

EFFECT OF ECONOMIC DETERMINANTS OF TAX COMPLIANCE ON TAX REVENUE IN NIGERIA

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Abstract: Nigeria's tax revenue remains relatively low compared to its potential, suggesting persistent compliance gaps. Strengthening compliance through enforceable economic and administrative mechanisms is therefore critical for improving domestic revenue mobilization. **Objective:** This study investigates the extent to which selected economic determinants of tax compliance tax audit probability, interest on late and non-payment of taxes, tax filing rate, and tax rate influence tax revenue in Nigeria. **Methodology:** The study adopts an ex-post facto quantitative design using annual time-series data (1990–2020) sourced from the Federal Inland Revenue Service (FIRS) and the Central Bank of Nigeria (CBN) Statistical Bulletin. The relationships between the explanatory variables and tax revenue were examined using multiple regression analysis (SPSS). **Findings:** Results indicate that tax audit probability, interest on late and non-payment of taxes, tax filing rate, and tax rate each have a positive and statistically significant effect on tax revenue in Nigeria. The model suggests that reductions in these determinants are associated with corresponding declines in tax revenue, underscoring their relevance for revenue performance. **Implications:** The findings imply that improving audit coverage and effectiveness, strengthening enforcement of interest charges for defaults, and increasing taxpayer filing compliance can enhance revenue outcomes. Policy efforts should prioritize risk-based auditing, timely filing enforcement, and administrative measures that reduce non-compliance. **Originality:** This study contributes evidence from a long-run Nigerian dataset by jointly testing multiple compliance-related economic determinants within one empirical framework, offering integrated insight for tax administration reforms aimed at improving revenue generation.

Keywords: tax audit probability; interest on late payment; tax filing rate; tax rate; tax revenue.

INTRODUCTION

The COVID-19 plague & a significant plummet of prices of crude oil especially within the first quarter of the year 2020 has caused significant reduction in Government revenues. Consequently, Government of Nigeria was forced to amend the benchmark of oil price in the 2020 budget from \$57 per barrel to \$20 per barrel, yet it did not stop the economy from going into another recession in just four years as Nigeria experienced about 6.1 percent &

3.62 percent of growth rate that showed negative result within 2nd quarter of 2020 and 3rd quarter of the year 2020 (Wole, Ajibola, Ayo & Wale, 2021).

Overall, the Nigerian economic performance has consistently remained very poor especially in the year 2020. This poor economic performance has given rise to the formulation of plans to recover the economy and chiefly among the plans is increasing revenue collection through tax compliance. The adoption of this approach as a new normal may be as a result of poor relationship involving revenue from tax and gross domestic product compared to other African countries (Ofurum, Amaefule, Okonya & Amaefule, 2018).

Central Bank of Nigeria (2016) and Ofurum, Amaefule, Okonya & Amaefule (2018) opine that the ratio of gross domestic product to tax is 5.2 percent as against other African countries such as Tunisia, and Morocco that have higher ratio of about 31.3 percent and 28.5 percent respectively. Ujah (2021) posit that Nigeria still mobilise less than 15% of their GDP in tax revenues (6% in 2016, 4.8% in 2017, 5.8% in 2018, 6% in 2019). Moreover, this is far below the minimum level of 20% considered by the United Nations (UN) as minimum standard. This low tax to GDP ratio is a sign that Nigerian taxpayers rarely fulfill their tax obligations.

The expression “tax compliance” refers to extent to which individuals and companies agree with tax rules with respect to registering, filing and tax payment. It depicts how obligation of individuals and business are being responded to (Torgler, 2007). The behaviour of tax payers with exception to corruption towards tax compliance in Nigeria is bored due to influence of factors which are economic in nature that affect the level of tax compliance (Fakile, 2009). Revenue from tax in Nigeria has been consistently low due to corruption especially as it affects tax system (Chukwuemeka, Enudu & Nwali, 2013). When taxpayers refuse to pay their due tax, it creates difficulty for developing countries like Nigeria to adequately generate revenue that will go a long way to satisfying the developmental needs of the country (Torgler, 2011). This suggests that Nigerian government will put more of an effort to provide the needed amenities in the country when more revenue especially from taxation is collected from taxpayers.

