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Capital Structure and Financial Performance of Quoted Manufacturing Companies in Nigeria

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Abstract: This study examines capital structure and financial performance of quoted manufacturing companies in Nigeria, with a view to identifying the optimal mix of financing that enhances company profitability and market valuation. Employing an ex-post facto research design, the study analyzes secondary data from 38 manufacturing companies listed on the Nigerian Exchange Group (NGX) over the period 2012 to 2023. The investigation utilizes a panel Autoregressive Distributed Lag (ARDL) model—including error correction and bounds testing—to differentiate between short-run and long-run effects short-term debt, and long-term debt on key performance indicators such as Return on Assets (ROA), Return on Equity (ROE), and Tobin's Q. The empirical findings reveal that long-term debt financing, exhibits a positive influence on both ROA and Tobin's Q in the long run, indicating its role in financing growth and operational improvements through tax advantages and disciplined managerial oversight. Short-term debt, on the other hand, negatively affects financial performance in the short term due to liquidity risks and the burden of frequent repayments. Nevertheless, short term debt when used judiciously, can provide several notable advantages that complement the broader capital structure of a manufacturing company. One of the primary benefits of short-term debt is its inherent flexibility.

Keywords: Capital structure, Financial performance, Manufacturing companies, ROE, ROA, Tobin's Q, Long-term debt, Short-term debt.

I. Introduction

The study of capital structure attempts to explain how listed companies utilize the mix of various forms of securities in order to finance investment. It has been an important issue from the strategic management standpoint since it is linked with a company's ability to meet the demands of various stakeholders (Uremadu & Onyekachi, 2019). Some commonly believe that a better mixture of an organization's capital is the oil that lubricates its performance and growth. Capital structure is the overall sources of finance used by a company in financing its operations ranging from retained earnings to equity and debt finance. Capital structure decision is the combination of debt and equity that a company uses to finance its business operations for the aim of profit making and decision regarding shareholder's wealth (Ebe, Ada & Uwakwe, 2021). Capital structure has been considered as one of the most important factors in companies financing policy due to its crucial role in corporate performance (Gambo, Ahmad & Musa, 2016).

According to Akintoye, (2016) capital structure decision is important for any business establishment arising from the need to maximize the wealth of business stakeholders and because of the fact that such decision has a significant impact on the companies' ability to compete in the competitive atmosphere. On a daily basis, we hear corporate officers, professional investors, and analysts discuss a company's capital structure. Many may not know what a capital structure is or why they should even concern themselves with this term, but the concept of capital structure is extremely important because capital structure reflects overall health in all types of assets and liabilities held (Boshnak, 2022).

The debt-equity mix which is external source as opined by Ogechi, Chinelo, Jenevive and Ebe (2022) can take any of the following three ways of financing investments which are; 100% equity: 0% debt, 0% equity: 100% debt and X% equity: Y% debt. From these three alternatives, option one is that of the unlevered company, that is, the company shuns the advantage of leverage (if any). Option two is that of a company that has no equity capital. This option may not actually be realistic or possible in the real life economic situation, because no provider of funds will invest his money in a company without equity capital. This partially explains the term "trading on equity", that is, it is the equity element that is present in the companies capital structure that encourages the debt providers to give their scarce resources to the business. Option three is the most realistic one in that, it combines both a certain percentage of debt and equity in the capital structure and therefore, the advantages of leverage (if any) is exploited.

Omaliko and Okpala, (2020) noted that capital structure is one of the fervently debated finance theories among the studies of researchers and scholars. Its magnitude derives from the fact that capital structure is closely related to the ability of companies to fulfill the needs of various stakeholders. Capital structure represents the major claims on company's assets. This includes the different types of both equities and liabilities. How much debt and how much of equity in consequence constitutes the grave

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question for financial managers. It seems certain factors need to be examined before deciding the structure of capital for any organization. If debt-equity is well structured, the cost of capital could increase which will lead to increase in the value of the companies (Aziz & Abbas, 2019).

Ogunleye, Adeyemi and Asamu (2018) stated that manufacturing sector is key important in the economy of every nation. This sector is considered important in both developed and developing countries. It producers of goods and services, that is, it involves in the conversion of raw materials into finished consumer goods or producer of intermediate goods. Like other industrial activities, manufacturing creates avenues for employment, helps to boost agriculture, helps to diversify the economy, and serves as a viable means of foreign exchange earnings for the country. In addition, the sector also helps to minimize the risk of over dependence on foreign trade or imported goods. The fact that manufacturing companies in Nigeria frequently use leverage to finance their operation through debt or equity or both, the extent to which capital structure affects their operation has been an issue of concern. It has been argued that the fastest trend through which a nation can achieve sustainable economic growth and development is neither by the level of its endowed material resources nor that of its vast human resources but technological innovation, enterprise development and industrial capacity (Ogunmakin, Adebayo & Omodara, 2022).

In Nigeria, most of the studies did not use short term debt as other components of capital structure. The studies which include Lawal (2014), Ubesie (2016), Oyedokun et al. (2018) Sebastain and Onuegbu (2019), Olaniyi et al. (2022) have left a gap that need to be filled. For example, Lawal (2014) studied capital structure and value of the firm: evidence from Nigeria banking Industry for the period of 2007 to 2012 used long term debt and equity as proxy for capital structure. However, they ignored short-term debt which constitute other important forms of financing for manufacturing companies in Nigeria. Thus, the finding could only be used in the context long term debt to equity financing. This means even within the purview of debt financing; only the long term debt aspect of the debt was covered, short term was not in his study. In reality, a study on capital structure is supposed to cover both types of debt financing.

This study therefore will undertake an in-depth evaluation of effect of capital structure on financial performance of quoted manufacturing companies in Nigeria by capturing long term debt, short term debt and equity as capital mix.

Objectives of the Study

The general objective of this study is to examine the effect of capital structure of quoted manufacturing companies in Nigeria with aim of improving their financial performance.

While the specific objectives are to;

i. determine the effect of long-term debt on financial performance of quoted manufacturing companies in the study area; and

ii. ascertain the relationship between short term debt and financial performance of quoted manufacturing companies in Nigeria.

Significance of the Study

The choice of appropriate capital structure is a critical decision for corporate financiers because of the likely impact of such financing decision in maximizing the wealth of its shareholders. The study will be of significant benefit to a number of individuals. These include the investors as this study will help them to recognize the link between capital structure and financial performance and choosing appropriate measures to evaluate and analyze the companies' financial status while committing their hard-earned funds to an expected return. This study will help investors to identify the problem associated with either debt financing or equity financing and identifying the best finance mix which will be more effective at encouraging on efficient operation of the companies.

Also, the government and its agencies will benefit from this study because the study will highlight the need from its findings if necessary for the government to formulate more favorable financial and economic guidelines as the sector demands and this will sustain the operations of Nigerian manufacturing companies, especially the potential companies yet to be quoted in the stock market.

Concept of Capital Structure

Capital structure is defined as the way an organization finances its operations through debts, equity and hybrid securities (Dinh & Pham, 2020). Also, according to Arikekpar (2020), capital structure of a company is crucial because it has to maximize returns to various sectors of the company and the impact its financing decision would have in a competitive environment. A company needs funds to finance its daily activities as well as its long-term investment. A company can generate capital through the issuance of stock (equity capital) or loan notes or bonds (debt capital). As organizations raise finance through the issuance of debt securities, the claims of creditors increase, while the claims of shareholders increase through the issuance of equity securities (Olusola, Menze, Chimezie & Chinedumet, 2022).

Capital structure refers to a company's overall financing structure, which includes a combination of specific retained earnings, short-term debt, long-term debt, equity capital, and preferred shares (Wu, 2019).

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Etale and Ekpulu (2019) affirmed that capital structure embodies the financial framework of corporate entity which comprises of the debt and equity employed to finance the company assets and overall operations. Manufacturing Company must be able to establish different ways for selecting the appropriate components of capital to employ in company operations in order to boost productivity and accomplish performance in order for the capital structure to be acceptable and effective. This method should be defined thoroughly by the finance management. The capacity of the company to correctly identify sources of finances adequate to support its operations will differentiate between good capital structure management and poor capital structure management (Tian & Zeitun, 2017).

Debt Financing

Debt financing involves an action that is bound by time for the repayment of debt and the debt's interest at an agreed end of the period. It occurs when a company borrows needed cash resulting in debt to a lender or an investor for a short term or for long-term capital needs of the company. Dare and Sola, (2018) defined debt as an organization's borrowing of cash to operate its activities. One of the advantages of using debt as a source of money is that when the loan is paid off, the connection ends and no more responsibilities exist.

According to Barbosa and Louri's (2015), an increase in total debt makes it possible for companies to borrow money. It opens up the possibility for them to get the necessary finance for their capital investment. An increase in debt has the particular characteristic of imposing a need on the borrower to repay the amount borrowed in addition to interest over a predetermined length of time. The rate of interest charged on the amount borrowed shows the risk level undertaken by the lender for providing the needed fund (Matar & Eneizan, 2018).

