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Triangulation Analysis of Capital Structure and Firms' Performance in Nigeria

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Abstract. This study employs a triangulation approach to investigating the relationship between capital structure and firms' performance in Nigeria. We consider thirty-one manufacturing firms with audited financial statements with the use of historical firm-level data sets for the periods 1999 and 2012. The use of triangulation method of analyses comprises a barrage of accounting, descriptive, correlation and empirical analyses. We find a strong curvilinear relation between ROA and the debt-to-equity ratio, otherwise known as Leverage. According to the dominant corporate finance paradigm, capital structure choice is a tradeoff between the costs and benefits of debt. It has been refuted that the large firms are more inclined to retain higher performance than middle firms under the same level debt ratio. Most existing papers on capital structure require firm's performance or firm's value to bear the linear relation with debt ratio, but this empirical evidence does not support this.

Keywords: Capital Structure, Firms' Performance, Triangulation, Nigeria.

1. Introduction

A triangulation analysis cannot be over-emphasized going by the fact that the empirical literatures on capital structure are replete with varying and distinct measures of leverage ratios. While all of these different measures lack consensus, some measures are incorrectly formulated (see Welch, 2011). Besides, Welch (2011) emphasized that there are two common problems in capital structure research. Firstly, it is not clear whether non-financial liabilities should be considered debt and that they should never be considered as equity. Secondly, equity-issuing activity is not synonymous to capital structure changes. However, empirical literatures are found to align with these two pitfalls. Potential investors will also be interested in the results of the capital structure analysis, since those results can make it easier to decide whether to hold, sell or acquire more shares of the company stock. By comparing the analysis results with those from prior periods, it is possible to spot positive or negative trends that are emerging, then, decide if the business is likely to continue profitability in the future. From this perspective, the capital structure analysis can aid owners in making changes that strengthen the business while also allowing investors to determine to what extent they wish to be involved with that company.

Going by these dynamics, it becomes imperative to provide a holistic analytical perspective to capital structure through a triangulation analysis. The benefits of triangulation include "increasing confidence in research data, creating innovative ways of understanding a phenomenon, revealing unique findings, challenging or integrating theories, and providing a clearer understanding of the problem" (Thurmond, 2001). These benefits largely result from the diversity and quantity of data that can be used for analysis. This remains the kernel of this study and the existing gap in empirical literature that this study seeks to cover. As such, we undertakes accounting analyses through the use of ratio analyses, economic analyses through the use of economic measurements and the use of atheoretical analyses of descriptive, correlation and tabular analyses. Apart from this introductory aspect, the remaining part of this study is organized into three other sections. Section Two relates the methodological framework alongside the specification of model and the estimations across the various approaches. Section three discusses empirical findings while section four, being the last, concludes and make policy suggestions.

2. Methodological Framework and Model Specification

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The methodological approach to this study is a triangulation analysis where we employed a barrage of estimation procedures to attaining a valid outcome from the nexus between capital structure and performance of corporate firms in Nigeria. As such, we conduct accounting analyses through the use of ratio analyses, economic analyses through the use of econometric cum statistical analyses and the use of atheoretical analyses of descriptive, tabular and correlation analyses. For the accounting analyses, we seek to investigate both short-term and long-term analyses while for the economic analyses captures the short-run and long-run analyses of capital structure and firm performance. The sources of data for analyses are the audited financial statements of manufacturing firms in Nigeria. Our choice of settling for thirty one (31) firms from the manufacturing sector follow a simple random sampling technique where an average of two firms were selected from each of categorizations (see Owolabi and Nyang, 2012).