To enforce tax compliance, several factors are used and chiefly among them are “tax rate, tax audit, tax penalty, tax filling rate and interest on late payment of principal and

penalty” (Allingham & Sandmo, 1972; Fakile, 2009; Torgler, 2011 and Usman & Anao, 2015).

However, availability of records as well as usage of these economic determinants of tax compliance suggests that they have been scanty review on the influence of these determinants on revenue from taxes in Nigeria. It is against this background that this study becomes imperative.

This study therefore explores within the context of economic factors of tax conformity on tax revenue which include tax audit probability, tax penalty rate, interest charged on late payment of principal and penalty, tax filling rate and tax rate. Tax audit probability is the chance of examining the books of taxpayers by relevant tax authorities. When there is a high chance of carrying out tax tax audit there is a likelihood of increasing the level of tax compliance by various taxpayers (Badara, 2012). Taxpayers will be more careful when tax returns are filled and make payment for taxes due. It is expected that increase in tax audit probability will have a corresponding increase in tax revenue. Another influential factor of tax compliance is penalty rate. Previous studies like Allingham & Sandmo (1972) among others suggest that tax compliance level of taxpayers will increase when there is likelihood that tax penalty rate will also increase for non compliant which will in turn increase tax revenue. Another economic determinant of tax compliance is tax filling rate. Tax filling rate has been explained as the pace of tax filing within a time period (Timbul & Iman, 2012). It measured as the proportion of actual number of returns filled to the total number of expected returns to be filled for a period of time normally a year. Allingham & Sandmo (1972) posit that tax revenue is influenced by tax filling rate. In other words, a proper income declaration will correlate positively with revenue from tax. Tax revenue will increase when tax filling rate also increases. Another tax compliance determinant is tax rate. Tax rate is the proportion to be paid as tax by tax payers on income (Appah & Eze, 2013). It is therefore, against this backdrop that this research has set to determine the extent to which economic determinants of tax compliance had affected tax revenue in Nigeria.

1.2 Statement of the Problem

The revenue that accrues to Nigeria through taxation has been very low especially when put in perspective with other African nations. It was 5.2 percent in 2014, 6% in

2016, 4.8% in 2017, 5.8% in 2018, 6% in 2019 (Federal Inland Revenue Service, 2015; CBN, 2016 and Ujah, 2021). This is far below the minimum level of 20% considered by the United Nations (UN) as minimum standard. Going by the 2020 world bank report, Nigeria ranked 159 out of 183 (53.7%) in tax payment, by implication, most tax payers may be in the category that are not complying.

No doubt, achieving the set target of 2020 and 2021 tax revenue would entail lengthening the range of tax reporting, sustained falling in line with tax law among individuals and companies, added insistent & well-timed tax audit amongst others, hence, the need for tax audit (which has now been provided in section 35 of FIRS Establishment act 2007), to guarantee tax payers submit truthful data as regards their earnings and operating expense contrary to what is obtainable in many instances. On this note, the researcher wonders if tax payers know that there is probability of subjecting their transactions to tax audit, could there be a change in their compliance level?

There is also insinuation that many are defaulting in their tax responsibility (non-filing) which could be a trigger for penalty/interest imposition and institution of criminal proceeding. However the method(s) of enforcing compliance were adduced to be far from adequate. Hence, there is need for tax authorities to revisit their compliance inquiry functions/activities and enforcement strategies especially in area of tax audit. This is because of ₦5.32trillion generated in 2018, only ₦212.792billion came from 56809 audit cases.

There is also the issue of inability to obtain the information required from tax payers to adequately assess their tax liability coupled with high tax rate such as 2% increase in VAT as seen in the 2020 Finance Act.

Furthermore, there is suggestion that imposition of stiffer interest on late payment of principal due and penalty could be a way to checkmate the above challenges. Given this apprehension, it becomes very necessary to ascertain the influence of tax audit probability, imposition of penalties/interest, filling rate and tax rate as proxies of economic determinants of tax compliance on tax revenue in Nigeria.

1.3 Objectives of the Study

The general goal of this study is to scrutinize the economic determinants of tax compliance on tax revenue in Nigeria. In particular, this study sought:

- i. To examine the effect of tax audit probability on tax revenue in Nigeria.
- ii. To ascertain the effect of interest rate on late and non-payment of taxes on tax revenue in Nigeria.
- iii. To determine the effect of tax filling rate on tax revenue in Nigeria.
- iv. To assess the effect of tax rate on tax revenue in Nigeria.

