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**CAPITAL STRUCTURE AND BANK PERFORMANCE – EVIDENCE FROM SUB-SAHARA AFRICA**

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**ABSTRACT:** *This paper seeks to examine the relationship between capital structure and bank performance in Sub-Sahara Africa. This study has employed the use of panel data techniques to analyze the relationship between capital structure and bank performance. The performance variables used in the study were return on asset (ROA), Return on equity (ROE) and net interest margin (NIM). The results from Levin-Lin-Chu and Im-pesaran-shin unit root test show that all the variables were stationary in levels. The study hypothesized negative relationship between capital structure and bank performance. The results also indicate that capital structure does not determine bank performance but rather it is performance that determines banks capital structure.*

**KEYWORDS:** Capital Structure, Bank performance, Return on Equity, Return on Asset and Net Interest margin, Total debt ratio

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## **INTRODUCTION**

Recent developments in the global economy coupled with the financial crisis and credit crunch in the last decade has made researchers developed further interests in studying the banking sector. Furthermore, due to the increasing spate of globalization, the effect of these incidents have trickled down into the African banking sector hence banks in Africa have been influenced by the changing nature of banking services worldwide (Ahmed &Rehman, 2008). Irrespective of such developments, banks are graded on the basis of their profitability, branch network and customer service. As the main functions of banks is to accumulate surplus funds and make them available to deficit sectors of the economy, they make profits through lending and borrowing activities hence, the bigger the size of the bank, the higher the expenditure. However, competition in the banking sector has tightened due to technological advancements and major changes in the financial and monetary environment of banks (Spathis et al., 2002). Since studies have showed an existing relationship between capital structure and bank profitability, there is the need for banks to determine their optimal capital structure to maximise their profitability and minimize losses in order to withstand the competition.

Capital structure refers to the firm's financing mix mainly debt and equity used to finance the firm. The ability of banks to carry out their stakeholders' needs is tightly related to capital structure. Capital structure, in financial terms, means the way a firm finances its assets through the combination of equity and debt (Saad, 2010). Since the seminal work of Modigliani and Miller (1958), capital structure studies have become an important subject matter in finance theory. How a firm is been finance is of great importance to both the managers of the firm and the providers of capital. This is due to the fact that, a wrong mix of finance employed can affect

the performance and survival of the firm. This study wants to contribute to the capital structure debate on the relationship between capital structure and firm performance. This study seeks to answer the question of whether capital structure affects banks performance in Sub-Saharan Africa.

Most empirical studies that analyze the relationship between capital structure and firm performance have been done for individual countries, thus limiting the generalizability of the results of such studies. The purpose for this study is to fill the gap related to capital structure and bank performance in Sub-Saharan Africa. Studies into capital structure and firm performance have ignored possible endogeneity of capital structure and bank performance. Capital structure may be correlated with bank performance. Ignoring possible endogeneity may lead to inconsistent estimates (see Wooldridge, 2002 and Camaron and Trivedi, 2005).

Reverse causality has been identified by previous studies (Berger and Udell, 2006) as a possible cause of spurious regressions. It is possible for a firm's performance to influence its capital structure rather than capital structure influencing firm's performance. Therefore, this paper will test for reverse causality by performing Granger causality tests on the relationships between capital structure and bank performance in sub-Saharan Africa. The main aim of this paper is to examine the impact of capital structure on the performance of banks in Sub-Saharan Africa.

### **Main Hypothesis**

The following main hypothesis will be tested;

*H<sub>0</sub>: there is no relationship between capital structure and bank performance in Sub-Saharan Africa.*

*H<sub>1</sub>: there is a relationship between capital structure and bank performance in Sub-Saharan Africa*

The motivation of this study is to fill a gap in the literature. Most capital structure studies have been done for developed countries. Examples of such studies include the work of Rajan and Zingales (1995) done for G-7 countries; Bevan and Danbolt (2000 and 2002) also utilize data from UK and France; and Hall et al. (2004) used data from European SMEs. There are a few studies that provide evidence from developing countries; for example, Boot et al. (2001) analyze data from only ten developing countries. Among all studies on capital structure, some have used cross-country studies, or a study on a particular region or country. However there is little or no work done on the capital structure of banks and how banks capital structure affects their performance in Sub-Saharan Africa. This study seeks to bridge the gap by analyzing capital structure and bank performance; evidence from Sub-Saharan Africa.

By analyzing capital structure and bank performance, there is the possibility of endogeneity problem between capital structure and bank performance. This study shall also address the endogeneity problem if it exists. Studies into capital structure and performance have ignored possible endogeneity of capital structure and bank performance. Capital structure may be correlated with bank performance. Ignoring possible endogeneity may lead to inconsistent estimates (see Wooldridge, 2002 and Camaron and Trivedi, 2005). The main objective of this study is to examine the relationship between capital structure and bank performance.

