Debt Financing and Firm Performance: Evidence from Cointegration Analysis

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Abstract

Erstwhile studies proved that debt can positively or negatively affect firm's performance. This study tests the long run and short run dynamic of debt on firm‘s performance in the context of the negative and positive effects. The panel cointegration model, fully modified Ordinary Least Square and error correction model were employed. The panel cointegration result indicates existence of long run relationship between debt and firm performance. 19.85% long run disequilibrium is corrected within a year while there is significant short run relationship between debt and return on investment. In the same vein, 1.52% long run disequilibrium is corrected within a year while there is significant short run relationship between debt and return on assets. This implies that the use of debt on investment and asset, should be properly scrutinise within the fine line of investment and asset to determine optimal use.

Keywords: *Debt, Firm Performance, Panel Data, Cointegration, Long-run, Short-run.*

JEL Classification: *H68, L25*

1. Introduction

Financing decision is one major area of financial management for any firm. The decision involves two major aspects; financing through equity or financing through long term debts. Firm's decision to combine the two sources necessitates the critical analysis of the best combination of the two financing decisions known as capital structure. Long term debt is the act of raising finance from external sources with bond issues or through loans without giving up ownership (Abor, 2005; Lin, Ma, Malatesta, & Xuan, 2013)

Long term debt financing comes with some conditions such as to repay the fund at a specified future date and thus the equity return of the levered firm is affected by some factors such as interest rate charged on loan, duration of loan repayment, leverage and interest coverage ratios (Kirimi, Simiyu & Dennis, 2017). Modigliani and Miller, (1958), assert that firms are expected to select the best combination of debt and equity that will maximise the value of the firm and shareholders wealth. Thus, for the purpose of expansion, the need to raise additional funding is inevitable and this action will alter the capital structure of the firm (Akingunola, Olawale & Olaniyan, 2017).

Therefore, an appropriate combination of equity and debt becomes a continuous activity for the financial manager. The availability of required financing as at when needed is very important for the performance of the firm and the attainment of the shareholders wealth maximisation objective. Notwithstanding the theoretical application of capital structure, studies (Bokhtiar Mainul, Afzalur & Nurul, 2014;Varun, 2014; Onaolapo & Kajola, 2010; Mubeen & Kalsoom 2014; Nirajini & Priya, 2013; Kirimi *et al*, 2017) so far do not agree on the optimal combination of equity and debt (long term and short term).

Consequently, this study attempts to provide an impetus for financing decision, to ascertain the use of long term debt on the quoted firm's performance and its appropriateness in financing. The remainder of this paper contains the literature review in Section 2. Section 3 presents the methodology. Section 4 contains data presentation and analysis. Section 5 provides the conclusions and recommendations of the study.

2. Literature Review

Bhatti and Nguyen (2012) indicate that financial markets are dependent on one another, thus event in debt market affect the money market and vice versa. Theoretically, the impetus to the theoretical background to the study of the combination of equity and debt financing needs, established that capital structure is not relevant when determining a firm's value based on perfect financial market assumption of no tax and bankruptcy cost (Modigliani & Miller

1958). In contrast to the assumption of perfect financial market, the trade-off and pecking order theories among others were developed.

2.1 Theoretical Background

This subsection discusses the related theories that underpin the study of debt and equity combination and performance of firms.

2.1.1 Modigliani and Miller Propositions

Modigliani and Miller (1958) found that capital structure is irrelevant to firm's value determination and this is known as 'MM Proposition I'. Proposition I indicates that value of firm is not related to its debt and equity combination but by its real assets. This proposition was built on the assumption of a perfect capital market where there is no taxes, bankruptcy costs, and availability of information.

Modigliani and Miller (1963) modified proposition I and conclude that tax shield can be generated by the use of debt, thus, the use of debt reduces tax to be paid. Hence, the absolute use of debt without equity is the optimal capital structure for firm, known as 'MM Proposition II'. The propositions I and II were built on the assumption of a perfect capital market. Propositions I and II focused on the advantages of debt finance with the resultant effects in the reduction of corporation tax.

