EFFECTS OF INCOME TAX VARIABILITY ON INVESTMENT UNDER UNCERTAINTY AND IRREVERSIBILITY: A STUDY OF NIGERIAN LISTED FIRMS

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Abstract:
This study examines the effects of income tax variability on investment under uncertainty and irreversibility with particular reference to the Nigerian listed firms. The research is based on ex facto design. The population for this study consists of only quoted Nigerian companies that have 2012 to 2016 annual financial reports. We selected a sample of 35 Nigerian firms engaged in non-financial activities. Thus, data were obtained from the annual reports of the sampled firms and publications of the Nigerian Stock Exchange (NSE) such as fact-books and NSE annual reports. For data analytical tool, the balanced panel data regression technique was adopted to avoid the problem of muilticolinearity, aggregation bias and endogeneity problems. The goodness of fit of the model was tested using the coefficient of determination (R-squared), descriptive statistics, correction matrix, ordinary least square using Stata 13 software. The study revealed among others that income tax variability has a negative effect on investment but failed the statistical significance test. So, in order to enhance tax certainty so as to curb investment irreversibility decision, the study recommends reduction in bureaucracy and in the frequency of tax changes as the most effective tools.

Key words: Tax variability, investment, uncertainty, irreversibility

Introduction:

Tax is a major player in every society of the world. The tax system is an opportunity for government to collect additional revenue needed in discharging its pressing obligations. A tax system offers itself as one of the most effective means of mobilizing a nation's internal resources and it lends itself to creating an environment conducive to the promotion of economic growth. [1], argues that taxes constitute key sources of revenue to the federation account shared by the federal, state and local governments.

Today, more than ever, uncertainty affects the business environment. Companies face fierce competition, therefore flexibility, innovation and active corporate strategy are crucial. The environment for business has changed due to the complexity of financial markets and ever rising environmental questions, that will have to be taken into account in the future business sphere. Uncertainty affects investment decisions, asset allocation, performance valuation, asset selection and financing decisions. Risk management and sustainable corporate strategy are therefore invaluable in the future business environment.

Companies perceive investment decision as an immediate cost for future rewards. Conventional theory explains that companies take on projects with a positive value of future cash flows. They compare the benefits to costs of an investment and undertake the investment if the benefits are higher. The importance

of stability for company investment has been confirmed by a series of studies. The uncertain environment will cause the management to reconsider an investment and wait until the new information about future conditions comes to the market. On the other hand, uncertainty can be seen as opportunity for the company to re-establish its position in the market with the right corporate strategy.

The standard approach to modeling investment under uncertainty considers a firm operating a single production process and using a homogeneous capital good. Investment decisions are assumed to be (partially) irreversible and market demand been uncertain. This generates real options on the investment decision and a separation of the thresholds for investment and disinvestment, with no investment undertaken in between these thresholds. Even low levels of uncertainty and irreversibility can lead these thresholds to be significantly spaced apart in relation to their positions under complete certainty and costless reversibility, changing the optimal investment behaviour of firms from being smooth and continuous to one that is lumpy and frequently zero.

Nevertheless uncertainty will still play an important role in determining firm-level investment through its effects on the investment decisions for the individual type of capital. Uncertainty does play an important role in determining the short run response of investment to changes in market demand, whether or not uncertainty has any effect on the level of the capital stock in the longer term. Higher levels of uncertainty increase the real option values associated with investment and disinvestment and so make firms more cautious in responding to changes in their market environment. The presence of (partial) irreversibility and uncertainty also leads to non-linear investment dynamics with an increasing marginal investment response to larger demand shocks. This is potentially important because the dynamic response of firms to tax incentives and interest rates will depend on the uncertainty in their environment and the size of the stimulus. Since uncertainty and demand shocks have important cross sectional and time series variability, this also provides a possible explanation for the parameter instability within and across samples that has often been reported in the context of empirical investment equations.

Statement of the Problem:

Companies are known for taking business risks which are surrounded by uncertainties and such risk may lead to losses of money invested, losses of material in site and the causes of all these could be that no good business decisions on how to invest has been made. Many things are put into consideration in determining areas to invest, considering how tax uncertainty in a particular area on investment can affect the company success and this normally utters the investment decision making of the company. This is because investment decisions are made based on the knowledge of information of prevalent in an area.

Conventional valuation methods that are used by companies use market specific risk as a measurement for uncertainty. They model the most likely outcome of an investment decision, based on how much a company is exposed to market risk. The value of investment however is not dependent only on market risk, but also on flexibility of the company's management on when to invest, how to expand the investments in the future and different changes in corporate strategy depending on how the initial investment turns out.

Irreversibility makes investment especially sensitive to various forms of risk, such as uncertainty over the future product prices and operating costs that determine cash flows, uncertainty over future interest rates,

and uncertainty over the cost and timing of the investment itself. In the context of macroeconomic policy, this means that if the goal is to stimulate investment, stability and credibility may be much more important than tax incentives or interest rates.Since output price uncertainty tends to retard investment [2], tax uncertainty might be expected to harm investment as well [3]. Further credence to a negative relationship between tax uncertainty and investment can be seen in the study of [3]. These studies show that the impact of the tax uncertainty depends to a large extent on the source and nature of the uncertainty. Specifically, [3] examined the effect of introducing a random tax policy using a dynamic general equilibrium model. They find that if random tax rates or credits are serially correlated, the target capital stock falls when taxes are high and rise when taxes are low. The study found that variance in future tax rates, is not important for long-term investments. These findings were corroborated by [4].

The focus of much of the research has been on tax policy. While most of the studies have considered the implications of tax policy for investment in an uncertain world, very few studies have been done to find out how much tax uncertainty would contribute to investment decisions in the Nigerian environment. Hence, this study is set to fill the intellectual void by empirically investigating the effects of tax uncertainty on investment in Nigeria by considering variability in fixed assets and capital expenditure.

Objectives of the Study:

The general objective of the study is to analyse the effect of company income tax on investment under uncertainty and irreversibility. However, the specific objectives are:

i. To determine the effect of income tax variability on the fixed asset variability of quoted companies in Nigeria.
ii. To examine the relationship between capital expenditure ratio and investment decision among listed firms in Nigeria.
iii. To find out the effect of income tax variability on the capital expenditure of quoted companies in Nigeria.

Research Hypotheses:

This research work is guided by the following hypotheses:

$H0_1$: Income tax variability has no significant effect on the fixed asset variability of quoted Companies in Nigeria.

$H0_2$: There is no significant relationship between capital expenditure ratio and investment decision among listed companies in Nigeria.

$H0_3$ Income tax variability has no significant effect on the capital expenditure of quoted companies in Nigeria.

Review of related Literature:

Conceptual Framework:

Tax Uncertainty:

If taxes are integrated into capital budgeting, the investment models are typically based on deterministic tax rates and deterministic tax bases. In many countries, however, tax reforms occur frequently, especially after a new government is elected. As a consequence, taxpayers and tax accountants have to adapt to new tax rates and different methods of computing tax bases.

Thus, tax policy can be regarded as a stochastic process which is difficult to be anticipated for investors. Furthermore, legislation is not the only source of tax uncertainty. Rather, there is tax uncertainty even if the tax law remains unchanged and if an investor has already made all economic decisions which are relevant for taxation. The reason is that taxpayers, fiscal authorities and tax courts may interpret tax laws and economic facts differently. Hence, tax uncertainty exists ex ante and ex post, i.e. prior to investment decisions and after investment decisions have been made. In the main, this type of tax uncertainty will be called fiscal tax uncertainty [5].

However, tax uncertainty is not exclusively determined by state-run institutions. The investor himself may be responsible for uncertainty with respect to his tax payments. The reason is as follows: Since current tax laws are too complicated to be integrated in manageable models of capital budgeting, investors use simplified models of computing the tax base for an investment project. Thus, the taxes actually paid and the tax payments anticipated by the model can deviate.

