

Determinants of Capital Structure of Listed Non-Financial Firms under Firm Life Cycles in Nigeria

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Abstract

This study examines the determinants of capital structure under firms' life cycles in Nigeria. A sample of seventy six (76) non-financial firms were investigated for the period 2014 to 2022. The dependent variable is debt-to-total asset, while the independent variables are firm size, growth opportunities, profitability, asset structure and firm age. Dummy variables (DLum1-5) were used to represent each of the five cycle life stages in line with Dickinson (2011) five stages of life cycle models. The Dynamic System-GMM was employed for analysis of data and the results generally revealed that life cycle stage is a significant determinant of capital structure of non-financial firms in Nigeria. It was found that while introduction stage (LDUM1), maturity stage (LDUM3) and shake-out stage (LDUM4) have significant positive relationship with capital structure, growth stage (LDUM2) and decline stage (LDUM5) are significant and negatively related to capital structure. Firm size and growth opportunities are significant determinants of capital structure across the life cycle stages. They were found to be inversely related to capital structure of non-financial firms in Nigeria. In the growth stage (LDUM2), profitability is a significant determinant of capital structure; but across the other stages, it does not significantly influence capital structure. The study recommends that asset managers should be constantly trained on how to effectively allocate company's funds across the life cycle stages.

Keywords: Capital Structure, Life Cycle, Non-Financial Firms.

1. Introduction

The life cycle of a firm begins from when it was conceived/established, grow and to the time of termination (Daft & Willmott, 2010; Mutura, 2020). It is the sequential stages that a firm do experienced rather than events that happen randomly (Bess, 1984). Thus, grouping firms along their life cycle stage invariably provides unique information on what determines their capital structure choices in relation to growth and profitability. According to Dickinson (2011), firm life cycle is the phases of firm's growth that occurred as a result of changes in certain factors occasioned from strategic activities embark upon by management of the firm. The firm life cycle may consist of 4 phases; birth, growth, maturity, and decline (Koh et al., 2015; Mutura, 2020); or 5 stages as advocated by Dickinson (2011) to include introduction stage, growth stage, maturity stage, shake-out stage and decline stage respectively. However, firm's life cycle can have a negative impact on the company, and this negative impact arises when the firm ignores it, hence, the firm will be able to benefit from the decisions it makes, if it knows the characteristics of each phase of its life cycle (Graciosa et al., 2020, p. 2; Puspita & Iffah, 2023, p. 22).

Firm's life cycle theory is very crucial in the determination of firm's financing decisions which Fama and French (2005) believed would positively enhance firm's profitability and growth opportunities. The factors that account for capital structure using firm's specific variables has been extensively researched across the globe. However, determinants of capital structure dynamics under varying stages in life cycle has not been extensively researched in Nigeria. According to Frank and Goyal (2009), Khurana, et. al (2024), different theories of capital structure apply to firms under different circumstances and those factors that may play significant role in some circumstances may present a different impact under another firm condition. It is in view of these dynamic behaviour of capital structure under different stages of firm's life cycles that motivated this study in the Nigeria context, using Nigerian non-financial firms' specific data.

In the empirical literature, different authors employed different number of classifications of life cycle stages, ranging from two stages, three stages, five stages and even up to ten stages (Adizes, 1999; Bulan & Yan, 2010; Dickinson, 2011; *Puspita & Iffah*, 2023). The use of these varied stages may have resulted in inconsistent findings and varied conclusions across studies. Besides, one cannot say with all certainty the different criteria used in classifying the stages that have resulted in the divergence outcomes. It was also observed that similar studies in Nigeria aligned with those studies carried out in developed countries probably due to limited data on firms at either at starting or declining stages. This study therefore take advantage of advancements in availability of firms' life cycles data sets to examine the extent to which the different firm life cycle stages have impacted the capital structure of non-financial firms in Nigeria overtime.

In terms of methodological gap, Castro et.al (2014) employed Fama-MacBeth regressions; Rehman, Wang and Yu (2016), *Puspita and Iffah* (2023), used Arellano-Bover/Blundell-Bond dynamic panel data model; and Ahsan et al. (2016), Khurana, et. al (2024) employed the GMM, and Inyama and Ugwuanyi (2016) employed OLS in Nigeria. Apart from those of Ahsan et al. (2016) who employed the GMM, no other prior studies do; and it is noted that the dynamic GMM estimator is known to be very good and efficient when compared to other known estimators, and this makes the technique more revealing.

This study is therefore an attempt to shift focus from the traditionally known studies on determinants of firm's capital structure to the influence of different firm life cycles on capital structure choices using most recent Nigerian non-financial firms' data set.

2. Literature Review

2.1 Concept of Capital Structure

The concept of capital structure is traceable to the early works of Modigliani and Miller in 1958 on the irrelevancy of capital structure theorem. According to theorem, capital structure is the combination of debt and equity used to finance investment opportunities by firms (Modigliani & Miller, 1958). However, Parmasivan and Subramanian (2009) defined it as the link among the different sources of long-term financing like equity funding, preference share capital and debt capital. Shelumiel (2017) defined it as the combination of capital supplied by owners from different sources, including the ones borrowed that is used to finance firm's operations. Now, the concept/idea or view of capital structure seems similar across the various researchers in the extant literature in terms of the bottom-line issues (debt-equity relationship). Therefore, for the purpose of this study, capital structure is simply defined as a relationship that exist among the various sources of a firm's liabilities and equities, such that issuance of bond or long-term notes payable

come in the form of debt; and common stock, preferred stock or retained earnings as equity. Thus, this continuous composition in the ordinary course of business, is very critical for the survival or otherwise of any business organization, including its long term growth and performance.

2.2 Determinants of Capital Structure

Several determinants of capital structure exist in the extant literature, but for the purpose of this study, the focus will be on the following few ones below:

Firm Size: Firm size across the literature is usually measured as the log of total assets (Akinyomi & Olagunju, 2012). It is considered to be a useful factor in the variations in firm leverage. Larger firms in terms of strong asset base under different firm life cycle stage will be able to use higher debt than the smaller firms. Also, due to their size, they are more advantageous for lower interest rate as well attracting financial institutions readiness to give them loans because, big firms are unlikely to default on loans as a result of their huge assets base (Eriotis et al, 2007).