Long Term Debt Financing

Ebe (2021), defined long term debt as the percentage of company's assets that are financed with loans and other financial obligation that would last more than one business cycle. Long term debt is the ratio that represents the financial position of a company and its ability to meet the whole financial requirements of the company. As this ratio is calculated yearly, decrease in the ratio would denote that the company is faring well and is less dependent on debt for their business needs. Long-term debts ratio shows the percentage of assets financed with debt which is payable after more than one year. It includes bonds and long-term loans. Normally, these bonds and loans carry a higher interest rate, as lenders demand a higher return in exchange for taking on the greater risk of loaning money over a long period of time. In reality, long-term debt limits managerial discretion by making access to new funds and over-investment less likely (Akaji, Nwadialor & Agubata, 2021).

Short Term Debt Financing

According to Olaniyi, Elulu and Abdusalam (2015), short-term debt is an account shown in the current liabilities portion of a company's statement of financial position and it comprises of any debt incurred by a company that is due within a year period. The debt in a company's liabilities account is usually made up of short term bank loans among other types. Short-term debt is used to finance current assets that can be quickly turned back into cash; examples of this type of debt are accounts receivable and inventories. Non-current liabilities in the form of long-term debt, or debts, are used to finance long-term assets, such as the purchase of land and the construction of a building or ship (Julius & Lucky, 2020). Short-term debt financing according to the matching principle of finance, short-term assets should be financed with short-term liabilities and long-term assets should be financed with long-term liabilities (Ebe et al., 2021). Short-term assets and liabilities are generally regarded as those items that will be used, liquidated, mature or paid off within one accounting year (Guin, 2011; Ada, Ebe & Uwakwe 2021). A company's current assets (including cash, inventories, accounts receivable, etc.) are generally considered short-term assets while plant and equipment are generally considered long-term assets. Nevertheless, current assets can be long-term if they are not completely used or liquidated during the year.

Equity

According to Akinleye and Akomolafe (2019), equity is a kind of capital that is used by most companies. This form of capital allows the ownership of the company to be gradually distributed among the shareholders. According to Barbosa and Louri (2020) equity is the value that is allocated to the owners of a corporate organization. Capital gains and dividends are two ways that shareholders might benefit from the company's future earnings. Ordinary shareholders, however, have minimal liability if the company loses money. This indicates that the amount of money they lose is equal to the amount of money they put into the company (Sunday & Samson, 2019). Equity helps a corporation to obtain capital without taking on debt (Oyedokun, Olatunji, & Sanyaolu, 2018). Internal and external equity are both possible sources of capital (Muigai & Murithi, 2017). Internal equity refers to a company's retained earnings that are included in the company's distributable reserves (Taani, 2017). When a company's retained earnings (internal equity) are insufficient for the investment opportunity, external stock is bought.

II. Theoretical Review

Several theories have been put forward to explain effect of capital structure on financial performance of quoted manufacturing companies in Nigeria. These theories include agency theory, irrelevant and relevant theory, and resource-based theory. Each of these theories is explicitly explained in the subsequent sub sections.

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Agency Cost Theory

This is a theory concerning the relationship between the principal (shareholders) and the agent of the principal (company's managers). This suggests that the firm can be viewed as a nexus of contracts (loosely defined) between resource holders. An agency relationship arises whenever one or more individual, called principals, hire one or more other individuals, called agents, to perform some service and then delegate decision- making authority to the agents. The agency theory concept was initially developed by Berle and Means (1932), who argued that due to a continuous dilution of equity ownership of large corporations, ownership and control become more separated. This situation gives professional managers an opportunity to pursue their interest instead of that of shareholders. Jensen and Meckling (1976) suggested that, for an optimal debt level in capital structure by minimizing the agency costs arising from the divergent interest of managers with shareholders and debt holders. They suggest that either ownership of the managers in the firm should be increased in order to align the interest of managers with that of the owners or use of debt should be motivated to control managers' tendency for excessive extra consumptions. The agency costs that arise from the conflicts between the managers and the owners of the firm are reduced by having a certain proportion of debt in the financial structure of the firm (Leland, 1998).

Jensen (1986) presents agency problem associated with free-cash flow. He suggested that free cash flow problem can be somehow controlled by increasing the stake of managers in the business or by increasing debt in the capital structure, thereby reducing the amount of "free" cash available to managers. Therefore, firms which are mostly financed by debt given managers less decision power of those financed mostly by equity, and thus debt can be used as a control mechanism, in which lenders and shareholders becomes the principal parties in the corporate governance structure.

Pecking Order Theory

The pecking order theory of capital structure as introduced by Donaldson (1961) is among the most influential theories of corporate leverage. It goes contrary to the idea of firms having a unique combination of debt and equity finance, which minimize their cost of capital. It is the main contender to the trade-off theory; it suggests that actual corporate leverage ratios typically do not reflect capital structure targets, but rather the widely observed corporate practice of financing new investments with internal funds when possible and issuing debt rather than equity if external funds are required. In the pecking order model, an equity offering is typically regarded as a very expensive last resort. The theory suggests that when a firm is looking for ways to finance its long-term investments, it has a well-defined order of preference with respect to the sources of finance it uses. It states that a firm's first preference should be the utilization of internal funds (i.e. retain earnings), followed by debt and then external equity.

However, investors are aware of this information asymmetry and will react negatively to issuing announcements, making them less keen on financing new equity without price reductions. Consequently, this will drive managers either towards missing up positive Net present value investments or issuing excessively high debt levels that may threaten the future of the company. These contradictions lead the following arguments. First, internal funds in form of retained earnings are more favorable than external equity. Second, financial slack, i.e. disposal of real assets, cash or marketable securities, is possible. Lastly, debt is more attractive than equity, simply because it is cheaper and less risky (Myers, 1989).

Empirical Review

Many studies have been undertaken in developed and developing countries on this area of study with the view of helping both growing and grown companies in structuring their finances efficiently. Some of these studies will be discussed in this section and to make this easier, the section will be grouped into developed and developing countries.

The following empirical were undertaken in developed countries:

Sabin and Miras (2015) investigated the influence of capital structure on Malaysian listed industrial product business performance from 2011 to 2015. The data is analyzed using descriptive statistics and multiple regression. The research discovered that industrial goods companies' financial structures significantly depend on equity financing. Aside from that, the regression results revealed that debt to equity has a negative influence on ROA, whereas total debt and total equity ratios had negligible effects. ROE is negatively impacted by debt to equity, positively impacted by total debt, and insignificantly impacted by total equity. Aside from that, debt to equity has a negative effect on ROE, total debt has a positive effect on ROE, and total equity has no effect on ROE. Finally, debt to equity has a negative significant effect on earnings per share, total debt ratio has a positive significant impact on earnings per share, and total debt has an insignificant influence on earnings per share. The present research investigates effect of capital structure on quoted manufacturing companies in Nigeria.

Olusola et al. (2022) assessed the effect of capital structure on firms' performance in Hong Kong. A panel data model was adopted in the study. ROA was used to measure performance, while capital structure was proxied by Total Debts Ratio (TDR). The study used 202 sample size covering the period of 2014 to 2018. The study established that TDR has positive significant influence on performance of listed firms in Hong.

The following empirical studies were undertaken in Nigeria.

Akinyomi (2013) using three manufacturing companies selected randomly from the food and beverage categories and a period of five years (2007-2011) using the static trade-off and the pecking order theory point of view. He adopted the use of correlation

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analysis method and revealed that each of debt to capital, debt to common equity, short term debt to total debt and the age of the firms' is significantly and positively related to return on asset and return on equity but long-term debt to capital is significantly and relatively related to return on asset and return on equity. His hypothesis also tested that there is significant relationship between capital structure and financial performance using both return on asset and return on equity. Babalola (2014), using 31 manufacturing firms with audited financial statements for a period of fourteen years (1999-2012) from static trade-off point of view. He employed the triangulation analysis and the study revealed that capital structure is a trade-off between the costs and benefits of debt, and it has been refuted that large firms are more inclined to retain higher performance than middle firms under the same level debt ratio.

Adesina, Nwidobie and Adesina (2015) assessed the effect of capital structure and financial performance in Nigeria using the sample of ten (10) listed Nigerian banks for the period of eight (8) years from 2005 to 2012. The study concluded that bank debt has a positive and significant effect on the financial performance of banks in Nigeria. Additionally, bank equity has a positive and significant relationship with bank financial performance; and bank debt and equity positively affect bank financial performance. El-Maude, Ahmed and Ahmed (2016) investigate the impact of capital structure on financial performance of firms in Nigerian cement industry, taking a sample of four listed companies. Descriptive statistics, correlation and regression were used for analyzing the data. The study reveals that, there is a statistically significant effect between long- and short-term liability on Return on Assets (ROA) and Return on Equity (ROE). The study concluded that the performance of companies in the cement industry is not optimize as a result of their inability to utilised debts in their capital structures.

Olaniyan, Soetan and Simon-Oke (2017) conducted research on the relationship between capital structure and firm performance from Africa countries applying Generalized Method of Moments (GMM) for its analysis. The empirical results revealed that a negative relationship existed between capital structure and firms' performance across African countries, with relatively high Agency costs among the firms. In the same vein, Umoru and Iyoha (2017) examined the causal link between capital structure and financial performance of 75 companies from 2010 – 2014. Their results showed that financial leverage proxy by ratio of non-current liabilities to overall assets has no causality with return on assets but ratio of current liabilities to overall assets or equity has a causality return on assets.

