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Applicability of Pecking Order and Signaling Theories: Evidence from Non-Finance Sector in Nigeria

NWOKOYE, Gladys Anwuli (Ph.D)
University of Benin, Edo State, Nigeria
Email: gladys.nwokoye@uniben.edu

And

FESTUS Babatunde Oshobuye
tundefsts@gmail.com

&

OMOREGIE, Nosa
Ambrose Alli University, Ekpoma
mobendexcel@gmail.com

Abstract
This study focused on testing the existence of the Pecking Order and the Signaling theories for companies in the Nigerian stock exchange. Data used is for 74 companies in the Nigerian Stock exchange for the period of 2010 to 2019. The tests were based on the effects of debt-to-equity ratios on cashflow (Pecking Order test) and lagged debt ratios on cashflow (Signaling Theory). The system GMM technique was employed in estimating the relationships of the study. The study found that increasing debt in a company led to declines in cashflow, thereby justifying the Pecking Order theory. Moreover, short term debt was found exert stronger influences on cashflow than long term debt. The study however, find no evidence of the Signaling theory among the companies in the sampled sector. We therefore recommend increasing debt to equity ratio as strategic option for improving firm valuation in the non- finance sector in Nigeria.

Keywords: *Capital structure, pecking order theory, and Signaling theory,*

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I. Introduction

Companies generally depend on finance for initial investment and expansion. The sources of finance available for firms or companies are internal sources, debt and equity. In practice, companies first resort to internal sources of financing as a means of starting a business, and then debt before issuing equity. In other words, companies choose their financing sources in priority preferring internal sources of fund when available, debt is preferred over equity if external financing is required. Peeking order theory and the signaling theory are studies that look into optimal capital structure that was posited by Maligliani and Miller (1963). Modigliani and Miller opined that due to the deduction of interest payments from a firm's taxable income, the capital structure mix is relevant to the firm's value.

According to Myers and Malut (1989), pecking order theory states that companies privatize their sources of financing from internal financing, debt to equity according to the cost of financing, preferring to raise equity as a financing means of last resort. Pecking order theory starts with asymmetric information as managers know more about their company's prospects, risk and value than outside investors. Asymmetric information affects the choice between internal and external financing and between the issue of debt or equity. Therefore, there exists a pecking order for the financing of new projects (Wikipedia, 2020). Myers (1984) stated that pecking order theory is among the most influential theories of corporate leverage simply because of adverse selection, information asymmetry and moral hazard, firm desire internal to external sources of finance. When outside funds are necessary, firms will opt for debt than equity because of lower information costs associated with debt issues as well as the inability of debt to dilute the control of equity capital (Akorsu, 2014).

Barclay and Smith (2005) argued that, signaling theory assumes that financing decisions are designed basically to signal manager's confidence in the firm's future prospects to outside investors as well as their financial independence. Asymmetric information favours the issue of debt over equity as the issue of debt signals the board confidence that an investment is profitable and that the current stock price is under-valued (were stock price over – valued, the issue of equity would be favoured). The issue of equity would signal a lack of confidence in the board and that they feel the share price is over – valued. An issue of equity would therefore lead to a drop in share price. This does not however apply to high-tech industries where the issue of equity is preferable due to the high cost of debt issue as assets are intangible (Wikipedia, 2020). However, Auton argued that the financial crises during 2008 and 2009 showed that corporate managers appeared to lack an understanding of the role of asymmetric information. The market for mortgage-backed securities, which many believe was at the core of financial crisis involved asymmetric information between investors and issuers.

Various scandals such as the one involving Bernce Madoff, illustrate the depth of asymmetric information problems between firms insiders and investors (Akorsu, 2014). Signaling theory posits that financial institutions and lenders have adverse selection regarding investment prospects. Managers of financial institutions then attempt to pass on to lenders their good expectations of future feat through various signals, which can be higher leverage or accumulated assets. Lenders judge the truth of these signals and then decide to save with such institutions who will intend give them out as loans to their customers. If high leverage can also work as financing signal for financial institutions, financial firms should have a higher leverage level which is connected with contemporaneous investments.

Since the benefits from the investments cannot be realized immediately due to the long term nature, banks as well as insurance companies reap interest on the borrowed loans, the relevant signaling should imply a positive relationship between financial institutions, current leverage and cashflow.

Consequently Pecking order financing suggests that financial institutions with given investment opportunities in any given period will first rely on available cashflow to meet financing needs in their effort of maintaining optimal capital structure and prevent dilution of control. When financial institutions are faced with high non-performing loans which invariably means their financial performance begins to dwindle, managers of such institutions will prefer utilizing debt financing to issuing equity which means that cashflow and leverage should be negatively related. In Nigeria, enough studies have not been carried out to empirically test non-finance quoted companies in Nigeria follow the pecking order and signaling theories of capital structure. This paper attempts to fill this gap. Therefore, the objectives of this study are: to examine if relationship between short term debt to equity ratio is negative to test its conformity with the Pecking order theory and positive with signaling theory; to examine if the relationship between longterm debt to equity ratio is negative to test it conformity with the Pecking order theory and positive with signaling theory; and to examine if the relationship between total debt to equity ratio is negative to test it conformity with the Pecking order theory and negative with signaling theory.

II. Literature Review

2.1 Theoretical Review

2.1.1 Pecking Order Theory

According to Abdikudor (2015), Pecking order theory takes a behavioural approach in explaining capital structure. Myers and Majlut (1984), Shyam – Sunder and Myers (1994) firms have a hierarchy and preferences in financing. They argued that firms preferred internal funds first, then debt and finally resort to equity to finance their operations. According to this theory, the management of firms make financial decisions that causes them the least difficulties (Wanja, 2015). According to Barclay and Smith (2005), the Pecking order theory implies that, companies that identify relatively smaller number of investment opportunities and free will have low debt ratios because the cash will be used to settle the debt. It therefore suggested that blue – chip firms with low operating cash will have high debt ratio because of their reluctance to raise new equity (Akorsu, 2014). It should be emphasized that where information asymmetry does not clearly manifests itself, the firm will then turn to debt if additional funds are needed, and eventually issue equity to cover any remaining capital requirements. It is clear at this point that, firms would prefer internal sources to costly external finance not only because of the cost of capital but to prevent the dilution of control of existing equity holders (Akorsu, 2014). However, the Pecking order theory is of the opinion that there is no well – defined optimal capital structure, instead the debt ratio is the result of hierarchical financing over time (Myer, 1984).

The Pecking order theory is assumed to be much more implemented by the small firms and non-dividend paying firms. In other words, firms that are profitable are and can generate earnings one expected to use debt capital than those that do not generate high earnings. According to Symeou (2003) the main reason that companies may choose to maintain spare debt capacity is to maintain their credit rating since it can take several years to recover from a downgrade. In Pecking order theory, debt ratio reflects the cumulative result of all the firm's previous financing decisions and as a result the cumulative requirement for external financing (Vasilis, 2010). That is, changes in the level of debt are not driven by the need to adjust it to an optimum, but rather by the need for external financing. This in turn, is determined by the imbalance between a firm's investment need and internally generated funds.