Profitability: This is the firm's capability to generate profits from its operations. According to Boot et al (2001), it is one of the four building blocks (profitability, efficiency, solvency, and market prospects) for analyzing firm's performance from their [financial statements](#). However, on the basis of financial theory, profitable firms are able to employ more leverage because the likelihood of going bankrupt is almost zero and creditors are more willing to give out more loans to them (Reinhard & Li, 2010).

Growth: Firm's growth is ascertained by market value of equity plus debt in current liabilities in addition to long-term debt plus preferred stocks, minus deferred taxes and investment tax credit over total assets (Castro, Tascón & Amor-Tapia, 2015). For the tradeoff theory, growth means higher bankruptcy costs, lower free cash flow problems, and exacerbated debt agency problems, that imply less debt (Frank & Goyal, 2009). Consistently, "while Bauer (2004) found lower debt in firms with future growth opportunities, Adam and Goyal (2008) argue that pecking order theory predicted higher debt for growth firms because new investments require additional funds, holding profitability fixed.

Asset Structure: In order to have a strong capital structure, the Asset structure of a firm needs to be very strong to guarantee strong capital structure that will sustain the firm, because it is an important determinant of firms' survival during stiff competition; and also guides investment decisions (Njagi, 2016). Thus, the absence of a strong asset base often make firm to go for debt financing (Njagi, 2016)

Firm Age: Firm age is the length of time during which an organization existed. According to Mintesinot (2010), "as firms become aged, the long years of track record will enable them to easily convince creditors and experts in finding alternative source of capital that is cost-effective". Firm age is defined as "the number of years of incorporation of the company; others believes that listing age, should define the age of the company (Shumway, 2001)".

2.3 Firm Life Cycles

According to Dickinson (2011), firm life cycle is the phases of firm's growth that occurred as a result of changes in certain factors occasioned from strategic activities embark upon by management of the firm. It consists of 5 stages as advocated by Dickinson (2011) such as introduction stage, growth stage, maturity stage, shake-out stage and decline stage respectively.

These five stages are the one adopted and analyzed in this study. In the extant literature, Black (1998) and Teixeira et.al (2006) argue that life cycle stages finds significant differences in the financial leverage of firms at different stages of development; adding that startups firms employ more equity financing while matured ones use more debt, but dying firms reduced usage of debt. With respect to the effect of life cycle stage on firm's capital structure requirement, Teixeira et.al (2006) observed that, if changes in other basic fundamentals over the cycle are taken into account, the Modigliani and Miller's (1965) premise about the independence of financial and investment decisions holds.

2.3.1 Stages in the Firm's Life Cycle

(i) Introduction Stage: This stage entails firms that are at the birth stage of their lives, and at this stage their products are new in the market, low sales and the need to increase sale. At this stage, they are usually faced with tens competitions from rivals firms, hence, they will required huge capital to compete favourably in order to move the product higher and gets to the next stage of the cycle (Gort, & Klepper, 1982). At this stage also, they have a centralized kind of structure coupled with high growth opportunities, but without adequate capital to finance them. This will make them go for external borrowing in order to meet up, thereby increasing leverage position (Owen & Yamson, 2010)

(ii) Growth Stage: the growth stage of a firm life cycle is usually characterized by effort directed at monitoring and processing relevant information about the competitive environment in order to assure performance (Necyk, Souza & Frezatti, 2007). It is at this stage also that most firms seek political relevance in their environment in order to maintain business stability.

(iii) Maturity Stage: This stage occurs immediately after the growth stage. It is often regarded as the longest stage of the firm's life cycle. It is at this stage that firm's sales growth begins to decline, the firm gets to its peak in terms of demand cycle; even advertising strategies have little or no impact on its sales growth. At this stage, firms have enough capacity to raise funds internally through retained earnings that might even lead to expansion process (Warusawitharana, 2013). However, firms are well able to benefit at the maturity stage with the ability to increase sales through brand/products differentiation in the market.

(iv) Shake-Out Stage: It is at this stage that firms always experience difficulties as a result of some changes in the business environment. This crisis situations may lead to reduction and reconfiguration of the entire market thereby reducing the overall sales and profitability of the firms. This stage, if not properly managed, it may lead to decline stage; and if managed well, by adjusting current strategy, could reverts to profitable position (Lester, Parnell & Carraher, 2003).

(v) Decline stage: This is usually a very critical moment for a firm's survival. The reason being that, at this stage, the firm experiences negative increase in cash inflow coupled with inability to respond to challenges (Necyk et al, 2007). This eventually leads to total decline in profit market value (Lester et al, 2003). It is also at this stage that stagnancy and decreasing sales income set in. However, Dickinson (2011) had argued that there is the possibility for the decline stage to occur immediately after any of the previous 4 stages if and only if the firm fails to establish itself in the market.

2.4 Theoretical Review

The Pecking Order Theory (POT)

The pecking order theory (POT) was advocated by Myers (1984), where he observed that firms do carve out their respective financial statement to align with the pecking order theory in financing their projects by using internal equity first, followed by debt, and external equity if need be (Myers, 1984). In contrast to Ross (1977), that firms use more debt to deal with asymmetry information in order to signal better prospects, Myers (2001) used information asymmetries to demonstrate that managers are unlikely to issue equity because of the fear that it will project stock price as overvalued.

Accordingly, the POT argues that, all other things being equal, firms that are in need of funds to prosecute new project/product will follow a hierarchical order of preference for financing options, starting from the most preferred to the least preferred. Thus, the hierarchy is said to follow this order: internal funding, debt issuance, debt-equity hybrid issuance, and equity issuance. The reasons why firms have that order of preference is as a result of information asymmetry which occurs because of the advantageous information about the firm at the disposal of managers at the expense of the shareholders. For this reason, shareholders often rely on the judgment of the managers regarding the future status of the firm, hence, the actions and decisions of the managers are seen to veritably signal or convey vital information about the prospect of the firm. Malm and Roslun (2013) corroborating this view stated that, “issuing shares sends a message that the shares are overvalued, whereas issuing debt does not send any message; debt issuing is therefore preferred to issuing of equity”. In a nut-shell, under the pecking order theory, managers and investors react according to available information; and if managers decide issuing undervalued equity, wealth will be transferred to investors at the detriment of the shareholders. For this reason, internal funds and debt will be best option to equity (Altally, 2014).