2.1.2 Pecking Order Theory

The pecking order theory also refers to as information asymmetry theory was propounded by Donaldson (1961) after conducting an interview survey of 25 large United States (US) firms, and concluded that internal financing, when available, is preferred by management to external sources. Information plays a major decision role for managers and investors with regards issuing equity vs debt and/or retained earnings (Myers 1984); Myers & Majluf 1984).

Pecking order theory hypothesized the order of financing fresh investment, the use of retained earnings is mostly preferred, followed by debt financing, and then by issuing new equity. This hypothesis hinged on the convenience and low-cost associated with the use of retained earnings. Debt capital is required in the event of unavailability or inadequacy of retained earnings as a result of tax advantage while issuing new equity is preferred lastly due to stock pricing (undervalued) and cost associated with issuing stock to raise new capital for investment.

2.1.3 Agency Cost Theory

Agency cost theory was propounded by Jensen and Meckling, (1976), postulates that stakeholders (shareholders, debt holders, management) interest, activities and functions affecting company's capital. Thus, it is important to find a mid-point that will benefit all the stakeholders. Therefore, optimal debt and equity combination for any company can be obtained by the difference between marginal benefits and marginal costs of extra debt and its associated agency costs.

Empirical studies on debt financing and firm performance are numerous but differ in coverage in terms of number of companies, methodology and country. Profitable companies declaring profit don't rely on debt for finance but tend to adjust their capital structure during the period of finance needs (Negash, 2014; Ramadan & Zayed, 2015).

Majumdar and Chhibber (1999); Simerly and Li (2000); Mesquita and Lara (2003); Abor (2005) studies the impact of debt ratio and firms' performance. Majumdar and Chhibber (1999) establish the existence of negative significant relationship between debt ratio and firm performance while Simerly and Li (2000) found mixed result due to the dynamic business environment. Mesquita and Lara (2003) asserts that long-term debt negatively (although insignificantly) affected rate of return, while Mesquita and Lara (2003) and Abor (2005) asserts that short-term debt and equity capital have significant positive effects on profitability.

The choice of capital structure mix has little or no impact on firm performance in Egypt (Ebaid, 2009), while Bandyopadhyay & Barua, 2016 suggests that Indian company's performance is determined by the capital structure decisions. There exists negative relationship between firm performance and capital structure in Malaysia listed companies (Salim & Yadav, 2012). Yazdanfar and Öhman (2015) assert that debt ratio (trade credit, short-term debt and long-term debt) has inverse relationship with profit of firm.

Nwude, Itiri, Agbadua and Udeh (2016) and Akingunola, Olawale and Olaniyan (2017) employed panel data analysis of firms in Nigeria and the parameter indicates mixed result depending on the measure of performance and debt structure. Omollo, Muturi and Wanjare (2018) examine the effects of debt structures on firm financial performance of Listed at the Nairobi Securities Exchange and found negative and statistically significant of debt structure on returns on assets. Profitability and capital structure were found to have negative relationship but firm size is positively related to non-debt tax shield (Oino & Ukaegbu, 2015).

Most studies mainly conduct regression analysis or generalized method of moments (GMM) and similar analysis using panel data (Ebaid, 2009; Majumdar & Sen, 2010; Salim & Yadav, 2012; Oino & Ukaegbu, 2015; Bandyopadhyay & Barua, 2016; Nwude, et al, 2016; Akingunola et al**,** 2017) . This study establishes the long and short run dynamics of debt on firm performance with the use of Vector Error Corrector Mechanism (VECM) in panel data environment.

3. Methodology

Multiple regression technique was used for this study during the sample period of 2008 – 2015. Data in the annual reports of eighty (80) quoted companies in the Nigerian stock exchange across different sectors was used for this study. The panel ECM model was used to establish the long and short run relationship between the variables.