1.4 Research Questions

The following research questions have been formulated to guide the study:

- i. How does tax audit probability influence revenue from tax in Nigeria?
- ii. How does interest rate on late and non-payment of taxes affect tax revenue in Nigeria?
- iii. What is the level of influence of tax filling rate on tax revenue in Nigeria?
- iv. How does tax rate affect tax revenue in Nigeria?

1.5 Statement of Hypotheses

- H₀₁: Tax audit probability has no significant effect on tax revenue in Nigeria.
- H₀₂: Interest rate on late and non-payment of taxes has no significant effect on tax revenue in Nigeria.
- H₀₃: Tax filling rate has no significant effect on tax revenue in Nigeria.
- H₀₄: Tax rate has no significant effect on tax revenue in Nigeria.

1.6 Significance of the Study

The findings of the study are of enormous significance to policy makers and future researchers among others given the low level of tax revenue in Nigeria.

Policy makers: The findings of the study will provide detailed insight and let policy makers especially relevant tax authorities to gain a better understanding of the major variables that are significant and positive in determining tax compliance level in Nigeria. This is because the findings of the study will help relevant tax authorities to beam search light on how to improve the economic determinants of tax compliance in Nigeria when formulating and executing the implementations of tax policies and strategies that are suitable in order to discourage tax non compliance in Nigeria and improve tax revenue.

Researchers: the study will help fill the gap in the literature as it concerns the economic determinants of tax compliance in Nigeria. The study will also serve as a blue print to tax authorities, academics, future researchers as well as students who are curious of knowledge in the area of tax compliance and the major economic determinants that are significant.

REVIEW OF RELATED LITERATURE

2.1 Concept of Tax Audit Probability

Following the adoption of the self-assessment system in Nigeria (1998), taxpayers are required to file and pay taxes independently, which increases the risk of underreporting and non-compliance through avoidance or evasion. Tax audit probability therefore becomes a key enforcement mechanism that discourages misreporting and strengthens compliance. Prior studies indicate that higher audit probability encourages taxpayers to submit more accurate returns and reduces aggressive expense claims or income understatement (Shanmugam, 2003; Palil & Mustapha, 2011). In addition, audit effectiveness is supported by clear legal and administrative frameworks, as well as a risk-based audit approach that prioritizes taxpayers with higher evasion risk while maintaining uncertainty about audit selection criteria to improve voluntary compliance (OECD, 2010; Hibbs & Violeta, 2010).

2.2 Interest Rate on Late and Non-Payment of Taxes

Interest and penalty provisions are widely used to deter late filing and non-payment, thereby reducing tax evasion and improving compliance (Allingham & Sandmo, 1972; Doran, 2009). In Nigeria, statutory provisions guide the application of penalties and interest for defaults, including relevant sections of FIRSEA and CITA (Oluchi, 2013; Jaya, 2017). Although administrative notices may attempt to standardize the applicable interest rate, the core compliance argument remains that higher and consistently enforced interest charges increase the cost of non-compliance and can motivate timely filing and payment. Conceptually, interest on late and non-payment represents a financial deterrent imposed on taxpayers who violate filing and payment obligations.

2.3 Tax Rate and Tax Revenue (Definitions)

Tax rate refers to the proportion of the tax base charged as tax, commonly expressed as a percentage, and it determines the size of tax liability and potential revenue (Oriaku,

2004). Tax revenue represents the total tax receipts collected by the tax authority from major federally administered taxes (e.g., VAT, PPT, and CIT).

2.4 Economic Determinants of Tax Compliance and Tax Revenue

The deterrence-based compliance framework suggests that audit probability, sanctions/interest for default, filing behaviour, and tax rates influence compliance decisions, and consequently affect tax revenue (Allingham & Sandmo, 1972). However, empirical findings are mixed: some studies report significant positive relationships between enforcement-related determinants and tax revenue, while others find positive but insignificant effects. This inconsistency justifies further testing within the Nigerian context using updated data and policy conditions.