III. Methodology

The study area covered manufacturing companies that are quoted on the Nigerian Exchange Group (NGX) as of January, 2023. Data from the financial statements of the companies was used. Census sampling method was employed to determine sample for the study after sanitizing the population of the study based on the criteria of elimination. (1) Manufacturing companies not listed by NGX as at January, 2012 was exempted (2) Companies with incomplete data for all variables for the purposes was eliminated. This technique is one of non-probabilities that offer an opportunity for researcher to pick sample number base on meeting of criteria specified. This technique will assist researcher to obtain relevant and complete data with low margin of error from data gathered for the sample study. Hence, the sample size for the study is 38.

Only secondary data was used for this research. Data was collected from the published financial statement of selected 38 listed manufacturing companies from 2012 to 2023 and Nigerian Exchange Group. Secondary data covering related capital structure variables such as (equity, long term debt and short term debt and performance variables (Return on Asset, Return on Equity and Tobin' Q) and control variables (firm size and liquidity) respectively.

IV. Resuit and Discussion

Objectives 1 and 2: To determine the effect of long-term debt and short term debt on financial performance of quoted manufacturing companies in Nigeria using the unit root test, lag selection criteria, and a panel ARDL in addition to relevant diagnostic tests.

Panel ARDL Regression

Dependent Variable: TOBIN_Q			
Method: ARDL			
Date: 11/07/24 Time: 12:14			
Sample (adjusted): 2 456			
Included observations: 455 after adjustments			
Maximum dependent lags: 1 (Automatic selection)			
Model selection method: Akaike info criterion (AIC)			
Dynamic regressors (1 lag, automatic): STD LDTA LIQ FS			
Fixed regressors: C			

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Number of models evalulated: 16				
Selected Model: ARDL(1, 1, 1, 1, 1)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
TOBIN_Q(-1)	0.835013	0.028402	29.40027	0.0000
STD_____	-0.024069	0.012101	-1.988975	0.0473
STD____(-1)	0.020060	0.011912	1.683991	0.0929
LDTA_____	0.058885	0.010315	5.708467	0.0000
LDTA____(-1)	-0.051416	0.010094	-5.093944	0.0000
LIQ	0.829015	0.014583	56.84677	0.0000
LIQ(-1)	-0.719020	0.027442	-26.20106	0.0000
FS	0.000592	7.75E-05	7.644079	0.0000
FS(-1)	-0.000539	7.95E-05	-6.772335	0.0000
C	0.006937	0.025907	0.267771	0.7890
R-squared	0.955293	Mean dependent var		1.757033
Adjusted R-squared	0.954389	S.D. dependent var		0.681588
S.E. of regression	0.145566	Akaike info criterion		-0.994645
Sum squared resid	9.429280	Schwarz criterion		-0.904089
Log likelihood	236.2816	Hannan-Quinn criter.		-0.958969
F-statistic	1056.515	Durbin-Watson stat		2.091723
Prob(F-statistic)	0.000000			
*Note: p-values and any subsequent tests do not account for model selection.				

Source: Researcher's compilation (2025)

The lagged value of TOBIN_Q has a coefficient of 0.835013, which is highly significant (p = 0.0000). This positive coefficient suggests strong persistence in Tobin's Q over time, indicating that past values of Tobin's Q are a substantial predictor of current values. The current value of short-term debt has a negative coefficient (-0.024069) and is statistically significant (p = 0.0473). This implies that an increase in short-term debt is associated with a decrease in Tobin's Q in the short term. However, the lagged value of short-term debt (STD(-1)) has a positive coefficient (0.020060) but is not statistically significant at the conventional level (p = 0.0929). This mixed result suggests that the immediate impact of short-term debt is negative, but the effect may diminish or even reverse over time.

The current value of long-term debt to total assets (LDTA) has a positive coefficient (0.058885) and is highly significant (p = 0.0000), indicating that increasing long-term debt improves Tobin's Q in the short term. Conversely, the lagged value of LDTA (LDTA(-1)) has a negative coefficient (-0.051416) and is also highly significant (p = 0.0000). This suggests that while long-term debt initially boosts Tobin's Q, the effect reverses in the subsequent period, potentially due to the costs associated with debt repayment or other long-term financial obligations.

The liquidity variable has a substantial positive coefficient (0.829015) for the current period and is highly significant (p = 0.0000), indicating that higher liquidity is associated with higher Tobin's Q. However, the lagged value of liquidity (LIQ(-1)) has a significant negative coefficient (-0.719020, p = 0.0000), suggesting that the positive impact of liquidity is partially offset in the following period. The current value of firm size (FS) has a positive coefficient (0.000592) and is highly significant (p = 0.0000), indicating that larger firms tend to have higher Tobin's Q. The lagged value of firm size (FS(-1)) has a negative coefficient (-0.000539) and is also highly significant (p = 0.0000), suggesting a slight diminishing return on firm size over time.nThe constant term is not statistically significant (p = 0.7890), indicating that the intercept does not play a significant role in this model.

The R-squared value of 0.955293 indicates that approximately 95.53% of the variation in Tobin's Q is explained by the model, which is very high. The adjusted R-squared of 0.954389 further confirms the model's strong explanatory power after adjusting for the number of predictors. The F-statistic of 1056.515 and its corresponding p-value of 0.0000 indicate that the overall model is

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statistically significant, meaning that the joint effect of the explanatory variables on Tobin's Q is highly significant. The Durbin-Watson statistic of 2.091723 is close to 2, suggesting that there is no significant autocorrelation in the residuals of the model.

Summarily, the ARDL model analysis reveals that Tobin's Q is significantly influenced by its past values, as well as by short-term debt, long-term debt to total assets, liquidity, and firm size. The results indicate a complex dynamic relationship where the effects of these variables can differ in the short and long term. Notably, liquidity and firm size have strong positive impacts on Tobin's Q in the short run, while their effects diminish slightly over time. Short-term debt negatively affects Tobin's Q in the immediate term, but this effect is less pronounced in the subsequent period. Long-term debt initially boosts Tobin's Q but has a negative impact in the following period.

ARDL Long Run Form and Bounds Test

This analysis examines the long-run relationship between Tobin's Q (TOBIN_Q) and key financial variables, including Short-Term Debt (STD), Long-Term Debt to Total Assets (LDTA), Liquidity (LIQ), and Firm Size (FS), using the Autoregressive Distributed Lag (ARDL) approach. The ARDL model chosen is ARDL(1, 1, 1, 1, 1), with a restricted constant and no trend. The bounds test is also employed to assess whether a long-term cointegration relationship exists among these variables.

ARDL Long Run Form and Bounds Test

ARDL Long Run Form and Bounds Test				
Dependent Variable: D(TOBIN_Q)				
Selected Model: ARDL(1, 1, 1, 1, 1)				
Case 2: Restricted Constant and No Trend				
Date: 11/07/24 Time: 12:26				
Sample: 1 456				
Included observations: 455				
Conditional Error Correction Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.006937	0.025907	0.267771	0.7890
TOBIN_Q(-1)*	-0.164987	0.028402	-5.809066	0.0000
STD____(-1)	-0.004009	0.002876	-1.394005	0.1640
LDTA____(-1)	0.007468	0.003190	2.340936	0.0197
LIQ(-1)	0.109995	0.023736	4.634176	0.0000
FS(-1)	5.35E-05	3.87E-05	1.381016	0.1680
D(STD____)	-0.024069	0.012101	-1.988975	0.0473
D(LDTA____)	0.058885	0.010315	5.708467	0.0000
D(LIQ)	0.829015	0.014583	56.84677	0.0000
D(FS)	0.000592	7.75E-05	7.644079	0.0000
* p-value incompatible with t-Bounds distribution.				
Levels Equation				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
STD_____	-0.024296	0.018567	-1.308549	0.1914
LDTA_____	0.045267	0.021252	2.129982	0.0337
LIQ	0.666692	0.064436	10.34651	0.0000
FS	0.000324	0.000214	1.512726	0.1311

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C	0.042047	0.158297	0.265622	0.7907
EC = TOBIN_Q - (-0.0243*STD____+ 0.0453*LDTA____+ 0.6667*LIQ +				
0.0003*FS + 0.0420)				
F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	7.289297	10%	2.2	3.09
k	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37
Actual Sample Size	455		Finite Sample: n=80	
		10%	2.303	3.22
		5%	2.688	3.698
		1%	3.602	4.787

Source: Researcher's compilation (2025)

The error correction term, TOBIN_Q(-1)*, has a coefficient of -0.164987 and is highly significant (p = 0.0000). This coefficient represents the speed of adjustment toward long-run equilibrium and implies that approximately 16.5% of any disequilibrium between TOBIN_Q and its determinants is corrected in each period. The negative and significant coefficient confirms the existence of a stable long-run relationship among the variables, as the system reverts to equilibrium over time.

