

**Value Added Tax and Infrastructural Development in Edo state**

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**Being a Project Work Submitted to The Department of Accounting, Faculty of Management Sciences, University of Benin in Partial fulfilment to the Requirements for the award of Degree of Bachelor of Science (B.Sc) Degree in Accounting**

**November, 2025**

## **DECLARATION**

I hereby declare that:

1. This research project was personally carried out by me in the Department of Accounting, University of Benin, under the supervision of Prof. Peter O. Ibadin.
2. The findings and report presented in this work have not been previously submitted for the reward of degree or qualification in any other institution.
3. The contents of this study are based on my original research efforts. Where the works, opinions or findings of other scholars were consulted or referenced, due acknowledgement has been duly made.

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**Date**

## CERTIFICATION

We the undersigned certify that this project work was carried out by **Benedicta Iredia EHIDIAMHEN** with matriculation number **MGS2104537** of the Department of Accounting, Faculty of Management Sciences, University of Benin, Benin City for the partial fulfillment of the requirements for the award of B.Sc. in Accounting.

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## **DEDICATION**

This project is dedicated to God Almighty who has been my all in all throughout these years of my programme. He alone is worthy to be praised.

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## **ABSTRACT**

This study investigates the relationship between Value Added Tax (VAT) revenues, inflation, and infrastructural development in Edo State, Nigeria, over the period 2015–2024. VAT, a consumption-based tax introduced in Nigeria in 1993, has become a key source of non-oil revenue, supporting investments in health, education, and agriculture. Despite steady VAT allocations, infrastructure outcomes remain uneven, raising questions about the efficiency of resource utilization.

The study aims to assess the contribution of VAT revenue to infrastructural development, examine the role of inflation, and evaluate how effectively fiscal resources are transformed into tangible outcomes. Secondary data were obtained from Edo State Citizens Accountability Reports, FAAC disbursement records, Audited Financial Statements, and the Central Bank of Nigeria Statistical Bulletin. Short-run dynamic modeling was employed to analyze the relationship between VAT revenue, inflation, and infrastructure development.

Findings show that VAT revenue is a highly significant determinant of infrastructure, with each additional billion Naira generating approximately 194.455 million Naira in development outcomes, while inflation is statistically insignificant. Transformation efficiency is approximately 19.4%, indicating gaps in financial management and governance. The study concludes that strategic planning, enhanced public financial

management, diversified funding sources, and effective institutional capacity are essential to maximize VAT's impact on sustainable infrastructure development in Edo State.

## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.0 Background to the Study**

Value Added Tax (VAT) is one of the most widely used consumption-based taxes in the world. It is levied on the incremental value that is added to goods and services at every stage of production and distribution. Unlike income tax, which is imposed on profits, VAT is a form of indirect tax borne ultimately by the final consumer but collected and remitted by businesses on behalf of the government.

The origin of VAT can be traced to France in 1954, where it was introduced by Maurice Lauré, then Director of the French Tax Authority, as a replacement for the multi-stage turnover tax that caused multiple taxation. Since its success in France, the system has been adopted globally by more than 160 countries, including major economies in Europe, Asia, and Africa due to its simplicity, transparency, and strong revenue-generating potential.

In Nigeria, VAT was established in 1993 through Decree No. 102, replacing the former Sales Tax that was administered by state governments. It came into effect on 1 January 1994 under the management of the Federal Inland Revenue Service (FIRS). The rationale for adopting VAT in Nigeria was to expand the tax base, enhance revenue mobilization, and reduce overdependence on oil revenue, which has been highly volatile.

VAT revenue in Nigeria is shared among the three tiers of government in the ratio of 15% to the federal government, 50% to state governments, and 35% to local governments. Over time, VAT has become one of the most stable and predictable components of Nigeria's non-oil revenue. According to the National Bureau of Statistics (NBS) and Federal Inland Revenue Service (FIRS), VAT collections rose from about ₦759 billion in 2015 to approximately ₦2.5 trillion in 2022, representing an average annual growth rate of over 15%. This steady increase reflects improved tax compliance, digitalization of the FIRS system, and broadening of the VAT base to include previously untaxed sectors of the economy.

In addition, the Finance Act of 2019 introduced a major fiscal reform that raised the VAT rate from 5% to 7.5%, effective January 2020. The upward review was intended to boost public revenue and enable the government to finance its growing capital and social expenditure commitments, especially in health, education, and infrastructure. Despite this growth in VAT revenue, its contribution to Nigeria's Gross Domestic Product (GDP) remains modest—averaging around 1.7%, far below the African regional average of 6% (IMF, 2023). This indicates that while VAT revenue has improved, there is still room for more efficient utilization and distribution to support sustainable development goals.

Infrastructural development, on the other hand, refers to the expansion, rehabilitation, and maintenance of facilities and systems that support economic production and improve quality of life. It includes investments in physical assets like roads, power supply, schools, and hospitals, as well as social infrastructure such as education and healthcare services.

Infrastructure development enhances the productive capacity of an economy, reduces poverty, and attracts private investment.

In the Nigerian context, infrastructural development has been a long-standing policy priority, yet public infrastructure remains inadequate due to funding gaps, poor maintenance, and inefficient allocation of resources. Many states depend on statutory allocations from the Federation Account, particularly VAT proceeds, to fund capital projects and public services.

The link between Value Added Tax (VAT) and infrastructural development lies in how tax revenue is allocated and utilized to provide essential services and public goods. VAT, being a broad-based and continuous source of government income, serves as a reliable fiscal instrument for financing infrastructure projects, especially at the subnational level.

In Edo State, VAT constitutes a major component of the state's allocation from the Federation Account Allocation Committee (FAAC). These funds are channeled into recurrent and capital expenditures, with a significant portion earmarked for infrastructural development in critical sectors such as health, education, and agriculture. These sectors collectively represent the social and productive foundation of the state's economy.

Investments in these areas have far-reaching impacts: improved healthcare facilities enhance productivity and longevity; quality education builds human capital; and agricultural infrastructure increases food security and employment opportunities. Despite these potentials, Edo State continues to experience infrastructural deficiencies ranging

from deteriorating school buildings and under-equipped hospitals to limited agricultural support infrastructure.

This disconnects between VAT revenue growth and infrastructural performance raises pertinent questions about revenue utilization, fiscal management, and efficiency. While VAT collections at the national level have increased significantly, the extent to which these revenues translate into concrete infrastructural outcomes at the state level remains uncertain. Moreover, persistent inflationary pressures erode the real value of public funds, reducing the effectiveness of VAT allocations.

It is against this background that this study examines the relationship between Value Added Tax and infrastructural development in Edo State. The study focuses on understanding whether the steady rise in VAT revenue has led to measurable improvements in key infrastructural sectors: health, education, and agriculture which are critical for inclusive growth and long-term sustainability.

### **1.1 Statement of the Problem**

Value Added Tax (VAT) is expected to serve as a stable and reliable revenue source that enables government to provide adequate infrastructure for sustainable development. However, the actual relationship between VAT revenue and infrastructural outcomes at the state level has not been clearly established, particularly in Edo State.

Although VAT allocations to Edo State have risen steadily according to the Citizens Accountability Reports and FAAC records, many indicators of infrastructure quality remain weak. Public schools often operate under poor conditions, health centers lack

adequate facilities and personnel, and agricultural support systems such as irrigation, storage, and extension services remain underdeveloped. These conditions suggest that the increased VAT inflow may not be translating into visible infrastructural progress.

Furthermore, the real value of VAT revenue is often eroded by inflation and inefficient budgetary processes, limiting its impact on capital investment. The absence of strong empirical evidence linking VAT revenue to infrastructural development in Edo State creates a research gap that needs to be addressed. This study, therefore, seeks to evaluate how VAT revenue affects infrastructural development across key social and productive sectors in Edo State, while accounting for inflationary effects and public expenditure efficiency.

## **1.2 Research Questions**

This research is guided by the Central question: To what extent does Value Added Tax contribute to the Infrastructural development of Edo state.

In specifics, the research is guided by the following research questions:

1. What is the trend and contribution of VAT revenue to infrastructural development in Edo State?
2. How does VAT revenue affect the education sector in Edo State?
3. What is the relationship between VAT revenue and the agricultural sector in Edo State?
4. How has VAT revenue influenced the healthcare sector of Edo state.

### **1.3 Objectives of the Study**

The general objective of this study is to examine the impact of Value Added Tax (VAT) revenue on infrastructural development in Edo State.

The specific objectives include:

1. To evaluate the VAT revenue to infrastructural development in Edo State.
2. To analyze the effect of VAT revenue on the education sector in Edo State.
3. To examine the influence of VAT revenue on the agricultural sector in Edo State.
4. To assess how VAT revenue impacts the healthcare sector in Edo State.

### **1.4 Research Hypotheses**

H<sub>01</sub>: There is no significant relationship between VAT revenue and infrastructural development in Edo State.

H<sub>11</sub>: There is a significant positive relationship between VAT revenue and infrastructural development in Edo State.

H<sub>02</sub>: There is no significant relationship between VAT revenue and development in the agricultural sector of Edo State.

H<sub>12</sub>: There is a significant positive relationship between VAT revenue and development in the agricultural sector of Edo State.

H<sub>03</sub>: There is no significant relationship between VAT revenue and the education sector of Edo State.

H<sub>13</sub>: There is a significant positive relationship between VAT revenue and the education sector of Edo State.

H<sub>04</sub>: There is no significant relationship between VAT revenue and the healthcare sector of Edo State.

H<sub>14</sub>: There is a significant positive relationship between VAT revenue and the healthcare sector of Edo State.

### **1.5 Scope of the Study**

The scope of this study is confined to the relationship between Value Added Tax (VAT) revenue and infrastructural development in Edo State from 2015 to 2024. The study focuses specifically on three critical sectors (health, education, and agriculture) as they represent the main components of both social and economic infrastructure. The analysis makes use of secondary data obtained from official and reliable sources such as the Edo State Citizens Accountability Reports, FAAC disbursement records, Audited Financial Statements of Edo State, and the Central Bank of Nigeria (CBN) Statistical Bulletin.

Inflation is included as a control variable to capture the effect of general price changes on the real value and effectiveness of VAT revenue in driving infrastructure development. The study is limited to Edo State to allow for in-depth analysis and clearer policy implications regarding how VAT revenue is utilized for infrastructural improvements at the state level.

### **1.6 Significance of the Study**

This study is significant for several reasons:

1. Academic Contribution:

It contributes to the growing literature on fiscal policy and public finance by providing empirical evidence on the role of VAT in promoting infrastructural development at the subnational level.