Investment Irreversibility:

Investment Irreversibility means that once the decision is made it cannot be reversed easily. When a certain investment is firm or industry specific, it represents a sunk cost for the company. This means that in the competitive environment the value of the investment is about the same for all companies in the industry. Thus, there will be little or no gain if an investment is reversed [6]. For example, when a company decides to build another production facility that turns out to be unprofitable, the company can sell the plant. But because the production plant is industry specific, there will be costs to reverse the investment. Because the investment is industry specific and also firm specific, its value for the new owners will be lower than for the primary investor [7].

[6], also mention another reason for irreversibility of investments, the so called “lemons problem”. Even for the investments that are not industry and firm specific, the market is often unable to evaluate the true value of the asset. Therefore, the buyers will be willing to buy something for a price close to the price of the average quality product. If the seller owns an above average quality product, he will be reluctant to sell and therefore drive the average quality down. This will then also drive the price down, which is the reason that an investment loses part of the value as soon as it is bought even though the true value of an asset is still the same as a new asset. In order to capture irreversibility, uncertainty and timing flexibility the real options approach has led to an important development in the field of capital budgeting. When it comes to making risky and irreversible investments, companies have various options to deal with uncertainty of future events which are important for the strategic development of the company.

Theoretical Literature:

Every scientific investigation into the unknown, adds to the repository of the knowledge available in that particular research area. It is therefore important to take into cognizance relevant theories underpinning the phenomenon to be studied [8]. To this end, this research reviewed one theory that is specifically relevant to the study: The Real Option Approach**.**

This theory is based on the simultaneous existence of three phenomena: uncertainty, irreversibility of investment and some freedom of choice on the timing of investment. It stems from the fact that investment

decisions are to a large extent irreversible, i.e. cannot be reversed except at a high cost (the cost is largely 'sunk'). Combining irreversibility with the existence of uncertainty over future behavior of variables that affect the value of the investment (such as future output prices) leads to the following intuitive reasoning: suppose there is some leeway in delaying investment until more information about the uncertain future becomes available; it may then be optimal to wait some time before investing. It is clear that waiting to invest implies risks (e.g. entry of competitors) and foregone profits, but it may prevent from being trapped in an irreversible investment project which turns out to be very costly when the adverse future materializes.

The theory states that an investment project is best treated analogous to holding a (American-type) financial call option: for some specific time period, an investor (a firm) has the right, but not the obligation, to pay a certain price (the investment cost) in return for an asset (an investment project) that has some value; when the investment decision is made, the option is exercised, which is an irreversible decision. Like a financial option, the option itself has some (non-negative) value, because of uncertainty over the future value of the investment project.

As a consequence, option pricing theory can be used to 'price' investment decisions and decide on optimal timing of exercise. This gave rise to a large body of new literature, and a new class of models usually referred to as 'real options' models [1]; [2]; [3]; [5].

Empirical Literature:

There are existing studies that consistently support the view that tax uncertainty has a negative impact on investment [9]; [10]; [11]; [12]: [7], [13], [8], [14], [15], [6], [16] , [17] [2], [5] [8] Analyzes random taxes in the context of tax evasion. He concludes that tax uncertainty can be socially useful under specific conditions. Based on effective tax rates, [18] show that anticipated changes in taxes are important determinants of investment behaviour and firm valuation. [19] distinguishes between tax base and tax rate uncertainty to derive welfare effects of tax uncertainty. He argues that uncertain tax policy may be rational for a revenue-maximizing government. [9] present a model of effective tax rates with time-dependent statutory tax rates, investment tax credits and present value of depreciation allowances to analyze the impact of anticipated tax reforms.

Since the late 1990s, the tax uncertainty literature focuses on the investment incentives of uncertain tax policy. [16], examine the investment effects of expected tax reforms with uncertain timing. They conclude that an expected reduction of the tax rate induces accelerated investment whereas an expected reduction of the tax base has the opposite effect. [2], use a model with an output price following a geometric Brownian motion and an uncertain investment tax credit to explain the effects of tax policy uncertainty on aggregate investment. They conclude that tax policy uncertainty tends to delay investment under a continuous-time random walk, but increases the capital stock under a Poisson jump process.

[20], shows that tax uncertainty may be partly responsible for equity premia because price adjustments due to tax changes are larger for long-term assets than for short-term assets. [21], found that the effects of tax policy uncertainty are likely to be small. [13], analyzes investment effects of uncertain investment tax credits following a jump-diffusion process. She finds that tax policy uncertainty delays investment. [7], derives neutral tax systems under asymmetric taxation with tax rate uncertainty. [7], uses a Poisson process for the

tax rate. He proves that the critical investment threshold is unaffected by tax policy uncertainty which means that a neutral stochastic tax system exists. [22], analyses the effects of tax rate uncertainty on investment under risk neutrality and risk aversion. He finds that the effects of tax uncertainty can go either way. More precisely, in the risk adverse case he finds that the negative effects of tax uncertainty on investment are in general more likely; interestingly, in the risk-neutral case investments are more likely to be discouraged by tax uncertainty if pre-tax cash flows are increasing. This latter result could imply that tax uncertainty may have negative effects especially on innovative investments and start-ups that are typically characterized by increasing cash flows.

[22], analyses the investment by a risk neutral firm, assuming irreversibility and considering a stochastic pre-tax cash flow and a tax payment, that both evolve over time as random walks, so that the state of the variable in each period does not convey any information on the state of the variable in the next period. He assumes that the two processes are correlated leaving unrestricted the sign of the correlation, and derives a closed-form solution. He finds that the effect of tax uncertainty on investment depends on the relative volatilities of the tax payment and the pre-tax cash flow, as well as by the correlation between the two processes. The higher the tax volatility and the lower the correlation between tax payment and pre-tax cash flow, the more likely tax volatility will have negative effects on investment.

Results similar to [22] are also found in [12], who analyze the category of capital taxes. They find that when tax uncertainty is already high, further increases tend to delay investments. In their framework, due to tax uncertainty, broadening the capital tax base from a special asset tax to a general wealth tax may delay investment if total volatility is high.

New surveys allow identifying which sources of tax uncertainty are relatively more important for economic choices. One survey conducted by Michael Devereux of the Oxford University Centre for Business Taxation for the European Tax Policy Forum in early 2016 – aimed at senior figures in tax departments of large multinational companies – has suggested that uncertainty about the effective tax rate on profit is considered the third most important factor for investment and location decisions, right after political uncertainty and macroeconomic conditions [23]. Also, the most important sources of tax uncertainty are complexity in the taxcode, followed by unpredictable or inconsistent treatment by the tax authority.

Methodology:

The research is based on ex facto design. The variables for this study consist of Fixed Asset Variability, Capital Expenditure Variability, Income Tax Variability, Capital Expenditure Ratio, Asset Tangibility Ratio and Total Asset. The population for this study consists of only quoted Nigerian companies that have 2012 to 2016 annual financial reports. We selected a sample of 35 Nigerian firms that engaged in non-financial activities. Thus, data were obtained from the annual reports of the sampled firms and publications of the Nigerian Stock Exchange (NSE) such as fact-books and NSE annual reports. For data analytical tool, the balanced panel data regression technique was adopted to avoid the problem of muilticolinearity, aggregation bias and endogeneity problems. The goodness of fit of the model was tested using the coefficient of determination (R-squared), descriptive statistics, correlation matrix, ordinary least square using Stata 13 software.

