Tax Avoidance and Investment Efficiency of Quoted Non-Financial Firms in Nigeria

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Abstract

This study investigates the relationship between tax avoidance and investment efficiency of listed non-financial firms in Nigeria. Using secondary data over the period from 2007 to 2022 of 75 of those firms on the floor of the Nigerian Exchange Group (NXG), the estimated generalized least squares (EGLS) results reveal that five of the variables (LCUT, LGCUT, CAT, BTD and PD) are positively and statistically significant with investment efficiency. Another five variables (CUT, LCAT, SHT, DT and PBTD) are negatively and statistically significant with investment efficiency. Seven of the variables (DBTD, TO, CTO, HS, BTDL, LGCAT and CT) are statistically not significant.

Keywords: *Tax Avoidance, Investment Efficiency, Quoted Non-Financial Firms, EGLS, NXG.*

1.0 Introduction

One very important strategic policy which all firms will always engage in their life time is investment decision. Investment decision, financing decision and dividend decision are central policies of any business organization. Investment decision involves the commitment of very huge sum of money into a project that is expected to last for a long time period of time with the hope that the cash inflows (future benefits) will exceed the cash outflows (present investment costs) and so increase the overall value of the firm (Egbadju & Omoluabi, 2023). Again, Brealey et al. (2011) opined that investment is one of the most significant decisions a corporation can make because it involves raising and committing significant amount of cash and thus it must be well planned for and executed. According to the new classic theory, firms should avoid taking on projects with a negative net present value (-NPV) and instead concentrate primarily on efforts with a positive net present value (+NPV). In order to optimize their values and reach the income-expenditure equilibrium level, they must also engage in certain levels of specific investments because effective investment can lead to sustainable economic growth and development (Manesh & Arefmanesh, 2023). Investment has long been thought to be a crucial tactic for expanding companies and avoiding recessions. Managers who invest at the right amount can maximize efficiency and promote shareholders' interests by taking advantage of profitable opportunities. It should be noted that resource limitations have made investment efficiency a very crucial matter. A firm reaches investment efficiency when it only funds projects with a +NPV. That is, investment efficiency refers to all of an investment's benefits, including socioeconomic ones as well as advantages for investors and other related parties. Investors implement plans aimed at achieving corporate goals in order to develop and improve valuable assets using their resources. When the investment efficiency is reached, the project is considered successful.

Previous studies suggest that tax avoidance might be taken into account in addition to the other investment options that management has at their disposal. Therefore, businesses seeking to maximize profits would take into account the chance to lower tax burdens to the degree that the advantages of creating cash tax savings through tax avoidance actions outweigh the associated costs (Mohammed et al., 2020). The term "tax avoidance" (TA) describes the legally-mandated strategies, plans, or actions that taxpayers employ to reduce their tax obligations, which are intended to reflect their fair share of the total tax burden on the general public. According to Dyreng et al. (2008), it is any tactic that lowers a firm's effective tax rate while adhering to the tax code or at the very least staying within its gray areas. It is the endeavour to lower one's tax liability while still following the guidelines set forth by the government (Mujiani et al., 2021).

There are two opposing views when linking TA with investment efficiency. First, Aurora et al. (2022) noted that TA is just one of many high-risk investment opportunities available to management. Since cash flows from TA can be a crucial source of capital, engaging in this strategy increases a firm's likelihood of retaining greater funds for greater investment. Thus, TA reduces wealth transfers from the firms to the government which enables firms to retain greater resources and increase shareholder value (Khurana et al., 2018). In contrast, TA could facilitate managerial opportunism to channel the excess cash flow and so make an inefficient investment decision due to agency problem (Khurana et al., 2018). Again, Mohammed et al. (2020) hypothesized that businesses engaging in TA will make unproductive or inefficient investments. Their claim was based on the observation that managerial choices have a significant impact on a firm's value and that investment decisions are among the most crucial ones a firm makes when it comes to capital expenditure and the firm's capacity to meet its strategic and operational goals. Consequently, shareholders require that firm management make prudent investments in order to maximize shareholder welfare and increase the firm's value.

In Nigeria, the general investment climate with respect to the ease of doing business is still low. Nigeria ranked 131 globally out of 190 countries and 21 out of 54 African countries where Mauritius ranked first (Statista, 2020). Although Egbunike et al. (2021) asserted that calls for new revenue streams have been made in response to the Nigerian government's steadily declining revenue, the country's tax to GDP ratio remains low, suggesting that both individuals and corporations may be involved in tax evasion. Otusanya (2011) reported that there are numerous unreported tax avoidance and evasion strategies in Nigeria apart from the three heinous cases of tax fraud and avoidance that Halliburton West Africa Ltd., Pan African Airlines Nigeria Ltd., and Chevron Nigeria Limited initiated against the Nigerian government.

Studies on TA and investment efficiency are very rare in Nigeria for out of the empirical literatures reviewed in this study, none is on Nigeria. However, several studies that have linked TA and investment efficiency found strong relationship between them both in developed economy- Mohammed et al. (2020); Khurana et al. (2018)- and in developing economy- Manesh and Arefmanesh (2023); Alsmady (2022)-with mixed outcomes. For examples, while some found a positive relationship (Mohammed et al. (2020); Khurana et al. (2018); others found a negative relationship (Manesh and Arefmanesh (2023); Alsmady (2022) with none showing no relationship at all. For as much as the results from previous studies have shown mixed outcomes, the main objective of this study is to investigate the impact which TA may have on investment efficiency of quoted non-financial firms in Nigeria. This study differs from others in that it uses seventeen (17) variables to measure tax avoidance. While both Varoonchotikul (2021) and Khurana et al. (2018) used three measures of tax avoidance; others used only one variants of TA measurements. Although Khurana et al. (2018) in United States of America used a time span of 22 years from 1994 to 2015; and Mohammed et al. (2020) also in United States of America used a time span of 24 years from 1993 to 2016, this study uses a more recent period of 16 years from 2007 to 2022. We, therefore, hypothesized that all the various TA measurements considered in this study have no significant relationship with investment efficiency of quoted non-financial firms in Nigeria. Following this introduction, the rest of the paper is divided into five sections with the literature review in section two, methodology in section three, discuss of results in section four and the fifth section concludes this paper with recommendations.

2.0 Review of Related Literature.

2.1 Theoretical Underpinning.

2.1.1 Pecking Order Theory and Investment Efficiency.

The pecking order theory of Myers and Majluf (1984) states that there is no ideal debt-to-equity mix ratio that optimizes the capital structure. Instead, when choosing how much money to invest in new projects, businesses give preference to employing internal resources (retained income) over external sources (Egbadju et al., 2023). If outside finance is needed, low-risk debt is better than risky equity. That is, there is a hierarchy in the utilization of funds since retained earnings are the least expensive source of funding and are unaffected by outside interferences (Mohammed et al., 2020). The next option in the hierarchy is external debt, with equity serving as a last resort only in situations requiring additional funding. Debt is far less expensive than equity, which has more restrictions and limitations. Applying the theory to this study, the pecking order theory states that cash serves only as a bridge between retained earnings and investment requirements, and that there is no ideal level of cash. Thus, businesses may be able to avoid paying taxes even if they have adequate cash on hand to finance their investments. The cost of external funding is higher than the cost of internal funding when there is information asymmetry. As a result, businesses prefer to use funds they generated internally before looking for outside capital.

Edwards et al. (2016) as cited in Mohammed et al. (2020) observed that tax planning could be leveraged on as an internal source of capital to help financially challenged firms with tax savings access good investment efforts. Tax avoidance may therefore be a firm action that provides value. Companies avoid paying taxes so they can increase their internal resources and reduce their capital requirements. When external funding becomes more expensive or limited in the presence of information asymmetry, the extra benefits from cash tax savings as locally generated funds become increasingly important (Edwards et al. , 2016 as cited in Mohammed et al., 2020).

2.2 Empirical Literature

Manesh and Arefmanesh (2023) analyzed the relationship between tax avoidance and investment efficiency in Iran. A panel data on 128 listed on the Tehran Stock Exchange spanning the period 2014 to 2021 was used in the study. Results of the pooled OLS showed that tax avoidance represented by effective tax rate (ETR) was negatively significant with investment efficiency.