Therefore linking the pecking order theory (POT) of capital structure to firm life cycle stages, a functional model is formulated such that POT (capital structure) in the order of retained earnings, debt employment and equity is hypothesized to be dependent on life cycle stages.

Thus, CAPS = f(LCYLE)1

Where:

CAPS is the capital structure; LCYLE represents the firm life cycle.

But in equation 1 above, capital structure comprises retained earnings, debt employment and equity. Hence, equation 2 and 3 is given by:

RTEN = f(Infancy, Adolescence, Go-Go, Shake-out, Decline).....2

DEBT = f(Infancy, Adolescence, Go-Go, Shake-out, Decline).....3

EQTY = f(Infancy, Adolescence, Go-Go, Shake-out, Decline).....4

However, prime and stable firms, on the other hand, have enough retained earnings and do not need debt compared to the growth phase; as they enter decline stages, there would be a reduction in retained earnings thereby making the firm employ and increase debt to finance acquisitions of young go-go firms.

2.5 Empirical Literature

Castro, Tascón and Amor-Tapia (2015) employed the Dickinson's (2011) life cycle stages of firms in relation to capital structure theory by using Fama-MacBeth regressions on a sample of 57,195 firms in UK, Germany, France and Spain for the period 1980 to 2011. It was found capital structure respond to firm's life cycle stages. Similarly, Drobetz et al (2015) examine corporate life-cycle and valuations of cash holdings. The panel data analysis technique was employed and the result revealed that firm's financing decisions varies across the life cycle stages. In a related study by Tian et. al (2015) on capital structure and life cycle stages in Chinese manufacturing firms over the period 1999 to 2011, used the Dickinson's (2011) approach; and the findings indicate that firms changes debt usage across the various cycle stages.

Inyiama and Nwankwo (2016) examined the relationship between life cycle, firm size and firm age in Nigeria brewery industry from 2004 to 2014. The OLS was used for analysis of data and it was generally noted that, firms in technology driven brewery sector tend to grow in asset base from growth stage to maturity stage and when they mature, tend to slow down the growth of asset and focus more on enhancing shareholders wealth. Arguing along the above life cycle stages, Ahsan et al. (2016) investigate the firm life cycle in relation to capital structures Pakistan firms for a period of 39 years (1972 to 2010). Employing the GMM, it was found that a low-high-low leverage exist at growth, maturity and decline stages. Rehman et al (2016) investigate how firm changes leverage policy is during life cycle stages. Employing the Arellano-Bover/Blundell-Bond dynamic panel data model on 867 Chinese non-financial firms for the period 1996 to 2014; the empirical results revealed that differences in adjustment rate

In another related study, Bruno (2017) examines determinants of capital structure changes in life cycle stages of 117 Iberian non-financial firms for a period of sixteen (16) years (2001 to 2016). Using the panel data analysis, the results revealed that leverage changes at every stage of the life cycle of the sampled firms. Wando, Marcelo, Karen and José (2017) investigated the relationship between firms' life cycles stages in line with Dickinson (2011) preposition, and employing multinomial logistic regression analysis on 1,515 public listed firms for the period 2005 to 2012, it was observed that leverage, dividends distribution, market-to-book, return on equity, firm size and revenue growth changes across firms' life cycle stages.

Furthermore, the study of Lobo et al. (2018) on the relationship between debt market capital structure in the U.S quoted firms for the period 1994 to 2015, used the regression analysis and found that cost of corporate loans was very low at the introduction and growth stages, but with a minimum at the maturity stage; increases in shake-out (turbulence) and decline. It was also observed that firms' DM and leverage were consistent with an inverted U-curve along with capital structure. Youssef (2019) examines the effect of firm's life cycle on capital structure of 70 SMEs firms in Tunisian for the period 2013 to 2016. The panel data analysis technique was employed for the analysis of data and it was found that life cycle theory significantly influences capital structure of SMEs firms; and that the firms used debt irrespective of maturity period during the early life cycle phases.

Wasilewski (2020) examines the effect of stages of a firm's life cycle on selected capital structure ratios in Poland for the period 199 to 2012. The outcome of the study indicated that early stages of a firm's life cycle were finance mainly by debt. On the other hands, at the introduction and growth stages, firms were associated with lower level of total assets to shareholders' equity with respect to capital structure when compared to shake-out stage. Also, the introduction stage revealed

that firms higher commitment to financing short-term shares as compared to the growth, maturity, and shake-out stages. In another related study by Zhang and Xu (2020) examines on how capital structure affect debt maturities of Chinese non-financial firms for the period 2009 to 2016. Employing the panel data analysis, it was found that adjustment in debt maturity structure across life cycles. It was also observed that introduction and turbulence stages had significant inverse negatively on DM structure, and growth stage had significant positive effect on long-term debt, while maturity stage had a weak effect on DM structure.

Can et. al (2023) examined the effect of life cycle stages on firms' capital expenditures Istanbul over the period over the period 2010 to 2021. Employing the GMM, they found that firms seem to invest less as they move forward in their life cycle stages, and that market capitalization, operating cash flow and leverage have significant positive effect on capital expenditure, while cash holding is inversely related to capital expenditure. Kochen (2023) examined financing over the life cycle of firms in 21 countries in Europe for the period 1996 to 2019. Using the dynamics model by calibrating the data set, it was found that young firms exit prematurely as external financing costs are higher than the option value of learning.