Model Specification and Measurement of Variables:

In specifying our linear regression model, our key variables are Fixed Asset Variability (FAV), Capital Expenditure Variability (CEV), Income Tax Variability (YTV), and a control variable of Firm Size (FSIZE). The panel multiple regression with an error term (μi) is expressed in the following equations:

$FAV_{it} = \alpha_0 + \alpha_1 YTVit + \beta_2 ATR_{it} + \alpha_3 CER_{it} + \alpha_4 FSIZE_{it} + \mu i$ ..... (1)

$CEV_{it} = \beta_0 + \beta_1 YTVit + \beta_2 ATR_{it} + \beta_3 CER_{it} + \alpha_4 FSIZE_{it}\ \mu i$ ..... (2)

Where:

The dependent variables are:

FAV = Fixed Assets Variability
CEV = Capital Expenditure Variability

The independent variable is:

YTV = Income Tax Variability

While the control variables include:

ATR = Asset Tangibility Ratio
CER = Capital Expenditure Ratio
FSIZE = Firm Size

Ui = Stocastic Error Term

Presentation and interpretation of results:

Presentation of Regression Results:

In identifying the possible firm's specific characteristics and exogenous factors that would impact on firm's investment decision, we conducted descriptive statistics, correlation matrix, data normality analysis and Panel Ordinary Least Square Regression. The results are analyzed as follows:

Appendix Table 4.1 shows among others, the mean (average), maximum, minimum, median, standard deviation, standard error (mean), variance for each of the variables. The results in Appendix Table 4.1 provided some insight into the nature of the selected Nigerian quoted companies that were used in this study. Firstly, the descriptive statistics is displayed based on fiscal year', and thereafter company name. From the statistics, it is observed that the highest mean value for the variable of interest 'Volatility in Fixed Assets' hits its highest point during the year 2014 (5.68), this result show that fixed assets utilization among all the sampled companies was more volatile in year 2014 but less volatile in year 2015. Also the value of volatility in capital expenditure hit its highest point during the year 2015 (7.05) but lowest in year 2012 (4.31). The variable of income tax variability for the year 2012 is zero since our sample began from the same year 2012. Company income tax variability showed that volatility in company income tax was highest in year 2014 following the variance value of 17481.71. The descriptive statistics shows that May & Baker had the highest mean variability of 234.004 with a variance value of 88812.5.

It can be described that companies within the pharmaceutical sector experienced a very high volatility in taxes than any other sector studied in the sample. Also, the company of Air Logistics services was revealed have the lowest mean (0.362) with a variance of 0.15. This shows that the services sector performed well in terms of volatility in taxes during the period under study. They were revealed to be more stable during the period under review. The pharmaceutical company of May & Baker was revealed to have the maximum income tax variability (596.85) while an Air & Logistics service was revealed to have the minimum income tax variability.

Again, the descriptive statistics records show that total assets of the sampled firms stood at a mean point of 7.19 and had companies like Vita Foam (7.07) Uni-Liver Nigeria (7.68), Total Nigeria Plc (7.96) PZ Cusson, Presco Plc, Okomu Oil Palm finding their mean around the average mean for the sample under review. The companies of Oando (8.882) UAC of Nig. (8.11) had mean values greater than the sample mean value of (7.19). The result show that the deviation is slim hence we can conclude that most of the sampled sectors are not of the same size.

Appendix Table 4.2 shows that all the variables of interest are normally distributed and satisfies the test of significance at 1% level of significance except for the variable of total asset which passed the significance test at 5%. The descriptive statistics in general revealed that there is no sample selection bias or outlier in the data that would impede generalization from this study. The use of correlation matrix in most regression analysis is to check for multicolinearity and to explore the association between each explanatory variable and the dependent variable.

Appendix Table 4.3 focuses on the correlation between the dependent variables of Interest Fixed Asset Variability, Capital Expenditure Variability, and the independent variables of Income Tax Variability, Capital Expenditure Ratio, Asset Tangibility Ratio, Total Asset, for the period 2012 and 2016.
In checking for multicolinearity, we notice that no two explanatory variables were perfectly correlated. This means that there is the absence of multicolinearity in our model. Multicolinearity between explanatory variables may result to wrong signs or implausible magnitudes in the estimated model coefficients, and the bias of the standard errors of the coefficients.

To examine the cause-effect relationships between the dependent variables of Interest Fixed Asset Variability, and the various independent variables of Income Tax Variability, Capital Expenditure Ratio, Asset Tangibility Ratio, and Total Asset as well as to test the formulated hypotheses, we used a panel data regression analysis since the data had both time series (2012 to 2016) and cross-sectional properties (35 quoted companies). The panel data regression results obtained is decomposed into two models and the results are presented and discussed in the table below.

Panel Regression Results:

	Expected Sign	FAV Random Effect Model	CEV Fixed Effect Model
ATR	+	0.13 (4.92) {0.000}***	0.33 (7.56) {0.000}***
CER	+	0.06 (2.67) {0.008}**	-0.23 (-7.37) {0.000}***
YTV	-	-0.004 (-1.22) {0.22}	-0.003 (-0.50) {0.616}
TA	+	0.19 (0.18) {0.86}	4.29 (1.08) {0.28}
Hausman Coeff		**0.79**	**0.04**

Note: (1) Parentheses ( ) are t-statistic while bracket {} are p-values
(2) ** , ***, implies statistical significance at 5% and 1% levels respectively

In testing for the cause-effect relationship between the dependent and independent variables in the Fixed Asset Variability and Capital Expenditure Variability models, the two widely used panel data regression estimation techniques (fixed effect and random effect) were adopted. The table above presents the panel data estimation techniques results (fixed effect and random effect). The results reveal difference in the magnitude of the coefficients, signs and the number of insignificant variables. The estimation of the fixed effect panel regression was based on the assumption of no correlation between the error term and explanatory variables, while that of the random effect, considers that the error term and explanatory variables are correlated. In selecting from the two panel regression estimation results, the Hausman test was conducted and the test is based on the null hypotheses that the random effect model is preferred to fixed effect model. A critical look at the p-value of the hausman test in Appendix 4:5 and 4:6 of Fixed Assets Variability model (0.79), and Capital Expenditure Variability models (0.34) respectively implies that we should reject the alternative hypothesis and accept the null hypothesis since the p-value of the hausman test is not significant even at 10% level of significance. This implies that we should adopt the random effect panel regression results in discussing the results, drawing our conclusion and recommendations. This also implies that the random effect results tend to be more appealing statistically when compared to the fixed effect result. But for the Capital Expenditure Variability Model we should accept the alternative hypothesis and reject the null hypothesis since the p-value of the hausman test is significant at 5% level of significance. This implies that we should adopt the fixed effect panel regression results in discussing the results, drawing

our conclusion and recommendations. This also implies that the random effect results tend to be more appealing statistically when compared to the fixed effect result.

Following the above, the discussion of the random effect results became imperative. The Wald chi statistics (50.32) and its p-value (0.0000) Appendix 4:7 show that the fixed assets variability panel random regression model is generally significant and well specified. This implies fixed asset variability model passed the overall significance test at the 1% level.

In addition to the above, the specific findings from each explanatory variable from the random effect panel regression models are provided as followings:

Fixed Asset Variability Model:

For the variable of asset tangibility ratio (ATR)**,** (Appendix 4:7) based on t-Statistics value of 4.92 and p-value of 0.000, finding reveal a positive impact on fixed assets variability (FAV), and passed the statistical significance test even at 1% level. The finding is consistent with *a priori* expectation. For this reason, we accept the alternative hypothesis (H_1) which states that asset tangibility ratio has a significant effect on fixed asset variability of selected quoted companies in Nigeria. This finding implies that as the ratio of asset tangibility increases by one unit, volatility in fixed assets increases by 0.13 units. This result showed a significant relationship hence may be adopted for policy recommendation.

For the variable of capital expenditure ratio (CER)**,** based on t-Statistics value of 2.67 and p-value of 0.008, finding reveal a positive impact on fixed assets variability (FAV), and passed the statistical significance test even at 5% level. The finding is consistent with *a priori* expectation. For this reason, we accept the alternative hypothesis (H_1) which states that capital expenditure ratio has a significant effect on fixed asset variability of selected quoted companies in Nigeria. This finding implies that as the ratio of capital expenditure increases by one unit, volatility in fixed assets increases by 0.06 units. This result showed a significant relationship hence may be adopted for policy recommendation.