2.1.2 Signalling Theory

Signaling theory was developed by Ross (1977). According to Ross (1977), if managers have inside information about a firm, the choice of their capital structure would signal crucial information in the market. Akoto and Gatsi (2010), argued that signaling theory is built on the presumption that managers have superior information than the stakeholders on the activities of the firm, and for that matter managers could increase the leverage component. The emphasis is that debt can be used as expensive signal to differentiate firm when planning financial leverage decisions. Firms managers decisions on capital structure is regarded as a signal. For instance, if a firm incurred more debt to finance it operations maybe considered as positive signal that the managers are doing well and there is prospects for the firm. According to Akorsu (2014), debt mandates firms to make a fixed set of cash payment to debt-holders over the term of the debt security. Firms could be forced into bankruptcy if they default in honouring their debt obligations. While bankruptcy is costly to managers as they could lose their jobs. It therefore means that the manager decision on debt is very critical to the firm wellbeing.

On the other hand, firms issuing shares could speak volume particularly signaling managers foreseeing negative prospect. Barclay and Smith (2005) and Akorsu (2014) in contrast to market timing where securities offering are seen as an attempt to raise "cheap" capital the signaling model assume that financing decisions are designed basically to convey managers confidence in the firms future prospects to outside investors. They argued that it is done to raise the value of shares when manager's think they are under-valued. Generally, firms payment of yearly dividend is not compulsory, however the firms that pay dividend can be said to be performing. According to Ross (1977) adding more debt to the company's capital structure can serve as a credible signal of higher expected future cashflow. This is the reason why financial leverage has been considered to be one potentially effective signaling mechanism.

2.2 Empirical Review

Several empirical studies have been carried out to linked the theory of capital structure to the Non – finance quoted companies. Fama and French (2002) observed that firms might employed equity finance without violating the Pecking order theory when firms anticipate need for external financing in the near future for the implementation of new projects. If the foreseen debt requirements become unfeasible by a future debt ratio above the firms' capacity, it will issue new shares to be able to issue more debt in the future, Myers (1977), Barclay and Smith (2005). Posit in favour of using market to book value, size of the firm and the profitability ratio in order to test the Pecking order theory. They found that the effect of debt capacity could be negative if the size and profitability increases, which would result to higher, market to book value ratio for the firm.

Titman and Wessel (1998) and Fama and French (2002) found a negative relationship between firm size, debt capital usage and profitability. They further noted that due to better information accessibility large firms face lower information cost when borrowing. Sunder and Myers (1999) investigate the effect of financial deficit on net debt issued through IPO. In the same vein, Frank and Goyel (2002) found that financial deficit has a greater impact on study of Pecking order as one unit increase in any component of financial deficit will have the same unit impact on debt ratio. Harris and Raviv (1991) opined that firms with few tangible assets would have greater asymmetric information problems and accumulate more debt. However, conventional financial wisdom says that more tangible assets will generate more confidence in the investors and hence will lead to more debt accumulation.

Tong and Green (2005) examine the predictions of Pecking order theory using data from the Chinese market, they find a significant negative relationship between leverage and profitability and a significant positive relationship between leverage and past dividend. They conclude that Pecking order theory will be capable of explaining the financing behaviour of Chinese companies. Adedeji (2002) studied the prediction of Pecking order theory in the UK market. He found that new debt issues did not have a one – to – one relationship with firms financing deficit as Pecking order theory suggests where new debt issues financed only 22% of financing deficit. The test results showed that excluding the negative values (surplus amount) from the deficit variable increased the estimated coefficient on the deficit variable from 22% to 39%, implying that including negative values can reduce the effect of deficit variable on the dependent variable which is the change in total debt level. Zeidan, Galil and Shapir (2018) argued that owners of private firms in Brazil follow the Pecking order theory.

Pakistan, Naveed, Ishfaq and Zulfqar (2010) argued that the capital structure of most insurance companies follows the pattern of the Pecking order theory such that it is only when there are debt facilities that insurance companies will normally opt for equity capital. Their results also showed that, the signaling theory hold in the sense that, the performance of the insurance companies signals to the debt provider that they can redeem their debt whenever it is due amounting to the reason why their debt components continue to rise. El-Walid and Singapurwoko (2011) in their investigation on testing theories of capital structure, found that, there are several factors that can influence the theories of capital structure. In view of that, their study used operation decision factor, macroeconomics factor, firm size factor, and industry factor to help understand the theories of capital structure. However, the result indicated that in uncategorized data, debt firm size, and operational decision positively affect the choice of capital based on the Pecking order theory as well as the free cashflow theory. On the other hand, industry factor is found to negatively affect the choice of debt capital. This implies the defiance of the Pecking order theory.

Chang, Chen and Chen (2013) study the determinants of debt decisions for 305 Taiwan electronic companies that are quoted on the Taiwan Stock Exchange in 2009. They showed that the determinants of capital structure are profitability and growth rate. From that backdrop, profitability negatively effects on capital structure. It implies that firms prefer to use their earnings to finance business activities and thus use less debt capital. Growth rate was found to positively affect capital structure. Size is a moderator variable in their study. Size of firms moderate the effects of tax rate on capital structure. Large firms appears to take advantage of the tax deductibility of debt. Akoto and Gatsi (2010) study capital structure pattern of Ghana banks to the Pecking order theory, they found that the banks in Ghana are hugely leveraged, implying high reliance on debt capital than equity capital. However, Ansong and Asmah (2013) showed that the capital structure of insurance companies in Ghana are made up of debt and equity capital. Akorsu (2014) in testing the Pecking and signaling theories for financial institutions in Ghana, they found that unlike corporate firms which usually use low leverage as a signal to attract potential investors, financial institutions prefer to use more debt capita in their operational activities with larger investment capacity, low cashflow as well as increase in their age. Beattie, Goodacre and Thomson (2006) uses a comprehensive survey of corporate financing decision – making in UK firms contained in the UKQl list to suggest that the complexities and diversity of capital structure decision is hard to be captured by capital structure theories, it is more than simple association between capital structure outcomes and firm – specific characteristics. In their study, 60% of responding firms are consistent with Pecking order hypothesis.

III. Methodology

3.1 Model Specification

The model estimated in this study considers cashflow as the major indicator variable for investors in terms of quality of the company. Testing the Pecking Order and the Signaling theories therefore implies that cashflow to asset ratio is employed as the dependent variable. The tests is therefore based on the effects of debt-to-equity ratio on the cashflow which is specified as follows:

$CF_{it} = f(D/E_{it})$ (1)

Where CF is cashflow and D/E is the debt-to-equity ratio, represents the given firm, and t is the time period. The debt structure is however expected to be disaggregated given that the theories specified the roles of short-term and long-term debt in the relationships. Hence, the debt ratio is disaggregated into short-term debt-to-equity ratio (STDE) and long term debt-to-equity ratio (LDTE). Total debt debt-to-equity ratio (TDE) is also included in the model. Moreover, cashflow is considered in terms of total operating flows to asset ratio (CFOA) and free cash to asset ratio (FCTA). Therefore, two sets of estimates are specified in the study:

$CFOA = f(STDE, LTDE, TDE, X)$ (2)

$CFOA = f(STDE, LTDE, TDE, X)$ (3)

Where X is a vector of control variables that are uncorrelated with the error term but affect cashflow in the firms (including firm age – FA, firm growth – FG, and firm size – FZ). In econometric terms, the system GMM model is specified as:

$CFOA_{it} = \alpha_1 STDE_{it} + \alpha_2 LTDE_{it} + \alpha_3 TDE_{it} + \alpha_4 FG_{it} + \alpha_5 FG_{it} + \alpha_6 FG_{it} + \delta_t + \varepsilon_{it}$ (4)

$FCTA_{it} = \beta_1 STDE_{it} + \beta_2 LTDE_{it} + \beta_3 TDE_{it} + \beta_4 FG_{it} + \beta_5 FG_{it} + \beta_6 FG_{it} + \delta_t + \varepsilon_{it}$ (5)

Where δ is the firm fixed-effect parameter and ε is the stochastic error term.