The coefficient for the lagged Short-Term Debt is -0.004009, but it is not statistically significant (p = 0.1640), indicating that short-term debt does not have a substantial long-run effect on Tobin's Q. The coefficient of lagged Long-Term Debt to Total Assets is positive (0.007468) and statistically significant (p = 0.0197), suggesting that long-term debt has a positive impact on Tobin's Q in the long run. This result indicates that an increase in long-term debt relative to total assets may be associated with an improvement in firm value over the long term. The lagged Liquidity variable shows a strong positive coefficient of 0.109995 and is highly significant (p = 0.0000), suggesting that higher liquidity positively influences Tobin's Q in the long run, likely by providing the firm with flexibility and a buffer against financial constraints. Firm size has a positive but statistically insignificant long-run coefficient (5.35E-05; p = 0.1680), indicating that firm size may not significantly influence Tobin's Q in the long run.

Short-Run Dynamics

The short-run coefficients for the first differences of the independent variables indicate the immediate effects of changes in each variable on Tobin's Q:

The short-term debt variable has a negative coefficient of -0.024069 and is significant (p = 0.0473), suggesting that an increase in short-term debt decreases Tobin's Q in the short term. The long-term debt to total assets variable has a positive and highly significant coefficient of 0.058885 (p = 0.0000), indicating that increases in long-term debt positively impact Tobin's Q in the short run. Liquidity has a large positive and highly significant coefficient of 0.829015 (p = 0.0000), demonstrating that higher liquidity enhances Tobin's Q in the short run. Firm size has a small but significant positive impact on Tobin's Q in the short run (0.000592, p = 0.0000), implying that larger firms have a marginally higher Tobin's Q over the short term.

Levels Equation (Long-Run Coefficients)

The long-run equation, based on the levels of the independent variables, provides insight into their cumulative effect on Tobin's Q: The long-run coefficient for short-term debt is -0.024296, though it is not significant (p = 0.1914). This suggests that short-term debt does not have a lasting impact on Tobin's Q. Long-term debt has a positive and significant long-run coefficient of 0.045267 (p = 0.0337), reinforcing that higher levels of long-term debt relative to assets contribute positively to firm value over the long term. Liquidity shows a robust long-run effect, with a coefficient of 0.666692 and high significance (p = 0.0000), indicating that liquidity has a sustained, beneficial influence on Tobin's Q. Firm size has a positive coefficient of 0.000324 but is not statistically significant (p = 0.1311), suggesting that while larger firms may have a slightly higher Tobin's Q, this effect is not substantial over the long term.

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Bounds Test for Long-Run Relationship

The F-bounds test evaluates whether a long-run cointegration relationship exists among the variables. With an F-statistic of 7.289297, the test statistic exceeds the upper bound critical values at the 1%, 2.5%, 5%, and 10% levels, regardless of sample size assumptions. This result indicates that we can reject the null hypothesis of no long-run relationship, confirming the presence of cointegration among TOBIN_Q, STD, LDTA, LIQ, and FS. Therefore, these variables have a stable long-run association with Tobin's Q. The ARDL bounds test and long-run form analysis reveal that Tobin's Q is significantly influenced by long-term debt and liquidity in both the short and long term, while short-term debt has a significant short-run effect but no substantial long-run impact. The error correction term further supports a stable long-run relationship, with any deviations from equilibrium corrected at a rate of 16.5% per period. Firm size, though positively associated with Tobin's Q, has no significant effect in the long term.

Capital Structure on Financial Performance (ROA)

VAR Lag Order Selection Criteria

The VAR (Vector Autoregression) Lag Order Selection Criteria helps identify the optimal lag length for a VAR model, ensuring that the model captures the dynamics of the relationships among variables effectively without overfitting. In this analysis, the endogenous variables under consideration include Return on Assets (ROA), Short-Term Debt (STD), Long-Term Debt to Total Assets (LDTA), Firm Size (FS), and Liquidity (LIQ), with a constant (C) as the only exogenous variable. The dataset comprises 448 observations, with the primary goal of determining the optimal lag length based on several selection criteria.

VAR Lag Order Selection Criteria

VAR Lag Order Selection Criteria						
Endogenous variables: ROA_____STD_____LDTA_____FS LIQ						
Exogenous variables: C						
Date: 11/07/24 Time: 12:46						
Sample: 1 456						
Included observations: 448						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-7053.282	NA	33291152	31.51019	31.55600	31.52825
1	-4895.426	4257.912	2438.483*	21.98851*	22.26338*	22.09687*
2	-4880.206	29.69289	2547.411	22.03217	22.53611	22.23083
3	-4875.993	8.125307	2795.410	22.12497	22.85797	22.41392
4	-4868.506	14.27208	3023.314	22.20315	23.16521	22.58240
5	-4847.388	39.78341*	3077.127	22.22048	23.41161	22.69004
6	-4841.377	11.18998	3350.882	22.30526	23.72544	22.86511
7	-4831.763	17.68346	3591.387	22.37394	24.02319	23.02409
8	-4816.749	27.27980	3758.240	22.41852	24.29683	23.15897

Source: Researcher's compilation (2025)

The VAR Lag Order Selection output presents the values of each criterion for lag orders from 0 to 8. Lag 1 is favored by almost all criteria. The lowest Final Prediction Error occurs at lag 1 (2438.483), suggesting that this lag minimizes prediction error and is optimal for forecasting purposes. The Akaike Information Criterion is minimized at lag 1 (21.98851), favoring this lag as it balances model complexity and fit. The Schwarz Information Criterion also reaches its lowest value at lag 1 (22.26338), reinforcing that the simplest model with adequate fit is achieved at lag 1. Hannan-Quinn Criterion is minimized at lag 1 (22.09687), suggesting that this lag length achieves a balance between overfitting and underfitting, with sufficient model parsimony. LR Test: The sequential modified LR test statistic selects lag 5 (39.78341), as it has the highest LR value, indicating a significant improvement in model fit by extending the lag length to 5. Despite the LR criterion suggesting lag 5, the FPE, AIC, SC, and HQ criteria all converge on lag 1 as the optimal choice. This consistency across most criteria suggests that a one-lag model is both sufficient and efficient for capturing the relationships among ROA, STD, LDTA, FS, and LIQ.

Based on the VAR lag selection criteria, lag 1 is the recommended choice for this VAR model. A one-lag structure is generally favored in time series models due to its simplicity and efficiency, avoiding the risk of overfitting, which can occur with higher lag

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lengths. By selecting lag 1, the model achieves an optimal balance between capturing the dynamics of the data and maintaining parsimony. This choice facilitates easier interpretation and provides robust results, making it a reliable basis for analyzing the relationships between the financial variables of interest, such as ROA, STD, LDTA, FS, and LIQ. Overall, using lag 1 provides an effective structure for this VAR model, adequately capturing the temporal dependencies among the financial variables while maintaining a parsimonious form that enhances interpretability and predictive accuracy.

Panel ARDL Regression

In this ARDL (Autoregressive Distributed Lag) model analysis, Return on Assets (ROA) is the dependent variable, with the independent (dynamic) variables being Short-Term Debt (STD), Long-Term Debt to Total Assets (LDTA), Firm Size (FS), and Liquidity (LIQ). The model was automatically selected using the Akaike Information Criterion (AIC), identifying ARDL(1, 1, 1, 1, 1) as the optimal lag structure.

Panel ARDL Regression

Dependent Variable: ROA				
Method: ARDL				
Date: 11/07/24 Time: 12:51				
Sample (adjusted): 2 456				
Included observations: 455 after adjustments				
Maximum dependent lags: 1 (Automatic selection)				
Model selection method: Akaike info criterion (AIC)				
Dynamic regressors (1 lag, automatic): STD LDTA FS LIQ				
Fixed regressors: C				
Number of models evalulated: 16				
Selected Model: ARDL(1, 1, 1, 1, 1)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
ROA(-1)	0.901815	0.021204	42.53118	0.0000
STD	-0.381550	0.079264	-4.813627	0.0000
STD(-1)	0.355258	0.078193	4.543350	0.0000
LDTA	0.210459	0.067017	3.140394	0.0018
LDTA(-1)	-0.156608	0.065810	-2.379706	0.0177
FS	0.006619	0.000510	12.97032	0.0000
FS(-1)	-0.006014	0.000531	-11.33641	0.0000
LIQ	5.069933	0.097012	52.26084	0.0000
LIQ(-1)	-4.538332	0.157151	-28.87885	0.0000
C	-0.242557	0.203602	-1.191329	0.2342
R-squared	0.979842	Mean dependent var		12.25011
Adjusted R-squared	0.979434	S.D. dependent var		6.663882
S.E. of regression	0.955649	Akaike info criterion		2.768880
Sum squared resid	406.4026	Schwarz criterion		2.859436
Log likelihood	-619.9202	Hannan-Quinn criter.		2.804555
F-statistic	2403.408	Durbin-Watson stat		2.030705
Prob(F-statistic)	0.000000			
*Note: p-values and any subsequent tests do not account for model				
selection.				

Source: Researcher's compilation (2025)

The model includes 455 observations after adjustments, using one lag for each dynamic regressor and selecting one fixed regressor (constant term, C). The R-squared value of 0.979842 and Adjusted R-squared of 0.979434 demonstrate that the model

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explains approximately 98% of the variance in ROA, indicating a highly accurate model fit. Additionally, the F-statistic (2403.408) is significant at a p-value of 0.0000, confirming the overall model's statistical significance. The Durbin-Watson statistic is 2.030705, which is close to 2, suggesting no strong autocorrelation in the residuals, enhancing the reliability of the model's estimates. The lagged value of ROA has a coefficient of 0.901815 and is statistically significant ($p < 0.01$). This indicates strong persistence in ROA, meaning that past performance significantly impacts current ROA. The high coefficient suggests that ROA is positively autocorrelated, with about 90% of past ROA values influencing the current period.