## **EMPIRICAL LITERATURE REVIEW**

Many studies have developed theoretical frameworks and conducted empirical tests to explain how firms chose between debt and equity and their relative proportion in firm financing (Baker and Wurgler, 2007), (Meier and Tarhan, 2007), and (Dittmar and Thakor, 2007). Others like Guedes and Opler, (1996) and Krishnaswami, Spindt, and Subramanian (1999) analyse debt issues from the perspective of agency theory and costs stemming from moral hazard problems. The point is that debt, arguably, can resolve agency problems between the shareholders and bondholders on one hand, and shareholders and managers on the other (Jensen and Meckling, 1976 and Jensen, 1986). Managers are believed to have no option other than being efficient where their organizations are significantly leveraged. This implies that firms leverage level can constrain and monitor managerial behaviour. Moreover, the use debt financing do not dilute shareholders voting right. The use of debt financing has the potential of increasing the risk of financial distress. The use of debt financing minimizes the problem of adverse selection unlike equity financing (Meier and Tarhan, 2007).

Some studies have concluded that the relationship between capital structure and firm performance is both positive and negative (Tian,et.al,) 2007;Tsangyaa,et.al.2009; Saeedi and Mahmoodi,2011;Abor,2005;Oke and Afolabi,2008),others concluded that the relationship is negative (Narendar,et.al.2007; Pratheepkanth, 2011;Shah,et.al.2011; Onalapo and Kajola, 2010).Yet,other studies have documented a positive relationship (Shoaib and Siddiqui,2011; Aman,2011; Chowdhury and Chowdhury,2010; Omorogie and Erah, 2010; Akintoye, 2008).With these mixed and conflicting results, the quest for examining the relationship between capital structure and firm performance has remained a puzzle and empirical study continues.

## **THEORETICAL LITERATURE REVIEW ON CAPITAL STRUCTURE**

### **Trade-Off Theory of Capital Structure**

The trade-off theory of capital structure states that a firm's choice of its debt – equity ratio is a trade-off between its interest tax shields and the costs of financial distress.The trade-off theories suggest that firms in the same industry should have similar or identical debt ratios in order to maximize tax savings. The tax benefit among other factors makes the after-tax cost of debt lower and hence the weighted average cost of capital will also be lower. Brigham and Gapenski (1996) argue that an optimal capital structure can be obtained if there exist tax benefit which is equal to the bankruptcy cost. It can be concluded that, there is an optimal capital structure where the weighted average cost of capital is at its minimum.

However, as a firm leverage ratio rises, tax benefits will eventually be offset by increases bankruptcy cost. The trade-off theory sought to establish an optimal capital structure where the weighted average cost of capital will be minimized and the firm value maximized. At the optimal level of capital structure, tax benefit will be equal to bankruptcy costs. Despite the theoretical appeal of debt financing, researchers of capital structure have not found the optimal capital structure (Simerly& Li, 2002).

### **Agency Theory of Capital Structure**

The agency cost theory of capital structure emanates from the principal-agent relationship (Jensen and Meckling, 1976). In order to moderate managerial behavior, debt financing can be used to mediate the conflict of interest which exists between shareholders and managers one

hand and also between shareholder and bondholders on the other hand. The conflict of interest is mediated because managers get debt discipline which will cause them to align their goals to shareholders goals.

Jensen and Meckling (1976) and Jensen and Ruback (1983) argue that, managers do not always pursue shareholders interest. To mitigate this problem, the leverage ratio should increase (Pinegar and Wilbricht, 1989). This will force the managers to invest in profitable ventures that will be of benefit to the shareholders. If they decide to invest in non-profit tax businesses or investment and are not able to pay interest on debt, then the bondholders will file for bankruptcy and they will lose their jobs. The contribution of the Agency cost theory is that, leverage firms are better for shareholders as debt can be used to monitor managerial behavior (Boodhoo, 2009). Thus, higher leverage is expected to lower agency cost, reduce managerial inefficiency and thereby enhancing firm and managerial performance (Jensen 1986, Koehhar 1996, Aghion, Dewatnipont and Rey, 1999).

### **Pecking Order Theory of Capital Structure**

From the foregoing analysis, the focus on the use of debt has been on only the economic gains and benefits of the formation of optimal capital structure. The pecking order theory is geared towards the signaling effect of the use of debt financing. According to the pecking order theory firms prefer financing their operations from internally generated funds, because the use of such funds does not send any negative signal that may lower the stock price of the firm. If internal finance is required, firms prefer to issue debt first before considering the issue of equity. This pecking order occurs because issuing debt is less likely to send a negative signal to investors. If a firm should issue equity it sends a negative signal to investors that the firm's share prices are overvalued that is why the managers are issuing equity. This will cause investor to sell their shares leading to a fall in the stock price of the firm. A share issue is thus interpreted by the market as a bad omen but debt is less likely to be interpreted this way. Firms therefore prefer to issue debt rather than equity if internal finance is insufficient. The pecking order theory is therefore a competing theory of capital structure that says firms prefer internal financing.

## **THEORETICAL FRAMEWORK AND METHODOLOGY**

A number of firm-level characteristics have been identified in previous empirical studies examining capital structure and these include; firm size, asset tangibility, profitability and growth. These are discussed in turn.

### **Debt Ratio (DR)**

The dependent variable used in this paper is the Debt Ratio (DR). According to the agency cost theory of capital structure, high leverage is expected to reduce agency cost, reduce inefficiency and eventually leads to improvements in firm's performance. Berger 2002 argues that an increase in the leverage ratio should result in lower agency costs outside equity and improve firm's performance, all other things being equal. From the analysis above an inverse relationship is expected to be between leverage (DR) and firm performance.