For the key variable of interest Income Tax Variability (YTV)**,** based on t-Statistics value of -1.22 and p-value of 0.22, finding reveal a negative impact on fixed assets variability (FAV), but failed the statistical significance test even at 10% level. This finding suggests that the effect of tax uncertainty on investment depends on the relative volatilities of the tax policies as well as the correlation between the two processes. The higher the tax volatility and the lower the correlation between tax payments, the more likely tax volatility will have negative effects on investment. The finding is consistent with *a priori* expectation. For

this reason, we accept the null hypothesis (H_0) which states that income tax variability has no significant effect on fixed asset variability of selected quoted companies in Nigeria. This finding implies that as the ratio of income tax variability increases by one unit, volatility in fixed assets falls by 0.004 units. This result is not statistically significant hence may not be adopted for policy recommendation. This finding, once more, corresponds with the findings of [24], [8], [10], [11], [12], [13] and [22] but do not tally with the result of [3], [25].

Capital Expenditure Variability Model:

For the variable of asset tangibility ratio (ATR)**, (**Appendix 4:8) based on t-Statistics value of 7.56 and p-value of 0.000, finding reveal a positive impact on capital expenditure variability (CEV), and passed the statistical significance test even at 1% level. The finding is consistent with *a priori* expectation. For this reason, we accept the alternative hypothesis (H_1) which states that asset tangibility ratio has a significant effect on capital expenditure variability of selected quoted companies in Nigeria. This finding implies that as the ratio of asset tangibility increases by one unit, volatility in capital expenditure increases by 0.33 units. This result showed a significant relationship hence may be adopted for policy recommendation.

For the variable of capital expenditure ratio (CER)**,** based on t-Statistics value of -7.37 and p-value of 0.000, finding reveal a negative impact on capital expenditure variability (CER), and passed the statistical significance test even at 1% level. The finding is consistent with *a priori* expectation. For this reason, we accept the alternative hypothesis (H_1) which states that capital expenditure ratio has a significant effect on capital expenditure variability of selected quoted companies in Nigeria. This finding implies that as the ratio of capital expenditure increases by one unit, volatility in capital expenditure falls by 0.23 units. This result showed a significant relationship hence may be adopted for policy recommendation.

For the key variable of interest "Income Tax Variability" (YTV)**,** based on t-Statistics value of -0.50 and p-value of 0.62, finding reveal a negative impact on capital expenditure variability (CEV), but failed the statistical significance test even at 10% level. This finding suggests that the effect of tax uncertainty on capital expenditure depends on the relative volatilities of the tax policies as well as the correlation between the two processes. The higher the tax volatility and the lower the correlation between tax payments, the more likely tax volatility will have negative effects on capital expenditure investments. Obviously this study finds similar directions and magnitudes in both models. The finding is consistent with *a priori* expectation. For this reason, we accept the null hypothesis (H_0) which states that income tax variability has no significant effect on capital expenditure variability of selected quoted companies in Nigeria. This finding implies that as the ratio of income tax variability increases by one unit, volatility in capital expenditure falls

by 0.003 units. This result appeared not to be statistically significant hence may not be adopted for policy recommendation. Our result supports the results of [24], [6], [10], [11],[12] [13] and [22] but do not agree with the result of [18], [25].

Findings, Conclusion and Recommendations:

Findings:

The study revealed that:

i. Asset tangibility ratio has a significant (1% level) positive impact on fixed assets variability while the variable of capital expenditure ratio reveals a significant positive relationship with fixed assets variability but at 5% level of significance.

ii. Income tax variability exhibited a negative relationship with the dependent variable of fixed asset variability but is not statistically significant even at 10% level.

iii. Following the capital expenditure variability model, there exist a significant positive relationship between assets tangibility ratio and capital expenditure variability which is quite similar to the fixed asset model in both magnitude and direction.

iv. There is a directional difference in the variable of capital expenditure ratio among the two models under consideration.

v. Income tax variability has a negative impact on investment but failed the statistical significance test.

Conclusion:

The study was intended to investigate the effects of company income tax on investment under uncertainty and irreversibility for Nigerian listed firms using a panel framework. In this study, we have taken thirty five (35) non-financial companies from the Nigerian stock exchange (NSE) (based on the availability of data) during the period 2012 - 2016, comprising of a panel model with fixed and random effects. Furthermore, we tested the sensitivity of our model by adopting the variable of Fixed Asset Variability (FAV) and Capital Expenditure Variability (CEV) as the dependent variables in the regression. In this analysis both fixed and random effect model were found to perform well.

As regards tax administrations, the most important sources of tax uncertainty are related to tax policy design and legislation, dispute resolution, as well as taxpayer behavior in particular relation to aggressive tax planning. However, following core business parlance, uncertainty in corporate taxation is considered relevant for investment decisions.

Recommendations:

Issues related to tax administration rank among the major drivers of uncertainty, hence, considerable bureaucracy to comply with the tax legislation, including documentation requirements and "unpredictable or inconsistent treatment by the tax authority" have been considered as the two most important sources of tax uncertainty among listed companies in Nigeria. So, in order to enhance tax certainty so as to curb investment irreversibility decision, the most effective tools are to:

i. Reduce the frequency of tax changes,

ii. Reduce bureaucracy,

iii. Provide detailed guidance in tax regulations and

iv. Announce important changes in advance.

APPENDIX 4:1a

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.tabstat volatilityinfixedasset volatility_capex asset_tangebility_ratio capital_expenditure_ratio
income_effective_tax income_variabilitytax total_assets, statistics( mean median max min sd
>  semean var ) by(fiscalyear)

Summary statistics: mean, p50, max, min, sd, se(mean), variance
  by categories of: fiscalyear (Fiscal year)

fiscalyear |  volati~t  volati~x  asset_~o  capita~o  inc~_tax  inc~ytax  total_~s
----------+---------------------------------------------------------------------
     2012 |  4.791143  4.314286  31.72171      2.23 -10.43743         0  7.119429
          |       2.8       2.79      30.47      1.92    -20.28         0      7.05
          |     28.27       16.7      69.87      13.7     70.57         0      8.71
          |       .14        .44       3.98     -8.76   -161.23         0      5.78
          |  6.080415  4.039241  16.16362  4.450932  45.99844         0   .716244
          |  1.027778  .6827563  2.732151  .7523448  7.775156         0  .1210673
          |  36.97145  16.31547  261.2627  19.81079  2115.857         0  .5130055
----------+---------------------------------------------------------------------
     2013 |  4.552857     5.006  36.67686  8.060571 -21.70057      45.5  7.158571
          |      2.97      2.63      33.71      4.36    -30.45     11.96      7.06
          |     34.48     37.29      87.19     72.79    806.68     520.5      8.77
          |       .17       .33       5.87      -2.3   -755.67    -34.85      5.82
          |  6.402519  6.877708  17.33721   14.4822  190.8999  119.9275  .7110106
          |  1.082223  1.162545  2.930523  2.447938  32.26797  20.27144  .1201827
          |  40.99224  47.30287  300.5787   209.734  36442.77  14382.59  .5055361
----------+---------------------------------------------------------------------
     2014 |  5.677714  5.669429  39.03057  5.140857 -23.97457  43.97286  7.200857
          |      3.76      3.94      34.84      1.12    -26.54      9.83       7.1
          |     37.34     30.65         98     32.35     34.96    596.85      8.95
          |        .3       .31       4.54    -14.48   -102.93    -38.62       5.8
          |  7.024544  6.539752  20.19073  10.43289  25.92391  132.2184  .7087909
          |  1.187365   1.10542  3.412857   1.76348   4.38194  22.34899  .1198075
          |  49.34422  42.76836  407.6657  108.8452   672.049  17481.71  .5023845
----------+---------------------------------------------------------------------
     2015 |  4.448571  7.052571  36.47057 -1.828286 -29.30543  19.01571  7.218571
          |      2.66      4.32      30.39        .5    -31.53      7.99      7.21
```

	20.97	72.74	70.81	11.31	163.64	168.06	8.98
	.62	.12	4.57	-102.36	-292.8	-53.37	5.82
	4.436283	12.48312	16.9419	17.96403	64.34246	39.03246	.7084205
	.7498687	2.110032	2.863703	3.036476	10.87586	6.59769	.1197449
	19.68061	155.8282	287.0278	322.7064	4139.952	1523.533	.5018596
2016	4.735143	6.449143	34.198	1.206286	-41.75114	18.36457	7.270857
	3.16	4.52	33.28	-.8	-31.32	5.72	7.15
	26.18	51.24	62.74	35.23	4.37	128.04	9
	.43	.02	3.49	-14.87	-211.17	-152.34	5.75
	5.002019	9.360091	14.49596	8.652084	44.93223	43.21314	.726091
	.8454955	1.582144	2.450265	1.462469	7.594932	7.304354	.1227318
	25.02019	87.61129	210.1329	74.85855	2018.905	1867.375	.5272081
Total	4.841086	5.698286	35.61954	2.961886	-25.43383	25.37063	7.193657
	3.04	3.43	33.71	1.12	-30.19	5.4	7.15
	37.34	72.74	98	72.79	806.68	596.85	9
	.14	.02	3.49	-102.36	-755.67	-152.34	5.75
	5.813962	8.325925	17.11034	12.46334	94.73257	84.77931	.7077886
	.4394942	.6293808	1.29342	.9421397	7.161109	6.408713	.0535038
	33.80215	69.32103	292.7638	155.3348	8974.26	7187.531	.5009647

APPENDIX 4:1b