The current value of STD has a coefficient of -0.381550, with a highly significant t-statistic ($p < 0.01$). This negative relationship indicates that an increase in short-term debt directly decreases ROA, implying that high reliance on short-term debt may have adverse effects on profitability. The lagged value of STD has a positive coefficient of 0.355258, also significant at $p < 0.01$. This suggests that while short-term debt reduces ROA in the current period, it has a positive effect on future ROA. This positive lag effect may imply that the initial costs of taking on short-term debt are followed by potential benefits or returns in subsequent periods.

The current value of LDTA has a positive coefficient (0.210459) and is statistically significant ($p < 0.01$), suggesting that an increase in long-term debt positively affects ROA in the same period. This could imply that long-term debt might support productive investments that enhance profitability. The lagged LDTA coefficient is -0.156608 and significant ($p < 0.05$). This negative sign indicates that, while current long-term debt can enhance profitability, its impact may diminish over time, possibly due to interest obligations or diminishing returns on investments funded by long-term debt.

Firm Size has a positive coefficient (0.006619) for the current period and is highly significant ($p < 0.01$). This positive coefficient suggests that larger firms, possibly due to economies of scale or market influence, experience better ROA. However, the lagged term **FS(-1)** has a negative coefficient (-0.006014), also significant ($p < 0.01$), suggesting that while firm size positively impacts ROA in the short term, its effect may become neutral or even slightly negative in subsequent periods. The liquidity variable has a substantial positive coefficient (5.069933) and a very high significance level in the current period. This suggests that higher liquidity improves profitability significantly, potentially due to increased flexibility in operations and lower financial risk. The lagged coefficient for liquidity is negative (-4.538332) and highly significant ($p < 0.01$), suggesting that while high liquidity benefits the firm in the current period, excessive liquidity could signal inefficiency or underutilized resources in subsequent periods, potentially reducing profitability.

The constant term has a coefficient of -0.242557, which is not statistically significant ($p = 0.2342$). This implies that the model does not have a significant intercept term, suggesting that when all other factors are held constant, ROA does not deviate significantly from zero. The model's fit, as indicated by the high R-squared and Adjusted R-squared values, shows that this ARDL structure captures the dynamics of ROA effectively. Additionally, the Akaike Information Criterion (AIC) at 2.768880 indicates a well-fitted model, particularly when compared across other model alternatives, as AIC penalizes model complexity. Overall, the ARDL model provides nuanced insights into how short-term debt, long-term debt, firm size, and liquidity dynamically impact profitability over time, with some effects reversing in subsequent periods. This suggests that while certain financial strategies, such as maintaining liquidity or increasing firm size, can benefit firms in the short run, they may need to be managed carefully to avoid negative effects in the longer term.

ARDL Long Run Form and Bounds Test

The ARDL (Autoregressive Distributed Lag) Long Run Form and Bounds Test analysis was conducted with Return on Assets (ROA) as the dependent variable and Short-Term Debt (STD), Long-Term Debt to Total Assets (LDTA), Firm Size (FS), and Liquidity (LIQ) as independent variables. The analysis uses ARDL(1, 1, 1, 1, 1) with an unrestricted constant and no trend in the levels equation.

ARDL Long Run Form and Bounds Test

ARDL Long Run Form and Bounds Test				
Dependent Variable: D(ROA____)				
Selected Model: ARDL(1, 1, 1, 1, 1)				
Case 3: Unrestricted Constant and No Trend				
Date: 11/07/24 Time: 12:55				
Sample: 1 456				
Included observations: 455				
Conditional Error Correction Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.

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C	-0.242557	0.203602	-1.191329	0.2342
ROA____(-1)*	-0.098185	0.021204	-4.630582	0.0000
STD____(-1)	-0.026291	0.018937	-1.388321	0.1657
LDTA____(-1)	0.053851	0.022203	2.425452	0.0157
FS(-1)	0.000605	0.000292	2.071507	0.0389
LIQ(-1)	0.531601	0.158381	3.356478	0.0009
D(STD____)	-0.381550	0.079264	-4.813627	0.0000
D(LDTA____)	0.210459	0.067017	3.140394	0.0018
D(FS)	0.006619	0.000510	12.97032	0.0000
D(LIQ)	5.069933	0.097012	52.26084	0.0000
* p-value incompatible with t-Bounds distribution.				
Levels Equation				
Case 3: Unrestricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
STD	-0.267772	0.191190	-1.400558	0.1620
LDTA	0.548466	0.217173	2.525484	0.0119
FS	0.006164	0.002358	2.614515	0.0092
LIQ	5.414273	0.749567	7.223201	0.0000
EC = ROA_____- (-0.2678*STD_____+ 0.5485*LDTA_____+ 0.0062*FS +				
5.4143*LIQ)				
F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	5.817360	10%	2.45	3.52
k	4	5%	2.86	4.01
		2.5%	3.25	4.49
		1%	3.74	5.06
Actual Sample Size	455		Finite Sample: n=80	
		10%	2.548	3.644
		5%	3.01	4.216
		1%	4.096	5.512
t-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-4.630582	10%	-2.57	-3.66
		5%	-2.86	-3.99
		2.5%	-3.13	-4.26
		1%	-3.43	-4.6

Source: Researcher's compilation (2025)

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The results from the Conditional Error Correction Model (ECM) show that ROA adjusts to deviations from its long-term equilibrium with other variables through a short-term correction mechanism. The lagged dependent variable, ROA (-1), has a coefficient of -0.098185 and is statistically significant ($p < 0.01$), indicating a stable adjustment back to the long-run equilibrium at a rate of approximately 9.8% per period. This negative and significant coefficient confirms the presence of a long-run relationship among the variables, as the model gradually corrects deviations in ROA due to changes in STD, LDTA, FS, and LIQ over time.

The current-period changes (denoted by D for each variable) show the immediate impact of changes in each regressor on ROA in the short term:

- D(STD) has a coefficient of -0.381550, statistically significant ($p < 0.01$), indicating that a change in short-term debt negatively affects ROA in the short run. This suggests that increasing short-term debt could place a burden on financial performance.
- D(LDTA) has a positive coefficient of 0.210459 ($p < 0.01$), suggesting that a short-term increase in long-term debt positively affects profitability. This short-term benefit from long-term debt could imply that the capital acquired is utilized effectively to enhance assets and productivity.
- D(FS) (change in Firm Size) shows a strong positive effect on ROA with a coefficient of 0.006619 and is highly significant ($p < 0.01$). This implies that as firm size increases, ROA improves in the short run, likely due to economies of scale or improved market position.
- D(LIQ) (change in Liquidity) has a substantial coefficient of 5.069933 ($p < 0.01$), indicating that increased liquidity in the short term strongly boosts ROA. This suggests that higher liquidity supports financial stability, leading to improved profitability.

Each long-run coefficient shows the expected impact of a sustained change in each predictor variable on ROA.

- The coefficient for STD is -0.267772, though not statistically significant ($p = 0.1620$), indicating a long-term negative but statistically insignificant relationship between short-term debt and ROA. This implies that while short-term debt might influence ROA in the short run, its lasting impact on ROA may be limited or inconsistent.
- LDTA has a positive coefficient of 0.548466 and is statistically significant ($p = 0.0119$). This suggests that in the long run, higher levels of long-term debt as a proportion of total assets positively impact ROA, likely because long-term debt facilitates long-term investments that enhance profitability over time.
- The coefficient of FS is 0.006164, significant at $p = 0.0092$, suggesting that firm size positively affects ROA in the long term. This could be due to the benefits of scale, better resource allocation, and potentially greater resilience in larger firms.
- Liquidity has a highly significant and positive long-run coefficient of 5.414273 ($p < 0.01$), indicating that liquidity is a critical factor in long-term profitability. Firms with higher liquidity are better positioned to manage short-term obligations and leverage investment opportunities, leading to higher profitability over time.

The Bounds Test assesses whether there is a long-term relationship among the variables by testing the null hypothesis of no levels relationship. Here, the F-statistic is 5.817360, which exceeds the critical upper bound at the 1% significance level (3.74 to 5.06) for the asymptotic sample. Thus, the null hypothesis is rejected, confirming that a long-run cointegration relationship exists among ROA, STD, LDTA, FS, and LIQ. Additionally, the t-Bounds Test provides a t-statistic of -4.630582, which is lower than the critical value at the 1% significance level for both I(0) and I(1) bounds. This further supports the presence of a cointegration relationship, meaning that deviations from the equilibrium in ROA due to changes in the independent variables are not permanent but will adjust over time.