Aurora et al. (2022) carried out an empirical assessment if there is any relationship between tax avoidance and investment efficiency in Indonesia. Secondarily sourced panel data obtained on some non-financial firms spanning the period from 2010 to 2019 for 2064 firm-year observations was used. Results of the OLS and Propensity Score Matching (PSM) regression showed that tax avoidance represented by both current effective tax rate (CETR) was positively significant with investment efficiency.

Alsmady (2022) studied the relationship, if any, that existed between tax avoidance and investment opportunities in six Arabian Gulf Cooperation Council (GCC) countries. An annual secondary panel data of selected 191 firms over the period from 2011 to 2017 making a total of 1337 firm-year observations was used. The OLS regression result revealed that tax avoidance proxied by cash paid-to-operating cash flow was negatively significant with investment opportunities.

Sukarno et al. (2022) examined the impact which tax avoidance has had on firms' investment efficiency in Indonesia. Secondarily sourced data from the annual reports of listed 69 non-financial firms from 2014 to 2019 totaling 414 firm-year observations were analyzed with the OLS regression method. The results indicated that tax avoidance proxied by permanent book-tax difference (DTAX) was positively significant with investment efficiency..

Jinming et al. (2022), in a research study, sought to verify if at all the tax avoidance improves investment efficiency in China. Using a secondarily sourced annual data of China's non-financial listed A-Share firms over the period starting from 2008 to 2019, the OLS regression results found out that ETR was positively related with investment efficiency.

Varoonchotikul (2021) studied how investment efficiency can be influenced by tax avoidance in Thailand. A sample of some listed companies on the Security Exchange of Thailand (SET) was selected covering the period 2008 to 2017 making 2,555 firm-year observations. The results of the OLS multiple regressions showed that all three tax avoidance measurements- effective tax rate (ETR), cash effective tax rate (CETR) and five-year cash effective tax rate (CETR5)- were positively significant with investment efficiency.

Mohammed et al. (2020) investigated whether tax avoidance represented by GAAP_ETR had any effect on investment efficiency in the United States of America. The study used secondary data collected from the annual reports of a large sampled firms spanning the period from 1993 to 2016. Results of the difference-in-difference (DID), Propensity score matching (PSM) as well as the twostage least squares (2SLS) revealed that GAAP_ETR had a positively significant relationship with investment efficiency.

Widuri et al. (2020) empirically tested the extent to which tax avoidance represented by ETR impacted investment efficiency in Indonesia. A panel data on 394 firms over the period 2014 to 2018 was used and analyzed with the OLS regression method. The results revealed that ETR had a positively significant relationship with investment efficiency.

Rahimi and Forughi (2020) attempted to ascertain the extent to which tax avoidance impacted investment efficiency in Iran. A sampled data of 152 firms of listed firms in the Tehran Stock Exchange (TSE) between 2009 and 2018 was used. Result showed that ETR relationship with investment efficiency was negatively significant.

Ding (2019) made an empirical test on the extent to which tax avoidance represented by book-tax-difference (BTD) impacted investment efficiency in China. A panel data on all A-share firms over the period 2010 to 2016 was used and analyzed with the OLS regression method. The results revealed that BTD had a positively significant relationship with investment efficiency.

Khurana et al. (2018) studied how investment efficiency can be influenced by tax avoidance in the United States of America. A sample of some listed companies in Compustat starting from 1994 and 2015 totaling 214,030 firm-year observations was used..
The results of the OLS multiple regressions showed that all three tax avoidance measurements-book-tax difference (BTD), permanent book-tax differences (DBTD) and probability that the firm has invested in a corporate tax shelter (TSScore)- were positively significant with investment efficiency.

3.0 Methodology

3.1 Research Design

Using the ex-post facto research design, often referred to as the descriptive or correlational research design, the study investigates if there is any relationship between ownership structure and firm performance of companies in Nigeria. The population of the study consists of 106 non-financial enterprises listed on the floor of the Nigerian Exchange Group (NXG). In order to conduct this study, secondary data from 75 out of 106 organizations' annual reports were gathered over a period of sixteen (16) years, from 2007 to 2022, totaling 1,200 observations.

3.2 Measurement and Definitions of Variables.

Table1

S/N		Definitions	Variable Types	Measurements
1	IER	Richardson(2006) Investment Efficiency Model	Dependent	See 3.2.1 for Details
2	IER(-1)		Lagged dependent	-
3	IEH	Huang et alRichardson Investment Efficiency Model	Dependent	See 3.2.1 for Details
4	IEH(-1)		Lagged dependent	-
5	CUT	Current Effective Tax Rate (Current ETR)	Independent	See 3.2.2 for Details
6	LCUT	Long-Run Current ETR	Independent	See 3.2.2 for Details
7	LGCUT	Lagged Current ETR	Independent	See 3.2.2 for Details
8	CAT	Cash Effective Tax Rate (Cash ETR)	Independent	See 3.2.2 for Details
9	LCAT	Long-Run Cash ETR	Independent	See 3.2.2 for Details
10	LGCAT	Lagged Cash ETR	Independent	See 3.2.2 for Details
11	HS	Henry and Sansing's (2014) Measure.	Independent	See 3.2.2 for Details
12	SHT	Tax Shelter Score	Independent	See 3.2.2 for Details
13	CT	Conforming Tax Avoidance	Independent	See 3.2.2 for Details
14	DT		Independent	See 3.2.2 for Details
15	BTD	Book-Tax-Differences (BTD)	Independent	See 3.2.2 for Details
16	BTDL	BTD Lagged Total Assets	Independent	See 3.2.2 for Details
17	PD	Permanent Difference	Independent	See 3.2.2 for Details
18	PBTD	Total Permanent Book-Tax-Differences (BTD)	Independent	See 3.2.2 for Details
19	DBTD	Discretionary Book-Tax-Differences (BTD) or Abnormal Book-Tax-Differences	Independent	See 3.2.2 for Details
20	TO	Tax Expense/Operating Cash Flow	Independent	See 3.2.2 for Details
21	CTO	Cash Tax Expense Paid/ Operating Cash Flow	Independent	See 3.2.2 for Details
22	ΔSALES	Change in Sales	Control	Percentage Change in annual Sales
23	OCF	Operating cash flows	Control	Total value of cash flows from Operations
24	TQ	Tobin'sQ	Control	Market value of equity (MVE) plus Book value of debt(BVD)/ Book value of assets(BVA)

25	RD	Research & Development Costs/TA	Control	Total amount spent on Research & Development divided by total assets.
26	CAPEX	Capital expenditure	Control	Amount spent of capital projects.
27	FI	Foreign Income	Control	Income earned outside the shores of Nigeria
28	CASH	Cash and cash equivalent/TA	Control	Total value of Cash and cash equivalent divided by total assets.
29	LEV	Leverage	Control	Total debts/ Total assets
30	YDUM	Year Fixed Effect Dummy	Control	A dummy variable which takes the value '1' for each year
31	IDUM	Industry Sector Fixed Effect Dummy	Control	A dummy variable which takes the value '1' for each industry

Source: Researcher's Computations from Extant Literature.

3.2.1 Derivation of the Dependent Variables (Investment Efficiency)

Investment efficiency, which, in this study, is the dependent variable, shows that firms only engage in investment projects at their optimal levels. That is, firms invest efficiently when they only accept all the projects with positive net present value (NPV). This occurs at the point where the level of actual investment does not deviate from that expected by the firm.

In accordance with previous studies, this study uses the abnormal investment to measure investment efficiency using both the Richardson (2006) and the Huang (2020) models shown below.

3.2.1.1 Richardson (2006) Measurement of Investment Efficiency

$$Invest_{it} = \beta o + \beta_1 Nest_{it-1} + \beta_2 Lev_{it-1} + \beta_3 Size_{it-1} + \beta_4 Age_{it-1} + \beta_5 Q_{it-1} + \beta_6 Invest_{it-1} + \beta_7 Industry_{it-1} + \beta_8 Years_{it-1} + \varepsilon_{it}$$

Where:

Invest = capital expenditures plus research & development expenditures plus acquisition expenditures minus cash receipts from the disposal of property, plant and equipment divided by lag one of total assets. Nest = net amount of property, plant and equipment plus intangible assets divided by total assets. Lev = Leverage or asset-liability ratio = total debts divided by total assets. Size = Firm size = Log total assets. Age = Number of years since incorporations. Q = Tobin'sQ = Market value of equity (MVE) plus Book value of debt(BVD)/ Book value of assets(BVA). Industry = Industry dummy = A dummy variable which takes the value '1' for each industry. Years = A dummy variable which takes the value '1' for each year

3.2.1.2 Huang (2020) Measurement of Investment Efficiency

$$Invest_{it} = \beta o + \beta_1 MTB_{it-1} + \beta_2 SG_{it-1} + \beta_3 FCF_{it-1} + \beta_4 LEV_{it-1} + \beta_5 LOGSALES_{it-1} + \varepsilon_{it}$$

Where:

Invest = capital expenditures plus research & development expenditures. MTB = Market value of equity / Book value of equity (BVE). SG = sales growth. FCF = Free cash flows = Operating cash flow minus capital expenditure divided by total assets. Lev = Leverage or asset-liability ratio = total debts divided by total assets. LOGSALES = Log of sales.