For the Pecking Order theory to hold, the following a priori signs must hold:

$\alpha_1, \alpha_2, \alpha_3, \beta_1, \beta_2, \beta_3 < 0$, which show that increase debt against equity leads to decline cashflow in the firm.

In testing the Signaling theory, information asymmetry is considered between debt ratios and cashflows. Hence, the model employs cashflow variables as the dependent variables, but uses the lags of the debt variables as the explanatory or forcing variables as follows:

$CFOA_{it} = \alpha_1 STDE_{it-1} + \alpha_2 LTDE_{it-1} + \alpha_3 TDE_{it-1} + \alpha_4 FG_{it} + \alpha_5 FG_{it} + \alpha_6 FG_{it} + \delta_t + \varepsilon_{it}$ (6)

$FCTA_{it} = \beta_1 STDE_{it-1} + \beta_2 LTDE_{it-1} + \beta_3 TDE_{it-1} + \beta_4 FG_{it} + \beta_5 FG_{it} + \beta_6 FG_{it} + \delta_t + \varepsilon_{it}$ (7)

For the Pecking Order theory to hold, the following a priori signs must hold:

$\alpha_1, \alpha_2, \alpha_3, \beta_1, \beta_2, \beta_3 > 0$, which show that increase in debt against equity in previous periods sends information to the market that leads to increases in the cashflow in the firm.

3.2 Method of Data Analysis

Given the financial systems within the firms, it is observed that both cashflow and debt or equity patterns are endogenous. This is because debt may stimulate cashflow and the reverse can also be the case. Hence, the relationship cannot be estimated with OLS since it would lead to simultaneity bias (Iyoha, 2004). For the purpose of analyzing the dynamic relationship among the variables as specified in (2) above, and for robustness check, the generalized methods of moments (GMM) estimators were used. Specifically, the system-GMM developed by Arellano and Bond (1991) and Bover and Blundel (1998) was used for two-step. The Hansen statistic developed by Hansen (1982) which is the minimized value of the two-step GMM function, is robust and used in this study to test for identifying restrictions and the validity of the instruments. For this purpose, it is expected that the p-value of the Hansen test should range between 0.1 and 0.25. Additionally, Roodman (2009) recommends that the number of instruments should not outnumber the cross-sections (i.e. countries). Another very necessary condition for the difference GMM is that the error term does not have second-order autocorrelation; otherwise the standard error of the instrument estimates grow without bound (Doytch and Uctum, 2011). Therefore, the presence of second-order serial correlation is confirmed based on the value of AR (2) which is generated by default using the xtabond2 command in STATA. If the p-value of AR (2) is significant, then there is problem of second order serial correlation.

IV. Data Analysis

4.1 Descriptive Statistics

The annual summary of the data used in the empirical analysis is shown in Table 1. It is seen that average of the ratio of cash flow from operations to total assets among the firms is 9.13 percent. The maximum of the variable is 58.95 percent and a minimum of -54.11 percent. Given that the standard deviation is relatively close to the mean value, it can be deduced that the companies in the study are essentially less liquid when compared to the total assets. The average for the ratio of free cash to asset is also 5.73 percent on average, which also buttresses the earlier note that the companies preferred less liquid positions in their operations. In terms of the debt structure, only the short term to equity ratio is positive at 45.71 while the average long term debt to equity ratio is -164.12 percent and total debt to equity ratio at -2.43. There is therefore evidence that these firms have a debt structure that indicates a more favoured long term debt pattern that exceeds average equity. The companies therefore appear to be highly levered. Average firm age is 26 years, although the minimum value indicates that there were certain firms in the study that are a year old. Firm growth is generally unimpressive, given the negative average value shown in the Table. The J-B statistic in the Table is highly significant for each of the variables. This clearly suggests that the variables are non-normal in their distribution, perhaps due to high level of heterogeneity that is induced by firm-specific effects.

Table 1: Descriptive Statistics

Variable	Mean	Max.	Min.	Std. Dev.	Skewness	J-B	Prob
CFOA	9.13	58.95	-54.11	13.28	0.04	77.89	0.00
FCFA	5.73	114.19	-87.91	19.79	0.23	674.84	0.00
TTDE	-2.42	202.90	-31.06	115.70	-26.58	158.00	0.00
LTDE	-164.12	487.31	-14.90	5485.89	-26.73	160.00	0.00
STDE	45.71	376.41	4.56	36.52	4.97	41.72	0.00
FS	7.08	9.24	5.09	0.83	0.21	12.00	0.00
FA	26.09	55.00	1.00	13.48	-0.24	57.55	0.00
FG	-0.35	103.90	-1176.19	53.53	-19.17	463.00	0.00

Another description of the dataset is in terms of the correlations among the main variables in the study. This shows the initial pattern of characterizations among the variables. The correlation matrix shown in Table 2 indicates that a strong positive correlation exists between the two cashflow variables, indicating that operating cash flow and free cash in the systems move in the same direction.

Table 2: Correlation Matrix

Variable	CFOA	FCFA	TTDE	LTDE	STDE	FS	FA
FCFA	0.60 (0.00)						
TTDE	0.07 (0.05)	0.13 (0.00)					
LTDE	0.07	0.13	1.00				

	(0.05)	(0.00)	(0.00)				
STDE	-0.12 (0.00)	-0.03 (0.40)	0.00 (0.90)	-0.01 0.78			
FS	0.14 (0.00)	-0.02 (0.59)	0.08 (0.02)	0.08 0.02	-0.05 0.16		
FA	-0.01 (0.79)	0.06 (0.08)	0.03 (0.38)	0.03 0.44	0.10 0.01	0.11 (0.00)	
FG	0.06 (0.09)	0.09 (0.01)	0.63 (0.00)	0.63 0.00	-0.01 0.76	0.12 (0.00)	0.05 (0.17)

Tests of Panel and Time series properties of Data

Cross-section Dependence Test

Before testing for the main time series properties of the datasets, it is necessary to disentangle the crucial features of the relevant variables taking into consideration the issue of cross-section dependence in the data. Since the companies in the sample are all Nigerian companies, they are likely to exhibit similar responses to overall cashflow indicators thereby presenting certain levels of interdependencies which may lead to spatial autoregressive processes (Woodridge, 2007). The issue of dependence across the companies is investigated by implementing the most commonly used test for cross section dependency (Pesaran, 2004 and 2007). Given that the number of cross-sectional units in this study is more than the time period (n = 74 and T=10), the standard Breusch and Pagan (1980) LM test for cross-equation correlation is not appropriate for testing cross-sectional dependence (Baltagi, Feng & Kao, 2012). We therefore adopt the cross-sectional dependence (CD) test developed by Pesaran (2004) which uses a pair-wise average of a sample correlation to test the existence of cross-sectional dependence. Unlike the traditional Breusch-Pagan (1980) LM test, the CD test is applicable for a large number of cross-sectional units (n) observed over T time periods. The result of the cross-sectional dependence test is presented in Table 3 below.