The ARDL Long Run Form and Bounds Test reveal both short-term and long-term dynamics between ROA and the financial variables. In the short term, liquidity and firm size positively impact ROA, while short-term debt has a detrimental effect. Long-term debt is beneficial in both short-term and long-term contexts, suggesting that careful leverage strategies can improve financial performance. Over the long run, liquidity and firm size continue to positively impact profitability, and long-term debt maintains a positive relationship, highlighting its role in supporting sustainable growth. The error correction term suggests that any short-term deviations from equilibrium will be corrected over time, with approximately 9.8% adjustment toward the long-run equilibrium each period. This gradual adjustment indicates a stable relationship among ROA, STD, LDTA, FS, and LIQ in the long run, reinforcing the relevance of managing debt and liquidity levels to sustain profitability in the manufacturing sector.

Capital Structure on Financial Performance (ROE): **VAR Lag Order Selection Criteria**

The Vector Autoregressive (VAR) Lag Order Selection Criteria table provides insight into determining the optimal lag length for a VAR model with endogenous variables: Return on Equity (ROE), Short-Term Debt (STD), Long-Term Debt to Total Assets (LDTA), Firm Size (FS), and Liquidity (LIQ). The model also includes a constant term as an exogenous variable. Selecting the

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correct lag length is essential in VAR modeling, as it ensures the model captures the dynamic relationship between variables without overfitting or introducing excessive complexity.

VAR Lag Order Selection Criteria

VAR Lag Order Selection Criteria						
Endogenous variables: ROE STD LDTA FS LIQ						
Exogenous variables: C						
Date: 11/07/24 Time: 13:00						
Sample: 1 456						
Included observations: 448						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-7329.020	NA	1.14e+08	32.74116	32.78697	32.75922
1	-5227.459	4146.831	10736.68*	23.47080*	23.74567*	23.57916*
2	-5209.474	35.08758	11078.68	23.50211	24.00605	23.70077
3	-5204.162	10.24456	12097.73	23.59001	24.32301	23.87896
4	-5194.466	18.48136	12955.69	23.65833	24.62039	24.03759
5	-5170.346	45.44100*	13010.69	23.66226	24.85338	24.13181
6	-5163.929	11.94558	14142.53	23.74522	25.16540	24.30507
7	-5152.445	21.12200	15031.62	23.80556	25.45481	24.45571
8	-5135.068	31.57464	15564.86	23.83959	25.71790	24.58004

Source: Researcher's compilation (2025)

From the results, lag 1 is consistently selected as the optimal lag across multiple criteria: FPE, AIC, SC, and HQ. This uniformity across these statistical tests strongly suggests that a one-period lag length is the most appropriate for this model. Given the use of lag 1:

The choice of lag 1 implies that the dynamics between ROE, STD, LDTA, FS, and LIQ can be effectively captured without introducing lags beyond the immediate past period. This parsimonious model avoids unnecessary complexity and reduces the risk of overfitting. The lowest FPE at lag 1 indicates that this model will likely yield the most accurate forecasts. By avoiding additional lags, the model minimizes error and reduces the chance of capturing noise rather than meaningful economic signals. With lag 1 selected, the model will provide a clearer and more immediate interpretation of shocks between variables. This is useful for assessing how an immediate change in one variable (e.g., a sudden increase in liquidity or debt) might impact ROE without complications from extended lags. The VAR Lag Order Selection Criteria strongly support lag 1 as the optimal choice for analyzing relationships among ROE, STD, LDTA, FS, and LIQ. This selection indicates that current changes in each variable have an immediate and most meaningful impact on other variables in the subsequent period, providing a straightforward, robust, and efficient model structure for capturing short-term interdependencies. This setup will help to forecast ROE and understand its determinants while maintaining a well-balanced, interpretable model.

Panel ARDL Regression

This Autoregressive Distributed Lag (ARDL) model examines the relationships between Return on Equity (ROE) and key financial indicators for a sample of 455 observations. The dependent variable is ROE, while the explanatory variables include Short-Term Debt (STD), Long-Term Debt to Total Assets (LDTA), Firm Size (FS), and Liquidity (LIQ), each included in the model with one lag. The Akaike Information Criterion (AIC) guided the model selection process, resulting in the chosen ARDL (1, 1, 1, 1, 1) structure, which incorporates one lag for each variable.

Panel ARDL Regression

Dependent Variable: ROE			
Method: ARDL			
Date: 11/07/24 Time: 13:04			

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Sample (adjusted): 2 456				
Included observations: 455 after adjustments				
Maximum dependent lags: 1 (Automatic selection)				
Model selection method: Akaike info criterion (AIC)				
Dynamic regressors (1 lag, automatic): STD_____LDTA_____FS LIQ				
Fixed regressors: C				
Number of models evalulated: 16				
Selected Model: ARDL(1, 1, 1, 1, 1)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
ROE____(-1)	0.877160	0.023473	37.36944	0.0000
STD_____	-0.843771	0.165377	-5.102103	0.0000
STD____(-1)	0.772625	0.163331	4.730434	0.0000
LDTA_____	0.651266	0.139692	4.662150	0.0000
LDTA____(-1)	-0.519376	0.137803	-3.768963	0.0002
FS	0.011015	0.001063	10.35723	0.0000
FS(-1)	-0.009720	0.001098	-8.850423	0.0000
LIQ	11.88629	0.200828	59.18640	0.0000
LIQ(-1)	-10.52273	0.363644	-28.93689	0.0000
C	-0.340924	0.418452	-0.814727	0.4157
R-squared	0.977498	Mean dependent var		26.81297
Adjusted R-squared	0.977043	S.D. dependent var		13.15704
S.E. of regression	1.993505	Akaike info criterion		4.239398
Sum squared resid	1768.457	Schwarz criterion		4.329954
Log likelihood	-954.4631	Hannan-Quinn criter.		4.275074
F-statistic	2147.885	Durbin-Watson stat		2.124584
Prob(F-statistic)	0.000000			
*Note: p-values and any subsequent tests do not account for model				
selection.				

Source: Researcher's compilation (2025)

The coefficient of the lagged ROE variable (ROEt−1) is highly significant (p-value = 0.0000) with a positive coefficient of 0.8772. This suggests a strong persistence in ROE, where previous values have a substantial influence on current ROE levels. A coefficient close to 1, as seen here, indicates that ROE is relatively stable over time, with current levels largely shaped by prior performance. The current period STD shows a significant negative relationship with ROE, with a coefficient of -0.8438 (p-value = 0.0000). This suggests that increases in short-term debt are associated with a reduction in profitability, likely due to the immediate financial burden of short-term obligations. Interestingly, the lagged value of STD has a positive and significant effect (coefficient of 0.7726, p-value = 0.0000), indicating a partial recovery effect in ROE over time. This dynamic suggests that while an immediate increase in short-term debt may initially strain profitability, the effect may moderate in subsequent periods, possibly as companies restructure or invest borrowed funds in profitable ventures. Current LDTA has a positive and significant impact on ROE (coefficient = 0.6513, p-value = 0.0000), implying that an increase in long-term debt is positively correlated with profitability. This effect may reflect the strategic benefits of using long-term debt for capital investments, which can enhance returns. However, the lagged LDTA variable has a negative coefficient (-0.5194, p-value = 0.0002), indicating a reversal effect where prolonged reliance on long-term debt may eventually have adverse effects on profitability, possibly due to interest obligations or diminishing returns on investments funded by debt.

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The coefficient for current FS is positive (0.0110, p-value = 0.0000), signifying that increases in firm size are associated with higher ROE, likely reflecting economies of scale and enhanced operational efficiencies. However, the lagged value of FS has a negative coefficient (-0.0097, p-value = 0.0000), suggesting that while growth in size initially boosts profitability, there may be diminishing returns or increased costs in subsequent periods. Liquidity has a strikingly large positive impact on ROE in the current period (coefficient = 11.8863, p-value = 0.0000), indicating that higher liquidity directly enhances profitability. This relationship might arise because liquidity enables firms to seize investment opportunities or meet operational needs without relying on costly external financing. However, the lagged liquidity variable has a negative coefficient (-10.5227, p-value = 0.0000), indicating that high liquidity in previous periods may reduce future profitability, potentially due to the opportunity cost of holding excessive cash reserves instead of investing in revenue-generating activities. The constant term is statistically insignificant (p-value = 0.4157), suggesting no significant baseline effect on ROE when all other variables are zero.

The model has an R-squared of 0.9775, indicating that approximately 97.75% of the variation in ROE is explained by the model. The adjusted R-squared is similarly high (0.9770), underscoring the strong explanatory power of the model. The F-statistic of 2147.885 is statistically significant (p-value = 0.0000), confirming the overall model fit and the joint significance of the variables in explaining ROE. The Durbin-Watson statistic is 2.1246, suggesting minimal autocorrelation in the residuals, which improves confidence in the model's reliability.

The ARDL model reveals a complex dynamic relationship between ROE and the selected financial indicators. The opposite effects of lagged and current STD and LDTA illustrate the nuanced impact of debt on profitability. Firms must manage debt prudently, balancing short-term and long-term debt to sustain profitability. While growth in size initially boosts ROE, firms may encounter increased costs over time, leading to diminishing returns. This finding underscores the need for efficient scale management. The model highlights that while liquidity enhances profitability in the short term, excessive liquidity may hurt future performance. Firms may need to actively invest surplus funds to avoid opportunity costs and ensure optimal profitability.