```
. tabstat volatilityinfixedasset volatility_capex asset_tangebility_ratio capital_expenditure_ratio
income_effective_tax income_variabilitytax total_assets, statistics( mean median max min sd
>  semean var ) by(fullcompanyname)

Summary statistics: mean, p50, max, min, sd, se(mean), variance
  by categories of: fullcompanyname (Full Company name)
```

fullcompanyname	volati~t	volati~x	asset_~o	capita~o	inc~_tax	inc~ytax	total_~s
7Up Nigeria	3.114	4.604	65.06	7.616	-.6319998	7.86	7.754
	2.52	5.21	65.66	9.67	-10.91	5.41	7.75
	5.6	5.25	69.01	17.18	29.37	19.78	7.83
	1.39	2.2	60.06	-2.81	-18.55	0	7.65
	1.679771	1.345095	3.67484	7.401789	20.73405	8.051128	.0779743
	.7512163	.6015447	1.643439	3.310181	9.272549	3.600574	.0348712
	2.82163	1.80928	13.50445	54.78648	429.9008	64.82065	.00608
A.G.Leventis Nig	2.774	5.14	30.314	-.546	-67.45	37.282	7.342
	1.06	4.58	30.11	-1.6	-56.47	18.9	7.35
	9.33	6.75	32.29	6.1	-11.88	100.31	7.38
	.99	3.33	28.75	-4.04	-153.73	0	7.31
	3.669514	1.528937	1.27133	4.012528	52.92614	41.74774	.0311449
	1.641056	.6837616	.5685562	1.794457	23.66929	18.67016	.0139284
	13.46533	2.33765	1.616281	16.10038	2801.176	1742.874	.00097
Academy	8.094	12.902	55.516	5.906	12.414	54.532	6.54
	5.96	13.33	61.66	.35	-17.44	17.48	6.55
	14.79	18.65	70.45	32.35	163.64	128.04	6.58
	2.81	5.06	37.66	-9.48	-40.89	0	6.45
	5.575081	4.995845	15.26834	16.56801	85.47521	64.80754	.0519616
	2.493252	2.23421	6.828209	7.409439	38.22568	28.98281	.0232379
	31.08153	24.95847	233.1222	274.4989	7306.012	4200.018	.0027

Air& Logistic Se	7.044	8.998	47.13	8.802	-.076	.362	6.624
	8.88	12.76	42.22	2.75	-.14	.26	6.63
	12.77	15.11	62.96	32.25	.77	.89	6.81
	1.16	.91	34.16	-.45	-.48	0	6.48
	5.361169	6.766799	12.75599	13.54974	.5056975	.3919439	.1262141
	2.397588	3.026205	5.704652	6.059629	.2261548	.1752826	.0564446
	28.74213	45.78957	162.7153	183.5955	.25573	.15362	.01593
Avon Crowncaps &	5.798	6.724	25.91	7.164	-121.342	52.2	7.034
	6.07	7.82	26.68	2.09	-55.12	26.5	7.05
	9.99	9.02	39.51	17.83	-17.65	168.06	7.09
	2.5	1.52	7.85	-.83	-292.8	0	6.96
	3.298283	2.992629	11.58737	9.083148	123.4434	68.42852	.0531978
	1.475037	1.338345	5.182029	4.062107	55.20559	30.60216	.0237908
	10.87867	8.95583	134.2671	82.50358	15238.28	4682.462	.00283
B.O.C Gases Nig	4.736	7.852	58.808	6.232	-12.64	17.386	6.496
	5.23	9.21	58.1	2.96	-26.54	13.45	6.51
	9.31	12.59	70.81	24.4	38.96	49.41	6.56
	.61	1.92	49.05	-4.59	-37.19	0	6.42
	3.918365	4.361298	9.517296	11.05948	30.89692	19.75218	.0559464
	1.752346	1.950432	4.256264	4.945951	13.81752	8.833442	.02502
	15.35358	19.02092	90.57892	122.3122	954.6199	390.1485	.00313
Berger Paints Ni	4.81	7.36	35.268	3.95	-19.27	13.866	6.554
	6.81	9.29	39.76	4.3	-29.42	7.7	6.56
	9.5	14.1	45.51	20	32.5	43.78	6.61
	.14	1.42	24.15	-14.48	-41.56	0	6.46
	4.364602	5.312085	9.251273	12.31266	30.51701	18.04912	.0577062
	1.951909	2.375637	4.137295	5.506391	13.64762	8.07181	.025807
	19.04975	28.21825	85.58606	151.6017	931.2876	325.7706	.00333
Beta Glass Compa	4.472	2.66	37.938	1.312	-18.282	14.438	7.432
	4.22	1.86	35.58	-.32	-28.19	4.82	7.43
	6.1	4.66	43.93	7.64	28.46	32.78	7.52
	3.45	1.22	31.7	-3.43	-36.08	0	7.35
	1.009094	1.502681	5.257339	4.293107	26.3713	15.66975	.0601665
	.4512804	.6720193	2.351154	1.919936	11.7936	7.007724	.0269073
	1.01827	2.25805	27.63962	18.43077	695.4454	245.541	.00362
Cadbury Nig	4.712	2.534	46.788	.3419999	-25.526	12.846	7.52
	2.53	2.03	49.97	-2.7	-27.23	14.22	7.46
	9.15	4.55	55.98	6.93	3.09	21.44	7.64
	1.88	.67	34.71	-4.15	-47.34	0	7.45
	3.355714	1.711645	9.366826	4.970973	19.24315	7.872533	.0924662
	1.500721	.7654711	4.188972	2.223087	8.605797	3.520704	.0413521
	11.26082	2.92973	87.73743	24.71057	370.2987	61.97678	.00855
Chellarams	3.212	3.312	24.188	2.304	-20.044	23.422	7.196
	2.7	4.59	25.4	.09	-33.2	20.38	7.19
	4.71	5.66	28.96	11.62	20.53	50.37	7.26
	2.02	.41	16.66	-.81	-62.54	0	7.14
	1.299681	2.529737	4.889368	5.281712	34.05223	20.75348	.046152
	.5812349	1.131333	2.186592	2.362053	15.22862	9.281239	.0206398
	1.68917	6.39957	23.90592	27.89648	1159.554	430.707	.00213
Chemical & Allie	.878	1.2	13.018	1.122	-18.738	9.566	6.53

		.66	1.4	12.98	.31	-31.93	.27	6.49
		1.61	1.84	14.31	3.77	32.85	45.93	6.69
		.43	.33	12.04	-.47	-32.31	0	6.46
		.4899694	.566348	.9812086	1.726867	28.85095	20.33693	.0930054
		.219121	.2532785	.4388098	.7722784	12.90254	9.094952	.0415933
		.24007	.32075	.9627703	2.98207	832.3771	413.5907	.00865
	Conoil	1.958	.584	5.232	-1.394	-36.598	4.234	7.892