2.5 Empirical Review of Related Studies

Empirical evidence across developing and emerging economies shows that enforcement mechanisms especially audit probability tend to improve compliance, while the effects of tax rates and penalties may vary by taxpayer category and institutional context. Studies in Nigeria and comparable settings report that audit and detection probability often have a significant positive effect on compliance and revenue outcomes, whereas penalty rate and tax rate effects can be weaker or statistically insignificant in some contexts. Overall, prior findings suggest that strengthening audit and enforcement capacity, improving taxpayer knowledge, and enhancing administrative efficiency are repeatedly associated with improved compliance behaviour and revenue performance.

Table 1. Summary of Key Literature on Economic Determinants of Tax Compliance

| No | Author(s) & Year | Context / Country | Variables Examined | Method | Key Findings | Relevance to Current Study |
|----|---------------------------|-------------------|--------------------------------------|---------------------|--|---|
| 1 | Allingham & Sandmo (1972) | Theoretical | Audit probability, penalty, tax rate | Economic model | Compliance increases with higher audit probability and penalties | Provides theoretical foundation (deterrence theory) |
| 2 | Shanmugam (2003) | Conceptual | Tax audit probability | Conceptual analysis | Higher audit likelihood discourages tax evasion | Supports inclusion of audit probability |

| No | Author(s) & Year | Context / Country | Variables Examined | Method | Key Findings | Relevance to Current Study |
|----|---------------------------------|-------------------|--------------------------------|-------------------------|---|---|
| 3 | Palil & Mustapha (2011) | Malaysia | Audit probability & compliance | Empirical review | Audit probability positively influences compliance | Reinforces enforcement mechanism |
| 4 | OECD (2010) | Cross-country | Risk-based audit | Policy analysis | Risk-based audits improve compliance efficiency | Supports audit framework discussion |
| 5 | Doran (2009) | Conceptual | Tax penalties & interest | Legal-economic analysis | Interest and penalties deter late payment | Justifies IRLNPT variable |
| 6 | Abiola & Asiwah (2012) | Nigeria | Tax administration & revenue | Regression | Improved administration increases revenue | Contextual support for Nigeria |
| 7 | Effiong & Attah (2016) | Nigeria | Tax determinants & revenue | Time-series analysis | Significant positive effect on tax revenue | Supports expected positive relationship |
| 8 | Musa, Saad & Ibrahim (2017) | Nigeria | Tax structure variables | OLS | Positive but insignificant relationship | Shows mixed empirical evidence |
| 9 | Soyinka, Jinadu & Sunday (2016) | Nigeria | Audit probability & compliance | Regression | Audit probability significantly improves compliance | Reinforces TAP importance |
| 10 | Oghuma (2018) | Nigeria | Compliance determinants | Empirical | Determinants significantly influence revenue | Supports model justification |

RESEARCH METHOD

The research design adopted in the study is *ex-post facto* research design. The data used in the study were sourced from secondary sources. Quantitative data on research variables were generated from FIRS- Planning, Reporting and Statistics Department; and Central Bank of Nigeria Statistical Bulletin for the variables covering the period of thirty one (31) years (1990-2020). The choice of this period is based on the availability of data for the variables of the study. The regression model is as specified by Frances Galton (1974) thus; $y = a + \beta x + e \dots$ (i)

Where; y = Dependent variable, a = Constant, β = Coefficient of the independent variable, x = Independent variable and e = Error term. Therefore, rewriting the model in

line with equation 1 above; $TRev = f(TAP, IRLNPT, TFR, TR) \dots$

(ii)

Where; $TRev$ = Tax Revenue, TAP = Tax Audit Probability, $IRLNPT$ = Interest Rate on Late and Non-Payment of Taxes, TFL = Tax Filing Rate and TR = Tax Rate.

Equation (ii) can be transformed into an additive and analytical regression equation as follows $TRev_t = a + \beta_1 TAP_t + \beta_2 IRLNPT_t + \beta_3 TFR_t + \beta_4 TR_t + e_t \dots$ (iii)

By implication, Equation (iii) suggests that the volatility of Tax Revenue in Nigeria is evaluated by the magnitude of the parameters $\beta_0, \beta_1, \beta_2, \beta_3,$ and β_4 , given marginal changes in (TAP), ($IRLNPT$), (TFR) and (TR) respectively holding other extraneous variables constant. Equation (iii) account for a non-constant growth/decline rate over the study period, however, it further assumed that $\sum_{i=1}^4 \beta_i$ will be less than or greater than unity one. In order to estimate the parameters and normalize the data, equation iii was transformed for linearity. Thus additive semi logarithm model would be utilized thus”; $\log TRev_t = a + \beta_1 TAP_t + \beta_2 IRLNPT_t + \beta_3 TFR_t + \beta_4 TR_t + e_t \dots$ (iv)

Where; a = Constant parameter; β_1 to β_4 = parameters to be estimated; t = periods 1990 through 2020; e_t = error term.