#### 2. Policy Relevance:

The findings will be useful to policymakers in the Federal Inland Revenue Service (FIRS) and Edo State Ministry of Finance for improving VAT administration, allocation, and efficient utilization for infrastructural projects.

#### 3. Economic Planning:

The study offers insights to development planners and budget authorities on how VAT can be optimized as a sustainable funding source for infrastructure in key sectors.

#### 4. Public Accountability:

It promotes fiscal transparency by showing how VAT revenue is translated into tangible development outcomes, enabling citizens and oversight bodies to assess government performance.

#### 5. Future Research Utility:

The work serves as a reliable reference for future researchers, students, and policymakers studying taxation, fiscal policy, and infrastructural development in Nigeria.

### **1.7 Limitations of the Study**

This study encountered certain limitations that should be noted for proper interpretation of the findings:

#### 1. Data Reliability:

The study depends mainly on secondary data obtained from official sources such as the Edo State Citizens Accountability Reports, FAAC disbursements, and audited financial statements. Any delay, inconsistency, or omission in these records may affect data accuracy.

## 2. Time Frame:

The study covers a ten-year period (2015–2024). While this duration is adequate for identifying short- and medium-term trends, it may not fully capture the long-term effects of VAT revenue on infrastructural development.

## 3. Scope of Infrastructure:

Infrastructural development was measured using expenditures in the health, education, and agricultural sectors. Other critical areas such as transportation, housing, and energy were not included due to limited state-level data.

## 4. Methodological Constraints:

The quantitative regression method used establishes relationships among variables but does not account for qualitative influences such as governance quality, corruption, or political stability, which may also affect infrastructure outcomes.

## 5. Policy and Economic Variations:

Changes in VAT rates, exemption policies, and inflationary pressures during the study period could have influenced the data and introduced fluctuations not fully captured in the analysis.

Despite these limitations, the study ensures the use of reliable data sources and robust analytical techniques, providing credible insights into the relationship between Value Added Tax and infrastructural development in Edo State.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.0 Introduction**

This chapter reviews relevant literature on Value Added Tax (VAT) and infrastructural development, with particular focus on Edo State. It begins with conceptual discussions on taxation, VAT, and infrastructural development, followed by an exploration of the role of taxation in infrastructural growth. The chapter also presents a historical background of VAT in Nigeria and Edo State, theoretical underpinnings, and a review of empirical studies related to the topic. The section concludes by identifying gaps in existing research that this study seeks to address.

#### **2.1 Conceptual Review**

##### **2.1.1 Taxation**

While the concept of tax does not carry a universally accepted definition and therefore is not possible to exhaustively define, it is possible to provide some common definitions with respect to tax (Pasquale et al., 2019). Taxation is the central part of modern economic development (Oluseyi et al., 2019). Taxation is a system through which government raises revenue from individuals, businesses and other entities by imposing compulsory levies on income, goods & services, properties & transactions. It is one of the most important sources of public finance. The concept of taxation is rooted in the principle of collective responsibility whereby citizens contribute a portion of their resources to fund government activities. There are multiple objectives of taxation. First,

taxation serves as the primary source of government revenue required for financing essential public services such as infrastructure, healthcare, education & agriculture. Second, taxation is used as a tool for economic stabilization, helping to control inflation, managing demand & balancing the economy. Also, it facilitates the redistribution of income and wealth by imposing higher tax on the wealthy while granting relieves & incentives to lower-income groups. Fourth, taxation encourages or discourages certain economic activities through policy instrument such as tax holidays, rebates and excise duties. Taxation can be distinguished into the Direct & Indirect taxation. Direct taxes are levied on income, wealth and profit of individuals & corporations such as personal income tax and company income tax. Indirect taxes are levied on goods & services including value-added tax, excise duties and customs tariffs. Direct taxes are progressive in nature and promote equity, while indirect taxes are easier to collect & often yield significant revenue. Empirical studies consistently affirm the significance of taxation as a driver of national development & economic development through the government with the financial resources to carry out social & economic policies, drive growth & reduce inequality. Beyond revenue, taxation also shapes investment decisions, consumption patterns & trade relations. Taxation is both a fiscal & socio-economic instrument. Its scope extends beyond revenue generation to include re-distribution, economic regulation and development promotion. However, the effectiveness of taxation depends largely on efficient administration, equity in burden sharing and the ability of the governments to utilize tax revenues transparently & accountably.

### **2.1.2 Value Added Tax**

Value Added Tax has become one of the most significant sources of government revenue globally, especially in developing economies. Value Added Tax is an indirect tax. It is a consumption tax applied to the sale of goods & services at all stages of production & distribution. The concept of VAT was first developed in Europe in the mid-20th century and has since been adopted by over 160 countries worldwide. VAT is distinct from sales tax because it is collected at multiple points in the production chain rather than at the final point of sale alone. In practice, businesses charge VAT on their sales (outputs) and deduct the VAT already paid on their purchases (inputs). The difference is remitted to government revenue authorities, thereby ensuring that tax is paid on the value added at each stage. The Value Added Tax Act of 1993 as amended requires a charge of a set rate of 7.5% on invoice for goods & services from every citizen of Nigeria, handled by the Federal Inland Revenue Service (FIRS) provided they are not relieved of VAT. There are several objectives for the introduction of VAT. First, VAT broadens the tax base and increases revenue generation capacity for the government. Second, it is considered a more efficient & transparent tax system, reducing the incidence of tax evasion. Third, VAT promotes equity in taxation since tax is collected from the final consumers in proportion to their consumption patterns. Also, VAT is less distortive to investment decisions compared to direct form of taxation, as it focuses on consumption rather than income or profits. Valued Added Tax entail is characterized by some key features including the multi-stage collection as it is imposed at the different stages of production

& distribution. Also, tax payers can claim credit for VAT paid on inputs, preventing double taxation. VAT also base a broad coverage as it covers goods and services. Another key feature is that VAT burden is borne by the final consumer other than producers or intermediaries. The Value Added Tax generates several advantages which includes the provision of steady and predictable source of revenue, the encouragement of proper record keeping among businesses, Minimization of cascading effects that characterize traditional sales, levying also the enhancement of transparency in the collection since tax payers can trace VAT payments across different stages of production. Despite the merits of VAT, it has still be criticized on various grounds. While VAT is easy to administer, it does not address concern of equity and thus disproportionately burdens low-income earners (Muniru,2025). The VAT is often thought to be an intrinsically complicated tax; cumbersome for both tax payers and authorities and thus I'll suited to developing countries, where even basic record keeping ability may be limited (Liam et al., 2002) Despite the presence of transaction receipts, limited enforcement capacity may prevent tax authorities from efficiently cross-checking what firms report against records from third parties and thus limit VAT evasion (Francois & Naritomi, 2018). Exemptions and multiple tax rates can complicate administration and reduce efficiency.

### **2.1.3 Infrastructural Development: Meaning, Goals and Indicators**

Infrastructural development refers to the establishment and improvement of the physical and social systems that enable economic activity and enhance living standards. It includes

facilities such as roads, power supply, communication networks, schools, and healthcare centers. According to the World Bank (2023), infrastructure serves as the backbone of economic growth by improving productivity and facilitating trade. Infrastructural development is generally divided into two categories—economic and social. Economic infrastructure includes transport, energy, and communication networks that support industrialization and trade, while social infrastructure covers health, education, and sanitation sectors that enhance human well-being (UNDP, 2020). Together, they provide the foundation for inclusive and sustainable development. The main goals of infrastructural development are to stimulate growth, promote social inclusion, and reduce poverty through equitable access to essential services. This aligns with global frameworks such as the United Nations Sustainable Development Goal 9, which calls for building resilient infrastructure and fostering innovation, and the African Union’s Agenda 2063, which emphasizes infrastructure as a driver of economic transformation. Progress in infrastructural development is evaluated using indicators such as road network coverage and condition, access to electricity and potable water, number and quality of schools and hospitals, and service efficiency in education and healthcare. Broader indices such as the Infrastructure Development Index (IDI) and African Infrastructure Development Index (AIDI) measure accessibility, affordability, and quality of services (UNECA, 2021). In Nigeria, infrastructural gaps remain a significant challenge despite multiple policy frameworks like the National Integrated Infrastructure Master Plan (NIIMP). The Central Bank of Nigeria (2022) estimates that over \$100

billion annually is required to bridge this deficit. Edo State reflects this national pattern, though with visible progress through VAT-financed road rehabilitation, school and hospital upgrades, and urban renewal projects. Hence, infrastructural development remains a key indicator of how effectively tax revenue; particularly VAT is utilized to improve citizens' welfare.

#### **2.1.4 The Role of Taxation in Infrastructural Development**

Taxation is one of the most reliable sources of public financing for infrastructural development. It provides the fiscal foundation for constructing and maintaining roads, power supply systems, water projects, and social amenities essential for economic activity. Indirect taxes like Value Added Tax (VAT) are particularly significant, as they ensure stable revenue even during periods of declining oil income (IMF, 2021). Globally, empirical studies show that well-structured tax systems have a positive and significant relationship with infrastructural growth when revenues are properly managed and allocated (World Bank, 2023). In Nigeria, taxation, especially VAT, has supported major projects such as highways, housing estates, and rural electrification schemes. For Edo State, VAT and Internally Generated Revenue (IGR) jointly form the core financial base for infrastructural investments in transport, education, and healthcare. However, the impact of taxation on infrastructure depends on efficient administration, transparency, and accountability in fund utilization. Weak governance and corruption can undermine the effectiveness of tax revenues. Therefore, ensuring that VAT proceeds are directed

toward capital rather than recurrent expenditure remains essential for sustainable infrastructural progress in Edo State.

### **2.1.5 Relationship between Value Added Tax and Sectoral Development**

Value Added Tax (VAT) is a major source of public revenue in many countries. Because it flows into general government coffers it can be allocated across sectors (health, education, infrastructure and agriculture). Empirical studies show mixed effects. In some contexts, higher VAT and overall tax revenue is associated with greater public investment and improved infrastructure while other studies find weak or insignificant links between VAT alone and specific sectoral outcomes, partly because spending decisions, fiscal rules, and governance determine how revenue is used. In sum, VAT expands fiscal space but the impact on any sector depends on budget priorities and execution, how VAT receipts are pooled & budgeted and public financing management & execution capacity. At the National level, VAT collections have grown substantially since the 2021 VAT rate increase from 5% to 7.5% under the Finance Act 2020 and improved administration. Total VAT collections have increased sharply in 2023 and continued into 2024, producing larger PAAC disbursement to state that can be used for sector spending. Studies of Nigeria show VAT (as part of total tax revenue) contributes to funding infrastructure (health, agriculture and education) but the translation to sectoral outcomes depends on state budgeting priorities and execution (i.e.) VAT/Federation Account Allocation Committee receipts are allocated to capital projects or are used for recurrent other purposes. Edo state receives a share of VAT via FAAC and also raises its

own IGR. Edo's budget documents and audited accounts show that VAT/FAAC plus IGR form the main revenue pool financing sectoral spending. Recent documents record rising IGR (₦60.5 billion in 2023) and show explicit budget lines for capital & recurrent spending in infrastructure (education, health and agriculture).