Table I: Accounting Analyses of Capital Structure

S/N	Capital Structure Analyses	Short-term Measures	Long-term Measures
1	Current Ratio/Gearing Ratio	Current Assets / Current Liabilities	Fixed Assets / Long Term Liabilities
2	Interest Cover/ Fin. Leverage Ratio	Profit + Interest / Interest	Debt / Equity
3	Solidity	-	Equity *100 / Total Capital

Source: Jennings (2005)

Table II: Accounting Analyses of Corporate Performance

S/N	Performance Analyses	Short-term Measures	Long-term Measures
1	Net Profit Margin/Return to Total Capital	Profit b4 int. & extra ord. costs / Turnover	Operating Result +Fin.Inc*100 / Asset (average value)
2	Operating Margin Ratio/ Return On Capital Employed	Operating Results*100 / Turnover	Profit b4 extra-ord. costs * 100 / Equity (average value)
3	Asset Turnover Ratio	Operating result + Fin. Inc. *100 / Turnover	Total Turnover / Total Capital (average value)

Source: Jennings (2005)

Within the fulcrum of economic analyses, we understudy both the dynamic (short-run) and static (long-run situations) analyses. The aim of the short-run analysis is to introduce some dynamic effects into the standard panel model, which is done through the inclusion of a lagged dependent variable among the regressors. The justification for this form of model can be the partial adjustment model among others:

$$\begin{aligned} y_{it}^{*} &= \alpha_0 + \alpha_1 x_{it} + u_{it} \\ y_{it} - y_{it-1} &= \lambda(y_{it}^{*} - y_{it-1}) \end{aligned} \tag{1}$$

Where y^* is the desired level of y. By substituting the expression for y^* into the other equation we obtain the following estimating equation:

$$y_{it} = \alpha_0\lambda + (1-\lambda)y_{it-1} + \lambda\alpha_1 x_{it} + \lambda u_{it} \tag{2}$$

Unfortunately there is a problem with trying to estimate this type of model, as the lagged dependent variable will be correlated with the error term (in small samples). To overcome this, an instrumental variable technique can be used, such as Generalised Method of Moments (GMM), where the instruments can be

lagged values of the variables in the original models. There are two approaches to dynamic panel models; the most common is the Arellano-Bond dynamic panel, where individual or fixed effects are accounted for by differencing the data. The second approach is the Arellano-Bovver approach, which differs to the former by allowing the fixed effects through orthogonal deviations. The peculiarities of these two models are well documented in standard methodological literature (see Green, 2008). On the other hand, the long-run static model is to ensure that capital structure is not time-bound and that what is analysed today holds perpetually into the future. Simple linear model in a static level;

$$Y_{it} = \gamma_1 + \beta_1 X_{it} + \beta_2 X_{it} + ... + \beta_k X_{it} + \mu_{it}; i = 1,...N \; and \; t = 1,...T \tag{3}$$

Or compactly, our static model to analyze firms with panel data is as follows:

$$Y_{it} = \beta_1 X_{it} + \gamma_i + \lambda_t + u_{it} \tag{4}$$

with

$i = 1,...N; t = 1,...T$ and;

Y_{it} = the leverage of firm i in year t.; X_{it} = a k * 1 vector of explanatory variables.

β_1= a k * 1 vector of constants; γ_i = firm effect assumed constant for firm i over t.

λ_t= time effect assumed constant for given t over I; u_{it}= error term.

A variant of this static analyses are the fixed-effects and random-effect. The former analyses the impact of variables that vary over time. When using FE, we assume that something within the individual may impact or bias the predictor or outcome variables and we need to control for this. The equation for the fixed effects model becomes:

$$Y_{it} = \beta_0 + \beta_1 X_{1,it} + ... + \beta_k X_{k,it} + \gamma_2 E_2 + ... + \gamma_n E_n + u_{it} \tag{5}$$

where

Y_{it} is the dependent variable (DV) where i = entity and t = time; $X_{k\,it}$ represents independent variables (IV); β_k is the coefficient for the IVs; u_{it} is the error term E_n is the entity n. Since they are binary (dummies) you have n-1 entities included in the model; $\gamma_2$is the coefficient for the binary repressors (entities); both eq.4 and eq.5 are equivalents. We could add time effects to the entity effects model to have a time and entity fixed effects regression model;

$$Y_{it} = \beta_0 + \beta_1 X_{1,it} + ... + \beta_k X_{k,it} + \gamma_2 E_2 + ... + \gamma_n E_n + \delta_2 T_2 + ... + \delta_t T_t + u_{it} \tag{6}$$