Xin et.al (2023) investigated the effect of firms' life cycle stages and national income on capital structure targeting behaviour in 11 Asian countries for the period 2010 to 2018. They employed the GMM in analysis of data and it was found that life cycle stages have positive moderating impact on capital structure, while gross national incomes per capita do not. On the aggregate effect, life cycle and gross national income moderator variables significantly affect target capital structure. Abu et. al (2023) examined the impact of firm life cycle on cost of debt of 20,307 firm-loan of 5,076 publicly traded U.S. firms for the period 1988 to 2018. Employing the panel data analysis technique, they found that firm life cycle stage significantly affect lending spreads: and that young firms are expected to pay at least 15 bps more than mature firms, whereas mature firms pay at least 11 bps more than old firms. Also, on the basis of mechanism analysis, it was observed that credit risk, systematic risk, and idiosyncratic risk follow the corporate life pattern in accordance with loan spreads, suggesting that banks charge a premium to compensate for risk, hence, structural changes occur as firms evolve across the corporate life cycle.

Puspita and Iffah (2023) studied how firm life cycle affect financial distress of non-financial firms in Indonesia for the period 2010 to 2020. Using the logistic regression and moderated regression analysis, it was observed that with respect to firm life cycle, working capital strategy influence the firms facing financial distress especially in the growth and mature stages. Bregonci, Marques, Pinto and Amaral (2023) studied the link that assisted among firms' life cycle stages and their debt maturities of 370 non-financial firms in Brazil for the period 2010 to 2019. Using the panel data analysis, it was discovered that debt maturities has a weak effect on capital structure; maturity stage had a positive effect on the DM, but at the shake-out and decline stages, debt maturities constantly reduced.

Khurana, Sharma and Miah (2024) examines the determinants and the speed of adjustment to optimal capital structure across various stages of the firm life cycle of 1435 listed non-financial firms over the period 2013 to 2022. Employing the two-step system generalized method of moments for analysis of data, it was found that FFs are inherently more indebted and adjust faster towards achieving optimal capital structure than NFFs. It was also found that firm's profitability, liquidity and tangibility are the major factors influencing debt across different stages of the FLC in both FFs and NFFs.

3. Methodology

The study employed the expos-facto research design. The population of the study comprises the non-financial firms listed on the Nigerian Exchange Limited over the period 2014 to 2022, while the sample size consists of ten (10) sectors drawn from: Agriculture, Automobile & Tyre, Breweries, Building and construction, Chemical and Paints, Conglomerates, Food/Beverages & Tobacco, Healthcare, Industrial/Domestic Products, and Oil and gas.

3.1 Sources of Data

The data for the study were sourced from MachameRatios® panel data sets from the database (www.machame.companies.site) as collated from the audited report of selected non-financial firms listed on the Nigerian Exchange Limited for the period 2014 to 2022.

3.2 Theoretical Framework and Model Specification

The theoretical framework for this study is anchored on the pecking order theory of capital structure, and also adopted Dickinson (2011), Castro, Tascón and Amor-Tapia (2015) firms' life cycle stages model with a slight modification, which include: introduction stage, Growth stage, Maturity stage, Shake-out stage and Decline stage. This enables us critically assess firm's specific factors such as age, asset structure, profitability, ownership structure, firm growth and financing decisions across the different stages of firm's life cycle. The life cycle stages are represented as introduction stage (LDUM 1), growth stage (LDUM 2), maturity stage (LDUM 3), shake-out stage (LDUM 4), decline stage (LDUM 5) respectively.

In order to effectively examine the behavioural pattern of the variables, five (5) models are stated, such that each stage of the life cycle is differentiated and proxied by a dummy variable (LDUM). For instance, Life cycle Dummy 1 to 5 takes the value 1 if the firm is in the stage and 0 if it is not. Therefore, the functional form of the model is stated as follows:

$$CAPS = f(FSIZE, FGRTH, PROF, ASTRU, OWS, FAGE, LDum).....(3.1)$$

In econometrics form, the five models are stated as follows:

$$TD/A_{it} = \alpha_0 + \alpha_1 FSIZE_{it} + \alpha_2 FSIZE_{it} * LDum1 + \alpha_3 FGRTH_{it} + \alpha_4 FGRTH_{it} * LDum1 + \alpha_5 PROF_{it} + \alpha_6 PROF_{it} * LDum1 + \alpha_7 ASTRU_{it} + \alpha_8 ASTRU_{it} * LDum1 + \alpha_{10} OWS_{it} + \alpha_{11} OWS_{it} * LDum1 + \alpha_{12} FAGE_{it} + \alpha_{13} FAGE_{it} * LDum1 + u_{it}.....(3.2)$$

$$TD/A_{it} = \beta_0 + \beta_1 FSIZE_{it} + \beta_2 FSIZE_{it} * LDum2 + \beta_3 FGRTH_{it} + \beta_4 FGRTH_{it} * LDum2 + \beta_5 PROF_{it} + \beta_6 PROF_{it} * LDum2 + \beta_7 ASTRU_{it} + \beta_8 ASTRU_{it} * LDum2 + \beta_9 OWS_{it} + \beta_{10} OWS_{it} * LDum2 + \beta_{11} FAGE_{it} + \beta_{12} FAGE_{it} * LDum2 + u_{it}.....(3.3)$$

$$TD/A_{it} = \gamma_0 + \gamma_1 FSIZE_{it} + \gamma_2 FSIZE_{it} * LDum3 + \gamma_3 FGRTH_{it} + \gamma_4 FGRTH_{it} * LDum3 + \gamma_5 PROF_{it} + \gamma_6 PROF_{it} * LDum3 + \gamma_7 ASTRU_{it} + \gamma_8 ASTRU_{it} * LDum3 + \gamma_9 OWS_{it} + \gamma_{10} OWS_{it} * LDum3 + \gamma_{11} FAGE_{it} + \gamma_{12} FAGE_{it} * LDum3 + u_{it}.....(3.4)$$

$$TD/A_{it} = \Omega_0 + \Omega_1 FSIZE_{it} + \Omega_2 FSIZE_{it} * LDum4 + \Omega_3 FGRTH_{it} + \Omega_4 FGRTH_{it} * LDum4 + \Omega_5 PROF_{it} + \Omega_6 PROF_{it} * LDum4 + \Omega_7 ASTRU_{it} + \Omega_8 ASTRU_{it} * LDum4 + \Omega_9 OWS_{it} + \Omega_{10} OWS_{it} * LDum4 + \Omega_{11} FAGE_{it} + \Omega_{12} FAGE_{it} * LDum4 + u_{it}.....(3.5)$$

$$TD/A_{it} = \delta_0 + \delta_1 FSIZE_{it} + \delta_2 FSIZE_{it} * LDum5 + \delta_3 FGRTH_{it} + \delta_4 FGRTH_{it} * LDum5 + \delta_5 PROF_{it} + \delta_6 PROF_{it} * LDum5 + \delta_7 ASTRU_{it} + \delta_8 ASTRU_{it} * LDum5 + \delta_9 OWS_{it} + \delta_{10} OWS_{it} * LDum5 + \delta_{11} FAGE_{it} + \delta_{12} FAGE_{it} * LDum5 + u_{it}.....(3.6)$$