Thus, the following steps are undertaken to obtain the value for investment efficiency:
Step1: Run a fixed effect regression estimation for each of the two models (Richardson, 2006 & Huang, 2020) above and obtain the result.
Step2: Extract the residual values and observe the pattern of both positive and negative values. The positive residuals represent over-investment while the negative residuals represent under-investment.
Step3: Obtain the absolute value from Step 2 above. However, a higher absolute value of the residual means a lesser efficient investment.
Step4: Investment efficiency is derived when the absolute value of the residuals from the regression model is multiplied by -1(Richard (2006); Aurora et al. (2022))

3.2.2 Derivation of the Independent Variables

3.2.2.1 Current Effective Tax Rate (Current ETR)
The current tax is the item of tax payable shown in the financial statement of a firm which is determined by the generally accepted accounting principles (GAAP). It is made up of current year tax expense only. Current effective tax rate is usually calculated as the current tax expense in a particular year divided by pre-tax book income or profit before tax in that year

$$\text{Current ETR} = \frac{\text{Current Year Tax Expense}}{\text{Pre-Tax Income or Profit Before Tax}}$$

3.2.2.2 Cash Effective Tax Rate (Current ETR)
The cash tax is the actual tax paid or payable to the Federal Inland Revenue Services (FIRS) which is based on the reported amount on FIRS‘s tax return each year. The book tax and the cash tax do produce different results due to differences in policy objectives, and this lead to the concept of timing differences which are temporary difference and permanent difference. Cash effective tax rate is usually calculated as the cash tax expense paid in a particular year divided by pre-tax book income or profit before tax in that year

$$\text{Cash ETR} = \frac{\text{Cash Tax Expense Paid}}{\text{Pre-Tax Income or Profit Before Tax}}$$

3.2.2.3. Long-Run GAAP ETR

$$= \frac{\text{Total Sum of Book Tax Expense Paid over n (3,5,10) years}}{\text{Total sum of Pre-Tax Income or Profit Before Tax}}$$

This is the cumulative number of book tax payable shown in the financial statement of a firm which is determined by the generally accepted accounting principles (GAAP)

3.2.2.4.Long-Run Current ETR

$$= \frac{\text{Total Sum of Current Year Tax Expense Paid over n (3,5) years}}{\text{Total sum of Pre-Tax Income or Profit Before Tax}}$$

This is the cumulative number of current year tax payable shown in the financial statement of a firm which is determined by the generally accepted accounting principles (GAAP)

3.2.2.5.Long-Run CASH ETR

$$= \frac{\text{Total Sum of Cash Tax Expense Paid over n (3,5,10) years}}{\text{Total sum of Pre-Tax Income or Profit Before Tax}}$$

This is the cumulative number of the actual tax paid or payable to the Federal Inland Revenue Services (FIRS) which is based on the reported amount on FIRS's tax return each year.

3.2.2.6.Lagged GAAP ETR

$$= \frac{\text{Book Tax Expense or Total Income Tax Expense}}{\text{Lag1 of Pre-Tax Income or Profit Before Tax}_{t-1}}$$

Lagged book effective tax rate is usually calculated as the total tax expense in a particular year divided by pre-tax book income or profit before tax of the immediate previous or preceding year

3.2.2.7.Lagged Current ETR

$$= \frac{\text{Current Year Tax Expense}}{\text{Lag1 of Pre-Tax Income or Profit Before Tax}_{t-1}}$$

Lagged current effective tax rate is usually calculated as the current tax expense in a particular year divided by pre-tax book income or profit before tax of the immediate previous or preceding year

3.2.2.8.Lagged Cash ETR

$$= \frac{\text{Cash Tax Expense Paid}}{\text{Lag1 of Pre-Tax Income or Profit Before Tax}_{t-1}}$$

Lagged cash effective tax rate is usually calculated as the cash tax expense paid in a particular year divided by pre-tax book income or profit before tax of the immediate previous or preceding year.

3.2.2.9.Conforming Tax Avoidance (TaxC)

Conforming tax avoidance measurement is the residuals (ε) obtained from either of the following regression equations:

$$\text{Taxes paid/Total assets} = \beta 0 + \beta 1\text{Cash\_Etr}_{it} + \beta 2NOL_{it} + \beta 3\Delta NOL_{it} + \varepsilon_{it}$$

OR

$$\text{Taxes paid/Total assets} = \beta 0 + \beta 1\text{Cash\_Etr}_{it} + \varepsilon_{it}$$

where NOL = net operating loss and equals 1 NOL is non-zero.
ΔNOL = change in net operating loss.

3.2.2.10. HS (Henry and Sansing's 2014) Measure.

$$HS = \frac{\Delta}{MVA} = \frac{\text{Cash Tax Paid} - (\text{Statutory Tax Rate} * \text{Profit Before Tax})}{MVA}$$

where MVA = book value of assets + (market value of equity -book value of equity) = BVA+ (MV E - BV E)

Book-Tax-Differences (BTD) Based Measures

3.2.2.11. $$BTD = \text{Profit Before Tax(PBT)} - \frac{\text{(Current Tax Expense)}}{\text{Statutory Tax Rate}}$$

3.2.2.12. $$BTDLaggedTA = \frac{\text{Book-Tax-Differences}}{\text{Lagged Total Assets or Total Assets}_{t-1}}$$

3.2.2.13. Discretionary Book-Tax-Differences (BTD) or Abnormal Book-Tax-Differences

$$\frac{\text{Book-Tax-Differences}}{\text{Total Assets}_{t-1}} = \beta 0 + \beta 1 * \frac{\text{Total Accruals}}{\text{Total Assets}_{t-1}} + \varepsilon_{it}$$

3.2.2.14. Total Permanent Book-Tax-Differences (BTD)

a) $$\text{Total Permanent BTD} = \text{Total BTD} - \frac{\text{(Deferred Tax Expense)}}{\text{Statutory Tax Rate}}$$

OR

b) Total Permanent BTD = (Statutory Tax Rate – Effective Tax Rate)* PBT

3.2.2.15. ETR Differential Measures.

ETR Differential = Statutory Income Tax Rate – Firms' Effective Tax Rate.

3.2.2.16. Discretionary permanent differences (DTAX) can be derived through the estimation and extraction of the residuals or error terms from the following regression equation:

a) $PERMDIFF = \beta o + \beta_1 INTANG + \beta_2 UNCON + \beta_3 MI + \beta_4 CSTE + \beta_5 \Delta NOL + \beta_6 LAGPERM + \varepsilon_{it}$

where:

$$PERMDIFF = PBT - \frac{(Current\ Tax)}{Statutory\ Tax\ Rate} + \frac{(Current\ Foreign\ Tax)}{Statutory\ Tax\ Rate} - \frac{(Current\ Deferred\ Tax)}{Statutory\ Tax\ Rate}$$

INTANG = Goodwill and other intangibles; UNCON = Income (loss) reported under the equity method; MI = Income (loss) attributable to minority interest; CSTE = Current state income tax expense; NOL = Change in net operating loss carryforwards; LAGPERM = One-Year Lag of PERMDIFF or $PERMDIFF_{t-1}$

That is, the portion of the ETR differential which is usually unexplained

b) It can also be derived as the error term extracted from the following regression equation:
ETR differential*Pre-tax book income (PBT) = $\beta 0 + \beta 1 Controls + \varepsilon_{it}$

Thus, while the ETR differential measures the difference between a firm's statutory income tax rate and its effective tax rate (ETR), DTAX which is the discretionary permanent difference measures the unexplained portion of ETR differential as developed by Frank et al. (2009).