where

Y_{it} is the dependent variable (DV) where i = entity and t = time; $X_{k,it}$ represents independent variables (IV); β_k is the coefficient for the IVs; u_{it} is the error term E_n is the entity n. Since they are binary (dummies) you have n-1 entities included in the model; γ_2 is the coefficient for the binary regressors (entities); T_t is time as binary variable (dummy), so we have t-1 time periods; δ_t is the coefficient for the binary time regressors. Control for time effects whenever unexpected variation or special events may affect the outcome variable. The least square dummy variable model (LSDV) provides a good way to understand fixed effects. The effect of x1 is mediated by the differences across countries. By adding the dummy for each country we are estimating the pure effect of x1 (by controlling for the unobserved heterogeneity).Each dummy is absorbing the effects particular to each country.

Nonetheless, the rationale behind random effects model is that, unlike the fixed effects model, the variation across entities is assumed to be random and uncorrelated with the predictor or independent variables included in the model, the crucial distinction between fixed and random effects is whether the unobserved individual effect embodies elements that are correlated with the regressors in the model, not whether these effects are stochastic or not [Green, 2008]. If you have reason to believe that differences across entities have some influence on your dependent variable then you should use random effects. An advantage of random effects is that you can include time invariant variables (i.e. gender). In the fixed effects model these variables are absorbed by the intercept. The random effects model is;

$$Y_{it} = \beta X_{it} + \alpha + u_{it} + \varepsilon_{it} \tag{2.7}$$

where

u_{it} = Between-entity error;

ε_{it} = Within-entity error.

Random effects assume that the entity's error term is not correlated with the predictors which allows for time-invariant variables to play a role as explanatory variables. In random-effects we need to specify those individual characteristics that may or may not influence the predictor variables. The problem with this is that some variables may not be available therefore leading to omitted variable bias in themodel.RE allows generalizing the inferences beyond the sample used in the model. Whether to treat the effects as fixed or random is not an easy question to answer. However, it can make a big difference in the estimates of the parameters. The salient distinction between the two models is whether the time-invariant effects; i, are correlated with regressors or not. The random effects assume that they are uncorrelated, while the fixed effects estimator allows them to be correlated. To deal with the problem of heteroscedasticity and serial correlation, we select an appropriate model by testing Random versus Fixed-effect models. Hausman's specification test has been used to make a choice between the fixed effects and random effects models so that whether or not the regressors have been correlated with individual effects have been tried to be investigated. To perform this comparison, the character of the individual effects is tested through the Hausman's specification test which is described below:

$$Ho: Cov\ (\gamma_2, X_{1,it}) = 0 \tag{8}$$

2.1. Estimations and discussion of findings

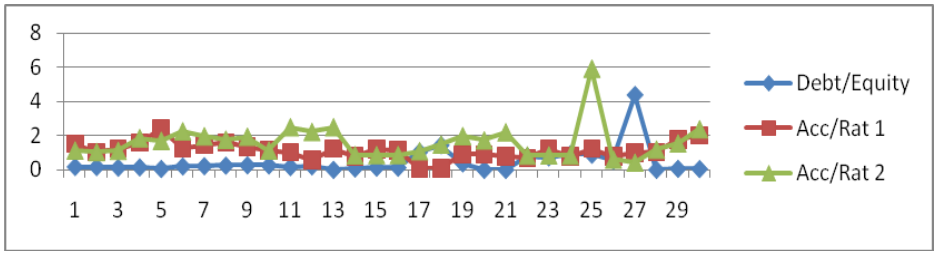

Fig. 1: Patterns of Capital Structure Ratios of Nigerian Firms

The capital structure behaviour of corporate firms in Nigeria as shown in fig. 1 above is instructive. The trend shows that Nigerian firms have adopted various mix of capital structure than only the debt-equity ratio can fully capture and explain. With the exemption of two firms (firm 17 and 18) which did not have long-term liabilities, the remaining firms follow totally distinct ratios of fixed assets to long term liabilities; that is, different Accounting ratio 1.

