis/

Siregar, R. (2011, November). Macro-prudential approaches to banking regulation: Perspectives of selected Asian Central Banks. *Asian Development Bank Institute* Working Papers No. 325. https://www.adb.org/sites/default/files/publication/156180/adbi-wp325.pdf

Srairi, S. (2013). Ownership structure and risk-taking behaviour in conventional and Islamic banks: Evidence for MENA countries. *Borsa Istanbul Review*, *13*(4), 115-127. https://doi.org/10.1016/j.bir.2013.10.010

Switala, F., Kowalska, I., & Malajkat, K. (2020). Size of banks as a factor which impacts the efficiency of the bank lending channel. *Financial Internet Quarterly*, *16*(1), 36-44. https://doi.org/10.2478/fiqf.2020-0005

Tabak, B.M., Gomes, G.M.R., & Medeiros, M.D.S. (2015). The impact of market power at bank level in risk-taking: The Brazilian case. *International Review of Financial Analysis*, *40*, 154-165. https://doi.org/10.1016/j.irfa.2015.05.014

Taboi, L. (2017). How the Kenyan banks went under African Business. https://african.business/2017/02/economy/kenyan-banks-went/

Tassev, L. (2019, July, 5th). Three bank failures open new chapter in never-ending financial crisis. https://news.bitcoin.com/three-bank-failures-open-new-chapter-in-neverending-financial-crisis/

Torbira, L. L., & Zaagha, A. S. (2016). Capital adequacy measures and bank financial performance in Nigeria: A cointegration analysis. *Journal of Finance and Economic Research, 3* (1).

Uhde, A., & Heimeshoff, U. (2009). Consolidation in banking and financial stability in Europe: Empirical evidence. *Journal of Banking and Finance, 33*, 1299–1311. https://doi.org/10.1016/j.jbankfin.2009.01.006

Viñals, J., C., Pazarbasioglu, J., Surti, A., Narain, M. E, & Chow, J. (2013), Creating a safer financial system: Will the Volcker, Vickers, and Liikanen structural measures help? IMF Staff Discussion Note 13/04.

Williams, B. (2014). Bank risk and national governance in Asia. *Journal of Banking and Finance, 49*, 10-26. https://doi.org/10.1016/j.jbankfin.2014.08.014

Xu, T.T., Hu, K., & Das, U.S. (2019, January). *Bank profitability and financial stability,* International Monetary Fund Working Paper Series (19 / 5). https://www.imf.org/en/Publications/WP/Issues/2019/01/11/BankProfitability-and-Financial-Stability-46470

Yudistira, D. (2003). Efficiency in Islamic banking: An empirical analysis of 18 banks. http://resistanceeconomy.com/uploads/Efficiency%20in%20Islamic%20Banking.pdf

Zafar, S.M. T., Maqbool, A., & Faetyal, A. (2011). A study on fundamental analysis of Indian social sector banks. *Journal of Management*, Dehradoon.