Where:

TD/A_{it} represents firm capital structure (ratio of total debt-asset ratio) for firm i at period t under firm life cycles respectively

FSIZE_{it} represents firm size capital structure for firm i at period t under firm life cycles respectively

FGRTH_{it} represents firm growth for firm i at period t under firm life cycles respectively

PROF_{it} represents firm profitability for firm i at period t under firm life cycles respectively

ASTRU_{it} represents firm asset structure for firm i at period t under firm life cycles respectively

OWST_{it} represents firm Ownership Structure for firm i at period t under firm life cycles respectively

FAGE_{it} represents firm Age for firm i at period t under firm life cycles respectively.

LDum(1 -5) = Firm Life Cycles Dummy Variable, 1 to 5 represents respective firm life cycle otherwise 0.

The *a-priori* expectations are $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6 > 0$. (same holds for $\beta, \gamma, \Omega, \delta$)

u_{it} = are the respective error terms

3.3 Method of Data Analysis

Two methods were employed in this study, which are the correlation matrix and the Generalized Method of Moments (GMM). While the correlation coefficient was used to examine the background characteristics of the data, the Generalized Method of Moments (GMM) estimation for linear and non-linear models was employed for the main analysis of the data: the GMM was formalized by Hansen (1982), and since has become one of the most widely used methods of estimation for models in economics and finance.

The Generalized Method of Moments estimate is defined as the β that minimizes the following model.

$$\frac{1}{T} u(\beta)' Z W_t^{-1} Z' u(\beta) \dots \dots \dots (1)$$

Where: matrix W_t is termed the *weighting matrix* since it acts to weight the various moment conditions in constructing the distance measure. As mentioned earlier, Z_t is any subset of the variables in the current information set and is used to capture the instruments in the model; and β is the coefficient of estimation. The justification for the use of GMM estimation is based on the fact that it does not need complete knowledge of the data distribution: only specified moments derived from an underlying model are needed for GMM estimation. The Eviews 9.0 econometric software was be used for the analysis.

3.4 Measurement of Variables

Table 3.1: Variables Measurement

"S/ N	Variabl e	Definition	Variable	Measurement	Source	<i>Aprior i sign.</i>
1	TD/A	Capital Structure	Dependent	Ratio of Total debt-Asset Ratio	Hall <i>et al</i> (2004), Li <i>et al</i> (2009)	+

2	FAGE	Firm Age	Independent	Age of the company since operation	Dogan, 2013; Halil & Hasan, 2012	+
3	ASTRU	Asset Structure	Independent	Fixed Assets + Current Assets	Njagi (2016)	+
4	SIZE	Size of the Firm	Independent	Log of total asset	Bjarni, 2007; Akinyomi & Olagunju, 2012	+
5	PROF	Firm Profitability	Independent	Earnings	Mudassar, (2015)	+
6	GRTH	Firm Growth	Independent	computed as market value of equity + debt + preferred stocks – taxes	Castro, Tascón & Amor-Tapia (2015)	+
7	OSTR	Ownership Structure	Independent	Percentage of State ownership in the firms	Su (2010), Li <i>et al</i> (2009), Njagi (2016)”	+

Source: Author's Compilations (2024)

4. Data Analysis and Presentation Results

In this section, the methods of data analysis earlier stated in the previous section are brought to bear; and this involves correlation coefficient and the GMM for the main estimation.

4.1 Correlation Analysis

The pattern of relationships among the variables can be observed based on the correlation among them. In Table 1, it is seen that the capital structure (DT_A) has a weak positive and negative correlation with all the hypothesized variables in the model. However, FSIZE and ASTRU are seen to be positively and highly correlated with value of 0.8458 percent. Also, a weak negative correlation value of -0.417 was observed between LDUM2 and LDUM3. Besides, all the other variables exhibited dissimilarities yet they are weakly correlated. This suggests absence of multicollinearity among the data set including the dummy variables.

Table 1: Pairwise Correlation Matrix

	DT_A	FSIZE	FGRTH	PROF	ASTRU	FAGE	LDUM1	LDUM2	LDUM3	LDUM4	LDUM5
DT_A	1										
FSIZE	-0.122	1									
FGRTH	-0.067	0.0998	1								
PROF	-0.026	0.0481	-0.013	1							
ASTRU	-0.012	0.8458**	0.1161	0.053	1						
FAGE	0.04	0.1188	0.0503	-0.036	0.1104	1					
LDUM1	0.0528	-0.098	-0.063	0.0906	-0.041	0.0144	1				

LDUM2	-0.007	0.0219	-0.083	-0.014	0.0447	-0.148	-0.122	1			
LDUM3	-0.106	0.1699	0.0662	-0.033	0.0853	0.0124	-0.296	-0.417	1		
LDUM4	-0.078	0.1071	-0.009	-0.082	0.1783	0.0088	0.0759	0.1004	0.259	1	
LDUM5	0.0587	-0.061	0.0194	-0.075	-0.024	-0.03	-0.066	-0.087	-0.225	0.0542	1

Source: Author's compilations (2024). ** Significant at 1%

4.2 Empirical Results on GMM Estimation

This section presents the role played by life cycle stages of the firm as well as the relevant firm's specific factors in the determination of the pattern of capital structure. The dynamic GMM was employed for the estimation of the relationship. In Table 2 below, the results for life cycle stage 1 (LDUM 1) and life cycle stage 2 (LDUM 2) are presented. LDUM 1 represents Introduction stage while LDUM 2 represents growth stage.