Table 3: Cross-section Dependence Test Results

Variables series tested	Pesaran CD	P-value	Abs corr
CFOA *equation*	0.893	0.371	0.095
FCFA equation	-1.092	0.241	0.119

From the result, it is seen that the Peseran CD test for all of the equations fail the significance test at the 5 percent level, suggesting the absence of cross-sectional dependence for the estimation structure. It further contributes to the efficiency of the estimation procedure especially as the estimation also allows for slope heterogeneity across panel units (Beqiraj, Fedeli & Forte, 2018; Adegboye & Eregha, 2019). We thus proceed by testing for unit root and for the presence of cointegration among the variables in the study.

4.2.2 Unit Root Test

Given that the data used in the study exhibit both firm-specific characteristics (individual heterogeneity) and common (homogenous) characteristics there is need for the use of panel unit root tests to check for the stationarity of the data – especially those that combine the two sectors. In this study, the tests developed by Levin, Lin and Chu (LLC) is used to examine the stationarity properties of the homogenous panel. This test assumes identical cointegration vectors among the countries. However, the different companies are likely to exhibit differences in their operational characteristics, hence the common unit root assumption may not be sufficiently realistic. To overcome this unique assumption for the firms in the sample, the Im, Pesaran and Shin (IPS, 2003) and the Augmented Dickey-Fuller tests, which allow for heterogeneity in the panel's cross-section and assumes a null hypothesis of no cointegration in the panel data, are adopted. The tests results are presented in table 4 below.

Table 4: Panel Data Unit Root Tests Results *in levels)

Variable	**Homogenous Unit Root Process**	**Heterogeneous Unit Root Process**		**Remarks**
	Intercept and Trend			
	LLC	**IPS**	**PP-Fisher**	
	***I*(0)**	***I*(0)**	***I*(0)**	
CFOA	-10.62**	-4.85**	536.1**	I[0]
FCFA	-10.83**	-4.81**	541.7**	I[0]
STDE	-1.98*	-0.02	344.1**	I[0]
LTDE	-1.77*	14.86**	311.4**	I[0]

TTDE	-17.79**	-2.33*	328.9**	I[0]
FS	-8.07**	-0.09	313.4**	I[0]
FA	-1.75*	0.63	0.44	I[0]
FG	-6.06**	-2.52*	490.4**	I[0]

Source: Estimated by the Author. *Note: ** and * indicate significant at 1% and 5 % levels respectively; IPS = Im, Pesaran & Shin; LLC = Levin, Lin & Chu*

In the unit root results in Table 5.8, it can be seen that the coefficient of the test for the variables in levels indicates that all the variables are stationary (given that the critical test values are higher than the test statistic). Given this condition, it is shown that the variables are all integrated of the same order (i.e., I[1]), therefore a cointegrated analysis can be performed for the variables with meaningful outcomes.

4.2.3 Cointegration Tests

The unit root results strongly indicate that the stationarity status of the variables are equal with each of the variables being I[0]. The long run conditions of the variable interactions can however be established to present a stronger background for a dynamic relationship among the variables. Table 5 shows the outcomes of the Pedroni and Kao panel cointegration tests on both the panel and the group assumptions along with the respective variance ratios and rho statistics (non-parametric tests). We use both the within dimension and between-group dimension tests to check whether the panel data are cointegrated. The coefficients of the IPS and Augmented Dickey Fuller test statistics for both the panel and group assumptions are significant at the 5 percent level. Thus, there is strong evidence of panel cointegration according to both the ADF-t and non-parametric-t statistics. These results are complemented by another residual based (Kao) panel cointegration test. The Kao residual cointegration test shown in Table 5.7 indicates that the null hypothesis of no cointegration can be rejected for each of the equations. Thus, the cointegration tests results show that there is strong long run relationships among the variables in the study. The panel estimation framework can therefore be employed in the empirical analysis.

Table 5: Panel Cointegration Tests

CFOA Equation							
	Within-dimension				between-dimension		**Kao**
	Unweighted		Weighted				
	Statistic	Prob.	Statistic	Prob.	Statistic	Prob	-3.37 (0.00)
Panel v-Statistic	-6.59	0.16	-9.57	0.12			
Panel rho-Statistic	10.34	0.033	10.439	0.01	13.94	0.03	
Panel PP-Statistic	-20.89	0	-29.44	0	-42.5	0	
Panel ADF-Statistic	-18.35	0	-23.38	0	-47.77	0	
FCFA Equation							
	Within-dimension				between-dimension		**Kao**
	Unweighted		Weighted				-5.04 (0.00)
	Statistic	Prob.	Statistic	Prob.	Statistic		
Panel v-Statistic	-6.6	0.06	-9.95	0.16			
Panel rho-Statistic	9.86	0.03	10.16	0.04	13.73	0.04	
Panel PP-Statistic	-23.1	0	-33.07	0	-44.41	0	
Panel ADF-Statistic	-28.09	0	-35.48	0	-48.89	0	

Regression Analysis

The empirical test of the Pecking Order Theory is conducted in this section. Recall that the dependent variables in the estimation are the ratio of operating cash flow to asset and that of the free cash to asset. In order to improve the robustness of the estimates, two of the control variables (FS and FG) are varied using different measures. In the first estimates, firm size and firm growth are considered in terms of assets, while in the second estimates the two variables are considered in terms of revenue inflow. The estimated equations are based on the dynamic panel data (DPD) estimations using the system GMM. In Table 6, the results of the dynamic estimates of the effects of the debt structure variables on the cash flow variables are presented in order to test the Pecking order Theory. The coefficient of the over-identifying restriction test statistic for the GMM estimates possess the expected values (i.e., greater than 0.1). Given that the Sargan -statistic value measures the appropriateness (or validity) of the instruments used for the estimation the results indicate that the instruments used in the estimation are valid. The Arrelano and Bonds first and second order serial correlation tests show that the first order statistic is statistically significant and has the expected negative sign. The second order statistic is not significant (in line with apriori expectation), suggesting that the model error terms are serial uncorrelated in levels. This provides additional support for the instrument's validity test indicated by the Sargan statistic.

Table 6: Regression result for testing the Pecking Order Theory

	Firm size and growth in terms of assets				*Firm size and growth in terms of revenue*			
	Dep var. = CFOA		*Dep var. = FCFA*		*Dep var. = CFOA*		*Dep var. = FCFA*	
	Coeff.	**p-val**	**Coeff.**	**p-val**	**Coeff.**	**p-val**	**Coeff.**	**p-val**
lag. dep. var.	0.406	0.01	0.142	0.002	0.403	0.02	0.135	0.00
STDE	-0.084	0.00	0.007	0.840	-0.079	0.00	0.010	0.78
LTDE	-0.002	0.46	0.001	0.885	-0.002	0.47	0.001	0.85
TTDE	0.088	0.42	-0.005	0.978	0.084	0.43	-0.014	0.94
FS	1.775	0.00	-2.149	0.017	3.340	0.00	1.008	0.21
FA	-0.021	0.53	0.086	0.119	-0.057	0.10	0.059	0.29
FG	-0.001	0.93	0.003	0.857	-0.005	0.49	-0.021	0.08
Overidentifying restriction (Sagan-prob)	0.151		0.180		0.137		0.281	
Arrelano-Bond AR(1)	-7.26 (0.00)		-8.02 (0.00)		-7.31 (0.00)		-7.93 (0.00)	
Arrelano-Bond AR(2)	0.82 (0.41)		0.08 (0.94)		0.86 (0.39)		0.14 (0.89)	
No. of observations	740		740		740		740	

Source: Author's computations

It can be seen that the estimated coefficients for the two sets of estimates (using asset or revenues for the FS and FG) are similar in terms of signs. The coefficient of each of the lagged dependent variables are significant at the 1 percent level for each of the estimates. This also justifies the use of a dynamic form for the relationship between cash flow ratios and the debt structure variables. Since the coefficients of the lagged dependent variables are all positive in the estimates, there is evidence of mean reversion and long run stability among the companies in the sample in terms of cash management. The coefficients for the estimates with asset-based FG and FS are however higher than those with the revenue-based FG and FS. This suggests that the degree of long run adjustment for firms with better assets is higher than for firms with smaller assets (even when their revenues are growing faster). Moreover, the results of the estimates with asset-based control variables present better positions for evaluation of the relationships. These are the estimates that in focus in this study.