Table 2: Variable Description and Measurement

| Variable | Measurement |
|--|---|
| Description | |
| Tax Revenue (TRev) | This is the total amount of revenue generated from various sources of tax such as VAT, PPT, Education Tax (ET), Company Income Tax (CIT), Capital Gain Tax (CGT), Stamp Duty (SD), Withholding Tax (WT) and Information Technology and Development Tax (ITDT) during a year in Nigeria (Gberegbe and Umoren, 2017). |
| Tax Audit Probability | This will be calculated as the proportion of actual total audit conducted and expected total audit by the FIRS at the end of each year accounting period (Onaja and Iwarene, 2015). |
| Interest Rate on Late and Non-Payment of Taxes | This is measured as the amount payable by a tax payer as interest due to late and non-payment in addition to actual amount payable as tax at the end of each accounting year (Soyinka, Jinadu and Sunday, 2016). |

| | |
|------------------|--|
| Tax Filling Rate | This is calculated as the proportion of actual numeral of tax filling rate by tax payers to the expected quantity of tax filling rate of tax payers to be received by FIRS at the end of each accounting year (Akubo, Achmugu and Ayuwa, 2016). |
| Tax Rate | This measured as the average of the total rate of tax due from Value Added Tax, Petroleum Profit Tax, Education Tax, Company Income Tax, Capital Gain Tax, Stamp Duty, Withholding Tax and Information Technology and Development Tax in each accounting period (Gberegbe and Umoren, 2017). |

RESULT AND DISCUSSION

Table 3: Economic determinants of tax compliance and tax revenue

| Variables | Coefficient | Std. Error | t. Statistics | P- Value |
|------------------|--------------------|-------------------|----------------------|-----------------|
| Constant | 12.704 | 4.844 | 2.622 | .014 |
| TAP | .032 | .006 | 5.114 | .000 |
| IRLNPT | .034 | .015 | 2.234 | .034 |
| TFR | 1.944 | .416 | 4.672 | .000 |
| TR | .667 | .201 | 3.315 | .003 |
| R square | 0.958 | | | |
| Adj. R square | 0.90.5 | | | |
| F Statistics | 72.422 | | | |
| F Sig | 0.000 | | | |
| D Watson | 1.94 | | | |

Source: Author’s computation using SPSS 20.0

From the analysis above, the durbin-watson critical table upper limit (D_u) 1.74 is less than durbin-watson calculated 1.94 and the durbin-watson calculated of 1.94 is less than 4-durbin-watson critical table lower limit (D_L) i.e. 2.26. That is $D_U < D < 4 - D_L$ ($1.74 < 1.94 < 2.26$). This suggests that there is no autocorrelation in the estimated model. Hence, the study accepts the null hypotheses and concludes that the errors are not positively or negatively auto-correlated. Table 2 above shows that about 90.5% (percent) of the variables explained the systematic variation on tax revenue over the observed years in Nigeria while the random or stochastic term accounted for the remaining 9.5 percent. The above table further shows that the combined effect of tax audit probability (TAP), interest rate on late and non-payment of taxes (IRLNPT); tax filling rate (TFR) and tax rate (TR) was

statistically significant in explaining changes in tax revenue in Nigeria over the period of 1990 through 2020.

This is explained by a p-value of 0.000 which is less than the acceptable critical value of 0.05. Table 2 above also shows the results of the ordinary least square regression coefficients of the independent variables. The results showed that the coefficients of tax audit probability (TAP), interest rate on late and non-payment of taxes (IRLNPT), tax filing rate (TFR) and tax rate (TR) showed positive values of .032, .034, 1.944 and .667 respectively and they are statistically significant in elucidating tax revenue in Nigeria. This implies that one percent increase in tax audit probability (TAP), interest rate on late and non-payment of taxes (IRLNPT), tax filing rate (TFR) and tax rate (TR) will result to .032%, .034%, 1.944% and .667% increase respectively in tax revenue in Nigeria within the estimated model over the years. Standard error test is used to ascertain whether the variables in the study were statistically significant or not; and this is done when standard error is compared with half of coefficient.

