EFFECT OF MACROECONOMIC FACTORS ON CAPITAL STRUCTURE OF FIRMS IN DEVELOPING AFRICA: A TWO-STEP GMM APPROACH

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Abstract
The study examines the effects of macroeconomic factors and on capital structure of non- financial firms in Africa. Using a recent data for an advanced dynamic model (2step system generalized methods of moment (GMM)) technique for a panel data model of 406 non-financial firm of 8 developing African nations. The findings reveal that macroeconomic variables are determinant of capital structure of non-financial in Africa. The findings show that financial managers can benefit from raising additional capital as macroeconomic conditions are favorable. Moreover, shareholders should employ firm managers with good knowledge of macroeconomic conditions and also encourage them raise debt capital needed to fund positive investment. Lastly, Policymakers should enact policies that promote financial market development because such policies would complement the banks' financing strategies and firms would have more access to debt capital.

Keywords: Capital Structure, Macroeconomic Factors, Developing Africa, Generalized Methods of Moment (GMM)

1. Introduction

Capital structure is the financial decisions regarding raising of capital from various sources of funds that comprises of retained earnings and debt and equity (Shahar & Manja, 2018). Capital structure decisions impact a firm in two aspects. First, firms of equal risk category with high leverage will likely have high costs of capital. Lastly, capital structure will affect firm's valuation, with high leveraged firms being more volatile and less valued than lower leveraged firms (Baltaci, and Ayaydin, 2014). However, Capital structure is a vital choice that could lead to an optimum funding mix that could optimize firm's share price (Lim, 2012).

Studies of corporate capital structures have a long history. Ever since the article by Modigliani and Miller (1958) of irrelevance proposition, extensive theoretical studies have been done on determinants of firm's capital structures. These efforts already resulted in the early 1980s in the establishment of the two major principles

of capital structure. In trade-off principle, firms trade off any potential tax savings bankruptcy from debt financing against deadweight costs. Pecking order hypothesis, on the other hand, indicates firms prioritize inside to outside funding and also debt to equity due to adverse selection, if external financing is used. Although neither theory is entirely satisfactory, they were instrumental in defining many of indicators that control the actual firms financing decisions.

The most important issues in corporate financial domain, both theoretically and empirically, is question of optimal capital structure that can increase shareholder returns (Kayo and Kimura, 2011). Since the Modigliani and Miller (1958) "capital structure irrelevance" proposals, we have experienced the emergence of many theoretical perspectives in this arena. Consequent theoretical work takes into consideration financial market imperfections and showed that firms capital structure arises from firms-specific and macroeconomics influences. The predominance of the capital structure studies focuses primarily on the analysis of certain specific features of firms such as size, tangibility, profitability, growth and business risk as capital structure determinants, and overlooked the importance of the economic condition which the firm operates. Certainly, the firms' decisions on capital structure is affected by macroeconomic factors like inflation rate, GDP growth, interest rate and Market capitalization to GDP. Therefore, analyzing the role of these macroeconomic variables alongside the firm-specific features gives a clearer picture of the decision and choices that firms make on capital structure.

The article aims at making contribution to knowledge the relevance capital structure decisions by examining capital structure determinants using a recent data for a large panel of firms in developing nations and concentrating on both firm-specific features and macroeconomic factors. The key contribution comes from evaluating the significance of macroeconomic variables roles in capital structure decisions and assessing potential impact of macroeconomic variables in determining firm's capital structure compared to the firm-specific features in developing African nations. Additional contribution comes in through estimate of capital structure determinants using recent data and new macroeconomic variables (interest rate and market capitalization to GDP) which past researches on macroeconomic determinants of capital structure do not mostly incorporate.

The article is arranged as follows: We provided an overview of theories relating to research of capital structure in section two. The Macroeconomic determinants in

the third, data and estimation methodology are introduced in section fourth, fifth section presented the results, and the sixth concluded the study.

2. Theories and determinants of Capital Structure

In the study of firm-specific determinants of capital structure two main theoretical approaches are particularly important the trade-off and pecking order theories. These principles offer multiple projections concerning specific firm features and macroeconomic factors affecting firm's decisions on capital structure. Kraus and Litzenberger (1973) offer a classic theory postulation that an ideal capital structure reflects a one-period trade-off between debt financing, tax advantages and deadweight prospects of bankruptcy cost. They, further argued that in the trade-off principle, choices in capital structure are defined by trade-off between the debt benefits and costs. Typical considerations for this trade-off are based on cost of bankruptcy, tax advantages and asset replacement related agency costs (Myers, 1977), and to overinvest (Stulz, 1990). Every firm has an optimal value-maximizing debt and equity ratio that it seeks to achieve (Gungoraydinoglu and Öztekin, 2011). As a result, while higher debt mitigates equity costs for firm, it intensifies disputes between bondholders and shareholders (Drobetz et al, 2013).