The main variables of interest in the estimates are those of the debt-to-equity ratios. From the result, the coefficients of short-term and long-term debt ratios are negative and pass the significance test at the 5 percent level. This outcome is robust whether the measure of cash flow ratio is operating cash of free cash. The coefficients of the total debt ratio is however not significant at the 5 percent level, although it is positive for the first estimate and negative for the second estimates. Given this outcome, there is sufficient grounds to indicate that the debt structure variables exert significant negative impacts on cash flow ratios among the firms in the study. Increases in the debt of the companies – relative to equity – results in decline in cashflow among the firms, irrespective of the cashflow being considered. This is essentially a justification of the Pecking Order system among the firms in the study. Furthermore, the coefficients of the short term debt ratio in both cash flow estimates (-0.084, -0.079) are greater than those of the long term debt ratio estimates (-0.002, -0.002) in absolute terms. The suggests that the impact of increasing short term debt ratio in contemporaneously more relevant than the impact of increasing long term debt ratio. Thus, the result from the test of the Pecking Order theory justifies this position for the companies in the Nigerian Stock exchange.

The empirical test of the Signaling Theory is conducted in this section. The dependent variables employed are still the ratio of operating cash flow to asset and that of the free cash to asset. The results are also estimated by including estimates with varied measures of FS and FG. The results of the system GMM estimates are presented in Table 6. The results show the impacts of the debt structure variables on the cash flow variables as indicated by the Signaling theory procedure. The value of Sargan test for over-identifying restriction also possess the expected values (i.e., greater than 0.1). This implies that the instruments used in the system GMM estimation are valid and well selected. The Arrelano and Bonds first and second order serial correlation tests show that the first order statistic is statistically significant and has the expected negative sign. The second order statistic is not significant (in line with apriori expectation), suggesting that the model error terms are serial uncorrelated in levels. This provides additional support for the instrument's validity test indicated by the Sargan statistic.

Table 7: Regression result for testing the Signaling Theory

Variables	*Firm size and growth in terms of assets*				*Firm size and growth in terms of revenue*			
	Dep var. = CFOA		*Dep var. = FCFA*		*Dep var. = CFOA*		*Dep var. = FCFA*	
	Coeff.	**p-val**	**Coeff.**	**p-val**	**Coeff.**	**p-val**	**Coeff.**	**p-val**
lag. dep. var.	0.501	0.02	-0.140	0.00	0.525	0.03	-0.134	0.00
$STDE_{t-1}$	-0.050	0.09	0.031	0.53	-0.061	0.04	0.027	0.58
$LTDE_{t-1}$	0.001	0.85	0.003	0.34	-0.001	0.78	0.003	0.34
$TTDE_{t-1}$	0.024	0.80	-0.140	0.37	0.031	0.74	-0.142	0.36
FS	1.887	0.00	-2.108	0.02	3.576	0.00	1.175	0.15
FA	-0.028	0.42	0.080	0.16	-0.059	0.09	0.059	0.30
FG	0.012	0.16	0.034	0.01	-0.005	0.54	-0.022	0.06
Overidentifying restriction (Hansen J-prob)	0.291		0.203		0.366		0.211	
Arrelano-Bond AR(1)	-7.45 (0.00)		-8.20 (0.00)		-7.59 (0.00)		-8.00 (0.00)	
Arrelano-Bond AR(2)	1.06 (0.291)		0.30 (0.77)		0.99 (0.32)		-0.39 (0.69)	
No. of observations	*740*		*740*		*740*		*740*	

Like in the Pecking Order test estimates, the lagged dependent variables possess impressive diagnostic structures. The coefficients are positive for the estimates using CFAO as the dependent variables, while in the FCFA estimates, the coefficients are negative. This indicates that the estimates for the FCFA equations are unstable and cannot be used for evaluation of the Signaling test. The tests are therefore based on the estimates for the CFOA equation. For this result, the coefficients of the lagged debt ratio variables all fail the significance test at the 5 percent level for the equation with asset-based control variables, while only the lagged short term debt ratio passed the significance test in the equation with the revenue-based control variables. Recall that establishing a Signaling theory entails that the coefficients of all the lagged debt variables are positive and significant. That position does not hold in this estimation, therefore the hypothesis of a Signaling theory holding for Nigerian firms is rejected. From the results, increasing debt over equity in the company does not tend to send significant information in the current period when the cashflows are considered. Essentially, cashflow does not respond significantly to previous periods adjustments in debt (or equity) issuance by the firms.

V. Conclusion

In this study, the focus is on the test of the Pecking Order and the Signaling theories using the companies in the Nigerian stock exchange as case studies. The argument has been that raising debt structure (in relation to equity) is a potent factor in explaining how investors behave towards a company. The intermediary factor that suggests beneficial or harmful effects of debt ratios is considered to be the cashflow. The study therefore considers cashflow as an indicator to investors regarding the direction of influence of raining debt in the company. Data employed included 74 companies in the Nigerian Stock exchange for the period of 2010 to 2019. Given the endogeneity of debt in a cashflow model, the problem of simultaneity bias in the estimates were avoided by employing a system GGM technique for estimating the relationships. The results fund that increasing debt in a company actually influences cashflow negatively, thereby justifying the Pecking Order theory. In the same vein, the results found evidence that short term debt are more important in influencing cashflow than long term debt. This further concretised the prevalence of the Pecking Order theory for the companies in Nigeria. The study however found no evidence of the Signaling theory for the companies. It is therefore recommended that increasing debt to equity to be a strategic option for improving firm valuation in Nigeria.