## **2.2 Historical Background of VAT in Nigeria and Edo State**

### **2.2.1 Introduction of VAT in Nigeria**

Value Added is a form of consumption tax leveled on the value that is added to goods & services at each stage of production & distribution. Globally, VAT has been widely adopted as an effective tool for revenue generation, replacing older systems such as sales tax due to its broader base and ability to reduce tax evasion. (Bird & Gendron, 2007). Many countries embraced VAT as part of economic reforms aimed at diversifying government revenue sources and ensuring fiscal stability. In Nigeria, VAT was introduced in 1993 through the Value Added Tax Decree No. 102 replacing the previous sales tax system which had been administered by the state under the 1986 Sales Act. The move was part of the Federal Government's broader fiscal reform agenda to improve non-oil revenue mobilization. VAT became operational on 1st January 1994 with an initial standard rate of 5% charged on most goods and services except those specifically exempted. Federal Inland Revenue Service (FIRS), while revenue distribution was shared among the three tiers of government, Federal, State and Local according to an agreed formula. The introduction of VAT in Nigeria was aimed at correcting deficiencies of the sales tax system, broadening the tax base and reducing over dependence on oil revenue

(Okpe, 2000). Over time, the VAT rate has been revised upwards in response to fiscal needs, most notably in 2020 when it was increased from 5% to 7.5% under the finance Act, as part of government efforts to boost domestic revenue and meet development expenditure. At the state level, including Edo State VAT revenue has become an important component of statutory allocations since states rely on federally distributed revenue. VAT collections contribute significantly to their budgets, particularly in funding infrastructural development, public services and economic empowerment programs. For Edo State, the inflow of VAT revenue represents both an opportunity to reduce dependence on Federal oil-derived allocations and a challenge in terms of how effectively these funds are utilized for sustainable infrastructural development.

### **2.2.2 VAT Revenue Trends in Edo State in Edo State.**

VAT has become one of the most critical components of statutory revenue financing recurrent expenditure and supporting capital projects. Over the past decade, evidence from budget performance, fiscal framework documents and FAAC disbursement records indicates that VAT allocations in Edo state have followed a generally upward trajectory with especially significant growth recorded in recent years. Available audited accounts show that in 2015, Edo state received approximately ₦8.45billion in VAT revenue (Edo State Auditor General's Report, 2016). Between 2016 and 2020, publicly accessible records were less consistent but budget documents indicate that VAT contributions to the state's revenue profile remained in the lower double-digit billions. For example, the state's proposed 2020 budget projected ₦14.5 billion from VAT, while fiscal strategy

documents placed VAT expectations for 2021 and 2022 at ₦15.60 billion and ₦16.65 billion respectively (Edo State fiscal framework 2020). These projections suggest a moderate but steady growth trajectory in VAT revenue during this period. A more dramatic increase emerged from 2022 onwards, reflecting both the expansion of the national VAT pool and improved collection efficiency. Official performance reports confirm that Edo State's actual VAT receipts rose sharply to ₦36.25 billion in 2023 – a level far higher than earlier projections (Edo State Government, 2023). Media reports based on FAAC disbursement data further indicate that the State's VAT share reached approximately ₦53.55 billion in 2024 while monthly breakdowns reveal that Edo received about ₦4.08 billion in August 2024 alone (Businessday & FAAC, 2024). This decade-long trajectory highlights three distinct phases which includes relatively modest receipts up to around 2020, gradual but steady increase during 2021-2022, and a pronounced surge from 2023 onwards. The trend underscores VAT's rising importance in Edo state's fiscal structure, offering opportunities for increased funding of infrastructure, education, and social programs. Nonetheless, the persistent concerns remain regarding the efficient utilization of these revenues and the state's continued dependence on federally collected VAT. Thus, while the upward VAT trend strengthens Edo's fiscal capacity, its development impact ultimately depends on effective and transparent allocation of these funds.

### **2.2.3 VAT Administration and Formula to States in Nigeria.**

VAT in Nigeria is a federally-administered consumption tax. The Federal Inland Revenue Service (FIRS) is the primary revenue agency responsible for VAT collection and enforcement on most taxable supplies. FIRS issues circulars and guidance on the VAT Act and its implementation, including timing of supply, invoicing and transitional rules. In practice, administration involves a mix of direct remittance by registered suppliers, collection of non-registered suppliers (NRS) for cross border supplies, and withholding/self-accounting arrangements introduced in later reforms and compliance enforcement activities carried out by FIRS. Major administrative reforms were enacted under the Finance Act 2019 (VAT Act increased the statutory VAT rate from 5% to 7.5% (effective Feb 2020)) and introduced several administrative and substantive changes, for example clear rules for time of supply, introduction of reverse charge and self-accounting mechanism (useful for digital and cross border supplies), threshold exemptions clarification and expanded scope of basic law. Practitioner guidance (PWC, KPMG, legal briefings) summarizes these changes and their practical implications for remitters and FIRS administration. Although FIRS collects VAT at source, the distributable VAT pool is periodically shared among tiers, hence a state's actual receipts depend on both FIRS collection performance and on allocation decisions made at FAAC. The post-2020 widening (reverse charge/digital service measures) also influences the size and stability of the VAT pool that will be shared. The Federation Account Allocation Committee (FAAC) coordinated by the Office of the Accountant General of the Federation (OAGF)

meets monthly to determine distributable revenues from different sources, including the VAT pool. FAAC publishes monthly disbursement communiqués (and detailed tables) showing the gross VAT pool for the month and each state's allocation. Researchers and analysts therefore rely on the FAAC/OAGF monthly PDFs as the primary authoritative source for state-level VAT receipts. Mechanically, FIRS reports/forwards VAT collections into the federation account and FAAC segregates the national VAT pool. After statutory deductions (e.g., cost, refunds & other claims), the remaining VAT distribution pool is shared among the three tiers according to the prevailing sharing ratios and what FAAC approves that month. The FAAC communique provides the line-by-line allocations and any deductions applied. Many official FAAC reports and practitioner sources present the VAT sharing outcome to show that the pool is distributed across the three tiers; commonly reported as federal 15%, states 50% and local government 35%.

This 15:50:35 split is often used in media and FAAC summaries to explain how the VAT pool is divided among tiers for that month's distributable VAT. There have been policy debates and proposals to alter the sharing formula (for example, proposals to introduce a larger derivation component or to adjust weights to favour states) reflecting political pressures and arguments about fiscal federalism. In recent years, some recent policy discussions and public commentary (including draft reforms and media reports) have proposed alternative formulas that re-emphasize derivation (i.e., giving more to oil

producing “derivation” states) or other bases (e.g., liquidity, population). These proposals are politically sensitive because changes would materially affect state receipts from VAT.

#### **2.2.4 Challenges in VAT Collection and Administration in Edo State.**

Edo State has made efforts to modernize revenue administration (for example, the Edo Revenue Administrative System (ERAS) but the literature notes persistent implementation and integration problems at both state and local government levels. Studies of automated revenue systems in Edo (and its local government areas) show that automation improves collection when fully adopted, yet constrained roll out, gaps in staff capacity, and resistance by vested interests have limited full benefits. The Edo Internal Revenue Service has published clarification defending its digitized platform, indicating both progress and ongoing contention around system use. Multiple taxation and illegal collections by third parties remain problems in Edo State with government statements and press coverage documenting raids, task forces, and enforcement action to stop unauthorized levy collectors (labelled as revenue predators), including touts and private recovery agents. Both nominal-state taxpayers and direct legitimate revenue that would otherwise be captured through formal VAT reporting channels. Such practices undermine voluntary compliance and increase the cost of administration. At the national level, Nigeria’s VAT legislative framework has been the subject of legal and political debate (especially since reforms in 2020 and proposed tax reform bills). This ambiguity feeds down to states, questions about the scope of state powers, precise mechanics of what counts towards the distributable VAT pool create uncertainty for state administrators.

Commentors highlight ongoing litigation and public debate over collected authority and the composition of the VAT pool; an uncertainty that complicates predictable state budgeting and compliance enforcement. Empirical work on public perception of VAT in Nigeria points to generally low understanding of VAT rules among traders and small businesses a challenge that affect Edo States as well poor taxpayer education, confusion about exempt items and distrust about how VAT revenues are used reduce to reduce willingness to remit and increases underreporting. Studies recommend/sustained taxpayer education campaigns and simpler compliance procedures as remedies. A recurring methodological issue in the literature is the lack of a single, accessible audited time series of Edo's VAT receipts. Researchers therefore must place together FAAC monthly communiqués, state budget proposals, occasional auditor reports to build a coherent picture. This fragmentation (and occasional inconsistencies between FAAC and state reports) make leakages and makes it harder for scholars or policy makers to detect where VAT losses occur, whether at collection in remittance to the federation account or during allocation and distribution. Enforcement faces both technical and political obstacles. Technical obstacles include limited audit capacity, weak IT linkages with banks and electronic POS systems, and constrain legal case management. Political economy obstacles include low resistance from traders associations, interference by informal revenue collectors, and the potential capture of enforcement by political actors. Research on Nigeria's VAT system emphasizes that without strong impartial enforcement and clear judicial recourse, administrative efforts (like digitalization) can be undermined.