3.1 Model Specification

The model used for this research, in its functional form is express as:

$$\mathrm{ROI} = \mathrm{F}(\mathrm{LTDTA}, \mathrm{STDTA}, \mathrm{TDTA}, \mathrm{TETA}) \qquad (3.1)$$

$$\mathrm{ROA} = \mathrm{F}(\mathrm{LTDTA}, \mathrm{STDTA}, \mathrm{TDTA}, \mathrm{TETA}) \qquad (3.2)$$

Where ROI is Return on investment; ROA = Return on asset; LTDTA is Ratio of long term debt to total asset; STDTA is Ratio of short term debt to total asset; TDTA is Ratio of total debt to total asset and TETA is Ratio of total equity to total asset.

The econometric form is written as:

$$\mathrm{ROI}_{it} = \beta_1 + \beta_2 \mathrm{LTDTA}_{it} + \beta_3 \mathrm{STDTA}_{it} + \beta_4 \mathrm{TDTA}_{it} + \beta_5 \mathrm{TETA}_{it} + \varepsilon_{it1} \qquad (3.3)$$

$$\mathrm{ROA}_{it} = \beta_1 + \beta_2 \mathrm{LTDTA}_{it} + \beta_3 \mathrm{STDTA}_{it} + \beta_4 \mathrm{TDTA}_{it} + \beta_5 \mathrm{TETA}_{it} + \varepsilon_{it2} \qquad (3.4)$$

i= 1, 2, 3…….80 firms, t = 2008-2015

Where i is the ith quoted company and t is the period for the variable defined above.

This study extends the result to establish the long and short run equilibrium relationship using the cointegration and error correction mechanism. The multivariate cointegrating regression model is given by:

$$\Delta \mathrm{X}_{it} = \sum_{it=1}^{n} \alpha_{it} \Delta \mathrm{X}_{it-i} + \alpha \mathrm{X}_{it-1} + \varepsilon_{it} \qquad (3.5)$$

Where X_{it} is the vector of the explanatory variables respectively, Δ is the difference operator, ε_{it} is residual vector, α_{it} is the short run parameter while α is the long run parameter measuring the short and long run adjustment to changes respectively. αX_{it-1} is the Error Correction Term measuring the speed of convergence to the long run steady or equilibrium state.

The ECM model is given as:

$$\Delta ROI_{it} = \beta_1 + \beta_2 \Delta LTDTA_{it} + \beta_3 \Delta STDTA_{it} + \beta_4 \Delta TDTA_{it} + \beta_5 \Delta TETA_{it} + \beta_6 \varepsilon_{1it-1} + \varepsilon_{t1} \quad (3.6)$$

$$\Delta ROA_{it} = \beta_1 + \beta_2 \Delta LTDTA_{it} + \beta_3 \Delta STDTA_{it} + \beta_4 \Delta TDTA_{it} + \beta_5 \Delta TETA_{it} + \beta_6 \varepsilon_{2it-1} + \varepsilon_{t2} \quad (3.7)$$

Where ε_{t1} and ε_{t2} are the error term while ε_{it1-1} and ε_{it2-1} are the lagged value of the error term in equations 3.3 and 3.4 respectively.

Where $\beta_2, \beta_3, \beta_4, \beta_5$, represents the short run coefficients of the variables respectively, β_6 is the coefficient of the Error Correction Term (derived from the cointegrating regression of the variables).

3.2 Methods of Data Analysis

Quantitative tools of data analysis employed are the panel data unit root test, pooled regression to determine the appropriate model from fixed or random effect model. The criterion technique was used to determine the lag length and the cointegration model was used to determine the long-run or equilibrium relationship. The Error Correction Mechanism (ECM) was used to determine the short run disequilibrium adjustment.

4. Analysis and Presentation of Results

This section provides the result and the interpretation of the result conducted on the data. The result were presented in tabular forms and followed by the interpretation.