		1.29	.4	4.57	-1.09	-33.7	3.43	7.92
		4.41	1.12	7.69	-1.05	-32.91	8.93	7.94
		.5	.02	3.49	-1.89	-45.54	0	7.84
		1.688097	.4587265	1.612489	.4530784	5.377864	4.457918	.0481663
		.7549397	.2051487	.7211269	.2026228	2.405054	1.993641	.0215406
		2.84967	.21043	2.60012	.20528	28.92142	19.87303	.00232
	Courtville Inves	4.32	4.194	26.064	4.288	-28.832	14.596	6.634
		3.85	4.27	28.4	4.09	-23.63	4.86	6.64
		7.28	6.45	35.25	12.68	-5.34	41.77	6.67
		1.5	2.02	15.05	-3.11	-64.41	0	6.6
		2.284809	1.584718	9.563013	5.675392	21.9126	17.91503	.0260769
		1.021797	.7087072	4.276709	2.538112	9.799613	8.011847	.0116619
		5.22035	2.51133	91.45122	32.21007	480.162	320.9484	.00068
	Cutix	3.178	7.364	39.968	4.99	-29.184	3.014	6.162
		2.51	9.53	43.31	2.19	-31.48	3.1	6.24
		5.79	11.98	45.33	24.13	-21.79	7.98	6.29
		.83	1.27	32.5	-3.87	-33.4	0	5.97
		2.154976	5.122492	5.96137	11.51147	5.049271	3.242681	.1505656
		.9637344	2.290848	2.666006	5.148088	2.258102	1.450171	.067335
		4.64392	26.23993	35.53793	132.514	25.49513	10.51498	.02267
	Livestock Feeds	3.278	1.488	18.424	3.34	-33.308	3.77	6.634
		3.01	1.15	18.22	3.23	-34.86	3.8	6.66
		5.35	2.4	26.39	6.47	-25.48	8	6.87
		2.09	1.04	13.3	.76	-37.39	0	6.32
		1.234006	.5816099	5.154845	2.342082	4.853552	3.588482	.2099523
		.5518641	.2601038	2.305317	1.047411	2.170575	1.604818	.0938935
		1.52277	.3382701	26.57243	5.48535	23.55697	12.8772	.04408
	May & Baker Nig	3.224	3.2	52.83	-1.77	135.152	234.004	6.918
		2.97	1.63	52.86	-2.3	-37.39	42.18	6.91
		5.19	6.61	57.88	.26	806.68	596.85	6.94
		1.16	.83	46.26	-3.63	-111.88	0	6.91
		1.720677	2.719118	4.286748	1.553705	381.1248	298.0143	.0130385
		.7695102	1.216026	1.917092	.6948381	170.4442	133.276	.005831
		2.96073	7.3936	18.37621	2.414	145256.1	88812.5	.00017
	Mobil Nig	4.086	2.984	15.962	.312	-17.716	10.894	7.67
		2.39	.37	14.78	.46	-29.44	3.63	7.69
		12.2	13.82	20.63	.62	29.39	43.45	7.79
		.79	.12	12.86	-.38	-32.16	0	7.53
		4.65615	6.059639	3.106271	.401086	26.52493	18.31182	.1019803
		2.082293	2.709953	1.389167	.1793711	11.86231	8.189294	.045607
		21.67973	36.71923	9.648918	.16087	703.5719	335.3226	.0104
	Mrs(Texaco Chevr	3.852	4.412	31.628	-1.52	-50.64	6.894	7.814
		3.5	.5	32.5	-1.73	-41.78	4.12	7.82
		5.13	16.7	39.6	-.8	-35.91	21.03	7.91

	2.66	.41	22.62	-2.09	-84.65	0	7.75
	1.161624	7.035103	6.448574	.5809475	20.53157	8.773599	.064265
	.519494	3.146194	2.88389	.2598076	9.181998	3.923673	.0287402
	1.34937	49.49267	41.58411	.3375	421.5454	76.97603	.00413
Nascon Allied	6.606	5.756	41.02	5.56	-19.574	10.126	7.158
	7.88	6.26	41.48	3.36	-31.32	1.05	7.1
	11.24	7.3	53.23	18.22	31.46	45.69	7.39
	.6	3.89	25.8	-1.68	-34.64	0	7.03
	4.022385	1.310393	11.3141	7.859351	28.57913	19.91436	.1465264
	1.798865	.5860256	5.059819	3.514809	12.78098	8.905971	.0655286
	16.17958	1.71713	128.0089	61.7694	816.7668	396.5816	.02147
Neimeth Int Phar	2.202	1.922	15.216	1.046	.1199998	14.62	6.426
	1.95	2.25	12.39	.26	6.31	17.97	6.44
	4.44	2.71	21.42	5.76	20.8	26.9	6.46
	.3	.85	11.67	-1.74	-31.74	0	6.34
	1.871302	.7711485	4.536527	2.839345	21.30917	11.13481	.0497995
	.8368716	.3448681	2.028797	1.269794	9.529749	4.979637	.022271
	3.50177	.59467	20.58008	8.061881	454.0805	123.9839	.00248
Nestle Nig	4.352	3.496	58.758	2.996	-18.048	12.708	8.064
	3.76	2.72	60.88	1.54	-14.55	7.08	8.03
	9.46	6.88	69.87	8.03	15.62	31.24	8.23
	1.76	.41	41.38	.6	-63.22	0	7.95
	3.055498	3.054313	10.66042	3.001788	28.58508	13.12153	.1038267
	1.36646	1.36593	4.767486	1.34244	12.78364	5.868129	.0464327
	9.33607	9.328831	113.6446	9.010729	817.107	172.1747	.01078
Nigeria Brewerie	2.986	5.504	55.95	4.562	-5.398	9.172	8.49
	2.47	5.72	55.49	4.36	-28.37	.58	8.54
	5.12	7.24	60.68	11.58	31.61	43.56	8.56
	1.59	2.95	52.07	-1.67	-30.82	0	8.4
	1.363096	1.843971	3.081453	5.242845	33.41809	19.22898	.0824624
	.6095949	.824649	1.378068	2.344671	14.94502	8.59946	.0368783
	1.85803	3.40023	9.495351	27.48742	1116.769	369.7535	.0068001
Nigerian Enamelw	12.726	14.172	27.01	8.876	-16.346	19.912	6.506
	12.67	21.65	22.24	-.92	-24.57	10.11	6.49
	21.53	23.25	52.05	48.13	39.12	45.04	6.7
	2.8	.22	3.98	-1.44	-37.14	0	6.34
	8.1401	11.68872	17.97417	21.94697	31.68926	22.73792	.1708214
	3.640363	5.227353	8.038294	9.814982	14.17187	10.1687	.0763936
	66.26123	136.6261	323.0708	481.6694	1004.209	517.0128	.0291799
Oando	6.17	9.108	28.576	2.352	-187.97	230.186	8.882
	4.79	10.22	29.09	7.08	-38.55	99.62	8.95
	9.41	10.6	35.31	15.95	4.65	537.62	9
	4.13	6.97	23.58	-9.61	-755.67	0	8.71
	2.285913	1.872477	4.537393	11.13967	322.9152	269.8172	.1325517