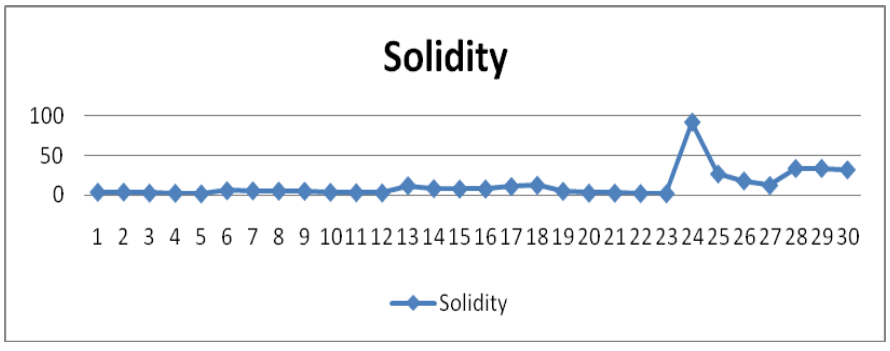

Fig. 2: Solidity of Nigerian manufacturing firms (in percentages).

Solidity is a measure of the extent by which the assets are funded by the equity (owners' capital). Hence, it is a measure of the vulnerability of the creditor's claim. The solidity ratio should preferably be about 30%. As depicted above, most Nigerian firms are not solid. As such, the creditor's claim could not be guaranteed. Only four firms out of the 31 sampled firms show exemption to this. The implication to this is that bankruptcy rate could be astronomically high in the Nigerian manufacturing firms since creditors legally

gain possessions of collaterals in lieu of loan repayment at the point of default. This could possibly explain the reason why most firms in the Nigerian manufacturing sector favour more equity to debt in their capital structure or finance mix.

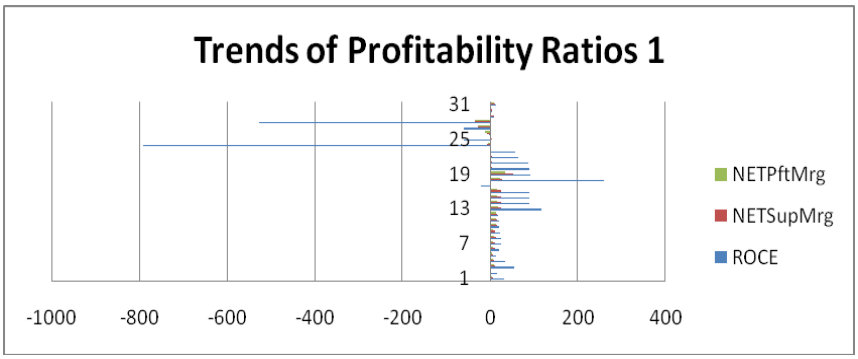

Fig. 3: Trends of profitability ratios 1.

As expected and as earlier discussed above, the return on capital employed (proxied ROCE) is the highest of the profitability ratio. This suggests that the management of firms in the Nigerian manufacturing sector have reasonably succeeded in judicious utilization of the resources kept at their disposal by the shareholders as well as the owners of the businesses; thus, maximizing the wealth of shareholders. This implies that the agency cost is relatively reduced since it appears the objective of the shareholders is secured in the hands of the board of directors who are in charge of the day to day activities of the businesses.

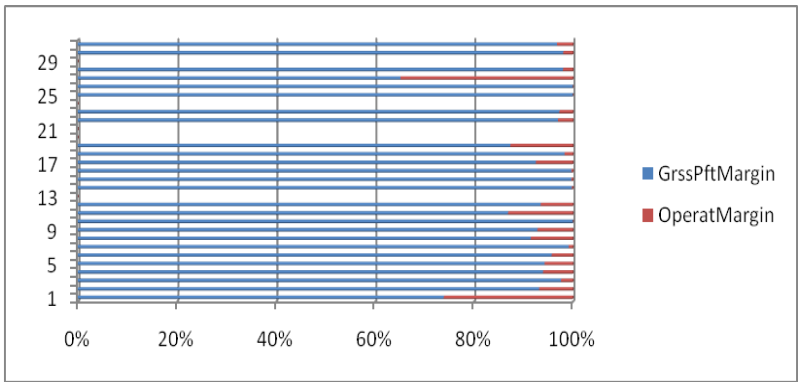

Fig. 4: Trends of profitability ratios 2

As describes in the fig. 4 above, the operating margin is constituted in the lowest 20th percentile while the gross profit margin is constituted in the upper 80th percentile. Two firms are exceptional to this behavior as their operating margin forms the lowest 40th percentile while their gross profit margin forms the remaining 60th percentile.