Table 4.1: Unit Test Result of ROA, LTDTA, STDTA, ROI, TETA, TDTA

Variable	Methods	Stat	Prob.	Variable	Methods	Stat	Prob.
ROA	Levin, Lin and	-	0.0000	ROI	Levin, Lin and	-	0.0000
	Chu	30.9458	0.0000		Chu	18.4117	0.0000
	Im, Pesaran and	-	0.0000		Im, Pesaran and	-	0.0000
	Shin	7.78719	0.0000		Shin	5.26377	0.0000
	ADF	346.374			ADF	286.305	
	PP	387.595			PP	294.756	
LTDTA	Levin, Lin and	-	0.0000	TETA	Levin, Lin and	-	0.0000
	Chu	21.0793	0.0000		Chu	13.2565	0.0000
	Im, Pesaran and	-	0.0000		Im, Pesaran and	-	0.0000
	Shin	3.97423	0.0000		Shin	4.00463	0.0000
	ADF	268.058			ADF	274.893	
	PP	243.061			PP	317.368	
STDTA	Levin, Lin and	-	0.0000	TDTA	Levin, Lin and	-	0.0000
	Chu	26.4693	0.0000		Chu	17.7949	0.0000
	Im, Pesaran and	-	0.0000		Im, Pesaran and	-	0.0000
	Shin	8.07173	0.0000		Shin	4.97020	0.0000
	ADF	337.865			ADF	272.956	
	PP	328.401			PP	276.753	

Source: Authors Computation, 2019.

Table 4.1 present the unit root test result for the variables used in the study. The result indicates that all the variables have no unit root and therefore, stationary at level. The p value of the unit root methods (Levin, Lin & Chu; Im, Pesaran & Chin; Augmented Dickey Fuller; and Philips Perron) used is less than 5%. This indicates that the data are suitable for regression analysis.

Table 4.2: Kao Residual Cointegration Test

Series: ROA, LTDTA, STDTA, TDTA, TETA			Series: ROI, LTDTA, STDTA, TDTA, TETA		
Methods	**Stat.**	**Prob.**	**Methods**	**Stat.**	**Prob.**
Augmented Dickey Fuller	- 9.588123	0.0000	Augmented Dickey Fuller	- 7.653698	0.0000

Source: Author's Computation, 2019.

The cointegration test result of the two models stated in equation 3.3 and 3.4 is depicted in table 4.2. The cointegration result indicates that return on asset (ROA) and debts (LTDTA, STDTA, TDTA, TETA) are cointegrated, so also return on investment (ROI) and debt (LTDTA, STDTA, TDTA, TETA) are cointegrated. This implies that debt and return on asset and investment have long run equilibrium relationship. P value of the Augmented Dickey Fuller statistics under Kao residual cointegration test is less than 5%. The panel long run model is now appropriate since the variables are cointegrated.

It is a requirement that the lag to select for the model should be determined. Thus, the lag selection criteria applied were Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC), Final Prediction Error (FPE), Hannan-Quinn Information Criterion (HQ) and sequential Modified LR test statistic (LR).

Table 4.3: VAR Lag Order Selection Criteria

	Variables: ROA, LTDTA, STDTA, TDTA, TETA					Variables: ROA, LTDTA, STDTA, TDTA, TETA				
Lag	LR	FPE	AIC	SC	HQ	LR	FPE	AIC	SC	HQ
0	NA	5.71e-06	2.11610	2.17498	2.13961	NA	0.66891	13.78728	13.84616	13.81079
1	883.386	4.01e-07	-0.54098	-0.18770	-0.39991	1132.756	0.02121	10.33603	10.68931	10.47710
2	306.819	1.74e-07*	-1.37767	-0.72999*	-1.11904*	317.493*	0.00888*	9.46479*	10.11247*	9.723425*
3	54.1858*	1.70e-07	-1.39966*	-0.45758	-1.02347	37.090	0.00919	9.49904	10.44112	9.875227
4	26.9255	1.82e-07	-1.33347	-0.096985	-0.83972	12.386	0.01031	9.61386	10.85034	10.10761

Source: Author's Computation, 2019.

The lag order selected by VAR for the variables ROA, LTDTA, STDTA, TDTA and TETA was lag 2 as indicated by FPE, SC and HQ, while the lag order selected for the variables ROA, LTDTA, STDTA, TDTA and TETA is also 2 lags as indicated by all the criterions. Therefore, the long run (cointegrating) equation was estimated using 2 lags for the variables as appropriate.

Table 4.4 shows the Panel Fully Modified Least Squares (FMOLS) for ROI and ROA as the dependent variable.