	1.022292	.8373973	2.029184	4.981812	144.4121	120.6659	.0592789
	5.2254	3.506171	20.58794	124.0923	104274.2	72801.31	.0175699
Okomu Oil Palm	29.448	39.884	57.168	-3.08	-17.606	5.628	7.43
	28.27	37.29	49.11	3.28	-16.87	5.4	7.48
	37.34	72.74	98	72.79	-9.23	12.57	7.49
	20.97	7.5	13.93	-102.36	-27	0	7.3
	6.54883	24.23424	34.94833	63.10186	7.181966	4.660469	.0839641

	2.928726	10.83788	15.62937	28.22001	3.211873	2.084225	.0375499
	42.88717	587.2986	1221.386	3981.844	51.58063	21.71997	.00705
Presco	7.244	3.838	28.928	6.086	-30.374	12.338	7.632
	3.23	3.29	30.47	6.59	-30.39	13.35	7.54
	24.8	5.95	32.72	11.4	-10	23.13	7.92
	.95	2.48	23.36	.52	-44.94	0	7.45
	9.882177	1.413106	3.749436	4.156228	14.33762	8.376626	.1943451
	4.419444	.6319604	1.676799	1.858722	6.411978	3.746141	.0869138
	97.65742	1.99687	14.05827	17.27423	205.5673	70.16787	.03777
Pz Cussons	1.732	1.014	35.812	.388	19.26	11.348	7.844
	1.7	.62	35.61	.16	30.29	2.53	7.85
	2.38	2.79	37.82	1.73	41.05	44.29	7.87
	1.2	.48	33.71	-1.05	-32.35	0	7.81
	.4253469	.9948769	1.788734	1.067296	29.33838	18.61603	.0240832
	.1902209	.4449225	.7999461	.4773091	13.12052	8.325341	.0107703
	.18092	.98978	3.199569	1.13912	860.7404	346.5565	.00058
Redstar Express	2.464	3.342	26.29	.97	-21.072	27.974	6.526
	2.45	3.43	26.74	-1.14	-37.22	43.94	6.54
	3.17	4.52	30.89	6.9	50.68	46.45	6.58
	1.82	1.8	23.12	-3.7	-44.12	0	6.46
	.6345707	1.028893	3.166141	4.692238	40.32796	23.41236	.0536656
	.2837887	.4601348	1.415941	2.098433	18.03521	10.47033	.024
	.40268	1.05862	10.02445	22.0171	1626.344	548.1385	.00288
Scoa Nig	4.73	5.098	26.418	10.814	-41.84	34.294	6.984
	2.44	3.73	20.71	6.28	-27.74	22.16	6.99
	14.47	14.18	52.72	35.23	.77	73.33	7.15
	1.48	1.75	17.55	2.11	-102.93	0	6.85
	5.479996	5.167337	14.91099	13.76269	39.5193	29.62373	.1143679
	2.450729	2.310903	6.668395	6.15486	17.67357	13.24813	.0511469
	30.03035	26.70137	222.3375	189.4115	1561.775	877.5651	.01308
Total Nigeria	1.916	.49	24.006	1.976	-30.782	5.896	7.964
	1.35	.44	24.8	1.56	-34.2	7.35	7.92
	3.75	.9	27.6	3.3	-20.41	12.22	8.14
	1.25	.18	18.42	1.12	-37.69	0	7.88
	1.064556	.2758623	3.568835	.9034821	6.920128	5.616318	.1052617
	.476084	.1233694	1.596031	.4040495	3.094775	2.511694	.0470745
	1.13328	.0761	12.73658	.81628	47.88817	31.54303	.01108
Trans-Nationwide	3.238	3.772	36.606	-2.756	-37.144	37.406	5.794
	3.12	4.64	33.28	-1.35	-32.65	20.08	5.8
	5.04	5.86	43.94	2.23	34.96	118.64	5.82
	1.34	1.12	30.39	-11.53	-161.23	0	5.75
	1.628871	2.343111	6.050333	5.175121	75.06809	49.41587	.0296649
	.7284531	1.047871	2.705791	2.314385	33.57147	22.09945	.0132665
	2.65322	5.49017	36.60653	26.78188	5635.219	2441.928	.00088
Uac Of Nig	.818	.602	27.678	.392	-29.826	4.154	8.11
	.83	.64	28.09	.65	-28.99	3.59	8.11
	1.11	.81	29.07	1.41	-23.91	7.99	8.14
	.45	.31	25.52	-.91	-35.21	0	8.09
	.2827013	.2080144	1.324111	.9151066	4.70652	2.966855	.0212132
	.1264279	.0930269	.5921603	.4092481	2.10482	1.326818	.0094868
	.07992	.04327	1.753269	.83742	22.15133	8.802229	.00045

Unilever Nig	3.164	2.616	51.018	6.79	-27.196	5.614	7.684
	3.81	2.53	53.08	5.06	-30.45	5.29	7.66
	6.62	4.17	54.55	13.7	-16.04	11.76	7.86
	.64	1.01	40.38	2.63	-32.68	0	7.56
	2.545983	1.147075	5.994578	4.580191	6.868677	5.320285	.1108152
	1.138598	.5129873	2.680857	2.048324	3.071766	2.379304	.0495581
	6.48203	1.31578	35.93497	20.97815	47.17873	28.30543	.01228
University Press	3.376	6.942	43.088	2.034	-25.492	-18.734	6.46
	3.62	5.67	43.49	.77	-32.8	-31.53	6.45
	7.44	10.94	46.59	10.03	4.37	4.37	6.5
	.65	3.34	38.01	-3.57	-33.79	-33.71	6.43
	2.623286	3.236946	3.167542	5.415116	16.71822	19.17438	.0264576
	1.173169	1.447606	1.416568	2.421713	7.476616	8.575045	.0118322
	6.88163	10.47782	10.03332	29.32348	279.4989	367.657	.0007
Vitafoam Nig	2.726	4.372	33.096	2.21	-48.184	-55.836	7.078
	2.87	2.79	33.89	4.63	-38.62	-38.62	7.08
	4.66	11.4	40.1	11.31	38.26	0	7.16
	.33	1.38	27.96	-14.87	-152.34	-152.34	7
	1.549235	4.01214	4.962845	10.01783	68.22242	57.38807	.0687022
	.6928391	1.794284	2.219452	4.480108	30.51	25.66473	.0307246
	2.40013	16.09727	24.62983	100.3569	4654.299	3293.391	.00472
Total	4.841086	5.698286	35.61954	2.961886	-25.43383	25.37063	7.193657
	3.04	3.43	33.71	1.12	-30.19	5.4	7.15
	37.34	72.74	98	72.79	806.68	596.85	9
	.14	.02	3.49	-102.36	-755.67	-152.34	5.75
	5.813962	8.325925	17.11034	12.46334	94.73257	84.77931	.7077886
	.4394942	.6293808	1.29342	.9421397	7.161109	6.408713	.0535038
	33.80215	69.32103	292.7638	155.3348	8974.26	7187.531	.5009647

APPENDIX 4:2