### **Firm Size**

The size of the firm is a very important determinant of its profitability that is why it is included as a controlled variable. Firm size has a positive relationship with short-term debt ratio (Abor J. 2008). According to Penrose (1959), larger firms enjoys economies of scale and economies

of scope and this has the tendency to impact its profitability, larger firms can also increase their market power and this will have an impact on its profitability and performance. Larger firms can take on more debt or increase leverage since their profits are high enough to service their debt Shepherd (1989).

Larger firms benefit from diversification and hence their earnings are not volatile making them able to take on more debt or increase their leverage ratio (Castanics, 1983; Fitman and Wessels 1988, Wald 1999). Young and smaller firms on the other hand cannot tolerate high debt ratios since they may not have stable earnings. Those who lend to large firms are more likely to be paid back their interest and principal than lenders to small firms thereby reducing the agency cost that is associated with debt and hence large firms can have higher debts.

Empirical evidence shows that there is a positive relationship between the size of a firm and its capital structure (see Barclay and Smith 1996, Friend and Lang, 1988, Hovakimian et al, 2004). Their analysis indicates that smaller firms are likely to finance their operations by equity rather than debt.

### **Asset Tangibility**

Asset tangibility is considered to be one of the most significant determinants of firm's performance. According to the literature there exist a positive relationship between asset tangibility and a firm's debt ratio, that is, the more tangible assets the firm has, the more leverage it is. This is because if firms have more tangible assets which it can easily convert into cash, it can increase its debt ratio since it can service the debt through its tangible assets in the event of liquidation.

Mackie-Mason (1990) concluded that a firm that has more tangible assets in its asset base is likely to choose debt and this will affect the firm's performance. Firms that invest more of their retained earnings in tangible assets will have low bankruptcy cost and financial distress than firms that rely on intangible assets Akintoye (2008).

Based on the above argument the relationship between asset tangibility and firm's performance is expected to be positive. It is believed that more debt will be used if firms have more tangible assets serve to as collateral (Wedig et al. 1988). By using the firm's assets as collateral the cost associated with adverse selection and moral hazards are reduced. This will result into firms with greater asset liquidation value having more access to debt at low cost than firms that have intangible assets. It is also suggested that bank funding will depend on whether its lending can be secured by tangible assets (Storey 1994; Berger and Udell 1998).

Empirical evidence suggests that, there is a positive relationship between asset tangibility and debt ratio of firms and this is consistent with theory (Bradley et al. 1984; Wedig et al 1988; Friend and Lang 1988, Mackie-Mason 1990; Rajan and Zingales 1995). Marsh (1982) also maintains that firms that have tangible assets are more likely to issue equity since few tangible assets implies that they cannot provide collateral.

### **Profitability**

The pecking order theory of capital structure seems to suggest that there is a negative relationship between a firm's capital structure and profitability. Murinde et al (2004) observe that retained earnings are the principal source of finance. According to Titman and Wessels (1988) and Barton et al. (1989), firms that have higher profit would maintain a low debt ratio

since they are able to generate those funds internally “all other things being equal”. Evidence from empirical studies seems to support the pecking order theory. Most studies have found a negative relationship between profitability and capital structure (see Friend and Lang 1988, Barton et al 1998). Cassar and Holmes (2003), Esperanca et al, (2003) and Hall et al. (2004) also suggest a negative relationship.

### **Growth**

When firms have high growth potential, most of the time, their retained earnings is not enough to finance their positive NPV projects and they resort to borrowing (Hall et al. 2004). Firms with high growth potential will have high debt ratios (Heshmati, 2001). Empirical research done, relating capital structures and firm growth suggest a positive relationship between them (see Kester, 1986, Titman and Wessels, 1988, Barton et al. 1989). Other researchers suggest that there exist a negative relationship between a firm growth in assets and its capital structure because higher growth firms use less debt based on the Pecking order theory ( see Kim and Sorensen, 1986, Rajan and Zingalls 1995, Roden and Lewellen 1995). According to Michqelas et al (1999) future growth is positively related to leverage ratio.

### **Taxation**

Most of the empirical studies that examine the relationship between capital structure and bank performance include taxation as a controlled variable. Some of these studies include Mackie-Mason (1990), shum (1996) and Graham (1999). Makie-Mason studies in 1990 provide evidence of the external effect that marginal corporate tax as on corporate financing decision regarding equity and debt. They concluded that changes in the marginal tax rate of a firm should affect its financing decision. They established the fact that a firm with a high tax shield is less to finance with debt if the probability of facing a zero tax rate is high. The main reason is that tax shields lower the effective marginal tax rate on interest deduction.

Graham (1999) concluded that indeed tax rate do affect corporate financing decision and performance but the magnitude of the effect is mostly not significant. However, De Angelo and Masulis (1980) show that there are other alternative tax shields such as depreciation, research and development expense that could be substituted for the fiscal role of debt.