3.2.2.17. SHELTER :

a) This is an indicator variable used when a firm is accused of engaging in any tax shelter activity

b) Alternatively, the probability that a firm may be engaged in tax sheltering can be computed as follows:

Tax Shelter Score (TSS) = -4.30 + 6.63 ∗ BTD - 1.72 ∗ LEV + 0.66 ∗ SIZE + 2.26 ∗ ROA + 1.62 ∗ FOREIGN INCOME + 1.56 ∗ R&D

where: BTD = Book-Tax-Differences = Profit Before Tax – $\frac{\text{(Current Tax Expense)}}{\text{Statutory Tax Rate}}$

LEV = Leverage = Total Debts / Total Assets; SIZE = Log of Total Assets; ROA = PBT/Total Assets; Foreign Income = Income earned outside the shores of Nigeria; R&D = Research & Development Expenditures / Total Assets.

3.2.2.18. Tax Expenses-To-Operating Cash Flow = $\frac{\text{Tax Expenses}}{\text{Operating cash Flow}}$

3.2.2.19. Cash Tax Expenses Paid-To-Operating Cash Flow = $\frac{\text{Cash Tax Expenses Paid}}{\text{Operating cash Flow}}$

3.3 Model Specification

The functional equation of investment efficiency to test the seventeen (17) hypotheses specified is stated as in equation 1:

IER = f (CUT, LCUT, LGCUT, CAT, LCAT, LGCAT, HS, SHT, CT, DT, BTD, BTDL, PD, PBTD, DBTD, TO, CTO) (Eq1a)

IEH= f (CUT, LCUT, LGCUT, CAT, LCAT, LGCAT, HS, SHT, CT, DT, BTD, BTDL, PD, PBTD, DBTD, TO, CTO) (Eq1b)

3.3.1. Universal Usage of Control Variables in Published Scholarly Articles From High Quality Journals.

Traditionally, control variables (CVs) are used in research models that have causal relationship. The two main ways of controlling for variables are by experimental design (before gathering the data) where the samples are manipulated or by statistical control (after gathering the data) where the researcher just includes relevant variables in the model. Some of the reasons for controlling are to eliminate omitted variables biases thereby reducing the error term which in turn increase statistical power by improving the estimated coefficients precision (De Battisti & Siletti, 2018).Cinelli et al. (2022) was of the opinion that while some data analysts, students as well as empirical social scientists have discussed the problem of omitting certain relevant variables, they have not provided a means of deciding which variables could improve or worsen existing biases in a regression model. According to Becker (2005), CVs are just as important as the predictors (independent) variable and the criterion (dependent) variable because one author‘s CV could be another author‘s predictor‘s or criterion variable such that including improperly any CV can produce misleading results. Hunermund and Louw (2020) noted that over 47 percent of scholarly papers published the previous five years in top management journals made use of CVs. They pointed out that they were specifically as authors asked to hypothesized and interpret CV coefficients as though these CVs were focal main variables for as much as the CVs could give valuable information to other researchers.

Therefore, introducing the three firm-specific control variables give rise to equation 2 as:
IER = f (CUT, LCUT, LGCUT, CAT, LCAT, LGCAT, HS, SHT, CT, DT, BTD, BTDL, PD, PBTD, DBTD, TO, CTO, ∆SALES, OCF, TQ, RD, CAPEX, FI, CASH, LEV) (Eq2a)

IEH = f (CUT, LCUT, LGCUT, CAT, LCAT, LGCAT, HS, SHT, CT, DT, BTD, BTDL, PD, PBTD, DBTD, TO, CTO, ∆SALES, OCF, TQ, RD, CAPEX, FI, CASH, LEV) (Eq2b)

Eq2 becomes Eq3 when the year dummy and industry sector dummy variables are introduced to control for specific fixed effect.

IER = f (CUT, LCUT, LGCUT, CAT, LCAT, LGCAT, HS, SHT, CT, DT, BTD, BTDL, PD, PBTD, DBTD, TO, CTO, ∆SALES, OCF, TQ, RD, CAPEX, FI, CASH, LEV, YDUM, IDUM) (Eq3a)

IEH = f (CUT, LCUT, LGCUT, CAT, LCAT, LGCAT, HS, SHT, CT, DT, BTD, BTDL, PD, PBTD, DBTD, TO, CTO, ∆SALES, OCF, TQ, RD, CAPEX, FI, CASH, LEV, YDUM, IDUM) (Eq3b)

The functional testable model will be derived as:

$$IER = \beta o + \beta_1 CUT + \beta_2 LCUT + \beta_3 LGCUT + \beta_4 CAT + \beta_5 LCAT + \beta_6 LGCAT + \beta_7 HS + \beta_8 SHT + \beta_9 CT + \beta_{10} DT + \beta_{11} BTD + \beta_{12} BTDL + \beta_{13} PD + \beta_{14} PBTD + \beta_{15} DBTD + \beta_{16} TO + \beta_{17} CTO + \beta_{18} \Delta SALES + \beta_{19} OCF + \beta_{20} TQ + \beta_{21} RD + \beta_{22} CAPEX + \beta_{23} FI + \beta_{24} CASH + \beta_{25} LEV + \beta_{26} YDUM + \beta_{27} IDUM + \varepsilon \quad (Eq4a)$$

$$IEH = \beta o + \beta_1 CUT + \beta_2 LCUT + \beta_3 LGCUT + \beta_4 CAT + \beta_5 LCAT + \beta_6 LGCAT + \beta_7 HS + \beta_8 SHT + \beta_9 CT + \beta_{10} DT + \beta_{11} BTD + \beta_{12} BTDL + \beta_{13} PD + \beta_{14} PBTD + \beta_{15} DBTD + \beta_{16} TO + \beta_{17} CTO + \beta_{18} \Delta SALES + \beta_{19} OCF + \beta_{20} TQ + \beta_{21} RD + \beta_{22} CAPEX + \beta_{23} FI + \beta_{24} CASH + \beta_{25} LEV + \beta_{26} YDUM + \beta_{27} IDUM + \varepsilon \quad (Eq4b)$$

Since we are using panel data, the model will be specified in the appropriate form as:

$$IER_{it} = \beta o + \beta_1 CUT_{it} + \beta_2 LCUT_{it} + \beta_3 LGCUT_{it} + \beta_4 CAT_{it} + \beta_5 LCAT_{it} + \beta_6 LGCAT_{it} + \beta_7 HS_{it} + \beta_8 SHT_{it} + \beta_9 CT_{it} + \beta_{10} DT_{it} + \beta_{11} BTD_{it} + \beta_{12} BTDL_{it} + \beta_{13} PD_{it} + \beta_{14} PBTD_{it} + \beta_{15} DBTD_{it} + \beta_{16} TO_{it} + \beta_{17} CTO_{it} + \beta_{18} \Delta SALES_{it} + \beta_{19} OCF_{it} + \beta_{20} TQ_{it} + \beta_{21} RD_{it} + \beta_{22} CAPEX_{it} + \beta_{23} FI_{it} + \beta_{24} CASH_{it} + \beta_{25} LEV_{it} + \beta_{26} YDUM_{it} + \beta_{27} IDUM_{it} + \varepsilon_{it} \quad (Eq5a)$$

$$IEH_{it} = \beta o + \beta_1 CUT_{it} + \beta_2 LCUT_{it} + \beta_3 LGCUT_{it} + \beta_4 CAT_{it} + \beta_5 LCAT_{it} + \beta_6 LGCAT_{it} + \beta_7 HS_{it} + \beta_8 SHT_{it} + \beta_9 CT_{it} + \beta_{10} DT_{it} + \beta_{11} BTD_{it} + \beta_{12} BTDL_{it} + \beta_{13} PD_{it} + \beta_{14} PBTD_{it} + \beta_{15} DBTD_{it} + \beta_{16} TO_{it} + \beta_{17} CTO_{it} + \beta_{18} \Delta SALES_{it} + \beta_{19} OCF_{it} + \beta_{20} TQ_{it} + \beta_{21} RD_{it} + \beta_{22} CAPEX_{it} + \beta_{23} FI_{it} +$$

$\beta_{24}CASH_{it} + \beta_{25}LEV_{it} + \beta_{26}YDUM_{it} + \beta_{27}IDUM_{it} + \varepsilon_{it}$ (Eq5b)