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Appendices

STATA Results

```
. xtabond2 CFOA l.CFOA STDE LTDE TTDE FS FA FG, gmm(l.CFOA STDE LTDE TTDE, collapse) iv(FS
FA FG) small
Favoring speed over space. To switch, type or click on mata: mata set matafavor space, perm.

Dynamic panel-data estimation, one-step system GMM
------------------------------------------------------------------------------
Group variable: companynum                    Number of obs      =       666
Time variable : Year                          Number of groups   =        74
Number of instruments = 43                    Obs per group: min =         9
F(7, 658)     =      5.06                                    avg =      9.00
Prob > F      =     0.000                                    max =         9
------------------------------------------------------------------------------
        CFOA |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        CFOA |
         L1. |   .4062047   .0173428     2.98   0.009     .1391659    .0467566
             |
        STDE |  -.0839776    .020696    -4.06   0.000    -.1246158   -.0433394
        LTDE |  -.0016839   .0022739    -0.74   0.459    -.0061489    .0027811
        TTDE |   .0879464   .1087237     0.81   0.419    -.1255407    .3014336
          FS |   1.775266    .563956     3.15   0.002     .6678954    2.882636
          FA |  -.0214966   .0337591    -0.64   0.525    -.0877851     .044792
          FG |  -.0009925   .0108814    -0.09   0.927    -.0223589     .020374
       _cons |   1.014638   4.142033     0.24   0.807    -7.118558    9.147834
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(FS FA FG)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(1/9).(L.CFOA STDE LTDE TTDE) collapsed
Instruments for levels equation
  Standard
    FS FA FG
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.(L.CFOA STDE LTDE TTDE) collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -7.26  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.82  Pr > z =  0.411
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(35)    =  43.58  Prob > chi2 =  0.151
  (Not robust, but not weakened by many instruments.)

Difference-in-Sargan tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Sargan test excluding group:     chi2(31)    =  35.99  Prob > chi2 =  0.246
    Difference (null H = exogenous): chi2(4)     =   7.59  Prob > chi2 =  0.108
  iv(FS FA FG)
    Sargan test excluding group:     chi2(32)    =  37.65  Prob > chi2 =  0.226
    Difference (null H = exogenous): chi2(3)     =   5.93  Prob > chi2 =  0.115


xtabond2 CFOA l.CFOA STDE LTDE TTDE FSR FA FGR, gmm(l.CFOA STDE LTDE TTDE, collapse)
iv(FSR FA FGR) small
Favoring speed over space. To switch, type or click on mata: mata set matafavor space, perm.
```

```
Dynamic panel-data estimation, one-step system GMM
------------------------------------------------------------------------------
Group variable: companynum                  Number of obs      =      665
Time variable : Year                    Number of groups   =       74
Number of instruments = 43                 Obs per group: min =        8
F(7, 657)     =     10.03                          avg =      8.99
Prob > F      =     0.000                          max =        9
------------------------------------------------------------------------------
       CFOA |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       CFOA |
        L1. |   .4028372   .0176423     2.20   0.023    -.1363868    .0507124
            |
       STDE |  -.0787243   .0212727    -3.70   0.000     -.120495   -.0369535
       LTDE |  -.0016045   .0022399    -0.72   0.474    -.0060028    .0027938
       TTDE |    .084049   .1064589     0.79   0.430    -.1249917    .2930898
        FSR |   3.340442   .5208147     6.41   0.000      2.31778    4.363104
         FA |  -.0569035   .0344441    -1.65   0.099    -.1245372    .0107303
        FGR |  -.0051299   .0073547    -0.70   0.486    -.0195715    .0093117
      _cons |  -8.742688   3.649338    -2.40   0.017    -15.90846   -1.576917
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(FSR FA FGR)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(1/9).(L.CFOA STDE LTDE TTDE) collapsed
Instruments for levels equation
  Standard
    FSR FA FGR
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.(L.CFOA STDE LTDE TTDE) collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -7.31  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.86  Pr > z =  0.388
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(35)   =  44.21  Prob > chi2 =  0.137
  (Not robust, but not weakened by many instruments.)

Difference-in-Sargan tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Sargan test excluding group:     chi2(31)   =  35.87  Prob > chi2 =  0.251
    Difference (null H = exogenous): chi2(4)    =   8.34  Prob > chi2 =  0.080
  iv(FSR FA FGR)
    Sargan test excluding group:     chi2(32)   =  36.37  Prob > chi2 =  0.272
    Difference (null H = exogenous): chi2(3)    =   7.85  Prob > chi2 =  0.049
```

```
xtabond2 FCFA l.FCFA STDE LTDE TTDE FS FA FG, gmm(l.FCFA STDE LTDE TTDE, collapse) iv(FS FA
FG) small
Favoring speed over space. To switch, type or click on mata: mata set matafavor space, perm.

Dynamic panel-data estimation, one-step system GMM
------------------------------------------------------------------------------
Group variable: companynum                  Number of obs      =      666
Time variable : Year                    Number of groups   =       74
Number of instruments = 43                 Obs per group: min =        9
```

```
F(7, 658)     =      4.21                              avg =      9.00
Prob > F      =     0.000                               max =        9
------------------------------------------------------------------------------
       FCFA |      Coef.   Std. Err.       t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       FCFA |
        L1. |   .1421868   .0452377     3.14   0.002    -.2310144   -.0533591
            |
       STDE |   .0068117   .0336405     0.20   0.840     -.059244    .0728673
       LTDE |   .0005358   .0036912     0.15   0.885    -.0067121    .0077837
       TTDE |  -.0047655   .1764953    -0.03   0.978    -.3513275    .3417964
         FS |  -2.149018   .8980151    -2.39   0.017    -3.912338   -.3856972
         FA |   .0858931   .0550396     1.56   0.119    -.0221813    .1939674
         FG |   .0031953   .0176798     0.18   0.857    -.0315203    .0379108
      _cons |   19.28808   6.719049     2.87   0.004     6.094718    32.48144
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(FS FA FG)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(1/9).(L.FCFA STDE LTDE TTDE) collapsed
Instruments for levels equation
  Standard
    FS FA FG
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.(L.FCFA STDE LTDE TTDE) collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -8.02  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =  -0.08  Pr > z =  0.937
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(35)   =  23.33  Prob > chi2 =  0.180
  (Not robust, but not weakened by many instruments.)

Difference-in-Sargan tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Sargan test excluding group:     chi2(31)   =  79.98  Prob > chi2 =  0.000
    Difference (null H = exogenous): chi2(4)    =   3.35  Prob > chi2 =  0.501
  iv(FS FA FG)
    Sargan test excluding group:     chi2(32)   =  79.56  Prob > chi2 =  0.000
    Difference (null H = exogenous): chi2(3)    =   3.77  Prob > chi2 =  0.287
```

```
. xtabond2 FCFA l.FCFA STDE LTDE TTDE FSR FA FGR, gmm(l.FCFA STDE LTDE TTDE, collapse)
iv(FSR FA FGR) small
Favoring speed over space. To switch, type or click on mata: mata set matafavor space, perm.

Dynamic panel-data estimation, one-step system GMM
------------------------------------------------------------------------------
Group variable: companynum                      Number of obs      =       665
Time variable : Year                         Number of groups   =        74
Number of instruments = 43                      Obs per group: min =         8
F(7, 657)     =      3.88                              avg =      8.99
Prob > F      =     0.000                               max =        9
------------------------------------------------------------------------------
       FCFA |      Coef.   Std. Err.       t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
```

```
       FCFA |
        L1. |   .1353488   .0455965     2.97   0.003    -.2248812   -.0458163
            |
       STDE |   .0096455   .0346659     0.28   0.781    -.0584239    .0777148
       LTDE |   .0007106   .0036456     0.19   0.846    -.0064479     .007869
       TTDE |  -.0137693   .1732887    -0.08   0.937    -.3540358    .3264971
        FSR |   1.008151   .8107505     1.24   0.214    -.5838238    2.600125
         FA |   .0589556   .0561356     1.05   0.294    -.0512711    .1691824
        FGR |  -.0208341   .0119593    -1.74   0.082    -.0443172    .0026489
      _cons |  -2.125756   5.883837    -0.36   0.718    -13.67915    9.427637
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(FSR FA FGR)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(1/9).(L.FCFA STDE LTDE TTDE) collapsed
Instruments for levels equation
  Standard
    FSR FA FGR
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.(L.FCFA STDE LTDE TTDE) collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -7.93  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =  -0.14  Pr > z =  0.887
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(35)   =  29.31  Prob > chi2 =  0.281
  (Not robust, but not weakened by many instruments.)

Difference-in-Sargan tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Sargan test excluding group:     chi2(31)   =  23.59  Prob > chi2 =  0.190
    Difference (null H = exogenous): chi2(4)    =   3.72  Prob > chi2 =  0.445
  iv(FSR FA FGR)
    Sargan test excluding group:     chi2(32)   =  85.04  Prob > chi2 =  0.000
    Difference (null H = exogenous): chi2(3)    =   4.27  Prob > chi2 =  0.234



. xtabond2 CFOA l.CFOA l.STDE l.LTDE l.TTDE FS FA FG, gmm(l.CFOA l.STDE l.LTDE l.TTDE, collapse)
iv(FS FA FG) small