Table 4.4: Panel Fully Modified Least Square (FMOLS) Cointegrating Equations

Dependent Variable: ROI			Dependent Variable: ROA		
Variable	Coefficient	Prob.	Variable	Coefficient	Prob.
LTDTA	14176.39	0.0000	LTDTA	-912.7676	0.0000
STDTA	14180.07	0.0000	STDTA	-909.4673	0.0000
TETA	-1.740632	0.8164	TETA	0.289373	0.0000
TDTA	-14155.57	0.0000	TDTA	909.4235	0.0000

Source: Author's Computation, 2019.

The FMOLS shown in table 4.4 indicates that LTDTA and STDTA have positive significant impact on ROI while they have negative significant impact on ROA. TDTA have negative significant effect on ROI but it has positive significant effect on ROA. TETA is negatively insignificant to ROI but it is positively significant to ROA. The ECM model for ROI and ROA was estimated from the residuals of the cointegrating equations of table 4.5.

Table 4.5: Cointegration Equation

Dependent Variable: ROI
Method: Panel Least Squares
Sample (adjusted): 2010 2015
Periods included: 6
Cross-sections included: 57
Total panel (balanced) observations: 342
ROI=C(1)+C(2)*ROI(-1)+C(3)*ROI(-2)+C(4)*LTDTA(-1)+C(5)*LTDTA(-2)
+C(6)*STDTA(-1)+C(7)*STDTA(-2)+C(8)*TDTA(-1)+C(9)*TDTA(-2)
+C(10)*TETA(-1)+C(11)*TETA(-2)+C(12)*ROI_RESID(-1)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	1.495198	1.728003	0.865275	0.3875
ROI (-1)	0.882753	0.046505	18.98178	0.0000
ROI (-2)	0.202517	0.052736	3.840219	0.0001
LTDTA (-1)	-2141.600	331.1195	-6.467756	0.0000
LTDTA (-2)	1.144664	13.71371	0.083469	0.9335
STDTA (-1)	-2141.585	331.2662	-6.464847	0.0000
STDTA (-2)	-0.931327	13.59675	-0.068496	0.9454
TDTA (-1)	2141.106	330.7662	6.473170	0.0000
TDTA (-2)	-1.135833	13.36772	-0.084968	0.9323
TETA (-1)	-0.344202	1.069765	-0.321755	0.7478
TETA (-2)	0.056176	1.063040	0.052844	0.9579
ROI_RESID (-1)	-0.198563	0.025942	-7.653985	0.0000

Source: Author's Computation, 2019.

The cointegration equation parameter {ROI_RESID (-1)} is expected to be negatively signed and significant. ROI_RESID (-1) representing the error correction mechanism is significant and negatively signed. This indicates that the variables have long-term equilibrium relationship from which 19.85% change in the long run disequilibrium is corrected within a year.

Table 4.6: Wald Test for the variables with ROI as the Dependent Variable

Variables	Test Stat.	Value	Prob.
LTDTA	F-Statistics	20.91631	0.0000
	Chi-square	41.83262	0.0000
STDTA	F-Statistics	20.91244	0.0000
	Chi-square	41.82489	0.0000
TDTA	F-Statistics	20.95113	0.0000
	Chi-square	41.90227	0.0000
TETA	F-Statistics	0.051771	0.9496
	Chi-square	0.103541	0.9495
ALL VARIABLES	F-Statistics	5.504846	0.0000
	Chi-square	44.03877	0.0000

Source: Author's Computation, 2019.

Table 4.6 indicates that LTDTA, STDTA, TDTA have significant short run relationship with ROI while TETA has insignificant short run relationship with ROI. The variables also have jointly significant short run relationship with ROI.