The theory of pecking order founded by Myers and Majluf (1984) was built on information asymmetry basis and it asserts that adverse cost of selection for issuing risky securities, whether due to information asymmetry or management ambition, contribute to a preferential classification over means of funding by forming a bridge among internal and external funding costs and raising the uncertainty of issuing securities. Firms initially raise retain earnings, debt, then equity to reduce adverse selection costs (Gungoraydinoglu and Öztekin, 2011). In pecking order principle, there's no condition of optimum capital structure for a firm, Myers ' rationale for the pecking order theory is based on the assumption that firm stakeholders are more knowledgeable than those outside the firm (Chakroborty, 2010). The pecking order principle lists sources of finance according to the level to which information asymmetry affects them. As a measure, firms are predominantly using internal financing. They prefer to give out debt over equity when they need outside funds (Drobetz et al, 2014). The pecking order principle does not assume, as opposed to trade-off principle, that firms have well-defined goal for optimal debt-equity ratio (Dang, 2013).

Among the few major studies that used firm-specific features to analyze capital structure determinants are Rajan and Zingales (1995) who used four specific firm

explanatory parameters, profitability, tangibility, size and growth. Booth et al. (2001) added by including business risks. Frank and Goyal (2009) identified average leverage of industry, ratio of market to book assets, fixed assets, expected inflation, size and profits as capital structure determinants. Dakua (2018) used profitability, size, risk, structure of assets, non-debt tax shield, growth opportunity and liquidity to measure capital structure. This study uses four firm-specific variables and they are non-debt tax shield, growth opportunity, profits and size.

Size of firm

A significant connection between size of firm and debt is expected by trade-off principle. That's because large firms are highly diverse and have lesser default risk. On other hand, the pecking order principle is widely assumed as predicting an adverse connection, since big firms have lesser adverse selection problem and can give equity quickly than small firms. The vast majority of empirical research conducted find a significant connection among size of firm and debt. Evidences show empirically that there is variations in results between size and debt. Chakrabarti and Chakrabarti (2019) and Dakua, (2018) positively linked the connection between size of firm and debt. Conversely, a negative connection was reported by Hanousek and Shamshur (2011) and Chakraborty (2010).

Profitability

In general, trade-off principle is defined as forecasting a positive link among firm profits and debt ratio. That is because risk of default is smaller, and interest-tax debt shields are of more value to firms with higher profits. On other hand, pecking order principle foresees an adverse connection among debt ratio and profitability as firms with higher profits can make use of retained earnings to finance business opportunities and thus have fewer desire for external debt. Even though most empirical researches show that the connection is robustly adverse. Yet some empirical studies show a positive result on the profit and debt ratio relation. Chakrabarti and Chakrabarti (2019) and Dakua, (2018) found a negative connection between profit and debt. Conversely, Bukair (2018) and Toumi, et al. (2012) found relation between profits and debt negative.

Market Price to Book (Growth opportunity)

Growth firms need to use less debt from a trade-off theory viewpoint, because growth opportunities are intangible assets without value of collateral if firms face bankruptcy (Myers, 1984). From pecking theory viewpoint, growing firms needing

funding should deliver security with fewer costs of information asymmetry. Dakua, (2018) and Acaravi, (2015) empirically found growth opportunity to be significantly connected to debt. Conversely, Gormley and Matsa, (2013) and Chakraborty (2010) report an adverse effect between growth opportunity and debt.

Non-Debt Tax Shield

In 1980, De Angelo and Masulis were obviously first to introduce into literature formally the concept of non-debt tax shields. The non-debt tax shield could be attributes such as depreciation deductions, allowances for depletion and tax credits for investment. Such shields could be viewed as replacements for the debt funding corporate tax benefits. Consequently, firms with greater volumes of non-debt tax shields will opt for lower debt rates. The trade-off principle thus predicts an adverse connection between the debt ratio and non-debt tax shields. Empirical research more often than not show findings which support this prediction; yet some show a positive relation. Among the few empirical studies that show an adverse link between debt and non-debt tax shield are Oztekin and Flannery, (2012), Iwarere and Akinleye, (2010). Conversely, Chakrabarti and Chakrabarti (2019) and Bukair (2018) posits a positive link between debt and non-debt tax shield.