```
. sktest volatilityinfixedasset volatility_capex asset_tangebility_ratio capital_expenditure_ratio
income_effective_tax income_variabilitytax total_assets
```

Skewness/Kurtosis tests for Normality

				joint	
Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	Prob>chi2
volatility	175	0.0000	0.0000	.	0.0000
volatility	175	0.0000	0.0000	.	0.0000
asset_tang~o	175	0.0027	0.2954	9.03	0.0109
capital_ex~o	175	0.0000	0.0000	.	0.0000
income_eff~x	175	0.0000	0.0000	.	0.0000
income_var~x	175	0.0000	0.0000	.	0.0000
total assets	175	0.1469	0.0721	5.30	0.0006

APPENDIX 4.3

```
. correlate volatilityinfixedasset volatility_capex asset_tangebility_ratio capital_expenditure_ratio
income_variabilitytax income_effective_tax total_assets
(obs=175)

             | volati~t volati~x asset_~o capita~o inc~ytax inc~_tax total_~s
-------------+------------------------------------------------------------------
volatility~t |   1.0000
volatility~x |   0.7167   1.0000
asset_tang~o |   0.3511   0.3633   1.0000
capital_ex~o |   0.1986  -0.1794   0.2608   1.0000
income_var~x |  -0.0115   0.0159   0.0778   0.0104   1.0000
income_eff~x |   0.0131   0.0223   0.1478  -0.0411   0.0297   1.0000
total_assets |  -0.0149  -0.0693   0.0541  -0.0288   0.1133  -0.1350   1.0000
```

APPENDIX 4:4a

```
. xtreg volatilityinfixedasset asset_tangebility_ratio capital_expenditure_ratio
income_effective_tax income_variabilitytax total_assets, fe

Fixed-effects (within) regression               Number of obs      =       175
Group variable: croid                           Number of groups   =        35

R-sq:  within  = 0.2645                         Obs per group: min =         5
       between = 0.0432                                        avg =       5.0
       overall = 0.0857                                        max =         5

                                                F(5,135)           =      9.71
corr(u_i, Xb)  = -0.3363                        Prob > F           =    0.0000

------------------------------------------------------------------------------
   volatilityinfixedasset |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------------------+---------------------------------------------------------------
  asset_tangebility_ratio |   .1474785   .0312953     4.71   0.000      .085586    .2093709
capital_expenditure_ratio |   .0541193   .0226916     2.38   0.018     .0092423    .0989963
     income_effective_tax |   .0020287   .0029209     0.69   0.489    -.0037478    .0078053
    income_variabilitytax |  -.0048237   .0037429    -1.29   0.200    -.0122261    .0025786
            total_assets |   2.682349   2.848533     0.94   0.348    -2.951172    8.315871
                   _cons |  -19.69425   20.65159    -0.95   0.342    -60.53674    21.14824
--------------------------+---------------------------------------------------------------
                 sigma_u |  5.1494356
                 sigma_e |  3.1969926
                     rho |  .72178901   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(34, 135) =    10.61             Prob > F = 0.0000

. estimates store FE
```

```
APPENDIX 4:4b
. xtreg volatilityinfixedasset asset_tangebility_ratio capital_expenditure_ratio
income_effective_tax income_variabilitytax total_assets, re

Random-effects GLS regression                   Number of obs      =       175
Group variable: croid                           Number of groups   =        35

R-sq:  within  = 0.2600                         Obs per group: min =         5
       between = 0.0840                                        avg =       5.0
       overall = 0.1338                                        max =         5

                                                Wald chi2(5)       =     50.32
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000

------------------------------------------------------------------------------
   volatilityinfixedasset |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
--------------------------+---------------------------------------------------------------
  asset_tangebility_ratio |   .1335692   .0271634     4.92   0.000       .08033    .1868084
capital_expenditure_ratio |   .0584958   .0218932     2.67   0.008      .015586    .1014056
     income_effective_tax |   .0016006    .002875     0.56   0.578    -.0040342    .0072354
    income_variabilitytax |  -.0044239   .0036189    -1.22   0.222    -.0115167     .002669
             total_assets |   .1897751   1.084161     0.18   0.861    -1.935141    2.314691
                    _cons |  -1.302079    7.89854    -0.16   0.869    -16.78293    14.17877
--------------------------+---------------------------------------------------------------
                  sigma_u |  4.6713926
                  sigma_e | 3.1969926
                      rho |  .68102653   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. Estimates store RE


APPENDIX 4:5
. hausman FE RE

                ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |       FE           RE         Difference          S.E.
-------------+----------------------------------------------------------------
asset_tang~o |    .1474785     .1335692        .0139092        .0155417
capital_ex~o |    .0541193     .0584958       -.0043765        .0059664
income_eff~x |    .0020287     .0016006        .0004281        .0005158
income_var~x |   -.0048237    -.0044239       -.0003999        .0009556
total_assets |    2.682349     .1897751        2.492574        2.634148
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =        2.38
                Prob>chi2 =      0.7939
```

```
APPENDIX 4:6a
. xtreg volatility_capex asset_tangebility_ratio capital_expenditure_ratio
income_effective_tax income_variabilitytax total_assets, fe

Fixed-effects (within) regression               Number of obs      =       175
Group variable: croid                           Number of groups   =        35

R-sq:  within = 0.3681                          Obs per group: min =         5
       Between = 0.0741                                        avg =       5.0
       Overall = 0.1290                                        max =         5

                                                F(5,135)           =     15.73
corr(u_i, Xb)  = -0.4768                        Prob > F           =    0.0000

------------------------------------------------------------------------------
        volatility_capex |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------------------+----------------------------------------------------------------
  asset_tangebility_ratio |   .3317891   .0438679     7.56   0.000     .2450319    .4185462
capital_expenditure_ratio |  -.2344831   .0318077    -7.37   0.000     -.297389   -.1715772
     income_effective_tax |   .0029004   .0040943     0.71   0.480    -.0051968    .0109977
    income_variabilitytax |  -.0026394   .0052466    -0.50   0.616    -.0130155    .0077368
             total_assets |   4.299642   3.992905     1.08   0.283    -3.597096    12.19638
                    _cons |  -36.21479   28.94818    -1.25   0.213    -93.46538    21.03579
-------------------------+----------------------------------------------------------------
                  sigma_u |  7.7031693
                  sigma_e |  4.4813551
                      rho |  .74713927   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(34, 135) =     9.66             Prob > F = 0.0000

. Estimates store FE

. Estimates store FE


APPENDIX 4.6b
. xtreg volatility_capex asset_tangebility_ratio capital_expenditure_ratio
income_effective_tax income_variabilitytax total_assets, re

Random-effects GLS regression                   Number of obs      =       175
Group variable: croid                           Number of groups   =        35

R-sq:  within  = 0.3593                         Obs per group: min =         5
       between = 0.1589                                        avg =       5.0
       overall = 0.2151                                        max =         5

                                                Wald chi2(5)       =     79.26
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
------------------------------------------------------------------------------
        volatility_capex |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------------------+----------------------------------------------------------------
  asset_tangebility_ratio |   .2889823   .0378895     7.63   0.000     .2147202    .3632443
capital_expenditure_ratio |  -.2190381   .0309846    -7.07   0.000    -.2797667   -.1583094
     income_effective_tax |    .001708   .0040742     0.42   0.675    -.0062773    .0096932
    income_variabilitytax |  -.002076   .0051145    -0.41   0.685    -.0121001    .0079482
             total_assets |  -.6490053   1.445747    -0.45   0.653    -3.482617    2.184606
                    _cons |   .8184652   10.53064     0.08   0.938    -19.82121    21.45814
-------------------------+----------------------------------------------------------------
```

```
                sigma_u |  6.0431493
                sigma_e |  4.4813551
                    rho |  .64519852   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. Estimates store RE
```

APPENDIX 4:7

```
. hausman FE RE

                ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |       FE           RE         Difference          S.E.
-------------+----------------------------------------------------------------
asset_tang~o |    .3317891     .2889823        .0428068        .0221083
capital_ex~o |   -.2344831    -.2190381        -.015445        .0071895
income_eff~x |    .0029004      .001708        .0011925        .0004051
income_var~x |   -.0026394     -.002076       -.0005634        .0011701
total_assets |    4.299642    -.6490053        4.948647        3.721976
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       11.86
                Prob>chi2 =      0.0368
                (V_b-V_B is not positive definite)
```

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