3.4 Dynamic Data Analysis using Estimated Generalized Least Squares (DEGLS) Technique:

The ordinary least squares (OLS) has been an important method of prediction ever known to mankind since it was invented in 1795 by the mathematician Carl Friedrich Gauss, and later on rediscovered and popularized by another mathematician known as Adrien-Marie Legendre in 1805 (ClockBackward, 2009). The OLS regression model is built on certain assumptions such that if any of these assumptions are violated, then OLS estimator may no longer be Best Linear Unbiased Estimate (BLUE) and so the generalized least squares (GLS) was developed towards the mid-twentieth centuries by Alexander Aitken in 1936 (Virgantari et al., 2019). The GLS regression is an extension of the normal linear OLS estimation designed with some level of unequal error variances (heteroscedastic), not equal or constant variance (homoscedastic) and correlations between the residuals or error terms (serial correlation) in mind. The GLS and OLS estimators are the same in the absence of autocorrelation and heteroskedasticity and so they differ with respect to the error term assumptions which the GLS estimator was improvised to tackle. Thus, the GLS estimator is a generalization of the OLS estimator which transforms it to a new estimator that is more efficient, consistent, unbiased and asymptotically normal (Priya & Riya, 2017).

A dynamic regression model is designed to solve some problems which the static models are not capable of solving. For examples, variables with unit roots (non-stationary variables), variables with endogeneity problem, variables with serial correlation especially second order, problem of small sample sizes cannot be effectively and efficiently estimated by the classical regression of OLS because it was built on certain strong assumptions which are not realistic. A dynamic GLS performs better in both homogenous and heterogeneous panels which ensure that the estimation is asymptotically efficient and simpler to compute **(**Madaleno & Moutinho, 2021).

By including the lagged value of the dependent variable, that is, IER_{it-1}, due to unobserved heterogeneity transforms the static model to a dynamic one. That means, including the lagged dependent variable to equation 5, we have equation 6 below:

$IER_{it} = \beta o + \beta_1 IER_{it-1} + \beta_2 CUT_{it} + \beta_3 LCUT_{it} + \beta_4 LGCUT_{it} + \beta_5 CAT_{it} + \beta_6 LCAT_{it} + \beta_7 LGCAT_{it} + \beta_8 HS_{it} + \beta_9 SHT_{it} + \beta_{10} CT_{it} + \beta_{11} DT_{it} + \beta_{12} BTD_{it} + \beta_{13} BTDL_{it} + \beta_{14} PD_{it} + \beta_{15} PBTD_{it} + \beta_{16} DBTD_{it} + \beta_{17} TO_{it} + \beta_{18} CTO_{it} + \beta_{19} \Delta SALES_{it} + \beta_{20} OCF_{it} + \beta_{21} TQ_{it} + \beta_{22} RD_{it} + \beta_{23} CAPEX_{it} + \beta_{24} FI_{it} + \beta_{25} CASH_{it} + \beta_{26} LEV_{it} + \beta_{27} YDUM_{it} + \beta_{28} IDUM_{it} + \varepsilon_{it}$ (Eq6)

Where the definitions are as stated in Table2 above.

β_1 to β_{28} are the beta coefficients of the instrumental, independent and control variables. From this study, we expect β_1 to β_{28} to be greater than zero.

ε_{it} = Error term for year 'i' in year 't'

4.0. Method of Data Analysis

Data collected are analyzed using EViews 13 in the following order: univariate data analyses or descriptive statistics; bivariate data analysis or correlation analysis; unit root test; estimation of the models; performance of some additional analysis and diagnostics tests.

4.1 Univariate Data Analyses (Descriptive Statistics)

The statistics in Table 2 below, which is based on equation1 above, show that the mean values of the variables as well as the maximum values. Since the mean values are lower than the maximum values, it confirms that there are no outliers in our data. The Jarque-Bera Statistics and its Probability of 0.000000 for all the variables show that the distribution is not normal. However, Ghasemi and Zahediasl (2012) noted that, in accordance with the central limit theorem (CLT), violating the normality assumption shouldn't be a significant problem once the observation is 100 and above. Our observation is 1200, and so normality assumption does not matter here.

Table 2

	CUT	LCUT	LGCUT	CAT	LCAT	LGCAT	HS	SHT	CT	DT	BTD	BTDL	PD	PBTD	DBTD	TO	CTO
Mean	28.41207	28.14844	0.005524	5.530824	5.462284	0.001618	-0.002269	-85236828	-0.049476	3.488793	-13385550	-632756.7	-1736220.	-2.63E+09	-0.037527	-0.832211	1.097195
Median	0.234280	0.233224	9.80E-08	0.114606	0.114089	5.08E-08	-2.41E-05	-555511.2	0.010278	29.79864	-91018.67	-0.021867	-333574.2	-2097339.	5.329508	0.095311	0.041641
Maximum	4999.629	4999.629	1.900848	1554.618	1554.618	0.619970	0.360785	1.51E+09	9.164608	3531.019	2.27E+08	31.94717	9.74E+08	8.12E+11	37.30079	1921.230	278.3477
Minimum	-3501.019	-3501.019	-1.737220	-14.91429	-14.91429	-0.635256	-0.823931	-1.17E+10	-28.45530	-4969.629	-1.76E+09	-7.24E+08	-1.07E+09	-1.56E+12	-4866.435	-1450.528	-33.08271
Std. Dev.	292.8138	292.7491	0.096175	54.42231	54.37980	0.033974	0.039524	7.73E+08	1.303585	292.8173	1.17E+08	21401600	71895968	6.64E+10	144.4436	76.38837	14.59514
Skewness	8.502263	8.510284	5.041430	21.76152	21.81426	3.861028	-13.12776	-11.26012	-16.05772	-8.392334	-11.14806	-33.77870	-4.215355	-15.56748	-33.47692	7.204512	15.04827
Kurtosis	158.9096	159.0806	273.4475	585.9320	587.8733	259.0059	259.4084	143.9572	312.7741	159.1549	141.5533	1142.001	129.4029	383.6057	1128.169	469.8119	242.7095
Jarque-Bera	1172455.	1175024.	3491274.	16287887	16396391	3126870.	3166717.	971260.6	4623257.	1175750.	938754.3	62056613	764991.3	6951232.	60559894	10397098	2782134.
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	32503.41	32201.81	6.319594	6327.263	6248.853	1.850706	-2.596143	-9.75E+10	-56.60001	3991.179	-1.53E+10	-7.24E+08	-1.99E+09	-3.01E+12	-42.93101	-952.0489	1255.191
Sum Sq. Dev.	98000737	97957435	10.57228	3385323.	3380037.	1.319271	1.785544	6.83E+20	1942.337	98003094	1.57E+19	5.24E+17	5.91E+18	5.03E+24	23847485	6669614.	243479.8
Observations	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200

Source: Researcher's Computations (2024) Using EViews13 Software.

4.2 Bivariate Data Analysis (Correlation Analysis)

The correlation analysis among the variables, which is based on equation1 above, are meant to first determine the association between each pair of the dependent and independent variables as well as among the explanatory variables. The degree of association may be weak (0.00 to 0.5), moderate (0.51 to 0.8) or high (0.81 and above). A very high association among the regressors poses a problem of multi-collinearity (Gujarati, 2003)

Table 3

Covariance Analysis: Ordinary
Date: 01/04/24 Time: 09:03
Sample: 2007 2022
Included observations: 1200

Balanced sample (listwise missing value deletion)