Table 2: Determinants of Capital Structure under Firms' Life Cycles 1 and 2 in Nigeria

	LDUM 1 (Introduction Stage)			LDUM 2 (Growth Stage)		
Variables	Coefficient	T-Ratio	Prob.	Coefficient	T-Ratio	Prob.
DT A(-4)	-0.002020	-0.176992	0.8596	0.043275	3.266402	0.0012**
FSIZE	-19.99904	-2.182135	0.0297*	-15.99656	-3.637045	0.0003**
FGRTH	-0.011445	-2.271524	0.0237*	-0.056181	-5.726894	0.0000**
PROF	-0.001128	-0.150833	0.8802	0.011531	2.165313	0.0308*
ASTRU	-20.89233	-1.169450	0.2430	-37.62690	-1.965320	0.0499*
FAGE	0.954655	1.278615	0.2019	1.109372	1.653375	0.0989
LDUM1	9.770976	3.127371	0.0019**	-	-	-
LDUM2	-	-	-	-4.845446	-2.552544	0.0110*
J-statistic	28.91050			38.86896		
Prob(J-stat)	0.469735			0.259644		

Source: Author's compilations 2024. Note: ** sig at 1% level; * sig at 5% level.

4.3 The Introduction Stage (LDUM 1)

First, we test whether the firms are in the introduction stage (LDUM 1). The result from Table 2 above showed that LDUM 1 has significant positive relationship with firm's capital structure (measured by debt-to-total assets (DT_A)). This suggests that the firms are truly at the birth stage (introduction stage) of life cycle. This is in line with theoretical expectation that firms in their early life stages are more levered and hence, they favour the use of debt for the purpose of growth (Owen & Yamson, 2010). This also corroborates the submission of Gort and Klepper (1982) that, at the introduction stage, the firm's products is new in the market, low sales and the need to increase sale. At this stage, they are usually faced with serious competitions from rivals firms, hence, they will required huge capital to compete favourably in order to move the product higher and gets to the next stage of the cycle. The finding however disagree with Miller (1977) and the static trade-off theory suggests that firms in infancy and adolescence cannot employ debt financing due to risk of going bankrupt, low earnings that cannot support tax benefit of higher interest payments.

Now, considering the relevance of the other variables in terms of signs and significance, the coefficient of firm sized (FSIZE) and growth (GRWTH) are negative and passes the 5 percent significance level; suggesting that the variables are significant determinants of capital structure at the introduction stage. Theoretically, firms with strong asset base under this stage will be able to use higher debt than the smaller firms because, they are more advantageous for lower interest rate as well attracting financial institutions readiness to give them loans because they are unlikely to default on loans as a result of their huge assets base (Eriotis, Vasiliou & Ventoura-Neokosmidi, 2007). However, the negative sign suggests that as the size and growth level of the firms increases the level of capital structure (leverage) employed decreases. Those of profitability (PROF) and asset structure (ASTRU) are negatively signed and failed the 5 percent significance level. This indicates that in non-financial firms in Nigeria, PROF and ASTRU do not significantly impact capital structure hence, they are not relevant factors to be considered in the determination of the level and pattern of capital structure employed by firms at the birth stage. However, firm's age (FAGE) has an insignificant positive relationship with capital structure. In all, the result showed that the model is well specified in the introduction stage because the J-statistic confirms the validity of the instruments (independent variables) in the GMM estimation.

4.4 The Growth stage (LDUM 2)

The estimation of growth stage as represented by LDUM 2 in Table 2 showed that the non-financial firms in Nigeria are in the growth stage of the life cycle. This was confirmed by the significant relationship between LDUM 2 and capital structure. This result corroborates the submission of Fama and French (2001) that a strong relationship does exists between firm's life cycle and growth opportunity, and that at this stage most firms seek political relevance in their environment in order to maintain business stability (Necyk, Souza & Frezatti, 2007). Also, the result is in line with the a priori expectation of the model which states that growth stage should be positively related with capital structure. Although LDUM 2 is negatively signed and it suggests less usage of debt in the capital structure at this stage. The finding agrees with study of Frielinghaus, Moster and Firer (2005), Bulan and Yan (2010), La Rocca, La Rocca and Cariola (2011); it also aligns with the tradeoff theory of capital structure that growth indirectly represents higher bankruptcy costs, lower free cash flow problems, and exacerbated debt agency problems, these imply less debt (Frank & Goyal, 2009).

The relevance of the other individual variables at the growth stage are also analyzed. The coefficients of FSIZE, FGRTH and ASTRU have significant inverse relationship with capital structure. They were significant at the 1 percent and 5 percent significant levels. This result suggests that in the determination of the pattern of capital structure employed by non-financial firms in Nigeria, FSIZE, FGRTH and ASTRU are the most important variables to be considered. However, the negative signs indicate that increases in FSIZE, FGRTH and ASTRU reduces firm's capital structure while the level of profitability increases as indicated by the significant positive impact of PROF on capital structure. The result of the Hansen J-statistic for the over-identification test is not significant and it shows that the model is well specified in the introduction stage and growth stage as well as the validity of the instruments (independent variables) in the GMM estimation.

Table 3: Determinants of Capital Structure under Firms' Life Cycles 3 and 4 in Nigeria

	LDUM 3 (Maturity Stage)			LDUM 4 (Shake-Out Stage)		
Variables	Coefficient	T-Ratio	Prob.	Coefficient	T-Ratio	Prob.
DT_A(-4)/(-1)	-0.010422	-1.022627	0.3072	0.147851	2.970142	0.0031**
FSIZE	-28.75631	-3.054463	0.0024**	-14.85165	-3.368560	0.0008**
FGRTH	-0.014749	-4.066292	0.0001**	-0.044048	-3.569454	0.0004**
PROF	0.011154	1.739578	0.0828	0.005861	1.054240	0.2923
ASTRU	-25.37171	-1.259846	0.2085	-27.37667	-1.414191	0.1579
FAGE	0.482173	0.685413	0.4935	0.837350	1.175836	0.2402
LDUM3	3.455890	1.904009	0.0577*	-	-	-
LDUM4	-	-	-	20.53768	2.234043	0.0259*
J-statistic	32.62621				39.69979	
Prob(J-stat)	0.293070				0.230911	

Source: Author's compilations 2024. **Note:** ** sig at 1% level; * sig at 5% level.