ARDL Long Run Form and Bounds Test

The ARDL (Autoregressive Distributed Lag) model analysis for ROE includes both short-run and long-run relationships, assessed through the Long Run Form and Bounds Test. This approach enables us to examine the equilibrium dynamics and long-run associations between ROE and key financial indicators: Short-Term Debt (STD), Long-Term Debt to Total Assets (LDTA), Firm Size (FS), and Liquidity (LIQ). Using an unrestricted constant with no trend, this ARDL model provides insights into both short-term impacts and the long-term equilibrium behavior of the dependent variable, ROE.

ARDL Long Run Form and Bounds Test

ARDL Long Run Form and Bounds Test				
Dependent Variable: D(ROE____)				
Selected Model: ARDL(1, 1, 1, 1, 1)				
Case 3: Unrestricted Constant and No Trend				
Date: 11/07/24 Time: 13:09				
Sample: 1 456				
Included observations: 455				
Conditional Error Correction Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.340924	0.418452	-0.814727	0.4157
ROE____(-1)*	-0.122840	0.023473	-5.233310	0.0000
STD____(-1)	-0.071145	0.039219	-1.814070	0.0703
LDTA____(-1)	0.131890	0.045393	2.905496	0.0038
FS(-1)	0.001295	0.000581	2.229957	0.0262
LIQ(-1)	1.363555	0.362941	3.756956	0.0002
D(STD____)	-0.843771	0.165377	-5.102103	0.0000
D(LDTA____)	0.651266	0.139692	4.662150	0.0000
D(FS)	0.011015	0.001063	10.35723	0.0000

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D(LIQ)	11.88629	0.200828	59.18640	0.0000
* p-value incompatible with t-Bounds distribution.				
Levels Equation				
Case 3: Unrestricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
STD	-0.579173	0.323619	-1.789676	0.0742
LDTA	1.073674	0.369734	2.903913	0.0039
FS	0.010540	0.003892	2.707975	0.0070
LIQ	11.10028	1.300107	8.537970	0.0000
EC = ROE_____- (-0.5792*STD_____+ 1.0737*LDTA_____+ 0.0105*FS +				
11.1003*LIQ)				
F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	7.954837	10%	2.45	3.52
k	4	5%	2.86	4.01
		2.5%	3.25	4.49
		1%	3.74	5.06
Actual Sample Size	455		Finite Sample: n=80	
		10%	2.548	3.644
		5%	3.01	4.216
		1%	4.096	5.512
t-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-5.233310	10%	-2.57	-3.66
		5%	-2.86	-3.99
		2.5%	-3.13	-4.26
		1%	-3.43	-4.6

Source: Researcher's compilation (2025)

The coefficient of the lagged ROE variable (ROEt−1), which represents the Error Correction Term (ECT), is -0.1228, and it is highly significant (p-value = 0.0000). This negative and statistically significant ECT indicates a stable long-run relationship and shows that ROE adjusts towards equilibrium following short-term shocks. The magnitude of -0.1228 suggests a relatively slow speed of adjustment, with only about 12.28% of the deviation from equilibrium being corrected in each period. This finding implies that any short-term divergence in ROE due to changes in debt levels, firm size, or liquidity will gradually adjust back to a long-term equilibrium over time.

Short-Term Dynamics:

In the short run, D(STD) has a negative and significant effect on ROE (coefficient = -0.8438, p-value = 0.0000), suggesting that increases in short-term debt decrease ROE immediately. This result aligns with the notion that higher short-term debt obligations may burden profitability in the short term due to repayment requirements or interest expenses. D(LDTA) positively impacts ROE in the short term (coefficient = 0.6513, p-value = 0.0000). This indicates that increases in long-term debt-to-total assets ratio tend to improve profitability, likely because long-term debt is often directed towards capital investments with potential returns. D(FS) has a significant positive short-term effect (coefficient = 0.0110, p-value = 0.0000), suggesting that as firm size increases,

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profitability is enhanced, possibly due to economies of scale or greater market reach. D(LIQ) has a highly positive effect on ROE in the short term (coefficient = 11.8863, p-value = 0.0000), implying that greater liquidity directly boosts profitability, as liquid assets provide financial flexibility to pursue growth or operational efficiency opportunities.

Long-Run Relationships

The levels equation reveals the long-term equilibrium relationship between ROE and each predictor, capturing the sustained impacts of these variables over time. In the long run, STD shows a negative but marginally insignificant relationship with ROE (coefficient = -0.5792, p-value = 0.0742). This implies that, while not statistically significant at the 5% level, an increase in short-term debt could still negatively influence profitability in the long run, suggesting that firms may need to manage short-term obligations carefully to avoid potential profitability drags. The LDTA coefficient is positive and significant in the long run (coefficient = 1.0737, p-value = 0.0039). This finding highlights that long-term debt positively influences ROE over time, likely due to its utility in financing projects that yield returns, fostering growth, and expanding assets. Thus, long-term debt appears to be more beneficial for sustainable profitability when compared to short-term debt.

FS has a positive and significant long-term impact on ROE (coefficient = 0.0105, p-value = 0.0070). This result suggests that larger firms tend to be more profitable over time, likely benefiting from economies of scale, stronger market presence, and operational efficiencies that improve ROE. Liquidity shows a strong positive and significant long-term relationship with ROE (coefficient = 11.1003, p-value = 0.0000). This coefficient underscores that a higher liquidity level consistently enhances profitability. The substantial magnitude of this coefficient reflects that, in the long run, liquidity enables firms to manage operations effectively, capitalize on profitable investments, and avoid the need for expensive financing. The Bounds Test is employed to determine whether a long-run (cointegrating) relationship exists among the variables. The F-statistic value is 7.9548, which exceeds the upper bound critical value at the 1% level of significance (5.06) for the asymptotic case (n = 1000). This outcome indicates that we reject the null hypothesis of "no levels relationship," confirming that a cointegrating (long-run) relationship exists among ROE, STD, LDTA, FS, and LIQ. The t-statistic for the error correction term is -5.2333, which is also below the lower bound of the critical value at the 1% significance level (–3.43 for I(0) and -4.60 for I(1)). This further supports the presence of a cointegrating relationship and reinforces the conclusion from the F-Bounds Test that a long-term equilibrium exists between ROE and the selected variables.

In summary, the ARDL Long Run Form and Bounds Test indicate both short- and long-term effects of financial indicators on ROE. The model's results indicate that short-term debt can be detrimental to profitability in both the short and long term, whereas long-term debt contributes positively. Firms aiming for sustainable profitability may consider reducing reliance on short-term debt while strategically using long-term debt for growth-oriented projects. Both firm size and liquidity positively impact ROE in the short and long run. Larger firms enjoy scale benefits, while liquidity enables operational efficiency and investment flexibility, underscoring the importance of efficient resource management to enhance long-term profitability. The significant and negative error correction term confirms that any deviation from equilibrium is corrected over time, though slowly. This gradual adjustment suggests that firms experiencing shocks will eventually return to stable profitability levels, but managers should implement effective controls and strategies to facilitate faster adjustments when needed.

Correlations Statistics

The correlation matrix provides insights into the relationships between the variables used in examining the effect of capital structure on the financial performance of quoted manufacturing companies in Nigeria.

Correlations Statistics

	ROA (%)	ROE (%)	Tobin Q	LDTA (%)	STD (%)	EQU (?'B)	LIQ	FS
ROA (%)	1							
	456							
ROE (%)	.975**	1						
	.000							
	456	456						
Tobin Q	.887**	.943**	1					
	.000	.000						
	456	456	456					
LDTA (%)	.291**	.245**	.188**	1				
	.000	.000	.000					

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	456	456	456	456				
STD (%)	.194**	.156**	.134**	.948**	1			
	.000	.001	.004	.000				
	456	456	456	456	456			
EQU (B)	.549**	.553**	.552**	.079	.011	1		
	.000	.000	.000	.093	.815			
	456	456	456	456	456	456		
LIQ	.851**	.887**	.897**	.011	-.039	.350**	1	
	.000	.000	.000	.808	.408	.000		
	456	456	456	456	456	456	456	
FS	.601**	.555**	.480**	.245**	.151**	.898**	.309**	1
	.000	.000	.000	.000	.001	.000	.000	
	456	456	456	456	456	456	456	456

Source: Researcher Computation, 2025

ROA shows a significant positive correlation with several variables, indicating that firms with higher profitability relative to their assets are likely to exhibit certain financial characteristics. ROA is highly correlated with Return on Equity (ROE) ($r = 0.975$, $p < 0.01$), suggesting a strong association between returns generated on assets and equity, which is expected as both metrics reflect profitability. ROA also has a strong positive correlation with Tobin's Q ($r = 0.887$, $p < 0.01$), reflecting that higher profitability aligns with increased market valuation. Additionally, Liquidity (LIQ) shows a strong positive correlation with ROA ($r = 0.851$, $p < 0.01$), implying that firms with high liquidity are generally more profitable on an asset basis. There is also a moderate correlation with Firm Size (FS) ($r = 0.601$, $p < 0.01$) and Equity (EQU) ($r = 0.549$, $p < 0.01$), indicating that larger firms with greater equity levels tend to have higher profitability. ROE is positively correlated with almost all variables, reflecting its central role as a profitability metric influenced by multiple aspects of financial structure and firm characteristics. The correlation with Tobin's Q ($r = 0.943$, $p < 0.01$) is strong, showing that firms with higher returns on equity are often valued more favorably in the market. Similar to ROA, ROE is also strongly correlated with Liquidity (LIQ) ($r = 0.887$, $p < 0.01$), suggesting that firms with high current assets relative to liabilities tend to deliver higher returns to shareholders. Furthermore, ROE has a moderate positive correlation with Firm Size (FS) ($r = 0.555$, $p < 0.01$) and Equity (EQU) ($r = 0.553$, $p < 0.01$), indicating that larger firms with a strong equity base tend to achieve higher equity returns.