### **Reverse Causality**

Based on the theories of capital structure reviewed in this paper, there is a possible endogeneity problem to exist between capital structure and bank performance and hence a reverse causality. The general notation of a Granger causality test which try to determine whether lagged terms of X predict Y and whether lagged terms of Y predict X respectively are specified as follows.

$$Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \alpha_2 Y_{t-2} + \dots + \alpha_p Y_{t-p} + \dots + \beta_p X_{t-p} + e_i \dots \dots \dots (1)$$

$$X_t = \beta_0 + \beta_1 X_{t-1} + \beta_2 X_{t-2} + \dots + \beta_p Y_{t-1} + \dots + \beta_p Y_{t-p} + u_i \dots \dots \dots (2)$$

where p is the number of lags,  $e_i$  and  $u_i$  are error terms. Equation 1 tests whether X Granger causes Y. If  $\beta$  does not equal to zero (0) significantly, we can say that Y Granger causes X.

In this paper, return on Asset (ROA) and return on equity (ROE) and net interest margin (NIM) shall be used as proxies for bank performance and the total debt ratio (TDR) as proxy for capital structure of banks in Sub-Sahara Africa. To perform the granger causality test the total debt ratio shall be used since it contains both short-term and long-term debt ratios. Short-term debt is considered because bank deposits which represent short-term debt are liabilities to the bank. The Granger – causality model is specified as follows.

$$ROA = \alpha_0 + \alpha_1 ROA_{t-1} + \alpha_2 ROA_{t-2} + \dots + \alpha_p TDR_{t-1} + \dots + \beta_p TDR_{t-p} + ei \dots (3)$$

$$TDR = \beta_0 + \beta_1 TDR_{t-1} + \beta_2 TDR_{t-2} + \dots + \beta_p ROA_{t-1} + \dots + \beta_R ROA_{t-p} + ui \dots (4)$$

$$ROE = \alpha_0 + \alpha_1 ROE_{t-1} + \alpha_2 ROE_{t-2} + \dots + \alpha_p TDR_{t-1} + \dots + \beta_p TDR_{t-p} + ei \dots (5)$$

$$TDR = \beta_0 + \beta_1 TDR_{t-1} + \beta_2 TDR_{t-2} + \dots + \beta_p ROE_{t-1} + \dots + \beta_p ROE_{t-1} + ui \dots (6)$$

$$NIM = \alpha_0 + \alpha_1 NIM_{t-1} + \alpha_2 NIM_{t-2} + \dots + \alpha_p TDR_{t-1} + \dots + \beta_p TDR_{t-p} + ei \dots (7)$$

$$TDR = \beta_0 + \beta_1 TDR_{t-1} + \beta_2 TDR_{t-2} + \dots + \beta_p NIM_{t-1} + \dots + \beta_p NIM_{t-1} + ui \dots (6)$$

Where TDR=total debt ratio

## RESEARCH METHODOLOGY

An unbalanced panel regression model will be used for the estimation in this study. This is because the data used in this study involves both cross-sectional data and time series and the number of banks selected in each country is not the same. The use of panel data is advantageous because of the several data points, the degrees of freedom are increased and collinearity among the explanatory variables is reduced leading to an improvement of economic efficiency and an increase in the predictive power of the model.

### Model Specification

In answering the question of whether capital structure determines banks performance in Africa, the study employs return on asset (ROA), return on equity (NIM) and Net interest margin (NIM) as the three dependent variables that measures bank performance.

Some writers such as Bettis and Hall (1982), Demsetz and Lehn(1985), Habib and Victor (1991), Zkeitun and Tian (2007) among others, used the return on Assets (ROA) and return on equity (NIM) as proxies for firms performance in their studies.

The main independent variable used in this study is the total debt ratio (TDR). However, there are a number of other factors that influences and determines banks performance known as the conolled variables are also included in this study. These controlled variables are treated as the explanatory variables. The controlled variables used in this model includes firm's size, asset tangibility, growth rate of firms assets, marginal corporate tax, GDP growth rate, interest rates and inflation rates. The model is therefore specified as;

$$Y_{it} = \beta_0 + \beta_{it} TDR_{it} + \beta_{it} \sum_{i=1}^n Z_{it} + e_{it}$$

With the subscript (i) denoting the cross-sectional dimension and t representing the time series dimension. The left hand-side variable represent the dependent variable in the model which is the banks performance,  $X_{it}$  represents the independent variables in the estimation model,  $\beta_i$  is the constant overtime t and specific to the individual cross-sectional unit i. The model for estimating capital structure and bank performance base on the variables discussed is specified as;

$Y_{it}$  – the dependent variables ROA, ROE and NIM

$TDR_{it}$  – the independent variable (TDR)

$Z_{it}$  – the controlled variables

$e_{it}$  is the error term, it is assumed to have zero mean and constant variance

The equation above can be estimated as follows:

### Model

$$ROA_{it} = \beta_0 + \beta_1 TDR_{it} + \beta_2 SIZE_{it} + \beta_3 TANG + \beta_4 GROWTH_{it} + \beta_5 TAX_{it} + \beta_6 GDPGR_{it} + \beta_7 INTEREST_{it} + \beta_8 INFLR_{it} + e_{it} \dots \dots \dots (1)$$

$$ROE_{it} = \beta_0 + \beta_1 TDR_{it} + \beta_2 SIZE_{it} + \beta_3 TANG + \beta_4 GROWTH_{it} + \beta_5 TAX_{it} + \beta_6 GDPGR_{it} + \beta_7 INTEREST_{it} + \beta_8 INFLR_{it} + e_{it} \dots \dots \dots (2)$$

$$NIM_{it} = \beta_0 + \beta_1 TDR_{it} + \beta_2 SIZE_{it} + \beta_3 TANG + \beta_4 GROWTH_{it} + \beta_5 TAX_{it} + \beta_6 GDPGR_{it} + \beta_7 INTEREST_{it} + \beta_8 INFLR_{it} + e_{it} \dots \dots \dots (3)$$

### Data Type and Sources:

A long panel data on banks from 37 countries in the Sub-Saharan region for the period 2000 to 2006 will be used. The data is a secondary data obtained from the Price Water House Coopers Annual Banking survey and from Doku(2011).

For inclusion in the sample was a seven (7) year data ranging from 2000-2006 resulting in a panel database. The criteria used for selecting the banks in each country was based on the availability and quality of data for the time period from 2000-2006. Some of the banks are public while others are private.

### Variable Definition and Measurement

$TDR_{it}$  = leverage (Total debt/equity + debt) for firm  $i$  in time  $t$ .

$STDR_{it}$  = (Short – term debt/equity + debt) for firm  $i$  in time  $t$ .

$LTDR_{it}$  = (Long – term debt/equity + debt) for firm  $i$  in time  $t$ .

$EQU_{it}$  = total assets divided by stockholders' equity for firm  $i$  in time  $t$

$TANG_{it}$  = fixed tangible assets divided by total assets for firm  $i$  in time  $t$

$SIZE$  = the size of the firm (natural log of total assets) for firm  $i$  in time  $t$ '

$GROWTH_{it}$  = growth rate of total assets for firm  $i$  in time  $t$

$ROA_{it}$  = earnings before interest and taxes divided by total assets for firm  $i$  at time

$ROE_{it}$  = earnings before interest and taxes divided by shareholder's equity for firm  $i$  at time  $t$

$NIM_{it}$  = interest revenue – interest expense divided by total assets

$e_{it}$  = the error term. the error term takes care of other explanatory variables that

equally determines capital structure but are not included in the model

$TDR$ =Debt ratio  $STDR$ =short-term debt ratio  $LTDR$ =long-term debt ratio  $EQU$ =equity multiplier  $TANG$ = asset tangibility  $SIZE$ =Size of the bank  $GROWTH$ = growth rate of total assets  $ROA$ =return on asset  $ROE$ =return on equity  $NIM$ =net interest margin  $TAX$ =corporate marginal tax rate  $GDPGR$ =GDP growth rate  $INTEREST$ = interest on loans  $INFLR$ = inflation rate

## RESULTS AND DISCUSSION

### Unit Roots Test

The study employed STATA 11.2 package to carry out two panel unit root test (Levin-Lin-Chu and Im-pesaran-shin) in order to determine whether the variables used to test for reverse causality using the Granger causality method are stationary. According to theory, to test for reverse causality by Granger causality method the variables used must be stationary. The variables used were all stationary at levels and hence they are integrated of order zero I (0) stochastic process. However only the results obtained by Levin-Lin-Chu unit root test are reported in the appendix.

### Reverse Causality

The purpose of this study was to examine the problem of simultaneity or endogeneity problem between capital structure and bank performance. To examine the endogeneity problem, granger causality test was carried out using Eviews 7 to determine whether capital structure Granger causes bank performance or it is bank performance that Granger causes capital structure of



banks in sub-Saharan Africa. According to the results obtained, there is no reverse causality or Granger causality between capital structure of banks in sub-Saharan Africa and bank performance and hence the problem of endogeneity does not exist.

### Table 1: Granger Causality Test

The following table represents the results obtained from the granger causality test of the dependent variables

#### Pairwise Granger Causality Test

Null Hypothesis:	Obs	F-Statistic	Prob.
ROA does not Granger Cause TDR	150	2.04659	0.0636
TDR does not Granger Cause ROA		1.45794	0.1972
ROE does not Granger Cause TDR	150	1.02994	0.4086
TDR does not Granger Cause ROE		1.78435	0.1067
NIM does not Granger Cause TDR	150	2.95362	0.0096
TDR does not Granger Cause NIM		0.82652	0.5513

### Fixed and Random Effect Models

This study employs samples of banks in Sub-Saharan Africa across 37 (thirty-seven) countries, hence the tendency for the fixed effect and random effect models estimates to differ from each other significantly. Hausman chi-square test was conducted in each equation and the results show that the Hausman test is significant at 5% level in all the equations used in the study. This implies that the two estimates differ significantly and hence the fixed effect is preferable to the random effect estimate. However the results of the OLS estimates (although not reported here) do not differ significantly from the fixed effect estimates, hence the conclusions are based on the results of the fixed effect estimates. The results of the Hausman test are reported in each regression table. The fixed effects model is used in this study because, if there are omitted variables, and these variables are correlated with the variables in the model, then fixed effects models may provide a means for controlling for omitted variable bias. In a fixed-effects model, subjects serve as their own controls. The idea is that whatever effects the omitted variables have on the subject at one time, they will also have the same effect at a later time; hence their effects will be constant, or “fixed.” However, in order for this to be true, the omitted variables must have time-invariant values with time-invariant effects. By time-invariant values, we mean that the value of the variable does not change across time. By time-invariant effects, we mean the variable has the same effect across time. Random effects models will estimate the effects of time-invariant variables, but the estimates may be biased because we are not controlling for omitted variables. Random effects models will often have smaller standard errors. But, the trade-off is that their coefficients are more likely to be biased.