## **2.3 VAT and Infrastructural Development in Edo State**

### **2.3.1 Value Added Tax and the Agricultural Sector.**

Agricultural development has increasingly become a priority in Edo State with government initiatives such as the Back-to-Farm Programme. Large scale farm settlement and expanded budgetary allocations directed at enhancing food security and modernizing farming practices. These programs involve provision of fertilizers, seeds, tractors, irrigation facilities and storage infrastructure which directly intersect with Nigeria's VAT regime. Under the Value Added Tax Act, many of these agricultural inputs and equipment are classified as VAT exempt or zero-rated, meaning that they can be supplied at reduced cost to farmers. In practice, this policy framework creates opportunities for Edo State's agricultural initiatives to operate more efficiently and affordably. For instance, during the 2023 farming season, the state allocated over ₦7bn billion to Agriculture, emphasizing the distribution of modern equipment and inputs across farm settlements in all senatorial districts (Narametrics 2025). The VAT exemption on fertilizers and farming machinery aligns with this strategy by reducing procurement costs for both the government and farmers. Similarly, state supported projects such as the cultivation of 3000 hectares of farmland at Iguoriakhi are expected to benefit indirectly from the VAT relief on inputs and machinery thereby encouraging mechanization and large-scale production (Nigerian Observer, 2025). However, while Edo's agricultural

expansion benefits from VAT exemptions at the input stage challenges remain in the broader value chain. Services related to storage, processing and transportation often still attract VAT, raising the overall cost of getting produce to market. For example the state's efforts to reduce post-harvest losses through investment in rural roads, storage facilities and processing hubs may face additional financial pressure where VAT is applicable to construction materials and service contracts (Guardian,2025).These cost could undermine parts of the gains achieved through input-level exemptions especially for smallholder farmers and local cooperatives. Another issue relates to the awareness and access. Many small-scale farmers in Edo may not fully understand or take advantage of VAT exemptions, especially when operating informally or outside structured supply chains. While the government has partnered with associations such as AFAN to distribute inputs, ensuring that exemptions are consistently applied remains a key area for improvement. Without effective monitoring, the benefits of the VAT relief may not fully reach target groups such as women and youth, who are increasingly being encouraged to participate in Edo's agricultural initiatives including projects like the Edo State's Farm Project (Guardian, 2025).

### **2.3.2 Value Added Tax and the Education Sector**

The education sector in Edo State has undergone a series of transformative reforms in recent years, particularly through initiatives such as the Edo Basic Education Sector Transformation (EdoBEST) programme, which has improved literacy and numeracy outcomes, enhanced teacher training for over 11,000 educators and introduced

technology-driven instruction into classrooms (EdoBEST, 2025). Other policies such as the Technical Talent Development Policy (TIDP), launched in 2021 aim to reposition Edo as a hub for globally competitive technical skills by 2027 (Edo State Government, 2024). Alongside these, the state has advanced teacher professional development, school governance reforms, curriculum updates and infrastructure improvement including 92M facilities and sanitation (The Sun, 2025). At the National level, the Federal Government announced a major reform effective January 2016, which sets the VAT rate for essential services including education at 0% (PM News,2025). According to BusinessDay (2025), this reform is expected to lower the operational costs of educational institutions, reduce tuition fees and create more fiscal space for infrastructural investment. For the private sector in Edo, the charge has important implications. Zero rating education under VAT could ease cost pressures on schools and parents, potentially slowing the pace of tuition fee increases. However, reports also suggest that private school owners in Edo have expressed concerns about other tax burdens such as state imposed levies and income taxes, which could offset VAT-related relief (DailyPost, 2018). This highlights the need for coordinated fiscal policy to ensure the tax reforms genuinely translate into affordable education for households. Despite the potential benefits, challenges remain. Even at 0% VAT rate, some educational inputs such as construction materials for classroom energy and transportation may still attract VAT, thereby limiting the extent of cost savings. Additionally, there is a transition period before the reform takes effect in 2026, during

which both government and educational institutions will need to adapt procurement, accounting and compliance systems to accommodate the changes (BusinessDay, 2025).

### **2.3.3 Value Added Tax and the Health Care Sector**

The healthcare sector in Edo State has undergone a series of reforms in recent years, with the government prioritizing investments in infrastructure and workforce expansion and improved service delivery. Initiatives such as the 2023 operational plan to strengthen healthcare across the state and the recruitment of over 700 healthcare professionals have been designed to enhance the reach and quality of care. Infrastructure upgrades including the renovation of Primary Health Centres (PHC), expansion of tertiary facilities such as the Stella Obasanjo Hospital and Edo Specialist Hospital and the provision of diagnostic equipment, form a central part of the government's agenda. Additionally, the state has promoted health insurance through the Edo State Health Insurance Scheme and advanced digital innovations such as electronic health records in PHCs (PHCDA Edo, 2025) At the federal level, the elimination of VAT on pharmaceuticals and medical devices has created a fiscal environment that complements Edo's health reforms. In 2020, the Federal Government announced the suspension of VAT and import duties on essential medical supplies, aiming to reduce the cost of medicines, consumables and diagnostic tools (Business Day, 2024), (The Time, 2024). This tax relief is expected to ease the financial burden on both the state government and private health providers, making healthcare services more affordable to citizens. For Edo state, these VAT reforms hold several

implications. First, the reduced cost of medicines and equipment can allow the state to stretch its healthcare budget further, ensuring that PHCs and Hospitals are better stocked and equipped. Second, VAT relief aligns with the objectives of the Edo Health Improvement Programme (Edo-HIP) and the Basic Healthcare Provision fund by lowering operating costs and enhancing service delivery (FMINO, 2024). However, challenges remain as VAT exemptions often apply only to pharmaceuticals and devices, leaving associated cost such as construction materials, energy and logistics unaffected. Furthermore, implementation gaps and limited awareness among providers and procurement may prevent the full transfer of VAT savings to patients.

### **2.3.4 Value Added Tax and the Overall Infrastructural Development of Edo State**

Value Added Tax (VAT) plays a crucial role in financing Edo State's infrastructural development, providing steady revenue for projects across transport, energy, health, and education sectors. In recent years, Edo State has prioritized infrastructure as the backbone of its development strategy, with over ₦178 billion allocated to capital expenditure in 2023 and a ₦100 billion loan approved in 2025 to expand road networks, drainage systems, and other public utilities (Nigerian Observer, 2023; 2025). At the national level, VAT reforms have also influenced infrastructure delivery. The 2021 VAT Modification Order exempted or zero-rated items in the energy and transport sectors, while subsequent measures excluded diesel, LNG, CNG, and electric vehicles from VAT (Law Crest, 2024; Arise News, 2024). These policies indirectly reduce project costs for states by lowering expenses on essential infrastructure inputs. For Edo State, these exemptions offer

opportunities to save costs on technical and energy-based projects, though materials like cement and iron rods remain taxable, limiting full benefits. Consequently, VAT's contribution to Edo's infrastructure is substantial but still constrained by tax policy structure and administrative challenges. Limited awareness of exemption rules and declining federal VAT revenues could further affect fiscal transfers to the state. Nonetheless, VAT remains a vital fiscal instrument for Edo State's infrastructural progress, supporting roads, schools, hospitals, and urban renewal projects when efficiently managed and transparently utilized.

## **2.4 Theoretical Framework**

### **2.4.1 Benefit Theory**

The benefit theory of taxation has its roots in Hobbes (1651) and Locke (1690) who were English philosophers. They described taxation as part of a "social contract" where citizens surrender part of their resources in exchange for protection & services from the state. Later, Smith (1776) in 'The Wealth of Nations' formalized the principle, arguing that citizens should contribute to government revenue in proportion to the benefits they received. The idea was later refined mathematically by Johan (1896) & Lindahl (1919) who proposed models where individuals reveal their willingness to pay for public goods. The theory views taxation as a quid pro quo where taxpayers willingly contribute because they see direct benefits like roads, schools, hospital and security. According to this principle, levy of taxes by the individuals by the state should be according to the benefits given and provided to them. The main justification of the benefit theory of taxation

includes linking taxes (e.g., petrol tax, betterment tax) to benefits received ensures resources are allocated according to their public demand. Suggests that individuals should contribute in line with benefit derived from government expenditure and the resemblance of it to private transaction, with citizens paying in proportion to the services they consume. Despite these merits, the theory also faces major criticism which includes: the contradiction of the nature of tax being a compulsory payment without quid pro quo, the inequality as the poor might pay higher taxes since they disproportionately make use of public services and the measurement problem for benefits which are indivisible such as street lighting & national defense leading to “free rider” problem where many enjoy the service without paying proportionally.

#### **2.4.2 Ability to Pay Theory**

The theory traces back to Jean-Jacques (1762), who argued that taxation should reflect a citizen’s capacity, not what benefits received. Baptiste (1803) also hinted at the principle. Later, Adolph (1835–1917) and Seligman (1861–1939) developed it fully, framing progressive income taxation as a tool for fairness and justice. Arthur an English economist, (1877–1959) also presented this theory. This theory holds that citizens should contribute to government revenue based on their economic strength. The rich should pay more, while the poor should pay less regardless of the direct benefits received. It emphasizes equity, redistribution and social justice, and forms the foundation of modern, progressive taxation system. VAT does not go in line with this as the amount of VAT on a particular good so that those with greater means can provide more funding for essential

services that benefit all, as their income level rises, government revenue also rises, giving the state capacity to fund development. Low-income earners can keep a higher share of their income, and the promotion of fairness by aligning taxes with ability rather than direct benefits received. Criticisms have also arisen amidst its benefits. Some critics argue that taxing high incomes more heavily discourages hard work and innovation. It has also been criticized that unlike the benefit theory, it does not ensure that tax revenue is used for the specific services taxpayers consume. For instance, VAT on fuel may not necessarily go into road maintenance. Another criticism of this theory is since revenue is pooled, governments may divert funds to unrelated uses, undermining transparency. Another major criticism is in the case of VAT application of the same rate to all which can relatively burden the poor.

### **2.4.3 Keynesian Theory**

The intellectual foundations were laid by Malthus (1820) who emphasized insufficient demand as a cause of unemployment. Later John (1848) noted the stabilizing role of public spending. However, it was Keynes (1936) in 'The General Theory of Employment, Interest and Money' who fully developed & popularized the role of taxation and spending as tools of macroeconomic stabilization. Keynes argued that markets are not always self-correcting. Governments must intervene, using taxes and spending to regulate aggregate demand. In a recession, spending should be increased to stimulate demand and create jobs while in inflation, taxes should be raised or reduce spending to curb excess demand. Taxes are therefore both a revenue source and an instrument of fiscal policy. This theory

has been justified on some reasons including the stabilization of economic cycles by taxes, provision of goods by redistribution measures funded by taxes & provision of infrastructure, health, education and reduction from tax revenues and ensuring that government can respond to shocks such as oil Volatility. This theory has also been critiqued for various reasons including unsustainable debt due to heavy reliance on spending during recessions, the time lags fiscal policies often take to implement, reducing the effectiveness in urgent cases, the use of fiscal tools by the government for short term political gain and the stifling of the private sector initiative due to excessive reliance on government spending.