Covariance Correlation	CUT	LCUT	LGCUT	CAT	LCAT	LGCAT	HS	SHT	CT	DT	BTD	BTDL	PD	PBTD	DBTD	TO	CTO
CUT	85664.9																
	1.00																
LCUT	85619.7	85627.1															
	0.99	1.00															
LGCUT	9.47918	9.49138	0.00924														
	0.34	0.34	1.00														
CAT	-2795.00	-2809.80	0.76009	2959.19													
	-0.18	-0.17	0.15	1.00													
LCAT	-2809.31	-2807.87	0.76408	2954.20	2954.57												
	-0.18	-0.17	0.15	0.99	1.00												
LGCAT	0.74468	0.74871	0.00297	0.62245	0.62375	0.00115											
	0.08	0.08	0.91	0.34	0.34	1.00											
HS	1.30005	1.29954	9.01E-5	-0.50302	-0.50315	-3.42E-	0.00156										
	0.11	0.11	0.02	-0.23	-0.23	-0.03	1.00										
SHT	-1.45E+1	-1.45E+1	-898877.	- 4.00E+0	- 3.98E+0	114625.	-172680.	5.97E+1									
	-0.06	-0.06	-0.01	-0.01	-0.01	0.00	-0.06	1.00									
CT	-44.0096	-44.1384	-0.01588	-4.05207	-4.09346	-0.01168	-0.00152	-106363	1.69784								
	-0.12	-0.12	-0.13	-0.06	-0.06	-0.26	-0.03	-0.01	1.00								
DT	692.9	686.1	0.15641	133.8	132.058	0.04572	0.09291	- 1.71E+1	-1.64062	85667.0							
	0.01	0.01	0.01	0.01	0.01	0.00	0.01	-0.08	-0.00	1.00							

BTD	-2.17E+0 -0.06	-2.17E+0 -0.06	-132907. -0.01	-581301 -0.01	-579066 -0.01	18078.9 0.00	-260371. -0.06	9.03E+1 0.99	-163950. -0.01	-2.60E+0 -0.08	1.37E+1 1.00						
BTDL	1702112 0.00	1685430 0.00	3495.09 0.00	349014. 0.00	344677. 0.00	1023.57 0.00	-1420.12 -0.00	-2.05E+1 0.00	-39707.2 -0.00	-1677514 -0.00	-3.42E+1 -0.00	4.58E+1 1.00					
PD	1.58E+0 0.01	1.59E+0 0.01	30124.9 0.00	202802 0.01	213607 0.01	1203.18 0.00	-75390.4 -0.03	1.02E+1 0.18	45670.1 0.00	-9.37E+0 -0.04	1.48E+1 0.18	9.39E+1 0.00	5.16E+1 1.00				
PBTD	1.51E+0 0.7	9.69E+0 0.99	797490. 0.00	1.13E+1 0.00	1.11E+1 0.00	414394. 0.00	-1.08E+0 -0.04	2.81E+1 0.55	-1.70E+0 -0.00	-3.86E+1 -0.20	4.25E+1 0.55	-1.53E+1 -0.01	1.53E+1 0.32	4.40E+2 1.00			
DBTD	139.461 0.00	138.037 0.00	-0.03738 -0.00	-40.4878 -0.01	-40.8573 -0.01	-0.03135 -0.01	-0.02636 -0.00	-2.98E+0 -0.00	5.35149 0.03	-97.6834 -0.00	-4774231 -0.00	-23667.0 -0.7	179417. 0.00	-1.12E+1 -0.00	20845.7 1.00		
TO	2243.67 0.10	2243.40 0.10	0.19053 0.03	-802.659 -0.22	-802.726 -0.22	-0.07350 -0.03	1.24264 0.41	-3.06E+0 -0.01	-1.72659 -0.02	34.5574 0.00	-4671514 -0.01	-757625. -0.00	135057 0.00	-6.14E+0 -0.00	-26.1993 -0.00	5830.08 1.00	
CTO	-838.436 -0.206359	-838.156 -0.196337	-0.08091 -0.057691	328.509 0.413945	328.581 0.414359	0.03077 0.062117	-0.33151 -0.575187	1.30E+0 0.011550	1.16155 0.061104	41.8637 0.009804	201141 0.011770	691983. 0.002217	-148182. -0.000141	2.55E+0 0.002640	11.5364 0.005477	-403.8342 -0.362533	212.832 1.000000

Source: Researcher's Computations (2024) Using EViews13 Software.

From Table 3 above, all the variables have weak associations and this attest to the fact that there is no problem of multicollinearity among the variables except those of LCUT to CUT(0.99969)' LCAT to CAT(0.99909) and LGCAT to LGCUT(0.91145) which are highly. correlated.

4.3. Unit Root Test.

Once the EViews workfile has been structured in panel data form, we can go ahead and perform a panel data unit root test as shown in Table 4 below.

Table 4

Variables	Augmented Dickey Fuller test-Statistic	Phillip-Perron test-Statistic	1% Critical Value	5% Critical Value	10% Critical Value	Order of Integration or stationarity
IER	-9.1239	-9.3491	-3.9657	-3.4135	-3.1288	I(0) stationary
IEH	-9.9661	-13.8385	-3.9657	-3.4135	-3.1288	I(0) stationary
CUT	-12.5909	-18.3695	-3.9657	-3.4135	-3.1288	I(0) stationary
LCUT	-12.5466	-17.5046	-3.9657	-3.4135	-3.1288	I(0) stationary
LGCUT	-12.7665	-22.6580	-3.9657	-3.4135	-3.1288	I(0) stationary
CAT	-19.9244	-29.5555	-3.9657	-3.4135	-3.1288	I(0) stationary
LCAT	-19.7777	-28.4866	-3.9657	-3.4135	-3.1288	I(0) stationary
LGCAT	-17.2035	-22.9464	-3.9657	-3.4135	-3.1288	I(0) stationary
HS	-14.9164	-19.9034	-3.9657	-3.4135	-3.1288	I(0) stationary
SHT	-7.1931	-11.5287	-3.9657	-3.4135	-3.1288	I(0) stationary
CT	-13.9908	-14.1531	-3.9657	-3.4135	-3.1288	I(0) stationary
DT	-12.5368	-17.4934	-3.9657	-3.4135	-3.1288	I(0) stationary
BTD	-8.6383	-11.4511	-3.9657	-3.4135	-3.1288	I(0) stationary
BTDL	-34.2654	-34.2654	-3.9657	-3.4135	-3.1288	I(0) stationary
PD	-9.61106	-41.5848	-3.9657	-3.4135	-3.1288	I(0) stationary
PBTD	-8.7554	-25.9247	-3.9657	-3.4135	-3.1288	I(0) stationary
DBTD	-33.6753	-33.6753	-3.9657	-3.4135	-3.1288	I(0) stationary
TO	-11.2367	-28.9174	-3.9657	-3.4135	-3.1288	I(0) stationary
CTO	-8.7322	-18.7586	-3.9657	-3.4135	-3.1288	I(0) stationary
ΔSALES	-24.7630	-43.8278	-3.9657	-3.4135	-3.1288	I(0) stationary
OCF	-10.4206	-31.7739	-3.9657	-3.4135	-3.1288	I(0) stationary
TQ	-28.5156	-28.5156	-3.9657	-3.4135	-3.1288	I(0) stationary
RD	-9.5241	-12.5948	-3.9657	-3.4135	-3.1288	I(0) stationary
CAPEX	-10.1306	-16.5314	-3.9657	-3.4135	-3.1288	I(0) stationary
FI	-9.0641	-16.5937	-3.9657	-3.4135	-3.1288	I(0) stationary
CASH	-21.2031	-27.6336	-3.9657	-3.4135	-3.1288	I(0) stationary
LEV	-23.3001	-10.3289	-3.9657	-3.4135	-3.1288	I(0) stationary

Source: Researcher's Computations (2024) Using EViews13 Software.

The results of the Augmented Dickey Fuller (ADF) test-Statistic as well as that of the Phillip-Perron (PP) test-Statistic for all the variables of interest are reported in Table 4 above. The results showed that the two test statistics (ADF & PP) are greater than all the tabulated critical values at the 1% Critical Value, 5% Critical Value and 10% Critical Value. This means that all the variables of interest are I(0), that is, stationary at levels. When variables are not stationary, it means that they can drift apart on the long run and the regression results obtained can be spurious or nonsensical.

We never computed a unit root test for the dummy variables (IDUM, YDUM) because the data were arbitrarily generated. Thus we can use the ordinary least squares (OLS) method of estimation.