Fixed effects models control for or partial out the effects of time-invariant variables with time-invariant effects. This is true whether the variable is explicitly measured or not. The fixed effect model removes the effects of time-invariant characteristics from predictor variables so that we can assess the predictor’s net effect (Oscar Torres-Reyna, 2001)

### Descriptive Statistics

Table 2 below shows the descriptive statistic of all the variables used in the study. The mean of the ROA of the sample banks is 2.61 while that of the ROE and NIM is 21.21 and -0.2429

respectively. The results indicates that on the average, for every dollar worth of total assets of the banks, 2.61 was earned as profit after tax, while \$21.21 was earned as profit after tax on every equity share issued. However, the mean net interest margin (NIM) is negative indicating that the banks interest expense far exceeds their interest income. The analysis showed that the selected banks have high performance ratios except that of the net interest margin. The mean total debt ratio is 0.8728, equity multiplier is 9.0395, and size is 8.77. The mean tangible assets is 0.0421, this means that the proportion of the firms fixed asset to total asset is about 4.2%. Growth rate of the banks on the average is 0.1299, average tax rate is 29.53, and the mean GDP growth rate of African countries is 4.70% which is significant. The mean interest rate on loans and inflation rate is 9.80% and 16.2% respectively

**Table 2: Descriptive Statistics of Variables**

VARIABLE	OBS	MEAN	STD. DEV.	MIN	MAX
ROA	1050	2.610419	4.158988	-56.7000	49.64
ROE	1050	21.2136	37.33168	-400.000	348.11
NIM	1050	-0.24289	3.842668	-71.5806	0.278698
EQU	1050	9.039476	63.55143	-2019.33	155.7958
STDR	1050	0.747639	0.163638	0.043393	0.962023
LTDR	1050	0.125159	0.135483	0.0000	0.928517
TDR	1050	0.872798	0.098309	0.117217	1.00000
SIZE	1050	8.772074	2.909463	-0.10536	14.34947
TANG	1050	0.042137	0.033704	8.13E-05	0.329206
GROWTH	1049	0.129881	48.40119	-1462.07	237.3132
TAX	1050	29.5301	4.777408	20.0000	40.0000
INTEREST	1050	9.797602	12.70141	0.854167	203.375
GDPGR	1050	4.70265	3.880106	-16.9951	27.46172
INFLR	1050	16.21115	60.97024	-9.61615	1096.678

*TDR=Debt ratio STDR=short-term debt ratio LTDR=long-term debt ratio EQU=equity multiplier TANG= asset tangibility SIZE=Size of the bank GROWTH= growth rate of total assets ROA=return on asset ROE=return on equity NIM=net interest margin TAX=corporate marginal tax rate GDPGR=GDP growth rate INTEREST= interest on loans INFLR= inflation rate*

### Correlation Analysis

Due to the problem of multicollinearity among variables, a correlation matrix of the variables used in the regression is presented in table 3. With regards to the total debt ratio it has a significant positive correlation with the equity multiplier, return on equity (ROE) and the growth rate but has a significant negative correlation with GDP growth rate, inflation rate and the net interest margin. The return on asset (ROA) exhibits a significant positive correlation with tax and GDP growth rate and significant negative correlation with the equity multiplier and the net interest margin and growth rate. The return on equity (roe) also exhibits a significant negative correlation with growth rate and the long term debt ratio at the 5% level but the rest of the variables the correlation is not significant. The net interest margin (NIM) is also significantly negatively correlated with the equity multiplier (EQU), the total debt ratio, asset

tangibility (tang) and the return on asset (ROA) and the tax rate but significantly positively correlated with the growth rate.

**Table 3: Correlation Matrix of all variables used in the study**

	roa	roe	nim	equm	stdr	ltdr	tdr	size	tang	growth	tax	interest
roa	1.0000											
roe	0.7830	1.0000										
nim	0.5119	0.3251	1.0000									
equm	-0.2916	0.1625	-0.3319	1.0000								
stdr	-0.3548	-0.0294	-0.2653	0.5638	1.0000							
ltdr	0.2498	0.1791	0.1218	-0.1026	-0.7607	1.0000						
tdr	-0.3389	0.1131	-0.3753	0.9099	0.5818	-0.0407	1.0000					
size	-0.2229	-0.1125	-0.2181	0.2129	0.3302	-0.2597	0.1867	1.0000				
tang	-0.0191	-0.1265	0.1923	-0.2463	-0.1997	0.1674	-0.2548	0.0637	1.0000			
growth	0.2227	0.1881	0.0478	-0.0104	-0.1431	0.1505	-0.0420	-0.2497	-0.0295	1.0000		
tax	0.0514	0.1262	-0.0546	0.0898	-0.0980	0.1823	0.0770	0.0656	0.1886	0.0798	1.0000	
interest	0.4153	0.2980	0.3972	-0.2258	-0.3096	0.2637	-0.2247	-0.4817	0.1653	0.2345	0.1202	1.0000
gdpgr	0.0624	0.0674	0.0631	0.0228	-0.0610	0.0756	-0.0071	-0.0019	0.0394	0.2002	0.0628	0.0267
inflr	0.3988	0.3082	0.3777	-0.2352	-0.3655	0.3039	-0.2514	-0.4491	0.1738	0.3153	0.0669	0.6928
		gdpgr	inflr									
gdpgr		1.0000										
inflr		0.1386	1.0000									