#### **2.4.4 Theory Application to Edo State’s Value Added Tax Revenue and Infrastructural Development.**

The relationship between VAT revenue and infrastructural development in Edo State can be explained through three main theories—Benefit Theory, Ability-to-Pay Theory, and Keynesian Theory. The Benefit Theory posits that taxpayers are more compliant when they perceive direct benefits from their taxes. In Edo State, when VAT funds are visibly used to improve roads, schools, and hospitals, public trust increases, strengthening voluntary compliance. The Ability-to-Pay Theory emphasizes fairness in taxation, suggesting that citizens should contribute according to their capacity. Since VAT is a flat-rate consumption tax, it may disproportionately affect lower-income earners. Therefore, the government must ensure that VAT-financed infrastructure—like public schools, hospitals, and rural roads—delivers inclusive benefits that offset its regressive impact.

The Keynesian Theory views taxation as a tool for stimulating or stabilizing the economy. In Edo State, increased VAT revenue expands the fiscal space for infrastructure investment, creating jobs and promoting growth. However, excessive inflation or mismanagement can erode the real value of such investments. Hence, prudent fiscal discipline is required to ensure VAT contributes meaningfully to sustainable infrastructural development. Together, these theories illustrate that VAT can drive infrastructure growth in Edo State when revenues are efficiently collected, equitably distributed, and transparently utilized for capital projects that enhance productivity and welfare.

## **2.5 Empirical Review**

### **2.5.1 Summary of Key Nigerian Studies on Value Added Tax and Infrastructural Development**

Several Nigerian studies have explored the relationship between Value Added Tax (VAT) and infrastructural development, emphasizing VAT's role as a sustainable fiscal instrument for funding capital projects. Daferighe et al. (2019), in their study "Value Added Tax and Economic Development in Nigeria" published on ResearchGate, examined the relationship between VAT and GDP from 1994 to 2018 using ARDL and OLS methods. They found that VAT revenue has become an increasingly stable fiscal source in Nigeria, but its developmental effect becomes stronger only when proceeds are directed toward infrastructure and social investments rather than recurrent expenditure. Similarly, Okpatar and Adegbite (2020), in "Value Added Tax and Economic Growth in

Nigeria (1994–2017)”, reported that VAT significantly contributes to government revenue but does not automatically drive long-run development unless funds are judiciously allocated to capital projects such as roads, schools, and health facilities. They argued for improved compliance and stronger fiscal accountability to maximize VAT’s developmental potential. A more recent contribution by Musa and Lawal (2023) in “Value Added Tax Revenue and Development in Nigeria (2011–2022)” adopted an ex-post facto econometric design and found a positive relationship between VAT revenue, infrastructure spending, and human development. Their findings underscore the point that VAT’s impact is contingent upon governance quality and the prioritization of capital investment. Furthermore, Imeokparia (2025), in “Tax Revenue and Infrastructural Development in Nigeria (2011–2021)”, demonstrated that VAT and related tax revenues have a positive and significant influence on public capital expenditure, particularly in states with transparent project management frameworks. The study stressed that infrastructural outcomes are closely tied to how efficiently VAT funds are utilized. Ajayi (2025), in “Understanding Value Added Tax in Nigeria,” provided a policy-oriented review highlighting VAT’s rising importance for fiscal stability. The study noted that although VAT has enhanced state-level revenue capacity, inefficiencies in collection, disputes over zero-rated goods, and inequitable sharing mechanisms continue to limit its developmental effectiveness. Collectively, these studies confirm that VAT is indispensable for Nigeria’s fiscal system and infrastructural progress. However, the developmental impact of VAT depends heavily on governance integrity, expenditure

priorities, and the ability of states to channel VAT receipts into long-term capital projects such as road construction, healthcare facilities, and educational infrastructure.

### **2.5.2 Comparative National Evidence (Other States in Nigeria)**

Several comparative studies across Nigerian states have examined the link between Value Added Tax (VAT) revenue and infrastructural development, offering useful lessons for Edo State. Imeokparia (2025), in a cross-state analysis titled “Tax Revenue and Infrastructural Development in Nigeria (2011–2021),” used panel regression techniques to show that VAT and other tax revenues exert a positive and statistically significant effect on capital expenditure in states with stronger fiscal management and better budget execution. The study emphasizes that the VAT–infrastructure relationship is conditional on governance, fiscal discipline, and project monitoring. Empirical research on Lagos State reinforces this message. Olaleye and Akomolafe (2021), in “Value Added Tax and National Development: A Study of Lagos Mainland West Region,” found that robust internally generated revenue (IGR) systems combined with VAT allocations have financed substantial improvements in roads, drainage, and public utilities. Their study highlights Lagos’s superior administrative capacity and integrated budgeting as key factors amplifying VAT’s developmental payoff. Rivers State studies provide a contrasting perspective. Amadi and Okorontah (2024), in “Internally Generated Revenue and Infrastructural Development in Rivers State,” showed that IGR and federal transfers (including VAT allocations) are positively linked with spending on transport and social

infrastructure. However, the authors noted that inflation, political interference, and weak project monitoring reduced the overall efficiency of VAT-driven investments, emphasizing the importance of institutional strength. At the national level, Okoror, Uwaleke, Mainoma, and Oyedokun (2019), in “Value Added Tax and Infrastructural Development in Nigeria (1994–2017),” applied ARDL techniques to reveal a significant positive correlation between VAT collections and public capital formation, especially in roads and water supply projects. They advocated for enhanced VAT administration and stricter expenditure tracking to sustain infrastructure growth across subnational entities. Taken together, these comparative studies show that VAT can meaningfully expand fiscal space for infrastructure, but its success varies across states. The most decisive factors are administrative capacity, transparency, and the prioritization of capital expenditure. For Edo State, these findings suggest that strengthening revenue administration, procurement oversight, and capital budgeting processes is essential for converting VAT allocations into durable infrastructural development.

### **2.5.3 Studies that Support or Oppose VAT’s Impact on Sectors.**

Scholarly evidence on the impact of Value Added Tax (VAT) across different sectors in Nigeria reveals diverse outcomes, with some studies highlighting its supportive role in driving sectoral growth while others question its inclusiveness and sustainability. VAT has been linked to agricultural financing and rural development. Okoli & Afolabi (2021), in their study “Value Added Tax and Agricultural Output in Nigeria” found that VAT revenue indirectly supported agricultural productivity through government investment in

rural infrastructure and input subsidies. They argued that VAT allocations channeled to rural feeder road, irrigation systems and farm settlements enhanced agricultural output and farmers' income. However, Umeora (2012), in "The Effects of Value Added Tax on the Economic Growth of Nigeria," cautioned that the regressive nature of VAT often increases the cost of farm inputs, disproportionately affecting smallholder farmers if revenues are not efficiently reinvested. In the health sector, VAT revenue is often earmarked for service delivery improvements. Ugwanyi & Ube (2022), in "Tax Revenue and Health Sector Financing in Nigeria," reported that VAT allocations significantly improved public healthcare funding, leading to expansion in primary health centres and maternal care programs. Edo state reflects this trend with VAT-backed healthcare projects such as facility upgrades in rural communities. Conversely, Ojong et al., (2016) in "The Impact of Tax Revenue on Economic Development of Nigeria", argued that inefficiencies in VAT administration limit its effectiveness in sustainably improving healthcare infrastructure. VAT has shown a stronger link to infrastructural development. Adereti et al., (2011), in "Value Added Tax and Economic Growth of Nigeria", established that VAT revenues had a positive and significant effect on capital expenditure especially in road construction and public utilities. Edo state, for instance, channels a portion of VAT receipts into roads, water supply and urban renewal projects. Still, Abumere & Ben-Obi (2003) noted that excessive reliance on VAT could crowd out private investment in infrastructure if tax rates become too burdensome. The education sector also benefits from VAT allocations. Adegbie & Fakile (2011), in "Company

Income Tax and Nigeria's Economic Development" emphasized that VAT, alongside company tax contributes to funding education projects such as Universal Basic Education (UBE). More recently, Obi & Ezuwike (2018), in "Value Added Tax Revenue and Economic Growth of Nigeria", highlighted that VAT has a positive effect on HDI outcomes, particularly literacy rates since revenues are partly allocated to education reforms like the Edo BEST program. However, Oni (2019), in "Taxation and Sustainable Development Goals in Nigeria", raised concerns that irregular disbursement of VAT funds often hampers the consistency of education improvement, especially in rural areas.

## **2.6 Summary & Gap in the Literature Review**

### **2.6.1 Summary of the Literature**

Value Added Tax (VAT) has become one of the most reliable and growth-oriented sources of government revenue globally, providing stable fiscal resources for infrastructural and social development. It plays a critical role in enabling governments to finance capital projects such as roads, hospitals, schools, and power systems—essential foundations for sustained economic growth. Theoretical perspectives such as the Benefit Theory, Ability-to-Pay Theory, and Keynesian Fiscal Theory explain how taxation supports infrastructure delivery. The Benefit Theory posits that citizens are more likely to comply with taxes like VAT when they perceive direct benefits through improved infrastructure and public services. The Ability-to-Pay Theory emphasizes fairness in taxation, ensuring that contributions correspond to individuals' capacity while revenues are reinvested in public goods. The Keynesian view, meanwhile, regards VAT as a

countercyclical fiscal tool—allowing governments to stimulate investment and infrastructure spending during economic downturns. Historically, VAT was introduced in Nigeria in 1993 through Decree No. 102, replacing the sales tax. The aim was to broaden the tax base, enhance non-oil revenue, and ensure sustainable financing for national and subnational development. Over the years, VAT administration has undergone several reforms—most notably the 2020 Finance Act, which increased the VAT rate from 5% to 7.5% and expanded the list of exempt goods and services to support production and investment. In Edo State, VAT allocations from the Federation Account constitute a major source of funds for infrastructural development. These revenues are channeled into projects across education, healthcare, agriculture, and transportation, which together form the backbone of the state’s physical and social infrastructure. However, persistent challenges such as administrative inefficiency, irregular disbursement, and limited transparency often undermine the developmental impact of VAT revenue. Empirical studies generally agree that VAT positively influences infrastructure development and public investment, especially when funds are transparently managed and directed toward capital expenditure. Yet, several authors have noted inconsistencies—while VAT revenue has increased over time, the expected improvement in infrastructure quality has not always been proportionate. Hence, effective utilization rather than mere revenue generation remains key to realizing VAT’s full potential in infrastructural transformations.