4.5 Maturity Stage (LDUM 3)

The estimation of the maturity stage (LDUM 3) of the firms' life cycle is reported in Table 3 above. In the result, LDUM 3 is significant and positive, passing the 5 percent significance level. It clearly indicates that the hypothesized non-financial firms in Nigeria are actually at their maturity stage. Indeed, this is the stage where Ross (1977) argues that firms use more debt to overcome information asymmetries and signal better prospects; but Myers (2001) also used information asymmetries to argue that managers are unlikely to issue equity because they fear it will signal that the stock price is overvalued. This finding aligns with those of Frielinghaus, Moster and Firer (2005), Castro, Tascón and Amor-Tapia (2015) who found significant relationship between life cycle stages and leverage. But the finding disagreed with those of Ahsan et al. (2016) who observed low leverage of firms during the maturity stage. We conclude that while non-financial firms in Nigeria used more debt in their capital structure at the maturity stage, the maturity stage is therefore very significant in the determination of capital structure in Nigeria within the investigating period.

The coefficients of FSIZE and FGRTH has significant positive impact on capital structure of non-financial firms in Nigeria; while those of the coefficients of PROF, ASTRU and FAGE failed the 5 percent significance level hence, they do not have significant impact on capital structure of firms at the maturity stage.

4.6 Shake-Out Stage (LDUM 4)

The estimation of the shake-out stage of the firms' life cycle is also reported in Table 3 above. In the result, LDUM 4 which represents the shake-out stage is significant and positive, passing the 5 percent significance level. The implication of this is that, the shake-out stage is a significant factor in the determination of the level and pattern of capital structure employed by non-financial firms in Nigeria. The finding agrees with those of Pinkova and Kaminkova (2012) as well as Castro, Tascón and Amor-Tapia (2015), Wando, Marcelo, Karen and José (2017) who found a strong positive relationship between leverage and firm life cycle.

As it relates to the other individual variables, the coefficients of FSIZE and FGRTTH are significant at the 1 percent level, indicating that these two variables are the only factors significantly affecting capital structure of non-financial firms at the shake-out stage in Nigeria. Those of PROF, ASTRU and FAGE failed the 5 percent significance levels, suggesting that they do not play significant role in the determination of capital structure of no-financial firms in Nigeria.

For the main diagnostic test, the Hansen J over-identification test, which helps to verify the validity of instruments for LDUM3 and LDUM4 models are 32.62621 and 9.69979, with their corresponding probabilities values of 0.293070 and 0.230911. It does fail to reject the null hypothesis of no endogeneity problem. The over-identification restrictions are therefore equal to zero and valid, indicating that the models are well specified for the maturity stage and shake-out stage, as well as the validity of the instruments in the GMM estimation.

Table 4: Determinants of Capital Structure under Firms' Life Cycle 5 in Nigeria

LDUM 5		(Decline Stage)	
Variables	Coefficient	T-Ratios	Prob.
DT_A(-1)	-0.123739	-3.831847	0.0001
FSIZE	-13.63979	-3.210131	0.0014**
FGRTTH	-0.028410	-5.095855	0.0000**
PROF	0.009480	1.856633	0.0639
ASTRU	-33.57847	-1.979400	0.0482*
FAGE	1.126471	1.533601	0.1257
LDUM5	-6.755069	-2.320616	0.0207*
J-statistic	29.62247		
Prob(J-stat)	0.725117		

Source: Author's compilations 2024. Note: ** sig at 1% level; * sig at 5% level.

4.7 Decline Stage (LDUM 5)

The last stage of the firms' life cycle analysis is the decline stage as represented by LDUM 5 in Table 4 above. From the result, it is seen that LDUM5 has significant inverse relationship with capital structure of non-financial firms. This also confirms that the decline stage significantly determines firms' capital structure in Nigeria. However, the negative sign is an indication that the level of capital structure reduces as LDUM5 increases by the day. Hence, there is the need for effective management of the companies' debt-equity structure at this stage in order to ensure continuous survival and profitability of the firms. Again, this finding is in line with those of Ahsan et al. (2016) found that decline stages reduces capital structure. It however agrees with the findings of Frielinghaus, Moster and Firer (2005), Pinkova and Kaminkova (2012) who found significant relationship between life cycle stages and leverage.

Now, with respect to the individual variables, it was again observed that the coefficients of FSIZE and FGRTTH passed the 1 percent significant level; suggesting that the two variables are potent factors for determining capital structure of non-financial firms at the decline stage in Nigeria. Asset structure (ASTRU) has significant inverse relationship with capital structure; while those of PROF and FAGE failed the 5 percent significant level. This also means that PROF and FAGE do not play significant role in the determination of the level of leverage during the decline stage. The result of

the J-statistic for the decline stage (LDUM5) model is not significant and it shows that the model is well specified for the decline stage as well as the validity of the instruments (independent variables) in the GMM estimation.

4.8 Discussion of Findings

This study followed Dickinson (2011) five stages of firms' life cycle. The empirical findings with respect to the introduction stage (LDUM1) indicates a significant positive relationship with capital structure as measured by debt-to-total assets. The implication of this is that non-financial firms in Nigeria are not only in the introduction stage but the introduction stage is also a significant determinant of the level of capital structure of firms. This is in line with theoretical expectation that firms in their early life stages are more levered and hence, they favour the use of debt for the purpose of growth (Owen & Yamson, 2010). This also corroborates the submission of Gort and Klepper (1982) that, at the introduction stage, the firm's products is new in the market, low sales and the need to increase sale. At this stage, they are usually faced with serious competitions from rival firms, hence, they will required huge capital to compete favourably in order to move the products higher and gets to the next stage of the cycle.