Macroeconomic Determinants

Several research, like De Jong et al. (2008) and Baltaci and Ayaydin, (2014) reveal that the safety and stability of the economic conditions has a tremendous effect on firm's capital structures. To analyze impact of economic conditions on firms' capital structure, the study used macroeconomic indicators such as GDP growth, interest rate, market capitalization to GDP, and Inflation rate to measures the general economic climate.

Inflation

Inflation is one of a country's key indices of stability. Any rise in inflation leads to economic instability. This uncertainty causes firms' inability to repay their debts. Higher inflation decreases the benefits of debt because of higher bankruptcy costs of debt imposed on firms (Gungoraydinoglu and Öztekin, 2011). In this situation, borrowers demand a higher return because of the risk that they are taking. Higher interest rates raise the firm's projected debt burden, firms lower the debt ratios. Additionally, firms are increasingly using weak dollars in times of high inflation to pay off debt and reduce their debt ratios (Drobetz et al, 2013). Inflation thus has an adverse impact on debt. Joeveer (2013) argues that anticipated inflation is forecasted to be related positively to debt due to increased real value of deductions

on debt tax. An adverse relationship is found among debt and inflation in the studies of Öztekin and Flannery (2012), Drobetz et al (2013) and Joeveer (2013). Conversely, there have been a positive link among inflation and the firm's debt financing in works of Sinha and Ghosh, (2010); and Ali, (2011).

Interest rate

Interest rate is the expense of acquiring loans on short-term or long-term grounds. Interest rate cannot be ignored because, of its impact on firm's debt. Companies prefer getting debt from financial institution and capital market in particular to fund investment when the expense is very low. Despite financial liberalization of their financial markets, interest rate in most developing economies is however very high. Interest rates are generally double digits, and financing are mostly obtained on a short-term basis. One of the reasons contributing for this is the saving behavior of bank depositors who save on a short-term basis and expect higher saving rates.

GDP growth rate

Growth in real gross domestic product (GDP) can be seen as an indicator of growth opportunities open to firms in an economy. In a sound economic environment, lack of tangible assets of firms compared to the available business opportunities means a higher value loss when businesses are in distress. The trade-off theory therefore predicts that there is a negative relationship between leverage and GDP growth. The pecking order hypothesis, by comparison, predicts a positive relationship between debt and GDP growth, because a high ratio of growth opportunities to internal funds will suggest a stronger need for external funding. Empirical research commonly find an adverse connection between debt and GDP growth (Demirgüc-Kunt and Maksimovic 1996). Conversely, Lim, (2012) and Drobetz et al. (2013) find positive GDP growth - debt relationship. According to usual practice, we measure GDP growth as annual growth in real GDP per annum, denoted by GDPG.

Market capitalization to GDP

According to Dincergok & Yalciner report (2011), the development of the stock market has significant connection to capital structure. In fact, market capitalization as proxy for the growth of the stock market has positive impact on capital structure (Gajurel, 2006). About the same period Bokpin (2009) claims that these variables have no connection. Conversely, Sett & Sarkhel (2010) considers an adverse connection between the growth of the stock markets and capital srtucture.

Moreover, researchers noted that the impact of stock market growth on debt rates of capital structure in certain developing nations with economies in transition is not

clear and distinct from developed ones. The study in developing nations found that growth of the stock market has same dimensional connection with debt. This is described as the company risks are varied, and asymmetric information decreases, making firms prefer more debt because the debt cost is lower than of equity.

3. Methodology and Specification of Models

This research sourced data for firm specific and macroeconomic factor from the data stream and world development indicators (WDI). Our sample cover a period between 2010 and 2016 for 4,642 financial firm across 22 developing nations. The study employed suitable and advanced dynamic panel estimator, Blundell and Bond's (1998) generalized methods of moment estimation technique (2step system GMM).

Model Specification

Model 1

$$TDTA_{it} = \lambda TDTA_{it-1} + \beta_0 + \beta_1 Slog_{it} + \beta_2 PRFTS_{it} + \beta_3 MTB + \beta_4 NDTS_{it} + \beta_5 INF_{it} + \beta_6 INT_{it} + \beta_7 GDPG_{it} + \phi_i + \alpha_t + \mu_{it}$$

Model 2

$$TDTA_{it} = \lambda TDTA_{it-1} + \beta_0 + \beta_1 Slog_{it} + \beta_2 PRFTS_{it} + \beta_3 MTB_{it} + \beta_4 NDTS_{it} + \beta_5 INF_{it} + \beta_6 INT_{it} + \beta_7 GDPG_{it} + \beta_8 MCGDP_{it} + \phi_i + \alpha_t + \mu_{it}$$