4.4 Regression Models Estimation Results.

Table 5a. Dependent Variable: IER
Method: Panel EGLS (Period SUR)
Date: 01/28/24 Time: 13:59
Sample (adjusted): 2007 2022
Periods included: 16
Cross-sections included: 75
Total panel (unbalanced) observations: 1200
Linear estimation after one-step weighting matrix
Period weights (PCSE) standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IER(-1)	0.799813	0.005528	144.6762	0.0000
CUT	-25422494	1085337.	-23.42360	0.0000
LCUT	25428295	1085355.	23.42855	0.0000
LGCUT	1.13E+08	48097151	2.344626	0.0192
CAT	73807096	4287825.	17.21318	0.0000
LCAT	-73825638	4288762.	-17.21374	0.0000
LGCAT	36454057	1.36E+08	0.267232	0.7893
HS	1.98E+08	1.19E+08	1.664573	0.0963
SHT	-1.390002	0.049577	-28.03696	0.0000
CT	14963.95	1068832.	0.014000	0.9888
DT	-10098.32	3256.879	-3.100612	0.0020
BTD	9.988405	0.340154	29.36437	0.0000
BTDL	-0.007200	0.022946	-0.313797	0.7537
PD	0.553091	0.038494	14.36813	0.0000
PBTD	-0.000626	1.38E-05	-45.28688	0.0000
DBTD	-10493.76	15840.47	-0.662465	0.5078
TO	-16247.00	28418.40	-0.571707	0.5676
CTO	434412.9	319639.7	1.359071	0.1744
C	-13792017	2365269.	-5.831058	0.0000

Weighted Statistics

R-squared	0.989409	Mean dependent var	-1.532220
Adjusted R-squared	0.989228	S.D. dependent var	8.782951
S.E. of regression	0.896547	Sum squared resid	848.0048
F-statistic	5475.488	Durbin-Watson stat	2.015481
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.810707	Mean dependent var	-1.97E+08
Sum squared resid	1.10E+20	Durbin-Watson stat	1.991500

Source: Researcher's Computations (2023) Using EViews13 Software.

Table 5b. Dependent Variable: IEH
Method: Panel EGLS (Period SUR)
Date: 01/28/23 Time: 08:59
Sample (adjusted): 2007 2022
Periods included: 16
Cross-sections included: 75
Total panel (unbalanced) observations: 1200
Linear estimation after one-step weighting matrix
Period SUR (PCSE) standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IEH(-1)	0.571396	0.005609	101.8630	0.0000
CUT	2574744.	503835.2	5.110290	0.0000
LCUT	-2568200.	503834.8	-5.097305	0.0000
LGCUT	-44053400	15964329	-2.759490	0.0059
CAT	-10249120	1491802.	-6.870296	0.0000
LCAT	10227369	1491947.	6.855048	0.0000
LGCAT	1.35E+08	47778928	2.823977	0.0048
HS	1278165.	10036520	0.127351	0.8987
SHT	-0.366943	0.009848	-37.26166	0.0000
CT	642513.7	352876.6	1.820789	0.0689
DT	-847.7578	1857.097	-0.456496	0.6481
BTD	2.492695	0.066470	37.50122	0.0000
BTDL	-0.014010	0.023207	-0.603680	0.5462
PD	0.057454	0.007304	7.866156	0.0000
PBTD	6.61E-06	8.12E-06	0.813132	0.4163
DBTD	-1268.427	3392.699	-0.373870	0.7086
TO	3980.060	13189.63	0.301757	0.7629
CTO	-35481.23	39291.67	-0.903022	0.3667
C	-4008091.	435461.1	-9.204244	0.0000

Weighted Statistics

R-squared	0.965911	Mean dependent var	-0.775057
Adjusted R-squared	0.965329	S.D. dependent var	5.042567
S.E. of regression	0.926780	Sum squared resid	906.1614
F-statistic	1660.744	Durbin-Watson stat	2.009140
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.603780	Mean dependent var	-22889794
Sum squared resid	2.91E+18	Durbin-Watson stat	1.939292

Source: Researcher's Computations (2024) Using EViews13 Software.

Table 5a and Table 5b above show the regression estimation results of the relationship between tax avoidance and investment efficiency of 75 listed non-financial firms in Nigeria based on equation 1a and 1b above.

4.4.1 Comparative Analysis of the two Regression Models Estimation Results.

Table 6

VARIABLES	IER Model Result (P-Values)	IEH Model Result (P-Values)
IER(-1)	0.0000	0.0000
CUT	0.0000	0.0000
LCUT	0.0000	0.0000
LGCUT	0.0192	0.0059
CAT	0.0000	0.0000
LCAT	0.0000	0.0000
LGCAT	0.7893	0.0048
HS	0.0963	0.8987
SHT	0.0000	0.0000
CT	0.9888	0.0689
DT	0.0020	0.6481
BTD	0.0000	0.0000
BTDL	0.7537	0.5462
PD	0.0000	0.0000
PBTD	0.0000	0.4163
DBTD	0.5078	0.7086
TO	0.5676	0.7629
CTO	0.1744	0.3667

Source: Researcher's Computations (2024) Using EViews13 Software.

A comparative analysis of the two results shows that the following variables (DBTD, TO, CTO, HS, BTDL and CT) are not statistically significant for both the IER and the IEH models. However, while two variables (PBTD and DT) are statistically significant for the IER model; LGCAT is the only statistically significant variable for the IEH model. This study, therefore, choose to report the regression result for the IER model because it has more statistically significant variables than the IEH model. Also, the IER model has a higher R-squared(0.989409) and Adjusted R-squared(0.989228) than that of the IEH model R-squared(0.965911) and Adjusted R-squared(0.965329).

4.5 Discussion of the Regression Estimation Results and Hypotheses Testing.

From Table 5a above, a look at the coefficient (0.799813) of IER (-1) shows that it is positively significant (t-Statistics = 144.6762 and p= 0.0000) at the 1% levels of significance. This result is in agreement with the extant literature that the dependent variable and its lag move in the same direction and must be significant (Egbadju & Jacob, 2022). The positive coefficient means that the current year investment plans from tax avoidance strategy is directly affected by previous period investment plans and this is a very, very good sign.

For the IER model, both the R^2 (0.989409) and the Adj R2 = (0.989228) indicated that about 99% of systematic variations in investment efficiency is accounted for by CUT, LCUT, LGCUT, CAT, LCAT, LGCAT, HS, SHT, CT, DT, BTD, BTDL, PD, PBTD, DBTD, TO and CTO.
The remaining 1% can be explained by other factors not captured by the model. The F-statistic (5475.488) and a Prob(F-stat.) of 0.000000 confirm that there is a joint statistical significant of a

linear relationship between the variables (dependent and independent). With a Durbin-Watson stat of 2.015481, the model is freed from serial correlation.

Looking at the independent variables (CUT, LCUT, LGCUT, CAT, LCAT, LGCAT, HS, SHT, CT, DT, BTD, BTDL, PD, PBTD, DBTD, TO and CTO) reveal that five of the variables (LCUT, LGCUT, CAT, BTD and PD) are positively and statistically significant with investment efficiency. The results means that the higher the levels of investment efficiency, the higher the firms' effective tax rate. This concludes that firms with increasing investment levels are not likely to engage in any tax avoidance activity. Another five variables (CUT, LCAT, SHT, DT and PBTD) are negatively and statistically significant with investment efficiency. The results means that the higher the levels of investment efficiency, the lower the firms' effective tax rate. This concludes that firms with increasing investment levels are more likely to engage in tax avoidance activity. Seven of the variables (DBTD, TO, CTO, HS, BTDL, LGCAT and CT) are statistically not significant. This means that there is no link between tax avoidance and investment efficiency.

Specifically, CUT relationship with IER is negatively significant with a coefficient of --25422494, a t-Statistic of -23.42360 and a p-value of 0.0000. This means that as CUT decreases, IER increases. This suggests that the more firms reduce their current effective tax rate, the more efficient investments managers are likely to engage in. The sign or direction as well as the size or magnitude is aligned with our expectations. We, therefore, reject the null hypothesis of no significant relationship between the CUT and IER and accept the alternative that CUT has a significant relationship with IER.

LCUT relationship with IER is positively significant with a coefficient of 25428295, a t-Statistic of 23.42855 and a p-value of 0.0000. This suggests that an increase in LCUT will increase IER. The results means that the higher the levels of investment efficiency, the higher the firms' long-run effective tax rate. This concludes that firms with increasing investment levels are not likely to engage in any tax avoidance activity. The sign or direction is contrary to our expectations but the size or magnitude is in line with our expectations. We, therefore, reject the null hypothesis of no significant relationship and accept the alternative hypothesis that there is a significant relationship between LCUT and IER.