Favoring speed over space. To switch, type or click on mata: mata set matafavor space, perm.

Dynamic panel-data estimation, one-step system GMM
------------------------------------------------------------------------------
Group variable: companynum                      Number of obs      =       666
Time variable : Year                            Number of groups   =        74
Number of instruments = 40                      Obs per group: min =         9
F(7, 658)     =      3.20                                      avg =      9.00
Prob > F      =     0.002                                      max =         9
------------------------------------------------------------------------------
       CFOA |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       CFOA |
        L1. |   .5012044   .2173917     2.36   0.021    -.1431616    .0429527
            |
       STDE |
        L1. |  -.0503452    .029855    -1.69   0.092    -.1089678    .0082775
```

```
        |
   LTDE |
    L1. |  -.000376   .0019726    -0.19   0.849    -.0042493    .0034973
        |
   TTDE |
    L1. |  .0235163   .0938147     0.25   0.802    -.1606959    .2077286
        |
     FS |  1.887152   .5644418     3.34   0.001     .7788275    2.995476
     FA | -.0276728   .0341908    -0.81   0.419     -.094809    .0394634
     FG |  .0118833   .0083857     1.42   0.157    -.0045827    .0283494
  _cons | -1.139106   4.258853    -0.27   0.789    -9.501685    7.223474
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(FS FA FG)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(1/9).(L.CFOA L.STDE L.LTDE L.TTDE) collapsed
Instruments for levels equation
  Standard
    FS FA FG
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.(L.CFOA L.STDE L.LTDE L.TTDE) collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -7.45  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   1.06  Pr > z =  0.291
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(32)   =  35.90  Prob > chi2 =  0.291
  (Not robust, but not weakened by many instruments.)

Difference-in-Sargan tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Sargan test excluding group:     chi2(28)   =  33.53  Prob > chi2 =  0.217
    Difference (null H = exogenous): chi2(4)    =   2.37  Prob > chi2 =  0.668
  iv(FS FA FG)
    Sargan test excluding group:     chi2(29)   =  27.58  Prob > chi2 =  0.541
    Difference (null H = exogenous): chi2(3)    =   8.32  Prob > chi2 =  0.040

. xtabond2 CFOA l.CFOA l.STDE l.LTDE l.TTDE FSR FA FGR, gmm(l.CFOA l.STDE l.LTDE l.TTDE,
collapse) iv(FSR FA FGR) small
Favoring speed over space. To switch, type or click on mata: mata set matafavor space, perm.

Dynamic panel-data estimation, one-step system GMM
------------------------------------------------------------------------------
Group variable: companynum                      Number of obs      =       665
Time variable : Year                            Number of groups   =        74
Number of instruments = 40                      Obs per group: min =         8
F(7, 657)     =      8.68                                      avg =      8.99
Prob > F      =     0.000                                      max =         9
------------------------------------------------------------------------------
   CFOA |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   CFOA |
    L1. |  .5251780   .2173669    -2.11   0.028    -.1455266    .0404909
        |
   STDE |
    L1. | -.0607418   .0288676    -2.10   0.036    -.1174257    -.004058
        |
   LTDE |
```

```
         L1. |  -.0005479   .0019604    -0.28   0.780    -.0043974    .0033016
             |
        TTDE |
         L1. |   .0308745   .0933095     0.33   0.741    -.1523463    .2140953
             |
         FSR |   3.576299   .5124013     6.98   0.000     2.570158    4.582441
          FA |  -.0590361   .0346913    -1.70   0.089    -.1271552     .009083
         FGR |  -.0045193   .0073171    -0.62   0.537    -.0188869    .0098484
       _cons |  -11.10523   3.661517    -3.03   0.003    -18.29491   -3.915541
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(FSR FA FGR)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(1/9).(L.CFOA L.STDE L.LTDE L.TTDE) collapsed
Instruments for levels equation
  Standard
    FSR FA FGR
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.(L.CFOA L.STDE L.LTDE L.TTDE) collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -7.59  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.99  Pr > z =  0.322
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(32)   =  34.12  Prob > chi2 =  0.366
  (Not robust, but not weakened by many instruments.)

Difference-in-Sargan tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Sargan test excluding group:     chi2(28)   =  32.10  Prob > chi2 =  0.271
    Difference (null H = exogenous): chi2(4)    =   2.02  Prob > chi2 =  0.732
  iv(FSR FA FGR)
    Sargan test excluding group:     chi2(29)   =  26.79  Prob > chi2 =  0.583
    Difference (null H = exogenous): chi2(3)    =   7.32  Prob > chi2 =  0.062

. xtabond2 FCFA l.FCFA l.STDE l.LTDE l.TTDE FS FA FG, gmm(l.FCFA l.STDE l.LTDE l.TTDE, collapse) iv(FS FA FG) small
Favoring speed over space. To switch, type or click on mata: mata set matafavor space, perm.

Dynamic panel-data estimation, one-step system GMM
------------------------------------------------------------------------------
Group variable: companynum                      Number of obs      =       666
Time variable : Year                            Number of groups   =        74
Number of instruments = 40                      Obs per group: min =         9
F(7, 658)     =      3.17                                      avg =      9.00
Prob > F      =     0.003                                      max =         9
------------------------------------------------------------------------------
        FCFA |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        FCFA |
         L1. |   .1398748    .046147     3.03   0.003    -.2304879   -.0492617
             |
        STDE |
         L1. |   .0311187   .0497407     0.63   0.532    -.0665509    .1287883
             |
        LTDE |
         L1. |   .0031071   .0032412     0.96   0.338    -.0032573    .0094715
             |
```

```
        TTDE |
         L1. |  -.1396939   .1541098    -0.91   0.365    -.4423002    .1629123
             |
          FS |  -2.108165   .9108921    -2.31   0.021    -3.896771   -.3195595
          FA |   .0796144   .0563414     1.41   0.158    -.0310162    .1902451
          FG |   .0344322   .0138108     2.49   0.013     .0073137    .0615507
       _cons |   18.18407   7.008607     2.59   0.010     4.422138      31.946
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(FS FA FG)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(1/9).(L.FCFA L.STDE L.LTDE L.TTDE) collapsed
Instruments for levels equation
  Standard
    FS FA FG
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.(L.FCFA L.STDE L.LTDE L.TTDE) collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -8.20  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.30  Pr > z =  0.766
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(32)   =  26.60  Prob > chi2 =  0.203
  (Not robust, but not weakened by many instruments.)

Difference-in-Sargan tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Sargan test excluding group:     chi2(28)   =  19.72  Prob > chi2 =  0.000
    Difference (null H = exogenous): chi2(4)    =  16.88  Prob > chi2 =  0.002
  iv(FS FA FG)
    Sargan test excluding group:     chi2(29)   =  81.39  Prob > chi2 =  0.000
    Difference (null H = exogenous): chi2(3)    =   5.21  Prob > chi2 =  0.157

xtabond2 FCFA l.FCFA l.STDE l.LTDE l.TTDE FSR FA FGR, gmm(l.FCFA l.STDE l.LTDE l.TTDE,
collapse) iv(FSR FA FGR) small
Favoring speed over space. To switch, type or click on mata: mata set matafavor space, perm.

Dynamic panel-data estimation, one-step system GMM
------------------------------------------------------------------------------
Group variable: companynum                      Number of obs      =       665
Time variable : Year                            Number of groups   =        74
Number of instruments = 40                      Obs per group: min =         8
F(7, 657)     =      2.32                                      avg =      8.99
Prob > F      =     0.024                                      max =         9
------------------------------------------------------------------------------
        FCFA |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        FCFA |
         L1. |   .1336716   .0462659     2.89   0.004    -.2245186   -.0428247
             |
        STDE |
         L1. |   .0265621   .0480864     0.55   0.581    -.0678594    .1209836
             |
        LTDE |
         L1. |   .0030925   .0032353     0.96   0.339    -.0032603    .0094453
             |
        TTDE |
         L1. |  -.1417621   .1539485    -0.92   0.357    -.4440525    .1605283
```

```
         |
     FSR |  1.174607   .8114749    1.45   0.148    -.4187898    2.768004
      FA |  .0594838   .0572755    1.04   0.299    -.0529814    .1719489
     FGR |  -.0223624  .0120678   -1.85   0.064    -.0460586    .0013338
   _cons |  -3.948085  6.014911   -0.66   0.512    -15.75885    7.862682
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(FSR FA FGR)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(1/9).(L.FCFA L.STDE L.LTDE L.TTDE) collapsed
Instruments for levels equation
  Standard
    FSR FA FGR
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.(L.FCFA L.STDE L.LTDE L.TTDE) collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -8.00  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =  -0.39  Pr > z =  0.696
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(32)   =  23.82  Prob > chi2 =  0.211
  (Not robust, but not weakened by many instruments.)

Difference-in-Sargan tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Sargan test excluding group:     chi2(28)   =  74.82  Prob > chi2 =  0.000
    Difference (null H = exogenous): chi2(4)    =   9.00  Prob > chi2 =  0.061
  iv(FSR FA FGR)
    Sargan test excluding group:     chi2(29)   =  81.36  Prob > chi2 =  0.000
    Difference (null H = exogenous): chi2(3)    =   2.46  Prob > chi2 =  0.482
```