Table 4.7: Cointegration Equation

Dependent Variable: ROA
Method: Panel Least Squares
Date: 03/19/19 Time: 16:39
Sample (adjusted): 2010 2015
Periods included: 6
Cross-sections included: 57
Total panel (balanced) observations: 342
ROA=C(1)+C(2)*ROA(-1)+C(3)*ROA(-2)+C(4)*LTDTA(-1)+C(5)*LTDTA(-2)
+C(6)*STDTA(-1)+C(7)*STDTA(-2)+C(8)*TDTA(-1)+C(9)*TDTA(-2)
+C(10)*TETA(-1)+C(11)*TETA(-2)+C(12)*ROA_RESID(-1)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.140725	0.032347	4.350475	0.0000
ROA(-1)	0.280560	0.044603	6.290135	0.0000
ROA(-2)	0.175844	0.037461	4.694045	0.0000
LTDTA(-1)	-17.11092	5.835877	-2.932021	0.0036
LTDTA(-2)	0.080297	0.241022	0.333152	0.7392
STDTA(-1)	-17.09724	5.839406	-2.927907	0.0036
STDTA(-2)	0.036443	0.239072	0.152437	0.8789
TDTA(-1)	17.03626	5.829125	2.922610	0.0037
TDTA(-2)	-0.096571	0.235179	-0.410628	0.6816
TETA(-1)	-0.076410	0.018959	-4.030200	0.0001
TETA(-2)	-0.029248	0.019237	-1.520383	0.1294
ROA_RESID(-1)	-0.001519	0.000456	-3.335284	0.0009

Source: Author's Computation, 2019.

The cointegration equation parameter {ROA_RESID (-1)} representing the error correction mechanism is negatively signed and significant at 5% level as shown in table 4.7. This indicates that the variables have long-term equilibrium relationship from which 1.52% long run disequilibrium is corrected within a year.

Table 4.8 indicates that LTDTA, STDTA, TDTA and TETA have significant short run relationship with ROA individually. The variables also have jointly significant short run relationship with ROA.

Table 4.8: Wald Test for the variables with ROA as the Dependent Variable

Variables	Test Stat.	Value	Prob.
LTDTA	F-Statistics	4.345343	0.0137
	Chi-square	8.690686	0.0130
STDTA	F-Statistics	4.291206	0.0145
	Chi-square	8.582412	0.0137
TDTA	F-Statistics	4.337019	0.0138
	Chi-square	8.674038	0.0131
TETA	F-Statistics	10.54448	0.0000
	Chi-square	21.08897	0.0000
ALL VARIABLES	F-Statistics	5.773731	0.0003
	Chi-square	30.18985	0.0002

Source: Author's Computation, 2019.

In summary, long term and short term debts has positive impact on return on investment similar to Kirimi, Simiyu and Dennis (2017) but in contrast to Salim and Yadav (2012), also there exist long run relationship between debt and return on investment. Long term and short term debt have negative impact on return on asset similar to Akingunola, Olawale and Olaniyan (2017); Salim and Yadav (2012); Ebaid (2009); and there exist long run relationship between debt and return on asset.

5. Conclusion and Recommendations

This study investigates the impact of debt on firm performance in Nigeria. Data from eighty (80) quoted firm on the Nigerian stock exchange ranging from 2008-2015 was used. The panel data was tested for stationarity using Levin, Lin & Chu; Im, Pesaran & Chin; Augmented Dickey Fuller; and Philips Perron unit root test and all the data exhibit I(0).

The kao panel co-integration test was used to test for long term relationship between the variables and findings shows that there exist log run relationship between debt and firm performance. There is also significant short term relationship between debt and firm performance as shown by the Wald test. The study also reveals that long and short term debt have significant positive effect on return on investment, while long and short term debt have significant negative effect on return on asset.

This implies that the use of debt policy on investment and asset, by quoted firms should be properly scrutinise within the fine line of investment and asset to determine the optimal use. It is therefore, concluded that there exist both long and short run relationship between debt (long and short term) and firm performance.

Based on the findings from the study, the study makes the following recommendation:

i. Firms need to strictly define the fine line separating investment and asset

ii. The separation of asset and investment as a measure of performance will enable the firm to make optimal use of the debt in the capital structure

iii. Quoted firm should adjust the level of their debt to reduce the eroding of profit by debt holders.

iv. Quoted firms should consistently monitor their liability indicators (such as leverage ratios) to caution against excessive use of debt.

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