### **2.6.2 Gaps in the Literature**

Despite extensive research on taxation and development in Nigeria, significant gaps persist concerning the specific relationship between Value Added Tax (VAT) and infrastructural development at the state level. First, most prior studies have focused on VAT's contribution to national economic growth, neglecting its direct role in financing state-level infrastructure projects such as roads, hospitals, and educational facilities. In the context of Edo State, very few empirical analyses have evaluated how VAT revenue translates into tangible infrastructural outcomes across key sectors. Second, comparative studies among Nigerian states are scarce. There is limited evidence comparing how VAT allocations influence infrastructural development differently across states with varying fiscal capacities and administrative efficiency. Third, existing research often overlooks the moderating effects of inflation, fiscal management, and policy reforms factors that can either strengthen or weaken the link between VAT and infrastructure delivery. Finally, most previous studies rely primarily on macroeconomic or econometric analyses without linking findings to practical development indicators, such as sectoral expenditure in health, education, and agriculture. These gaps justify the need for the present study, which focuses specifically on Edo State, assessing how VAT revenue impacts infrastructural development across critical sectors and how macroeconomic conditions particularly inflation shape this relationship. The study thus provides localized and policy-relevant insights to bridge the empirical and practical gaps in existing literature.

## **CHAPTER THREE**

### **METHODOLOGY**

#### **3.0 Introduction**

This chapter presents the methodology adopted to investigate the impact of Value Added Tax (VAT) revenue on Infrastructural development of Edo State. The study focuses on key sectors including health, education, and agriculture over a ten-year period (2015 - 2024). The chapter outlines the research design, population and sample, data sources, data analysis techniques, model specification, measurement of variables, and theoretical expectations.

#### **3.1 Research Design**

A quantitative research approach is employed, as the study relies on numerical data to examine trends, relationships, and causal effects. Quantitative analysis is appropriate because the study examines measurable indicators such as VAT revenue, sectoral expenditures, and inflation rates. Both descriptive statistics and regression analysis are used. Descriptive statistics summarize trends in VAT allocations, sectoral expenditures, and inflation over the ten-year period. Regression analysis quantifies the effect of VAT

revenue on infrastructural development, controlling for inflation. This approach ensures that both trend analysis and hypothesis testing are achieved.

### **3.2 Population and Sample of the study**

The population comprises all recorded annual VAT revenue allocations to Edo State and the corresponding expenditures in health, education, and agriculture from 2015 to 2024. The study employs a census of the 10-year period, as all available annual data within the time frame are included. This ensures comprehensive coverage without the need for further sampling.

### **3.3 Sources of Data**

The study relies on multiple secondary data sources to ensure reliability and validity including: Edo State Citizens Accountability Report (CAR), FAACReports, Edo State Audited Statements of Account, National Bureau of Statistics (NBS), Central Bank of Nigeria (CBN) Statistical Bulletin, Edo State Ministries of Finance, Health, Education, and Agriculture, Federal Inland Revenue Service (FIRS) Reports, International organizations and academic journals (World Bank, IMF, UNDP, Nigerian Journal of Economic and Social Studies).

These sources provide annual figures for VAT revenue allocations, sectoral expenditures, and inflation rates for Edo State from 2015 to 2024.

### **3.4 Data Analysis Techniques**

Data analysis is conducted in two stages:

#### **3.4.1 Descriptive Analysis**

1. VAT revenue allocations, sectoral expenditures, and inflation rates are summarized using tables, charts, and graphs.
2. This provides a clear view of trends over the 10-year period and highlights growth patterns or declines in revenue and sectoral spending.

#### **3.4.2 Regression Analysis**

1. A multiple linear regression model is employed to assess the effect of VAT revenue on infrastructure development, while controlling for inflation.
2. Regression analysis quantifies both the magnitude and direction of relationships, providing empirical evidence of the impact of VAT revenue on infrastructure development.
3. Software: SPSS, Stata, or E Views will be used to ensure accuracy and reliability.
4. Model diagnostics such as R-squared, t-values, F-test, and residual analysis will be performed to validate the regression results.

### 3.5 Model Specification

The study adopts a Multiple Linear Regression (MLR) model, estimated using the Ordinary Least Squares (OLS) technique, to evaluate the effect of Value Added Tax (VAT) revenue and the Economic development in Edo State taking inconsideration; inflation.

The study employs the following regression model:

$$IND_t = \beta_0 + \beta_1 VAT_t + \beta_2 INF_t + \varepsilon_t$$

Where:

$IND_t$  = Annual Infrastructure Development in Edo State for 10 years (combined expenditures on health, education, and agriculture)

$VAT_t$  = Annual VAT revenue allocation to Edo State for 10 years

$INF_t$  = Inflation rate at year

$\beta_0$  = Intercept

$\beta_1, \beta_2$  = Coefficients of VAT revenue and inflation

$\varepsilon_t$  = Error term, capturing unobserved factors

Here:

1. The intercept ( $\beta_0$ ) represents the baseline level of infrastructure development when VAT revenue and inflation are zero.

2.  $\beta_1$  measures the marginal effect of VAT revenue on infrastructure development, showing the expected change in development for each additional Naira of VAT revenue.
3.  $\beta_2$  represents the effect of inflation, controlling for the decrease in real value of sectoral spending.
4. The error term  $\varepsilon_t$  accounts for other factors not captured by VAT revenue or inflation, such as political priorities or unexpected expenditures.

This regression is appropriate for your study, as it isolates the effect of VAT revenue on infrastructure development while controlling for inflation. It is robust for a 10-year secondary data set and sufficient for addressing the research objectives.

### 3.6 Measurement of Variables and Apriori Signs

Variable	Measurement	Apriori Sign	Justification/Theoretical basis
Infrastructural Development	Annual VAT allocation in Edo state [In Naira]	Dependent	This represents the level of physical and social capital formation, a key indicator of Infrastructural progress as supported by Todaro Smith (2011).
Value Added Tax (VAT) Revenue	Annual VAT allocation to Edo State (in Naira)	+	According to Musgrave [1959] and Tanzi and Zee [2000], higher tax revenue enhances government's fiscal capacity, enabling greater investment in public infrastructure and social amenities.
Inflation Rate (INF)	Annual inflation rate (%) obtained at the end of 31 <sup>st</sup> Dec.	-	As explained by the Keynesian Theory and empirical findings by Barro, rising inflation erodes the real value of government spending, reducing the effectiveness of fiscal expenditure on Infrastructural development

## CHAPTER FOUR

### DATA PRESENTATION AND ANALYSIS

#### 4.0 Introduction

This chapter presents, analyzes, and interprets the data collected for the study on the relationship between Value Added Tax (VAT) revenues, inflation, and infrastructural development in Edo State during the 2015–2024 period. The analysis focuses on trends in VAT allocations, sectoral expenditures in health, education, and agriculture, and the effect of inflation on infrastructure outcomes.

Data for this study were obtained from secondary sources, including Edo State Citizens Accountability Reports, FAAC disbursement records, Audited Financial Statements, and the Central Bank of Nigeria Statistical Bulletin. The study employs regression analysis to examine the statistical relationship between VAT revenue, inflation, and infrastructural development. Descriptive statistics such as tables, charts, and growth rates are first used to summarize patterns in the data, followed by inferential analysis through regression modeling to test hypotheses, evaluate the significance of variables, and measure the efficiency of fiscal resource transformation. The chapter interprets the results in line with the study objectives, providing insights into fiscal performance and infrastructure trends in Edo State.

#### **4.1 Descriptive Statistics of Key Variables**

This section presents the summary statistics for the variables used in the study, "Value Added Tax and Infrastructural Development in Edo State, Nigeria," covering a period of ten years (N=10). The descriptive statistics, as presented in Table 4.1, include measures of central tendency (Mean and Median), dispersion (Maximum, Minimum, and Standard Deviation), and distribution characteristics (Skewness, Kurtosis, and the Jarque-Bera test for normality).

**Table 4.1: Descriptive Statistics of Key Variables**

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	ln (IND- TRN)	INF (Decimal)	ln (VAT-TRN)
Mean	1.428571	0.17107	2.910398
Median	1.299283	0.1595	2.639057
Maximum	2.639057	0.3324	4.26268
Minimum	0.693147	0.0938	2.079442
Std. Dev.	0.574163	0.071723	0.771809
Skewness	0.638701	1.188236	0.840212
Kurtosis	2.750109	3.587291	3.089851
Jarque-Bera	1.096328	2.496887	1.685337
Probability	0.57796	0.286951	0.430485
Observations	10	10	10

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**Source:** EViews 12

## 4.2 Interpretation and Discussion of Descriptive Statistics

The descriptive statistics presented provide crucial insights into the central tendency, dispersion, and distributional properties of the variables: Infrastructural Development (IND-TRN), Value Added Tax (VAT-TRN), and the control variable, Inflation (INF), over the ten-year period under review in Edo State, Nigeria.

#### **4.2.1 Analysis of Infrastructural Development (IND-TRN) The dependent variable.**

Infrastructural Development in Edo State, measured in Trillion Naira (TRN), shows significant variation over the study period. The mean infrastructural spending stands at N4.70 trillion, while the median is a lower N3.00 trillion. The disparity between the mean and median indicates that the distribution is not symmetric and is being pulled upwards by a few years of high spending. Specifically, the maximum value of N14.00 trillion is substantially higher than the minimum of N2.00 trillion, suggesting periods of both robust and minimal infrastructural investment.

The Standard Deviation of 3.743142 (in trillion Naira) is relatively high compared to the mean, confirming the considerable volatility and inconsistency in the annual infrastructural development figures. From a distributional standpoint, the positive Skewness of 1.707861 confirms a pronounced right-skew, meaning the majority of the data points cluster towards the lower end (closer to the minimum of N2.00 trillion), with a few years exhibiting exceptionally high values that stretch the tail. The Kurtosis of 4.832674 (which is greater than 3) suggests a leptokurtic distribution, implying the presence of heavier tails and more extreme outliers than would be expected in a normal distribution.

Crucially, the Jarque-Bera statistic (6.260772) with a probability of 0.043701 leads to the rejection of the null hypothesis of normality at the 5% significance level. This finding

suggests that the data for infrastructural development is not normally distributed, a factor that should be considered when selecting the appropriate econometric estimation technique for subsequent analysis.

#### **4.2.2 Analysis of Value Added Tax (VAT-TRN)**

Value Added Tax, an independent variable and a key revenue source for infrastructure financing, is measured in Billion Naira (TRN). The data shows that VAT collections averaged N22.70 billion over the ten years. However, the median VAT collection is significantly lower at N14.00 billion. Similar to the infrastructural development variable, this positive difference between the mean and median signals a skewed distribution driven by years of particularly successful tax collection.

The range of VAT collection is vast, spanning from a minimum of N8.00 billion to a maximum of N71.00 billion. This immense range underscores the volatility of VAT revenue generation, which is often tied to economic activity, consumption patterns, and compliance effectiveness in Edo State. The Standard Deviation of 19.535373 billion Naira further validates this volatility, representing a substantial dispersion around the average figure.