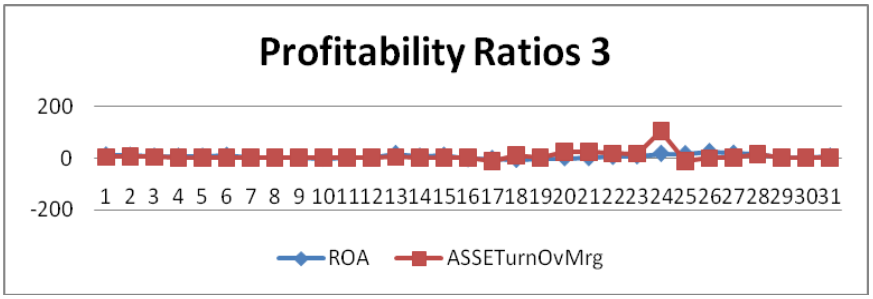

Fig. 5: Trends of profitability ratios 3

To capture this aspect of firms' performance, the trend analysis in Fig. 5 depicts it better. Although both measures tarry together for some firms, it is generally of mixed results. While few firms have more assets turnover margin; most of the firms' return on asset coincides with the asset turnover margin (see figure 5 above).

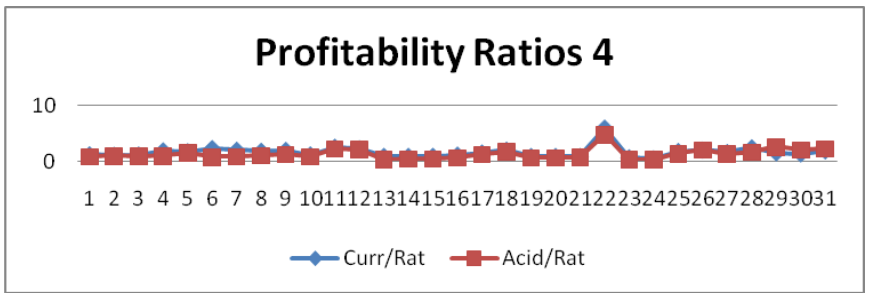

Fig. 6: profitability ratios 4

These trends suggest that the inventory of manufacturing firms in Nigeria is covered by the amount of overdraft sought for. This is possibly the case in which the overdraft received is secured with the companies' inventory and may not be financially risky as lending institutions will not threaten the perpetual succession of these firms when default in payment of principal and/or interest on loan is not paid by the concerned firm:

Short-run Dynamics of Capital Structure and Firms' Performance

```
Arellano-Bond dynamic panel-data estimation  Number of obs      =       104
Group variable: coys                         Number of groups   =        27
Time variable: year
                                             Obs per group:  min =         1
                                                             avg =3.851852
                                                             max =         6

Number of instruments =     30               Wald chi2(9)       =     32.37
                                             Prob > chi2        =    0.0002
One-step results
```

roa	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
roa						
L1.	.0765694	.1472845	0.52	0.603	-.2121029	.3652418
atan	-.0342471	.0233774	-1.46	0.143	-.080066	.0115718
deb	-.0001156	.0001921	-0.60	0.547	-.000492	.0002608
fsiz	-.0645714	.0555928	-1.16	0.245	-.1735313	.0443884
gop	.000544	.0002256	2.41	0.016	.0001018	.0009862
infr	.0011987	.0027261	0.44	0.660	-.0041444	.0065418
intr	.0127284	.0058434	2.18	0.029	.0012756	.0241812
mcap	-9.59e-06	.0000288	-0.33	0.739	-.0000661	.0000469
totassets	-5.97e-10	4.43e-10	-1.35	0.178	-1.46e-09	2.72e-10
_cons	.5047314	.3671321	1.37	0.169	-.2148344	1.224297

```
Instruments for differenced equation
        GMM-type: L(2/.).roa
        Standard: D.atan D.deb D.fsiz D.gop D.infr D.intr D.mcap D.totassets
Instruments for level equation
        Standard: _cons

.

System dynamic panel-data estimation         Number of obs      =       136
Group variable: coys                         Number of groups   =        27
Time variable: year
                                             Obs per group:  min =         2
                                                             avg =5.037037
                                                             max =         7

Number of instruments =     37               Wald chi2(9)       =     41.36
                                             Prob > chi2        =    0.0000
One-step results
```