Where
TDTA = Total Debt to Total Assets
Slog = Log of Size
MTB = Market to Book value
NDTS = Non Debt Tax Shield
PRFTS = Profits
INF = Inflation Rate
INT = Interest rate
GDPG = Gross Domestic Product Growth
MCGDP = Market Capitalization to Gross Domestic Product
$Ø_i$ = Industry Effects
α_t = Year Fixed Effects
λ = Adjustment Parameter
μ = Error Term

4. Results and Discussion

Critical examination of descriptive statistics in Table 5a for dependent variables and independent variables reveal some vital information. As can be seen from the

entire firm level variables, the mean is greater than the median, except for GDPG variable. Thus, the data is mostly characterized by positive skewness. Based on the mean values of TDTA (3.18), it can be deduced that firms in developing countries prefer debt in their capital structure. Moreover, standard deviation of TDTA is fairly high. This implies that on average, firms in developing countries do not reflect large differences in their total debt holdings when the debt measures are scaled by total assets.

Inflation rates and interest rates means is 6.22 and 10.45 respectively. The disparity in inflation rate and interest rate ranges from -0.90 and 3.42 (minimum value) for some firms and 17.45 and 52.1 (maximum value) for other firms. Thus, the disparity between inflation rates and interest rate implies that some developing countries, firms are faced with higher inflation and interest rates than others in developing nations. However, firms faced with higher inflation and interest rate may make less effective capital structure decision than other firms with lesser rates of inflation and interest.

Table 1 Summary of Descriptive Statistics

Index	TDT	SLlog	PRFT	MTB	NDTS	INF	INT	GDPG	MCGDP
Mean	3.181	14.849	0.062	2.006	0.076	6.223	10.458	5.792	76.357
Median	2.960	14.686	0.070	1.100	0.055	6.217	10.008	6.066	67.464
Max	8.990	26.030	19.619	233.09	857.5	17.454	52.1	14.047	270.197
Min	0.000	0.000	-5.621	-69.7	0.000	-0.900	3.422	-3.549	7.462
Std. Dev.	2.104	2.966	0.196	5.347	4.756	3.284	6.677	2.432	46.763
Skewness	0.483	0.396	43.531	13.158	179.289	0.215	3.558	-0.655	1.662

Source: Authors computation using Stata 14, 2020

With respect to GDPG and MCGDP, the results indicate that the mean is 5.79 and 76.35 respectively. The difference between GDPG and MCGDP ranges from -3.54 and 7.46 (minimum value) for some firms and 14.04 and 270.19 (maximum value) for other firms. Hence, the difference between GDPG and MCGDP implies that

some developing countries firms are having better economic conditions in their countries than other firms' developing countries. However, firms with better economic conditions could make effective capital structure decision than firms with lesser economic conditions.

Correlation results for Model 1 and 2

Table 5b present the correlation coefficient among total debts to total assets (TDTA) and inflation and interest rates are statistically significant and positive (0.09 and 0.07). Similarly, the correlation coefficient between the total debts to total assets and GDP growth and market

capitalization to gross domestic product are statistically significant and positive (0.05 and 0.01) respectively. This suggests that as the economy increases with better condition, debt increases. Moreover, the correlation coefficient between TDTA and firm size is statistically positive and significant (0.07). Likewise, the correlation coefficient between TDTA and profits is statistically significant and positive (0.05). This suggest that as firm size and profits increases, debt increases.

Table 2. Correlation results for objective one (Equation 1 and 2)

	TDTA	SLlog	PRFTS	MTB	NDTS	INF	INT	GDPG	MCGDP
TDTA	1.00								
SLlog	0.078	1.00							
PRFTS	0.005	0.006	1.00						
MTB	-0.065[b]	0.061	0.019	1.00					
NDTS	-0.004[b]	-0.006	-0.099	-0.019	1.00				
INF	0.097[b]	0.047	0.007	-0.007	-0.007	1.00			
INT	0.070[b]	0.064	0.004	0.010	-0.005	0.293	1.00		
GDPG	0.059[b]	-0.011	0.003	0.005	-0.003	0.260	-0.257	1.00	
MCGDP	-0.010[b]	-0.204	-0.005	-0.029	0.005	-0.290	-0.371	-0.115	1.00

Source: Output of Stata 14, 2020

Notes: [a] and [b] indicate correlation coefficient is significant at 1 and 5 percent levels, respectively.

Furthermore, correlation coefficient among total debt to total assets and MTB (growth opportunity) is positive and significant statistically. This suggests that as

growth opportunity increases, debt increases. Conversely, TDTA is adversely related NDTS and statistically significant.