LGCUT relationship with IER is positively significant with a coefficient of 1.13E+08, a t-Statistic of 2.344626 and a p-value of 0.0192. This suggests that an increase in LGCUT will increase IER. The results mean that the higher the levels of investment efficiency, the higher the firms' lagged effective tax rate. This concludes that firms with increasing investment levels are not likely to engage in any tax avoidance activity. The sign or direction is contrary to our expectations but the size or magnitude is in line with our expectations. We, therefore, reject the null hypothesis of no significant relationship and accept the alternative hypothesis that there is a significant relationship between LGCUT and IER.

CAT relationship with IER is positively significant with a coefficient of 73807096, a t-Statistic of 17.21318 and a p-value of 0.0000. This suggests that an increase in CAT will increase IER. The results mean that the higher the levels of investment efficiency, the higher the firms' cash effective tax rate. This concludes that firms with increasing investment levels are not likely to engage in any tax avoidance activity. The sign or direction is contrary to our expectations but the size or magnitude is in line with our expectations. We, therefore, reject the null hypothesis of no significant relationship and accept the alternative hypothesis that there is a significant relationship between CAT and IER.

LCAT relationship with IER is negatively significant with a coefficient of -738256384, a t-Statistic of -17.21374 and a p-value of 0.0000. This means that as LCAT decreases, IER increases. This suggests that the more firms reduce their long-run effective tax rate, the more efficient investments managers are likely to engage in. The sign or direction as well as the size or magnitude is aligned with our expectations. We, therefore, reject the null hypothesis of no significant relationship between the LCAT and IER and accept the alternative that LCAT has a significant relationship with IER.

SHT relationship with IER is negatively significant with a coefficient of -1.390002, a t-Statistic of -28.03696 and a p-value of 0.0000. This means that as SHT decreases, IER increases. This suggests that the more firms reduce their tax shelter activity, the more efficient investments managers are likely to engage in it. The sign or direction as well as the size or magnitude is aligned with our expectations. We, therefore, reject the null hypothesis of no significant relationship between the SHT and IER and accept the alternative that SHT has a significant relationship with IER.

DT relationship with IER is negatively significant with a coefficient of -10098.32, a t-Statistic of -3.100612 and a p-value of 0.0020. This means that as DT decreases, IER increases. This suggests that the more firms reduce their discretionary tax, the more efficient investments managers are likely to engage in it. The sign or direction as well as the size or magnitude is aligned with our expectations. We, therefore, reject the null hypothesis of no significant relationship between the DT and IER and accept the alternative that DT has a significant relationship with IER.

BTD relationship with IER is positively significant with a coefficient of 9.988405, a t-Statistic of 29.36437 and a p-value of 0.0000. This suggests that an increase in BTD will increase IER. The results mean that the higher the levels of investment efficiency, the higher the firms' book-tax-difference. This concludes that firms with increasing investment levels are not likely to engage in any tax avoidance activity. The sign or direction is contrary to our expectations but the size or magnitude is in line with our expectations. We, therefore, reject the null hypothesis of no significant relationship and accept the alternative hypothesis that there is a significant relationship between BTD and IER.

PD relationship with IER is positively significant with a coefficient of 0.553091, a t-Statistic of 14.36813 and a p-value of 0.0000. This suggests that an increase in PD will increase IER. The results mean that the higher the levels of investment efficiency, the higher the firms' permanent difference. This concludes that firms with increasing investment levels are not likely to engage in any tax avoidance activity. The sign or direction is contrary to our expectations but the size or magnitude is in line with our expectations. We, therefore, reject the null hypothesis of no significant relationship and accept the alternative hypothesis that there is a significant relationship between PD and IER.

PBTD relationship with IER is negatively significant with a coefficient of -0.000626, a t-Statistic of -45.28688 and a p-value of 0.0000. This means that as PBTD decreases, IER increases. This suggests that the more firms reduce their permanent book-tax-difference, the more efficient investments managers are likely to engage in it. The sign or direction as well as the size or magnitude is aligned with our expectations. We, therefore, reject the null hypothesis of no significant relationship between the PBTD and IER and accept the alternative that PBTD has a significant relationship with IER.

4.6 Additional Analysis for Robustness Checks using Results from Table5a and Table 7

To test the robustness of our results, we include both the firm-specific control variables (ΔSALES, OCF, TQ, RD, CAPEX, FI, CASH and LEV) as well as the industry-year fixed effect control variables (YDUM and IDUM) as stated in equations 3, 4, 5 and 6.

Table 7. Dependent Variable: IER
Method: Panel EGLS (Period SUR)
Date: 01/28/24 Time: 13:50
Sample (adjusted): 2007 2022
Periods included: 16
Cross-sections included: 75
Total panel (unbalanced) observations: 1200
Linear estimation after one-step weighting matrix
Period SUR (PCSE) standard errors & covariance (d.f. corrected)
WARNING: estimated coefficient covariance matrix is of reduced rank

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IER(-1)	0.437487	0.008375	52.23983	0.0000
CUT	9.02E+09	9.38E+08	9.620302	0.0000
LCUT	-9.02E+09	9.38E+08	-9.620231	0.0000
LGCUT	-2.73E+08	67293287	-4.052180	0.0001
CAT	-2.73E+10	2.84E+09	-9.621288	0.0000
LCAT	2.73E+10	2.84E+09	9.621294	0.0000
LGCAT	5.76E+08	1.80E+08	3.199306	0.0014
HS	1.07E+08	97475604	1.093307	0.2745
SHT	32.40233	2.030976	15.95407	0.0000
CT	4845570.	1257460.	3.853458	0.0001
DT	-13659.92	4791.347	-2.850956	0.0044
BTD	-213.3042	13.46278	-15.84399	0.0000
BTDL	-64.95134	171.2853	-0.379200	0.7046
PD	1.062494	0.038343	27.71013	0.0000

PBTD	-0.000577	2.41E-05	-23.92913	0.0000
DBTD	24518.47	22312.06	1.098889	0.2721
TO	-21365.80	160827.4	-0.132849	0.8943
CTO	256166.0	303619.4	0.843708	0.3990
-_SALES	0.084008	0.019546	4.298000	0.0000
OCF	-0.227704	0.028527	-7.982006	0.0000
TQ	3622.724	9556.090	0.379101	0.7047
RD	-2.409054	1.269075	-1.898275	0.0580
CAPEX	-1.995312	0.030304	-65.84218	0.0000
FI	-52.59388	3.343013	-15.73248	0.0000
CASH	-0.239904	0.041554	-5.773254	0.0000
LEV	103591.5	21072.39	4.915980	0.0000
IDUM	1815339.	1353687.	1.341034	0.1802
YDUM	317819.3	509651.8	0.623601	0.5330
C	-36048748	8782068.	-4.104813	0.0000

Weighted Statistics

R-squared	0.983091	Mean dependent var	-1.108470
Adjusted R-squared	0.982613	S.D. dependent var	7.003026
S.E. of regression	0.914250	Sum squared resid	826.6583
F-statistic	2053.650	Durbin-Watson stat	1.900878
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.929573	Mean dependent var	-2.02E+08
Sum squared resid	4.06E+19	Durbin-Watson stat	1.599726

Source: Researcher's Computations (2024) Using EViews13 Software.

From the results in Table 5a (that do not include any control variable) and Table 7 (that includes control variable) above, the results are the same except for LGCAT. From Table 5a result, LGCAT was not significant with a P-value of 0.7893, but from Table 7, LGCAT is significant with a P-value of 0.0014. This shows the robustness of these results in deciding how tax avoidance has helped the firms to achieve efficiency in investment for the period under consideration..

Conclusion and Recommendations

This study investigates the relationship between tax avoidance and investment efficiency of listed non-financial firms in Nigeria. Using secondary data over the period from 2007 to 2022 of 75 of those firms on the floor of the Nigerian Exchange Group (NXG), the estimated generalized least squares (EGLS) results reveal that five of the variables (LCUT, LGCUT, CAT, BTD and PD) are positively and statistically significant with investment efficiency. Another five variables (CUT, LCAT, SHT, DT and PBTD) are negatively and statistically significant with investment efficiency. Seven of the variables (DBTD, TO, CTO, HS, BTDL, LGCAT and CT) are statistically not significant.

Based on the results above, the study recommends the followings:

- Management should continue to engage in tax avoidance since it can save fund from it to undertake profitable investment.
- Management should nevertheless consider the extra costs implications from tax audit and reputational loss when tax avoidance is on the extreme side of the continuum.

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