*TDR=Debt ratio STDR=short-term debt ratio LTDR=long-term debt ratio EQU=equity multiplier TANG= asset tangibility SIZE=Size of the bank GROWTH= growth rate of total assets ROA=return on asset ROE=return on equity NIM=net interest margin TAX=corporate marginal tax rate GDPGR=GDP growth rate INTEREST= interest on loans INFLR= inflation rate*

## Regression Results and Discussion

### Capital Structure and Bank Performance Regression Results

The regression results of capital structure and bank performance are presented in table 4. The total debt ratio is not statistically significant in determining banks performance as measured by the return on asset (ROA), the return on equity (ROE) and the net interest margin (NIM) in Sub-Saharan Africa. This implies that, the performance of banks in Sub-Saharan Africa do not depend on their capital structure. Size is not statistically significant in determining return on asset (ROA) and return on equity (ROE) but it is statistically significant in determining net interest margin (NIM) at 5%. Asset tangibility (tang) is statistically significant at 10% in determining ROA and ROE but not significant in determining NIM. The growth rate of banks is also statistically significant in explaining banks' performance (ROA, ROE, and NIM) which is consistent with theory. Growth rate is not statistically significant in determining banks performance in Africa. Tax rate is not statistically significant in determining ROA and ROE but it is statistically significant at 10% level in determining the net interest margin (NIM) of banks in sub-Saharan Africa. GDP growth rate is not statistically significant in determining banks performance (ROA, ROE and NIM) in Sub-Saharan Africa. It carry the expected sign in ROA indicating that as the economy grows banks will also perform well which is consistent with theoretical arguments. Interest rate is also significant in determining ROA and ROE at 1% and 10% respectively but it is not statistically significant in determining the net interest margin (NIM) (Bartholdy and Mateus, 2008). The inflation rate is not statistically significant in determining ROA and ROE of banks in Sub-Saharan Africa but it is statistically significant at 1% in determining the net interest margin (NIM). According to previous studies, there is positive relationship between bank performance and inflation rate especially if the inflation is anticipated (Perry, 1992; Thorton, 1992; Bourke, 1989).

**Table 4:** The table shows the regression results of Capital structure and bank performance in Sub-Saharan Africa with ROA, ROE and NIM as performance variables and TDR as capital structure measure

	(1) ROA	(2) ROE	(3) NIM
TDR	-17.01 (-1.55)	12.78 (0.19)	-2.044 (-0.88)
SIZE	0.266 (1.02)	0.583 (0.29)	2.037** (2.63)
TANG	-31.17* (-2.53)	-192.7* (-2.29)	0.496 (0.07)
GROWTH	0.00141 (0.99)	0.00587 (0.40)	0.000734 (0.37)
TAX	-0.0380 (-0.89)	0.779 (0.87)	0.0874* (2.04)
GDPGR	0.0860 (1.27)	-0.377 (-0.75)	-0.146 (-1.31)
INTEREST	0.0643*** (3.53)	0.270* (2.10)	0.0429 (1.13)
INFLR	0.00324 (0.61)	-0.000979 (-0.04)	0.0183*** (4.06)
_CONS	16.48 (1.51)	-10.79 (-0.16)	-18.95** (-3.17)
N	1049	1049	1049
R-sq	0.148	0.026	0.411
adj. R-sq	0.141	0.019	0.407
<b>Hausman Test:</b> Random vs Fixed effects			
Chi-square	27.15	14.60	3876.55
P-values	0.0003	0.0415	0.0000

t statistics in parentheses (bracket)

\* p<0.10, \*\* p<0.05, \*\*\* p<0.01

*TDR=Debt ratio TANG= asset tangibility SIZE=Size of the bank GROWTH= growth rate of total assets ROA=return on asset ROE=return on equity NIM=net interest margin TAX=corporate marginal tax rate GDPGR=GDP growth rate INTEREST= interest on loans INFLR= inflation rate*

**Robustness Test: Capital Structure and Bank Performance Regression Results**

In the previous section, total debt ratio (TDR) was used as the measure of capital structure. This measure includes short-term debt (deposit) and long-term debt. As a robustness test, I use long-term debt ratio (LTDR) as a measure of capital structure in order to be consistent with the literature. The regression results of the robustness test of capital structure and bank performance are presented in table 5. The long-term debt ratio is not statistically significant in determining banks performance as measured by the return on asset (ROA), the return on equity (ROE) and the net interest margin (NIM) in Sub-Sahara Africa. This implies that, the performance of banks in Sub-Sahara Africa do not depend on their long-term debt ratio (capital structure). The other explanatory variables are not significantly different from the earlier regression when using the total debt ratio as the main independent variable. It can be concluded that, the results from the robustnesstest is not different from the earlier regression using the total debt ratio as a proxy for capital structure.