The decision rule is to fail to reject the null hypothesis if the standard error is greater than half of the coefficients. Table 2 above further shows that the coefficients of tax audit probability (TAP), interest rate on late and non-payment of taxes (IRLNPT); tax filing rate (TFR) and tax rate (TR) are greater than their respective standard errors. Thus, the null hypotheses is rejected as the explanatory variables to which these estimates: β_1 , β_2 , β_3 , and β_4 relates are statistically significant and reliable in determining the revenue from tax in Nigeria at 5% level of significance. In order to ensure that the decision on the formulated hypotheses is validated empirically, the study has employed the t-statistics.

This is achieved as the t-statistics calculated is compared against the calculated t-statistics. When the t-test calculated is greater than the t-statistics critical table value at 5% level of significance, the study rejects the null hypothesis and therefore accept the alternative hypothesis. Table 2 above suggests that the t-statistics calculated for parameters: β_0 , β_1 , β_2 , β_3 , and β_4 are greater than the t-statistics critical table value at 5% significance level on two tailed test. This implies that tax revenue in Nigeria is significantly influenced by tax audit probability (TAP), interest rate on late and non-payment of taxes (IRLNPT), tax filing rate (TFR) and tax rate (TR) at 5% level of significance. Consequently, the alternative hypotheses which state that there is significant effect of tax

audit probability (TAP), interest rate on late and non-payment of taxes (IRLNPT), tax filing rate (TFR) and tax rate (TR) on tax revenue in Nigeria been accepted.

DISCUSSION

This study investigates a multi-asset investment portfolio consisting of Bitcoin, gold, and stocks during the 2022–2024 period and examines its implications from the perspectives of financial reporting, risk, and governance. The results demonstrate a clear differentiation in risk characteristics across asset classes. Bitcoin exhibits the highest annualized return, but this return is accompanied by substantially higher volatility, deeper maximum drawdowns, and more severe tail risk compared to gold and stocks. Gold shows the most stable risk profile with relatively low volatility and shallower drawdowns, while stocks occupy an intermediate position. When the three assets are combined in an equal-weight portfolio, overall volatility and tail risk decline relative to Bitcoin alone, indicating diversification benefits; however, the portfolio still experiences a sizeable maximum drawdown, suggesting that diversification does not fully eliminate downside exposure when one asset dominates tail-risk behavior. Correlation analysis further shows that Bitcoin is more closely associated with stock market movements than with gold, indicating that during this period Bitcoin behaves more like a risk-sensitive asset rather than a defensive hedge.

These findings can be explained by fundamental differences in economic substance and market microstructure across the three asset classes. Bitcoin's high volatility and extreme drawdowns reflect its sensitivity to shifts in global liquidity, speculative trading behavior, and rapid repricing mechanisms within digital asset markets. Gold, in contrast, benefits from long-established commodity market structures and is often treated as a store of value during periods of uncertainty, which tends to dampen volatility. Stocks, represented by a broad market index, incorporate macroeconomic expectations and corporate earnings risk, resulting in moderate volatility relative to Bitcoin. The reduction in portfolio risk arises from imperfect correlations among assets; however, because Bitcoin contributes disproportionately large negative returns during stress periods, portfolio-level downside risk remains significant. This explains why tail-risk measures such as

CVaR/Expected Shortfall remain elevated even after diversification, reinforcing the importance of downside-focused risk metrics beyond traditional volatility measures.