Date: 04/29/21 Time: 13:25
Sample: 2010 2019
Included observations: 740
Cross-sections included: 74 in non-parametric (PP) test; 0 (74 dropped) parametric (ADF) test
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
User-specified lag length: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-6.593241	0.1600	-9.571492	0.1284
Panel rho-Statistic	10.34755	0.0837	10.43980	0.0664
Panel PP-Statistic	-20.89353	0.0000	-29.43583	0.0000
Panel ADF-Statistic	-18.35473	0.0000	-23.3836	0.0000

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	13.94649	1.0000
Group PP-Statistic	-42.49510	0.0000
Group ADF-Statistic	-47.7743	0.0000

Pedroni Residual Cointegration Test
Series: FCFA STDE TTDE LTDE FS FG FA
Date: 04/29/21 Time: 13:28
Sample: 2010 2019
Included observations: 740
Cross-sections included: 74 in non-parametric (PP) test; 0 (74 dropped) parametric (ADF) test
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
User-specified lag length: 1
Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-6.603838	0.0630	-9.947608	0.1625
Panel rho-Statistic	9.863828	0.0387	10.16652	0.0463
Panel PP-Statistic	-23.10436	0.0000	-33.06602	0.0000
Panel ADF-Statistic	-28.09472	0.0000	-35.48473	0.0000

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	13.73281	1.0000
Group PP-Statistic	-44.41003	0.0000
Group ADF-Statistic	-48.89432	0.0000

Kao Residual Cointegration Test
Series: FCFA STDE TTDE LTDE FS FG FA
Date: 04/29/21 Time: 13:30
Sample: 2010 2019
Included observations: 740
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
User-specified lag length: 1
Newey-West automatic bandwidth selection and Bartlett kernel

	t-Statistic	Prob.
ADF	-3.376031	0.0004
Residual variance	689.1889	
HAC variance	238.1742	

Panel unit root test: Summary
Series: CFOA
Date: 04/29/21 Time: 13:30
Sample: 2010 2019
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-10.6521	0.0000	74	592
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-4.84976	0.0000	74	592
ADF - Fisher Chi-square	253.626	0.0000	74	592
PP - Fisher Chi-square	536.019	0.0000	74	666

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: FCFA
Date: 04/29/21 Time: 13:31
Sample: 2010 2019
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-10.8285	0.0000	74	592
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-4.81205	0.0000	74	592
ADF - Fisher Chi-square	258.911	0.0000	74	592
PP - Fisher Chi-square	541.777	0.0000	74	666

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: TTDE
Date: 04/29/21 Time: 13:32
Sample: 2010 2019
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-17.7943	0.0000	74	592
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.33307	0.0098	74	592
ADF - Fisher Chi-square	190.709	0.0103	74	592
PP - Fisher Chi-square	328.904	0.0000	74	666

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: LTDE
Date: 04/29/21 Time: 13:32
Sample: 2010 2019
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.77896	0.0376	74	592
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	14.8606	0.0000	74	592
ADF - Fisher Chi-square	264.782	0.0000	74	592
PP - Fisher Chi-square	311.389	0.0000	74	666

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: STDE
Date: 04/29/21 Time: 13:32
Sample: 2010 2019
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.98052	0.0201	74	592
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.01726	0.4931	74	592
ADF - Fisher Chi-square	183.842	0.0242	74	592
PP - Fisher Chi-square	344.116	0.0000	74	666

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: FS
Date: 04/29/21 Time: 13:33
Sample: 2010 2019

Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-8.07882	0.0000	74	592
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.09542	0.4620	74	592
ADF - Fisher Chi-square	163.872	0.1762	74	592
PP - Fisher Chi-square	313.402	0.0000	74	666

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: FA
Date: 04/29/21 Time: 13:33
Sample: 2010 2019
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	1.74954	0.0132	1	8
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.63591	0.7376	1	8
ADF - Fisher Chi-square	0.44215	0.8017	1	8
PP - Fisher Chi-square	0.62753	0.7307	1	9

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: FG
Date: 04/29/21 Time: 13:34
Sample: 2010 2019
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-6.06740	0.0000	74	592

Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.52333	0.0058	74	592
ADF - Fisher Chi-square	205.411	0.0013	74	592
PP - Fisher Chi-square	490.430	0.0000	74	666

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

NWOKOYE, Gladys Anwuli (Ph.D), et. al. “Applicability of Pecking Order and Signaling Theories: Evidence from Non-Finance Sector in Nigeria.” *IOSR Journal of Economics and Finance (IOSR-JEF)*, 13(03), 2022, pp. 60-82.