The growth stage (LDUM2) was also found to be significantly related to capital structure, confirming the relevant nature of the stage to firms' capital structure. Although LDUM 2 is negative, and it suggests less usage of debt in the capital structure at this stage. Indeed, it aligns with the static trade-off theory which suggests that firms in growth stage cannot employ debt financing due to risk of going bankrupt, low earnings that cannot support tax benefit of higher interest payments, hence, less debt (Miller, 1977; Frank & Goyal, 2009). On the contrary, the pecking order theory would predict more debt when firms expect to grow, as new investments require additional funds, holding profitability fixed (Adam & Goyal, 2008). By implication, during the growth stage, capital structure of non-financial firms in Nigeria follows the tradeoff theory where firms reduce the use of debt as they grow.

The outcome of the maturity stage of firms' life cycle (LDUM3) confirmed that the stage is a significant determinant of capital structure of non-financial firms in Nigeria within the period of investigation. LDUM3 was positive and passes the 5 percent significance level. The results is in line with theoretical expectation as postulated by Ross (1977) that firms often employ more debt to overcome information asymmetries and signal better prospects. However, on the basis of information asymmetries, Myers (2001) argued that managers are unlikely to issue equity because they fear it will signal that the stock price is overvalued. Corporate managers in Nigeria should know that maturity stage is often regarded as the longest stage of the firm's life cycle because, it is at this stage that firm's sales growth begins to decline, gets to its peak in terms of demand cycle. Even Owen and Yamson (2010) This finding therefore aligns with those of Frielinghaus, Moster and Firer (2005), Castro, Tascón and Amor-Tapia (2015) who found significant relationship between life cycle stages (maturity stage) and leverage; but disagreed with those of Ahsan et al. (2016) who observed low leverage during the maturity stage.

The significant positive relationship between the shake-out stage and capital structure is an indication of the higher demand of debt financing in order to take the firm out of crisis situation.

This stage, if not properly managed may lead to decline stage; and if managed well, by adjusting current financing strategy, could reverts to profitable position. This is true because, a firm at the Shake-out stage of its life cycle needs to adjust its strategic plans in order to go back to its previous

stage, where it was more profitable (Lester, Parnell & Carraher, 2003). The finding strongly supports those of Pinkova and Kaminkova (2012) as well as Castro et al (2015), Wando, Marcelo, Karen and José (2017) who found a strong positive relationship between leverage and shake-out stage of firm life cycle.

The decline stage is a significant determinant of capital structure of non-financial firms in Nigeria. Indeed, the decline stage of the life cycle is often a very critical moment for a firms' survival. The reason being that, at this stage, the firm experiences negative cash inflow, growth stagnation coupled with decreased ability to respond to challenges (Necyk, Souza & Frezatti, 2007). Thus, firm's inability to meet pressing outside demands at an earlier stage result in total decline in profit, asset structure as well as decline in its market value (Lester, Parnell & Carraher, 2003). It is also at this stage that a firm experiences stagnancy and decreasing sales income. However, Dickinson (2011) had argued that there is the possibility for the decline stage to occur immediately after any of the previous 4 stages if and only if the firm fails to establish itself in the market. The implication of the forgoing is for the effective management of companies' debt-equity structure for continuous survival and profitability. The finding is in support of Ahsan et al. (2016) who found that decline stages reduce capital structure, but agrees with Frielinghaus et. al (2005), Pinkova and Kaminkova (2012) who found significant relationship between life cycle stages and leverage.

5. Conclusion

This study investigated the determinants of capital structure under firms' life cycles in Nigeria. A sample of seventy six (76) non-financial firms was used for the period of nine years, 2014 to 2022. The dependent variable was debt-to-total asset, while the independent variables are firm size, growth opportunities, profitability, asset structure and firm age. Dummy variables (DLum1-5) were used to represent each of the five cycle life stages in line with Dickinson (2011) five stages of life cycle models. The Dynamic System-GMM was employed for analysis of data and the results generally revealed that life cycle stage is a significant determinant of capital structure of non-financial firms in Nigeria. It was found that while introduction stage (LDUM1), maturity stage (LDUM3) and shake-out stage (LDUM4) have significant positive relationship with capital structure, growth stage (LDUM2) and decline stage (LDUM5) are significant and negatively related to capital structure. Firm size and growth opportunities are significant determinants of capital structure across the life cycle stages. They were found to be inversely related to capital structure of non-financial firms in Nigeria. In the growth stage (LDUM2), profitability is a significant determinant of capital structure; but across the other stages, it does not significantly influence capital structure. The study concludes that the five life cycle stages as advocated by Dickinson (2011) holds in listed non-financial firms in Nigeria and are also significant determinants of capital structure of the firms.

5.1 Recommendations

Based on the findings from this study, the following recommendations are forwarded:

First, since firm size and growth opportunities have consistently proved to be potent factors for determining capital structure in Nigeria, it therefore follows that managers should focus more attention on FSIZE and FGRTH if they are to effectively manage their firms' capital structure across the life cycle. This is true because, as they firm grow in size and the assets enlarged, management will opt for appropriate capital structure that will match or suit the growth of the firm. They should also take cognizance of the shake-out stage which represents crisis situation, because

at this stage the profit of the firm is threatened and the option of going for more debt (as confirmed by the significant positive relationship between LDUM4 and capital structure above) becomes imminent.

Secondly, corporate managers should be more effective and efficient in the management of the companies' debt-equity structure during the decline stage in order to ensure continuous survival and profitability. The reason being the stage is a very critical moment for survival, where firms experience negative cash inflow, growth stagnation coupled with inability to respond to challenges.

Thirdly, lenders, financial institutions or financiers, should always endeavor to study their clients life stages because, an understanding of clients' life stages and growth patterns holds multiple advantages for them. An awareness of the client's specific growth stage and where the firm has been and how it got there will help them (lenders) better evaluate the firm's financial information, current and future needs, and management capabilities' thereby avoiding the pitfall of non-performing loans

Lastly, asset managers should be constantly trained on how to effectively allocate company's funds across life cycle stages. This is very imperative because, proper understanding of organizational life stages will go a long way to assist them routinely allocate funds according to the company's future prospects.

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