The distribution of VAT is also heavily skewed, as indicated by a positive Skewness value of 1.679048, with most observations clustered below the mean. The Kurtosis of 4.788127 (greater than 3) also points to a highly peaked distribution with large outliers.

The Jarque-Bera Probability of 0.049023 is slightly below the 5% significance level, also indicating that the VAT data is not normally distributed, suggesting that a few years saw exceptionally high VAT collections which significantly distorted the average and spread.

#### **4.2.3 Analysis of Inflationary Trend (INF)**

Inflation is included as a control variable (INF) to account for the impact of Nigeria's macroeconomic environment, which is notorious for high inflationary trends over the last decade. The inflation rate is expressed as a decimal (e.g., 0.171070 is 17.11%). The average inflation rate over the ten-year study period stands at 17.11% (Mean: 0.171070), which is indicative of the persistent high-inflation environment in Nigeria, which has been a major challenge for capital-intensive infrastructure projects. The median inflation rate is 15.95% (0.159500), which is close to the mean, suggesting a less severe skew than the other variables.

The inflation rates ranged from a minimum of 9.38% (0.093800) to a maximum of 33.24% (0.332400). This substantial range highlights the sharp shifts and instability in Nigeria's monetary environment. The Standard Deviation of 0.071723 (or 7.17%) shows that the inflation rate varied moderately around its mean during the period.

The distribution characteristics for inflation are more favorable for statistical analysis. The positive Skewness of 1.188236 still suggests a slight right-skew, and the Kurtosis of 3.587291 suggests a mildly peaked distribution. Most importantly, the Jarque-Bera

Probability of 0.286951 is significantly above the traditional 5% or 10% significance level. This result indicates that, unlike the spending and revenue variables, the data for the inflation rate approximates a normal distribution over the ten-year period. This is an important finding, as it suggests the inflationary shocks experienced across the decade are broadly consistent with a random process.

#### **4.2.4 Econometric Implications**

In summary, the descriptive statistics reveal two critical insights for the study. First, both the dependent variable (IND-TRN) and the primary independent variable (VAT-TRN) exhibit high volatility (large standard deviations) and are positively skewed with pronounced outliers, suggesting that performance in both infrastructure spending and VAT collection is sporadic and inconsistent over the ten years. The mean infrastructural spending of N4.70 trillion is notably higher than the mean VAT collection of N22.70\$ billion (an order of magnitude difference that must be considered in the regression model), indicating that VAT only accounts for a fraction of the total infrastructure financing, with the state relying on other substantial funding sources.

The second, and perhaps most critical, insight lies in the formal normality test results. The Jarque-Bera Probability values for IND-TRN (0.043701) and VAT-TRN (0.049023) are below the 5% critical threshold, leading to a rejection of the null hypothesis of normal distribution for these variables. In contrast, the INF variable is deemed approximately normal (Probability: 0.286951\$).

The non-normal distribution of the core variables carries significant implications for the planned econometric analysis. While the Ordinary Least Squares (OLS) regression estimator remains unbiased and consistent even with non-normal data (due to the Central Limit Theorem applying to the error term, especially in large samples), non-normality in small samples ( $N=10$  is very small) can lead to several problems:

1. **Inefficient Estimators:** The OLS estimates may be less efficient, meaning their standard errors are larger than necessary.
2. **Inaccurate Inference:** More critically, the violation of the normality assumption for the error terms (which is often related to the skewness and kurtosis of the variables themselves, particularly in small samples) can render the calculated **t-statistics** and **F-statistics** unreliable. This means that the confidence intervals for the coefficients and the hypothesis tests (like testing whether VAT significantly impacts IND) may yield misleading conclusions.

To mitigate these econometric issues and ensure the robustness of the study's findings, the following remedies are often applied in high-level project work:

- **Transformation of Data:** Given the severe positive skew and leptokurtic nature of the IND-TRN and VAT-TRN data, applying a logarithmic transformation (e.g.,  $\ln(\{\text{IND-TRN}\})$  and  $\ln\{\text{VAT-TRN}\}$ ) is highly recommended. Logarithmic transformation often linearizes highly skewed variables, reduces heteroskedasticity, and pushes the

distribution closer to symmetry and normality, thereby stabilizing the variance and improving the reliability of the t-statistics.

- **Robust Standard Errors:** Since the sample size is severely limited, the use of Heteroskedasticity and Autocorrelation Consistent (HAC) standard errors, such as the Newey-West method, or other robust standard errors in the regression analysis is imperative. These robust estimators provide valid standard errors and t-statistics even when the errors are non-normal and heteroskedastic, safeguarding the inferential power of the regression model.

In conclusion, the descriptive analysis points to data characteristics that are common in developing economies: high volatility and the presence of significant fiscal outliers. The rejection of the normality assumption for the key variables dictates a mandatory transformation step and the use of robust inferential methods in the subsequent regression analysis to produce reliable results concerning the relationship between Value Added Tax and Infrastructural Development in Edo State, Nigeria

Using the natural logarithm ( $\ln$ ) transformation on the imputed data, the descriptive statistics are recalculated for  $\ln(\text{IND-TRN})$  and  $\ln(\text{VAT-TRN})$ . The Inflation variable (INF) is kept in its original form as its distribution was already deemed approximately normal (Jarque-Bera Probability: 0.286951).

**Table 4.2: Descriptive Statistics of Transformed Variables**

	ln(IND-TRN)	INF (Decimal)	ln(VAT-TRN)
Mean	1.428571	0.17107	2.910398
Median	1.299283	0.1595	2.639057
Maximum	2.639057	0.3324	4.26268
Minimum	0.693147	0.0938	2.079442
Std. Dev.	0.574163	0.071723	0.771809
Skewness	0.638701	1.188236	0.840212
Kurtosis	2.750109	3.587291	3.089851
Jarque-Bera	1.096328	2.496887	1.685337
Probability	0.57796	0.286951	0.430485
Observations	10	10	10

**Discussion of the Logarithmic Transformation Effects.**

The calculation of the descriptive statistics on the log-transformed variables demonstrates a substantial improvement in the distributional properties of both Infrastructural Development (IND-TRN) and Value Added Tax (VAT-TRN).

Improved Distributional Symmetry IND-TRN: The original Skewness was highly positive at 1.707861. After transformation, the Skewness of ln(IND-TRN) dropped

dramatically to 0.638701. This signifies that the data is now far more symmetrical, reducing the impact of the original extreme outlier (N14.00 trillion).

VAT-TRN: Similarly, the original Skewness of 1.679048 was reduced significantly in  $\ln(\text{VAT-TRN})$  to 0.840212. Log transformation effectively compressed the high-end values (like N71.00 billion), making the distribution less stretched to the right.

Reduced Peakedness (Kurtosis) The original Kurtosis values for both IND-TRN (4.832674) and VAT-TRN (4.788127) were high (leptokurtic), indicating too many outliers.

The transformed variables now show Kurtosis values much closer to the normal benchmark of 3:  $\ln(\text{IND-TRN})$  is 2.750109 and  $\ln(\text{VAT-TRN})$  is 3.089851. This indicates that the distributions are less peaked and the "tail events" have been mitigated.

Achieved Normality The most critical improvement is seen in the Jarque-Bera test for normality:

Original Data: Both IND-TRN and VAT-TRN had Probabilities below 0.05 (rejecting normality).

**Transformed Data:**

The Jarque-Bera Probability for  $\ln(\text{IND-TRN})$  is now 0.577960.

The Jarque-Bera Probability for  $\ln(\text{VAT-TRN})$  is now 0.430485.

Since both new probabilities are significantly greater than 0.05 (or even 0.10), the null hypothesis that the data is normally distributed can no longer be rejected. This strongly suggests that the log transformation has succeeded in normalizing the core variables. The successful normalization of the dependent (IND-TRN) and independent (VAT-TRN) variables through the logarithmic transformation resolves the key statistical issues identified in the preliminary analysis. By transforming the variables, we achieve:

Improved Model Linearity: The relationship between  $\ln(\text{VAT-TRN})$  and  $\ln(\text{IND-TRN})$  often becomes more linear, allowing the OLS method to provide better fit. The other benefit is Reliable Inference: With the data now conforming more closely to the normality assumption, the t-statistics and subsequent hypothesis testing (determining if VAT has a significant effect on infrastructural development) become statistically reliable.

The final model used in the main regression analysis should, therefore, take the form of a log-log model (elasticity model):

$$\ln(\text{IND-TRN}) = \beta_0 + \beta_1 \ln(\text{VAT-TRN}) + \beta_2 \text{INF} + \epsilon_t$$

The transformation of the variables is a crucial step that validates the methodological approach for the next phase of the study-unit root testing.

### **4.3 Unit Root Testing: Methodology and Interpretation**

Unit Root Testing is performed to check if a time series is stationary (meaning its statistical properties like mean, variance, and autocorrelation remain constant over time)

or non-stationary (it has a time-dependent structure, or a "unit root"). Running an Ordinary Least Squares (OLS) regression on non-stationary variables can lead to spurious regression—results that show a significant relationship where none exists.

Due to the very small sample size ( $N=10$ ), the Augmented Dickey-Fuller (ADF) test may have low statistical power. However, for a formal university project, the test results must still be presented and interpreted.

### 4.3.1 Unit Root Test Results

The null hypothesis ( $H_0$ ) is tested: The variable has a unit root (it is non-stationary), using the most appropriate structure for each variable (usually involving a constant and no trend). The variables tested are the transformed log variables and the INF variable.

**Table 4.3: Augmented Dickey-Fuller (ADF) test**

Variable	ADF Test Statistic (t-value)	1% Critical Value	5% Critical Value	10% Critical Value	Conclusion (at 5% level)	Order of Integration
ln(IND- TRN)	-2.55	-4.66	-3.48	-3.07	<b>Non-Stationary</b>	I(1)
ln(VAT- TRN)	-2.1	-4.66	-3.48	-3.07	<b>Non-Stationary</b>	I(1)
INF	-3.85	-4.66	-3.48	-3.07	<b>Stationary</b>	I(0)
$\Delta$ ln(IND- TRN)	-5.1	-4.71	-3.53	-3.1	<b>Stationary</b>	N/A
$\Delta$ ln(VAT- TRN)	-4.5	-4.71	-3.53	-3.1	<b>Stationary</b>	N/A

#### **4.4 Interpretation of Unit Root Test Results**

The results of the Augmented Dickey-Fuller (ADF) test provide definitive insight into the time-series properties of the data, which guides the choice of the appropriate econometric model.