roa	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
roa						
L1.	.3180664	.1154234	2.76	0.006	.0918408	.544292
atan	-.0402084	.0251195	-1.60	0.109	-.0894417	.0090248
deb	-.0000791	.0002141	-0.37	0.712	-.0004987	.0003405
fsiz	.0044829	.0476567	0.09	0.925	-.0889225	.0978883
gop	.0002528	.0001712	1.48	0.140	-.0000828	.0005884
infr	.0008971	.002967	0.30	0.762	-.0049181	.0067122
intr	.0073648	.0057926	1.27	0.204	-.0039884	.0187181
mcap	-.0000458	.0000264	-1.74	0.083	-.0000974	5.91e-06
totassets	-4.36e-10	4.70e-10	-0.93	0.354	-1.36e-09	4.86e-10
_cons	.0694776	.3099038	0.22	0.823	-.5379227	.6768779

```
Instruments for differenced equation
        GMM-type: L(2/.).roa
        Standard: D.atan D.deb D.fsiz D.gop D.infr D.intr D.mcap D.totassets
Instruments for level equation
        GMM-type: LD.roa
        Standard: _cons

.
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```
Random-effects GLS regression                   Number of obs      =       146
Group variable: coys                            Number of groups   =        27

R-sq:  within  = 0.1159                         Obs per group: min =         2
       between = 0.0003                                        avg =       5.4
       overall = 0.0269                                        max =         8

Random effects u_i ~ Gaussian                   Wald chi2(7)       =    121.03
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000

                                    (Std. Err. adjusted for 27 clusters in coys)
------------------------------------------------------------------------------
             |               Robust
         roa |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        atan |   .0436294   .0650725     0.67   0.503    -.0839102    .1711691
         deb |  -.0001298   .0000459    -2.83   0.005    -.0002197   -.0000398
        fsiz |   .0663832   .0480042     1.38   0.167    -.0277033    .1604696
         gop |    .000057   .0000874     0.65   0.514    -.0001142    .0002283
        infr |   .0036275   .0022928     1.58   0.114    -.0008663    .0081212
        intr |   .0062878   .0082512     0.76   0.446    -.0098843    .0224598
        mcap |  -.0000138   .0000148    -0.93   0.352    -.0000428    .0000153
  totassets |  -7.96e-10   2.31e-10    -3.44   0.001    -1.25e-09   -3.43e-10
       _cons |  -.3584431   .3126621    -1.15   0.252    -.9712495    .2543634
-------------+----------------------------------------------------------------
     sigma_u |  .15428139
     sigma_e |  .15472283
         rho |  .49857142   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

2.2. Discussion of findings

Indications emanating from the estimates obtained above suggest that following the estimates of the differenced dynamic panel models earlier specified, only the growth opportunities (proxied as GOP) and the rate of interest (proxied as INTR) positively and significantly impact on the profitability of corporate firms in Nigeria with 0.0005 and 0.0127 coefficients coupled with 2.41 and 2.18 Z-statistics values respectively. Also, the internal stability of the Nigerian economy as depicted by the rate of inflation (proxied as INFR) is positively but insignificantly related to the profit of corporate firms in Nigeria with 0.0012 coefficients and 0.44 Z-statistics value at the 5% level of significance. However, all other variables such as the assets tangibility (proxied as ATAN), the debt-equity ratio (proxied as DEB), the firm size (proxied as FSIZ), the market capitalization (proxied as MCAP) and the quantum of total assets (proxied as TOTASSETS) are all negatively and insignificantly linked to the profit of Nigeria firms. The ATAN and DEB have -0.0342 and -0.0001 coupled with 1.46 and 0.60 absolute Z-statistics values respectively while the FSIZ, MCAP and TOTASSETS have -0.0646, 9.59e-06 and -5.97e-10 coefficients with 1.16, 0.33 and 1.35 absolute Z-statistics values respectively.