**Table 5:** The table shows the regression results of the robustness test of Capital structure and bank performance in Sub-Sahara Africa with ROA, ROE and NIM as performance variables and LTDR as capital structure measure.

	(1) ROA	(2) ROE	(3) NIM
LTDR	-4.046 (-1.06)	-10.18 (-0.22)	0.361 (0.41)
SIZE	0.167 (0.58)	0.759 (0.37)	2.018** (2.65)
TANG	-26.34* (-2.48)	-195.2* (-2.79)	1.004 (0.15)
GROWTH	0.00134 (1.04)	0.00480 (0.35)	0.000797 (0.41)
TAX	-0.0104 (-0.24)	0.766 (0.83)	0.0902* (2.01)
GDPGR	0.0889 (1.23)	-0.390 (-0.77)	-0.145 (-1.31)
INTEREST	0.0711*** (3.28)	0.274* (1.74)	0.0432 (1.14)
INFLR	0.00497 (0.79)	-0.00429 (-0.16)	0.0186*** (4.07)
_CONS	1.878 (0.59)	0.688 (0.02)	-20.73** (-2.87)
N	1049	1049	1049
R-sq	0.088	0.026	0.410
adj. R-sq	0.081	0.019	0.406
<b>Hausman Test:</b> Random vs Fixed effects			
Chi-square	20.16	15.73	4935.40
P-values	0.0098	0.0465	0.0000

t statistics in parentheses

\* p<0.10, \*\* p<0.05, \*\*\* p<0.01

LTDR=long-term debt ratio TANG= asset tangibility SIZE=Size of the bank GROWTH= growth rate of total assets ROA=return on asset ROE=return on equity NIM=net interest margin TAX=corporate marginal tax rate GDPGR=GDP growth rate INTEREST= interest on loans INFLR= inflation rate

## **SUMMARY, CONCLUSION AND POLICY IMPLICATIONS**

### **Summary and Conclusions of Study**

This paper examines capital structure and bank performance in Sub-Sahara Africa; eight variables were selected as the determinants of banks performance in Sub-Sahara Africa which include debt ratio, size of a bank, asset tangibility, growth rate of banks, taxes, GDP growth rate, interest rates and inflation rate. Due to the problem of heteroskedasticity, autocorrelation and multicollinearity in the panels, the study employed cluster robust standard errors to estimate the parameters. Hausman test was conducted and the results show that fixed effect model is more appropriate since the p-values of the Hausman chi-square are statistically significant.

This paper examines capital structure and banks performance in sub-Sahara Africa by the using the total debt ratio as a proxy for capital structure since it includes both the short-term and long term debt ratios. The main objective was to examine whether capital structure affects banks performance in sub-Sahara Africa and also to examine nature of relationship between capital structure and bank performance.

The results show that the capital structure of banks in Africa is statistically insignificant. This implies that capital structure do not impact banks performance that is, banks' performance does not depend on their capital structure but rather it is capital structure that depends on banks' performance from the previous analysis of the determinants of capital structure. The pecking order theory suggests that firms first of all rely on internally generated funds which are their retained earnings and if internal funds are exhausted then they fall on debt capital. This is evident on the fact that all the debt ratios are not statistically significant. The results also indicate that size is an important determinant of total debt ratio and asset tangibility is also an important determinant of bank performance but it does not carry the expected signs in the ROA and ROE. Tax rate and inflation are significant in determining only the net interest margin (NIM), however growth rate of banks, size and the GDP growth rate are not significant in determining banks performance in Africa.

The study performed a robustness test by replacing the total debt ratio with the long-term debt ratio as a proxy for capital structure to run another regression to examine whether the results will be different from the above analysis. However, according to the results obtained, they are not significantly different from the earlier regression results obtained using the total debt ratio as the main independent variable. This confirms that banks performance do not depend on their capital structure from the above analysis.

### **POLICY IMPLICATIONS OF THE STUDY**

Since return on asset (ROA) is statistically significant and negatively impact short-term debt ratio, the long-term debt and the total debt ratio, the management of banks in Africa should be concerned with putting measures in place to enhance their return on assets (ROA). If banks should put measures in place to increase and enhance their return on asset (ROA), it will reduce their debt ratios. A reduction in banks debt ratios will enable them avoid some of the negative tendencies that is associated with increasing financial leverage such as bankruptcy cost and financial distress. Banks should also have more tangible assets which they can use generate more profit in order to reduce their debt ratios since tangible asset is significant in determining

their total debt ratio. Banks should also grow their assets since asset growth reduces their long-term debt ratio significantly.

The government and monetary authorities should put policies in place to curb inflation in order to avoid unanticipated inflation, since unanticipated inflation reduces banks' debt ratios because the cost of borrowing will be very high.

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