Tobin's Q, a measure of market valuation relative to asset replacement costs, is significantly correlated with most profitability and structure-related variables. It has a strong positive correlation with ROE ($r = 0.943$, $p < 0.01$) and ROA ($r = 0.887$, $p < 0.01$), reflecting that profitable firms are valued higher in the market. The positive correlation with Liquidity (LIQ) ($r = 0.897$, $p < 0.01$) is also strong, suggesting that firms with high liquidity are more favorably valued. Tobin's Q also has moderate correlations with Firm Size (FS) ($r = 0.480$, $p < 0.01$) and Equity (EQU) ($r = 0.552$, $p < 0.01$), which may imply that larger firms with robust equity bases tend to have higher market valuations.

The LDTA ratio shows a significant but weak positive correlation with ROA ($r = 0.291$, $p < 0.01$), ROE ($r = 0.245$, $p < 0.01$), and Tobin's Q ($r = 0.188$, $p < 0.01$), indicating that firms with some level of long-term debt may still maintain moderate profitability and market valuation. LDTA is highly correlated with Short-term Debt (STD) ($r = 0.948$, $p < 0.01$), which is logical, as firms with long-term debt tend to also have short-term debt as part of their overall capital structure. However, LDTA shows no significant correlation with Equity (EQU) ($p > 0.05$), which may indicate that long-term debt levels do not directly relate to the equity levels in these firms. STD demonstrates a significant positive correlation with ROA ($r = 0.194$, $p < 0.01$), ROE ($r = 0.156$, $p < 0.01$), and Tobin's Q ($r = 0.134$, $p < 0.01$), indicating a weak relationship between short-term debt and profitability. The very strong correlation with LDTA ($r = 0.948$, $p < 0.01$) suggests that firms with higher long-term debt also exhibit higher short-term debt, indicating an overall reliance on debt financing in the capital structure.

Equity is moderately correlated with ROA ($r = 0.549$, $p < 0.01$), ROE ($r = 0.553$, $p < 0.01$), and Tobin's Q ($r = 0.552$, $p < 0.01$), implying that firms with a substantial equity base tend to be more profitable and have favorable market valuations. There is a very strong positive correlation between Equity and Firm Size (FS) ($r = 0.898$, $p < 0.01$), which is expected as larger firms tend to accumulate more equity. Equity also shows a moderate correlation with Liquidity (LIQ) ($r = 0.350$, $p < 0.01$), suggesting that firms with more equity are also likely to maintain a higher liquidity position.

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Liquidity is highly correlated with ROE ($r = 0.887$, $p < 0.01$), Tobin's Q ($r = 0.897$, $p < 0.01$), and ROA ($r = 0.851$, $p < 0.01$), indicating that firms with greater liquidity tend to be more profitable and have higher market valuations. The moderate correlation with Firm Size (FS) ($r = 0.309$, $p < 0.01$) suggests that larger firms may maintain better liquidity, possibly to support stability and financial resilience. Liquidity's significant correlations with profitability measures highlight its importance in achieving financial performance.

Firm Size is significantly correlated with profitability metrics like ROA ($r = 0.601$, $p < 0.01$), ROE ($r = 0.555$, $p < 0.01$), and Tobin's Q ($r = 0.480$, $p < 0.01$), suggesting that larger firms are generally more profitable and are perceived positively in the market. The strong correlation between Firm Size and Equity (EQU) ($r = 0.898$, $p < 0.01$) further reinforces the idea that larger firms tend to have substantial equity bases. Additionally, the positive correlation with Liquidity (LIQ) ($r = 0.309$, $p < 0.01$) suggests that larger firms may also maintain higher liquidity, which can contribute to financial stability.

Overall, the correlation analysis reveals meaningful relationships between profitability, market valuation, capital structure, and firm characteristics. High correlations between ROA, ROE, Tobin's Q, and liquidity suggest that profitable firms with higher market valuations also tend to maintain strong liquidity positions. Firm size and equity are closely related, indicating that larger firms possess significant equity bases, which likely supports their profitability and market value. Debt variables (LDTA and STD) show weaker correlations with profitability measures, suggesting that while debt may play a role in capital structure, it is not as strongly tied to profitability in this sample of Nigerian manufacturing firms.

Panel Co-integration Analysis

The Kao Residual Cointegration Test was conducted to determine whether a long-term equilibrium relationship exists among the variables in this study: Return on Assets (ROA), Return on Equity (ROE), Tobin's Q, Short-term Debt to Total Assets (STD), Long-term Debt to Total Assets (LDTA), Equity (EQU), Firm Size (FS), and Liquidity (LIQ). Cointegration testing is essential when dealing with non-stationary time series data, as it helps confirm if these variables share a stable, long-term association despite any short-term deviations. Establishing cointegration among these variables allows for the use of error correction modeling, which adjusts for short-term fluctuations while maintaining long-term equilibrium.

Kao Panel Cointegration Test

Within dimension	Weighted Statistic
Augmented Dickey Fuller	-3.808384*
P-stat	0.0001
Residual Variance	0.030420
HAC Variance	0.038383

Source: Researcher's compilation (2025) using Eviews 10. * sig @1%, ** sig @10%

The test results show an ADF t-statistic of -3.808384 with a probability value of 0.0001. This low probability value is significant at the 1% level, leading to the rejection of the null hypothesis of no cointegration. Therefore, we can conclude that a significant cointegrating relationship exists among ROA, ROE, Tobin's Q, STD, LDTA, EQU, FS, and LIQ. This suggests that despite short-term variations, these variables move together over the long term, maintaining a stable association within the sample period (2012–2023).

The residual variance and HAC (Heteroskedasticity and Autocorrelation Consistent) variance are 0.030420 and 0.038383, respectively. These values provide insight into the variation of residuals and are adjusted for autocorrelation and heteroskedasticity using the Newey-West automatic bandwidth selection and Bartlett kernel. The relatively low residual variance indicates that the deviations from the long-term relationship are minimal, enhancing the credibility of the identified cointegration among the variables.

The Kao Residual Cointegration Test reveals a significant cointegrating relationship among the variables ROA, ROE, Tobin's Q, STD, LDTA, EQU, FS, and LIQ. The ADF t-statistic is highly significant, supporting the existence of a stable, long-term relationship despite short-term fluctuations. The negative coefficient of the lagged residuals further confirms the tendency of deviations to correct over time, indicating that the variables converge to a long-term equilibrium. This finding allows for the development of an error correction model, which can capture short-term adjustments while maintaining the long-term balance among the variables. Therefore, these results provide a solid foundation for interpreting the interconnected nature of financial performance, debt structure, equity, firm size, and liquidity within the context of manufacturing firms in Nigeria.

Recommendations

Based on the study's results, the following recommendations are provided to enhance the financial performance of quoted manufacturing companies in Nigeria:

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The study shows that long-term debt positively influences financial performance by providing the necessary capital for growth without the immediate repayment pressures of short-term debt. Nevertheless, in many market environments, short-term financing carries lower interest rates compared to long-term debt. This can reduce the overall cost of capital, especially when funds are needed to cover short-term operational expenses rather than for long-term investments.

Nevertheless, in case where debt is necessary, short term debt is recommended. Short-term debt, when used judiciously, can provide several notable advantages that complement the broader capital structure of a manufacturing companies. One of the primary benefits of short-term debt is its inherent flexibility. Because short-term borrowings typically have maturities of less than one year, they offer companies the agility to address immediate operational needs such as managing seasonal inventory fluctuations, bridging temporary cash flow gaps, and financing urgent working capital requirements. This flexibility is particularly valuable in the manufacturing sector, where production cycles and market demands can change rapidly

Given these benefits, it is advisable for manufacturing companies to integrate short-term debt into their capital structure as working capital of the companies to use it to finance their day-to-day activities like payment of supplier of raw material, payment of salaries and wages of employees and payment of all other bills that fall due within accounting period. Companies should use short-term debt to finance transient cash flow needs and operational cycles, ensuring that they maintain a healthy liquidity position. However, it is crucial to balance short-term debt with long-term financing to avoid excessive reliance that could lead to liquidity risks or financial distress. By carefully managing the mix of short-term and long-term debt, companies can optimize their capital structure, enhancing both flexibility and cost-effectiveness while mitigating risks.

In line with the findings of the study there is a need for government policy on the acquisition of capital both short term and long term to enhance the performance of manufacturing companies in Nigeria. Therefore, Nigeria Exchange Group should be strengthened to enable Manufacturing companies to make floatation of more capital less cumbersome.

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