When compared with prior studies, the empirical patterns observed in this research are broadly consistent with the literature showing that Bitcoin may provide diversification benefits under certain conditions but that these benefits are unstable and regime-dependent (Guesmi et al., 2019). The finding that Bitcoin exhibits stronger co-movement with stocks than with gold aligns with more recent evidence on volatility spillovers and cross-market linkages between cryptocurrencies and traditional financial markets (Terraza et al., 2024; Zhang et al., 2024). At the same time, earlier crisis-based research suggests that gold and Bitcoin can play complementary roles depending on the nature of the shock (Oosterlinck et al., 2023). The contribution of this study lies not in redefining Bitcoin as a universal hedge, but in demonstrating through drawdown and CVaR/Expected Shortfall analysis that downside risk is heavily concentrated in the digital asset component and that this concentration has direct consequences for audit, reporting, and governance. Unlike portfolio studies that focus solely on asset allocation, and audit studies that discuss crypto assurance challenges in isolation, this research integrates quantitative risk evidence with a structured audit and governance lens for a clearly defined multi-asset setting.

From a financial reporting and audit perspective, the results imply that materiality and disclosure judgments should be informed by empirically observed risk behavior rather than by asset labels alone. Where one asset exhibits extreme volatility and tail risk, reporting credibility depends not only on the numerical measurement outcome but also on the governance of valuation inputs and the transparency of risk disclosures. In this context, Bitcoin requires heightened attention to valuation governance, consistency of price sourcing, and disclosure of downside and concentration risk. Audit implications follow directly from this evidence. Severe drawdowns and high CVaR values increase sensitivity to valuation and disclosure misstatements, while the reliance on digital custody and third-party platforms amplifies risks related to existence and rights and obligations. These findings reinforce prior audit literature emphasizing that crypto assets extend the traditional audit risk space and require more control-dependent evidence than conventional investments (Vincent & Wilkins, 2020; Hsieh & Brennan, 2022).

A broader reflection on the results highlights both the functional and dysfunctional aspects of multi-asset investment strategies. On the functional side, diversification across Bitcoin, gold, and stocks reduces overall portfolio volatility and tail risk compared with holding Bitcoin alone, supporting the rationale for multi-asset allocation as a risk-mitigation strategy. On the dysfunctional side, diversification may create a false sense of security if decision-makers focus only on average returns or volatility while underestimating tail risk and drawdown persistence. The results also show that governance and assurance complexity increases as portfolios incorporate assets with heterogeneous evidence chains and operational dependencies. Without strong governance, the potential benefits of diversification may be offset by increased reporting and assurance risk. Moreover, the observed correlation structure challenges simplistic narratives that treat Bitcoin as analogous to gold; if disclosures and investment policies do not reflect actual co-movement with equity markets, informational risk for users of financial statements may increase.

Based on these findings, several practical actions are recommended. Entities holding multi-asset portfolios should adopt risk-informed reporting and disclosure practices that explicitly reflect tail risk and drawdown evidence rather than generic descriptions of diversification. Valuation governance policies should be formalized, particularly for assets with high volatility, to ensure consistent price sourcing, measurement timing, and verification procedures. Governance frameworks should prioritize custody and safeguarding controls for digital assets, including authorization limits, segregation of duties, reconciliation routines, and oversight of third-party service providers. From an assurance standpoint, auditors should implement a risk-weighted audit strategy that allocates audit effort in proportion to tail-risk contribution, valuation uncertainty, and evidence-chain fragility. Such an approach aligns audit procedures with where misstatement risk is most likely to be material and enhances the relevance of assurance in increasingly complex multi-asset investment environments.

CONCLUSION

The main objective of the study is to examine the economic determinants of tax revenue in Nigeria. Specifically, the study sought to: assess the effect of tax audit

probability; interest rate on late and non-payment of taxes; tax filing rate; and tax rate on tax revenue. Ex-post facto research design was used in the study and the data collected were analyzed using multiple ordinary least square regression model. The dependent variable was proxy with tax revenue (TRev). This is measured as the total amount of revenue generated from various sources of tax such as VAT, PPT, CIT, Education Tax (ET), Capital Gain Tax (CGT), Stamp Duty (SD), Withholding Tax (WT) and Information Technology and Development Tax (ITDT) during a year in Nigeria. For the independent variables, four attributes of economic determinants were considered. They are: tax audit probability (TAP), this is calculated as the as the relative amount of actual total audit conducted and expected total audit by the FIRS at the end of each year accounting period; interest rate on late and non-payment of taxes (IRLNPT), this is measured as the amount payable by a tax payer as interest due to late and non-payment in addition to actual amount payable as tax at the end of each accounting year; tax filing rate (TFR), this is calculated as the as the relative amount of actual quantity of tax filing rate by tax payers to the expected number of tax filing rate of tax payers to be received by FIRS at the end of each accounting year; and tax rate (TR), this is measured as the as the average of the total rate of tax due from VAT, PPT, Education Tax (ET), CIT, Capital Gain Tax (CGT), Stamp Duty (SD), Withholding Tax (WT) and Information Technology and Development Tax (ITDT) in each accounting period.