Generalized Method of Moments Results

The study estimates a dynamic panel model built on trade-off theory. Total debt to debt assets ratios is used as dependent variable for results of models 1 to 2. System GMM is the main estimation. The coefficients estimated in the models are significant and have the expected sign. Inflation rate coefficients for model 1 and 2 are (0.051** and 0.059** with t-statistics of 3.87 and 2.96 respectively) significant statistically both at 5 percent level and positively linked TDTA. This positive connection implies that favorable inflation rate increases debt. Also, Interest rate coefficients for model 1 and 2 are (0.042** and 0.045** with t-statistics of 2.46 and 2.79 respectively) significant statistically both at 5 percent level and positively related to TDTA ratio. This positive relation signifies that favorable interest rate increases debt. Likewise, the coefficient of gross domestic product growth (0.001*** and 0.001*** t-statistics of 3.24 and 3.54) in model 1 and 2 respectively are significant statistically both at 1 percent level and positively linked to TDTA ratio. This positive link implies that higher growth in gross domestic product increases debt.

Furthermore, market capitalization to gross domestic product coefficients in model 2 is 0.002** with t-statistics of 3.84 and statistically significant at 1 percent and positively related to TDTA ratio. This significant connection implies that high market value reduces firms' risk which in turn increases debt. However, firm size coefficients for model 1 and 2 are 0.104* and 0.056** with t-statistics of 1.94 and 2.99 respectively are statistically significant both at 10 and 5 percent level and positively linked to TDTA ratio. This positive relation signifies that increase in firm size increases debt. Likewise, the coefficient of Market to book (firms' growth opportunity) is 0.031** and 0.043** t-statistics 2.75 and 3.02 in model 1 and 2 respectively are significant statistically both at 5 percent and positively linked to TDTA ratio. This positive link implies that increase in growth opportunities increases debt.

Table 3. Panel System GMM Result for model 1 and 2

	SYSTEM GMM	SYSTEM GMM
	1	2
SOA	0.040	0.042
$TDTA_{it-1}$	0.960* (25.22)	0.958* (24.24)
INF	0.051** (3.87)	0.059** (2.96)
INT	0.042** (2.46)	0.045** (2.79)
GDPG	0.001*** (3.24)	0.001*** (3.54)
MCGDP	-	0.002*** (3.84)
SLlog	0.104* (1.95)	0.056** (2.99)
PRFTS	-0.900 (-1.38)	-0.589 (-0.91)
MTB	0.031** (2.75)	0.043** (3.02)
NDTS	-36.62 (-1.38)	-23.97 (-0.91)
Industry effects	Yes	Yes
Firm fixed effect	Yes	Yes
Year fixed effect	Yes	Yes
AR(1)	0.000	0.000
AR(2)	0.491	0.490
Difference Sargan Test	-	-
Instruments	54	64

Source: Output of Stata 14.

Notes: SOA is speed of Adjustment to Target Debt level. Asterisks indicate significance at 10% (*), 5% (**) and 1% (***). T-statistics of GMM system model are based on Windmeijer-corrected standard errors. 2nd order serial correlation in first difference is distributed as N (0, 1) under the null of no serial correlation in the residuals.

4.1 Findings, Implications and Discussion

The positive relation between capital structure (debt) and macroeconomics variables support the insights drawn from the theory of trade-off that firms make efficient decisions on capital structure, like deciding on optimal mix of capital

structure that maximize benefits of debt interest tax shield which may bring high returns to shareholders. The positive relationship macroeconomics variables and capital structure, point to the need for shareholders to employ firm managers with sufficient knowledge of macroeconomic conditions that will enhance choices of capital structure. Firms with strategies and targets on macroeconomic situations make higher quality decisions because their knowledge on the workings of the economy allows them to have practical insights on better debt financing decisions (Cole and Sokolyk, 2017), such as capital structure decisions and maximization of shareholders' returns.

Policymakers should be more specific about how to improve the economic conditions in an economy which will aid firms to make valuable decisions on debt management. Policymakers should also create an environment that supports managerial training and should also continue to formulate policies that encourage firm managers to take advantage of training opportunities to enrich their skill and knowledge on debt financing considering macroeconomic conditions in an economy.

5. Conclusion

An important issue in the literature is that unobservable macro-specific variables explain most of the variation in firm's capital structure in developing nations. This study argues and confirms that macroeconomic variables are the potentially factors which explain some of the variation in firms' capital structure. As firms operate with better economic conditions, they proffer effective decisions of capital structure like optimal capital structure; firms can increase shareholders' returns. The results reveal that macroeconomic variables are capital structure determinants in developing African nations and results are robust to model alternative specification and used different macroeconomic variables. The macroeconomic variables are significant statistically and related positively to debt.

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