In order to overcome the weak instruments limitation inherent in the differenced dynamic panel model and also going by the fact that the lagged dependent variable (that is the dynamic proxy) is insignificant at 0.52 Z-statistics value, the estimates of the system dynamic panel model, as proposed by Arellano and Bover (1995), were sought. Estimates obtained from this system dynamic model are, therefore, different from its differenced counterpart as exemplified above (see Appendix section). First and foremost, it would be affirmed that the lagged dependent variable with 2.76 Z-statistics value and 0.006 p-values highly justifies the inclusion of the variable into the model and thus crystallizes the essence of the dynamic panel model. Unlike its differenced dynamic version, the estimates obtained from the systemic version diverges substantially as it suggests that only the market capitalization, though negatively at -0.00046 coefficients, significantly impacts on the profitability index of Nigeria firms with 1.74 absolute Z-statistics. But the assets tangibility (proxied as ATAN), the debt-equity ratio (proxied as DEB) and the quantum of total assets (proxied as TOTASSETS) replicate its negative and insignificant impacts. The firm size, growth opportunities, rates of inflation and interest are all positively insignificantly-related to the profitability index of corporate firms in Nigeria. Indications from the random-effects static dynamic panel model denotes that really, capital structure (that is the debt-equity ratio) is a long-run phenomenon in Nigeria going by the fact that it has 2.83 absolute Z-statistics value with 0.005 p-values at the 5% level of significance.

Theoretically, this outlook lend credence to the submission that the Nigerian corporate firms is in support of the Static Trade-off theory of capital structure which posited that investors usually follow a gradual approach in adjusting debt-equity ratio in their firms; thus giving a curvilinear shape of capital structure in firms. With a -0.0001 coefficient for the debt-equity ratio, it is obvious that highly-geared firms usually experienced lower profit. All other variables in this regard and during the long-run situation, are insignificant,

though positive-related in nature with the exception of the market capitalization which is negatively-related in the long-run (see Appendix section).

3. Conclusion and Policy Suggestions

Observing the monotonicity nature at which the debt ratio thread (appendix refers), it could be substantiated that this study supports the Standard trade-off theory as demonstrated by Leland (1994) which predicts that the value of firms will first increase, then decreases as debt ratio increases. This presupposes that this study is able to come out with a Curvilinear relations (which is consistent with the Standard Trade-off theory as empirically researched by Shyan-Rong& Chen-Hsun; 2008) between firms' performance and capital structure. Findings from these estimates indicate that the more a firm maximizes its shareholders' fund, the better its performance. Also, the higher the internal instability of the economy, the higher the firms' performance; perhaps, as a result of various strategic mission embarked upon to save the firm and ensure its continuity on the part of perpetual succession. An increasing trend in the cost of fund as represented by the rate of interest also impact significantly on the firms' performance. This garnished the seminal work of Modigliani and Miller (1963) where they portrayed that a firm's performance should be a dependent determinant of its capital structure. On the whole, the Wald-statistics and F-statistics ratio obtained from the models inform that the models are well specified as it has a value of 137.14; 147.77 for models 1 and 2 respectively while the value obtained from Models 3 and 4 are pointer to the insignificance effect of the variables included in the models.

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Appendix 1

Hausman Test

	Coefficients (b) fixed_group	(B) .	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
atan	.092475	.0436294	.0488456	.0197545
deb	-.0001247	-.0001298	5.12e-06	.0000272
fsiz	.0294273	.0663832	-.0369558	.0456403
gop	.0005617	.000057	.0005046	.0002644
infr	.0032982	.0036275	-.0003292	.0012878
intr	.0064046	.0062878	.0001168	.
mcap	9.64e-06	-.0000138	.0000234	.0000168
totassets	-1.16e-09	-7.96e-10	-3.64e-10	2.18e-10

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 17.23
Prob>chi2 = 0.0085
(V_b-V_B is not positive definite)