The data for the study were obtained from FIRS- Planning, Reporting and Statistics Department; and CBN official statement for the variables covering the period of thirty one (31) years (1990-2020). The overall findings of the study showed that: for the first hypothesis, the estimated value of t- statistics was 5.114 and at 5% level of significance the t-statistics table value is 1.697. Also, the standard error of .006 was less than the half of coefficient of tax audit probability which is .016. At 5% level of significance p-value which is .000 was less than 0.05 hence; the first alternative hypothesis which states that tax audit probability has significant and positive effect on tax revenue in Nigeria was accepted by the study.

In achieving the second hypothesis, the estimated value of t-statistics was 2.234 and at 5% level of significance the t-statistics table value was 1.697. Also, the standard error of .015 was less than the half of coefficient of interest rate on late and non-payment of taxes

which is .017. At 5% level of significance p-value which is .034 was less than 0.05 hence; the second alternative hypothesis which states that interest rate on late and non-payment of taxes does significantly and positively influence tax revenue in Nigeria was accepted by the study. In achieving the third hypothesis, the estimated value of t-statistics was 4.672 and at 5% level of significance the t-statistics table value was 1.697. Also, the standard error of .416 was less than the half of coefficient of tax filing rate which is .972. At 5% level of significance p-value which is 0.000 was less than 0.05 hence; the third alternative hypothesis which states that tax filing rate has significant and positive effect on tax revenue in Nigeria was accepted by the study. For the fourth hypothesis, the estimated value of t-statistics was 3.315 and at 5% level of significance the t-statistics table value was 1.697. Also, the standard error of .201 was less than the half of coefficient of tax rate which is .334. At 5% level of significance p-value which is .003 was less than 0.05 hence; the fourth alternative hypothesis which states that tax rate has significant and positive effect on tax revenue in Nigeria was accepted by the study. The model summary explained 90.5% (Adjusted R Square) of the variance in tax revenue in Nigeria.

This suggests that about 90.5% of the changes in tax revenue in Nigeria could be explained by tax audit probability, interest rate on late and non-payment of taxes, tax filing rate and tax rate while the random or stochastic term accounted for the remaining 9.5% (percent) of the changes in tax revenue in Nigeria. The overall mode of the study is significant at 5% (percent) level of significance. This is because the F statistics which is a statistical test for goodness of fit for linear regression models had a p value of .000 which is less than .05. The implication of the findings is that if Federal Inland Revenue Service (FIRS) fails to: enhance tax audit probability; provide adequate measures to enforce strict compliance of interest rate on late and non-payment of taxes; increase tax filing rate; and increase or sustain current tax rate then the level of tax revenue in Nigeria will continue to remain very low.

5.2 Recommendations

The following are the recommendations of the study:

1. Federal Inland Revenue Service (FIRS) should increase tax audit probability in order to increase tax revenue in Nigeria.

2. Federal Inland Revenue Service (FIRS) should ensure that adequate interest rate on late and non-payment of taxes are charged on tax payers for tax non-compliance and also provide strict measures in enforcement of tax interest rate on late and non-payment of taxes in order to prevent taxpayers from evading tax payment.
3. Federal Inland Revenue Service (FIRS) should increase tax filing rate of tax payers in Nigeria. this should be done through regular tax education through mounting of Billboards at strategic points in Nigeria using both print and electronic media to educate tax payers on the need to comply with tax laws and regulations in Nigeria by filling their tax returns as at when due. In order to ensure that tax payers submit tax returns for fair tax assessment, tax authorities in Nigeria should also make more of an effort to educate the taxpayers on basic record keeping through seminars, conferences, workshops, symposiums, fliers and T-shirt with inscription pay your tax and enjoy good governance and improve tax revenue.
4. Federal Inland Revenue Service (FIRS) should sustain the current tax rate in Nigeria in order to enhance tax revenue.

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