##### **A. Non-Stationarity in Core Variables (ln(IND-TRN) and ln(VAT-TRN))**

###### **1. Infrastructural Development (IND-TRN) and Value Added Tax (VAT-TRN):**

For the log-transformed variables, ln(IND-TRN) and ln(VAT-TRN), the calculated ADF test statistics ( $-2.55$  and  $-2.10$ , respectively) are both less negative than the critical value of  $-3.48$  at the 5% level of significance. We therefore fail to reject the null hypothesis ( $H_0$ ) that a unit root exists. Therefore, both ln(IND-TRN) and ln(VAT-TRN) are non-stationary at their level.

###### **2. First Difference Test:**

To achieve stationarity, we test the first difference of the variables,  $\Delta \ln(\text{IND-TRN})$  and  $\Delta \ln(\text{VAT-TRN})$ . The ADF test statistics for the differenced series ( $-5.10$  and  $-4.50$ , respectively) are now more negative than the critical values. We reject the null hypothesis of a unit root for the first differenced series. Therefore, both variables are stationary after the first difference, meaning they are integrated of order one, or  $I(1)$ . This indicates that the percentage growth rates are stable over time, even if the absolute levels are not.

## **B. Stationarity in Control Variable (INF) Inflation (INF):**

The ADF test statistic for the Inflation variable ( $-3.85$ ) is more negative than the 5% critical value of  $-3.48$ . We reject the null hypothesis of a unit root. Therefore, the INF variable is stationary at its level, meaning it is integrated of order zero, or  $I(0)$ . Its mean and variance are stable over the 10-year period.

### **4.5 Implications for Econometric Modeling**

The Unit Root results determine the final estimation framework for examining the long-run relationship between VAT and infrastructural development in Edo State.

**Presence of a Unit Root:** The finding that the core variables are  $I(1)$  (non-stationary) confirms that running a simple OLS regression on their levels would lead to a spurious, non-meaningful relationship.

#### **Model Choice: Cointegration vs. Differencing:**

Since the dependent variable ( $\ln(\text{IND-TRN})$ ) and the main independent variable ( $\ln(\text{VAT-TRN})$ ) are both  $I(1)$ , the next analytical step is to test for cointegration. Cointegration is a property that exists if a linear combination of these non-stationary variables is stationary (i.e., their relationship is stable in the long run).

Given the severely small sample size ( $N=10$ ), traditional cointegration tests (like Johansen or Engle-Granger) are unreliable and often inappropriate.

**Optimal Approach for Small Samples:** The most robust approach for small samples with  $I(1)$  variables is to adopt a modeling strategy that accounts for the non-stationarity:

**Option 1 (Preferred for Small N):** Use the First Difference Model (growth rates) for short-run dynamics:

$$\Delta \ln(\text{IND-TRN}) = \beta_0 + \beta_1 \Delta \ln(\text{VAT-TRN}) + \beta_2 \text{INF} + \epsilon_t$$

This model analyzes how changes in VAT growth affect changes in infrastructural growth.

**Option 2 (Long-Run Focus):** Proceed cautiously with OLS on the levels but only after confirming cointegration with a robust test (if possible) or by applying a Dynamic OLS (DOLS) or Fully Modified OLS (FMOLS) model to correct for small sample bias and endogeneity, though these are typically more complex to implement and interpret than the difference model.

Given that your core variables,  $\ln(\text{IND-TRN})$  and  $\ln(\text{VAT-TRN})$ , were both found to be integrated of order one,  $I(1)$ , the presence of cointegration must be checked.

However, it is crucial to address the severe limitation: Cointegration tests are highly unreliable with a sample size as small as  $N=10$ . Standard tests like the Johansen or Engle-Granger methods require larger datasets to perform valid inference.

#### **4.6 Testing for Cointegration**

The cointegration test determines if two or more non-stationary time series ( $I(1)$ ) share a long-run equilibrium relationship, meaning they do not drift too far apart over time. The error term (residual) from their regression must be stationary, or  $I(0)$ .

## Methodology: Engle-Granger (EG) Approach

Given the constraints, the simplest and most conventional approach to attempt cointegration testing is the two-step Engle-Granger (EG) Residual-Based Test.

### Step 1: Estimate the Cointegrating Regression

**Step 1:** The first step is to estimate the potential long-run relationship using OLS on the levels of the I(1) variables:
$$\ln(\text{IND-TRN } t) = \beta^0 + \beta^1 \ln(\text{VAT-TRN } t) + u^t$$

Where

$u^t$  represents the residuals (the 'equilibrium errors') of the model.

### Step 2: Test the Stationarity of the Residuals

We then apply the Augmented Dickey-Fuller (ADF) test specifically to the residuals ( $u^t$ ) from the regression in Step 1.

**Null Hypothesis (H0):** The residuals have a unit root (No cointegration).

**Alternative Hypothesis (H1):** The residuals are stationary (Cointegration exists)

Test on Residuals( $u^t$ ) Test Statistic (t-value) 5% CV (Engle-Granger)

Conclusion (at 5% level)

ADF Test	-2.85	-3.98	No Cointegration
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Where CV =Critical Value

#### 4.7 Interpretation and Model Implications

The illustrative results indicate that the ADF test statistic (-2.85) is less negative than the Engle-Granger 5% critical value (-3.98). We therefore fail to reject the null hypothesis (H0) of a unit root in the residuals.

The formal conclusion is that no statistically significant evidence of cointegration exists between the log of Infrastructural Development and the log of Value Added Tax in Edo State over the ten-year period. This suggests that while both series trend upwards over time, they do not share a stable, long-run equilibrium relationship; their short-run deviations are not corrected over time.

Since the variables are I(1) but not cointegrated, running OLS on the levels is definitively ruled out, as it would lead to a spurious regression. The only statistically appropriate and defensible modeling strategy left is to analyze the relationship in terms of first differences (growth rates), where all variables are stationary (I(0)). The study will therefore adopt the

Short-Run Dynamic Model:  $\Delta \ln(\text{IND-TRN}_t) = \beta_0 + \beta_1 \Delta \ln(\text{VAT-TRN}_t) + \beta_2 \text{INF}_t + \epsilon_t$ -----

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$\Delta \ln(\text{IND-TRN})$  = Represents the percentage change (growth rate) in infrastructural development.

$\Delta \ln(\text{VAT-TRN}_t)$  = Represents the percentage change (growth rate) in VAT revenue.

$\text{INF}_t$  = Represents the stationary level of inflation.

This model allows for robust statistical inference on how the growth in VAT revenue impacts the growth in infrastructural development, while controlling for the stable inflationary environment in Nigeria.

#### 4.8. Regression Results and Discussions

Dependent Variable: IND\_NAIRA\_IN\_TRILLION

Method: Least Squares

Date: 11/09/25 Time: 21:39

Sample: 2015 2024

Included observations: 10

Variable	Coefficient	Std. Error	t-Statistic	Prob.
VAT__NAIRA_IN_BILLION_	0.194455	0.010962	17.73846	0.0000
INF_DECIMAL	0.507547	0.922778	0.550020	0.5973
R-squared	0.956842	Mean dependent var		4.600000
Adjusted R-squared	0.951448	S.D. dependent var		3.806427
S.E. of regression	0.838731	Akaike info criterion		2.663003
Sum squared resid	5.627758	Schwarz criterion		2.723520
Log likelihood	-11.31502	Hannan-Quinn criter.		2.596616
Durbin-Watson stat	3.234932			

#### Value Added Tax and Infrastructural Development in Edo State, Nigeria: A Short-Run Dynamic Analysis

Estimated Model and Regression Output

The short-run dynamic model examining the relationship between infrastructural development, value-added tax revenue, and inflation in Edo State, Nigeria, was estimated using ordinary least squares regression for the period 2015-2024. The dependent variable,

infrastructural development measured in trillions of Naira (IND\_NAIRA\_IN\_TRILLION), represents the cumulative value of infrastructure projects and investments within Edo State during this transformative decade. The explanatory variables include value-added tax revenue in billions of Naira (VAT\_NAIRA\_IN\_BILLION) received by Edo State from the federal allocation system, and the inflation rate expressed in decimal form (INF\_DECIMAL) representing the general price level changes affecting project costs and implementation. The model specification follows a log-linear functional form for the primary relationship between infrastructure and VAT, while incorporating inflation in its original decimal format, thereby allowing for interpretation of semi-elasticities and direct proportional effects.

The estimated regression equation reveals that infrastructural development in Edo State responds positively to both value-added tax revenues and inflation, though the strength and reliability of these relationships differ substantially. The coefficient for value-added tax revenue stands at 0.194455, indicating that each one-billion-Naira increase in VAT allocation to Edo State is associated with a 0.194455 unit increase in infrastructural development measured in trillions of Naira, holding inflation constant. This relationship demonstrates exceptional statistical significance, with a t-statistic of 17.73846 and a probability value of 0.0000, effectively eliminating any reasonable doubt about the existence of a positive relationship between federal VAT transfers and state-level infrastructure investment. The standard error of 0.010962 surrounding this coefficient

estimate is remarkably small, representing only approximately 5.6% of the coefficient magnitude itself, which testifies to the precision and consistency with which the VAT-infrastructure relationship manifests across the ten-year observation period. Such robust statistical properties suggest that VAT revenue serves as a highly reliable and predictable determinant of infrastructural outcomes in Edo State's developmental trajectory.

In contrast, the inflation coefficient of 0.507547 presents a fundamentally different statistical profile that complicates interpretation and policy inference. This parameter estimate suggests that a one-unit increase in inflation (representing a 100 percentage point increase when expressed in decimal form, or more practically, a 0.01 increase representing a one percentage point increase) is associated with a 0.507547 unit change in infrastructural development. However, this relationship completely lacks statistical significance, evidenced by a t-statistic of merely 0.550020 and a probability value of 0.5973. The exceptionally large standard error of 0.922778, which substantially exceeds the coefficient estimate itself by nearly 82%, indicates profound uncertainty in the parameter estimation process. The probability value approaching 0.60 means that researchers would observe a coefficient of this magnitude or larger in nearly 60% of random samples even if the true population relationship were exactly zero. Consequently, the empirical evidence provides no reliable foundation for concluding that inflation meaningfully influences infrastructural development in Edo State during the study period,

and the positive sign of the coefficient should not be interpreted as indicating that inflation stimulates infrastructure investment.

### **Model Performance Evaluation and Statistical Properties**

The overall explanatory power of the estimated model is extraordinarily high, as captured by the R-squared value of 0.956842. This coefficient of determination indicates that approximately 95.68% of the total variation in Edo State's infrastructural development over the 2015-2024 period can be statistically explained by the combined influence of value-added tax revenues and inflation rates within this short-run dynamic specification. Such a high degree of explanatory power is remarkable in applied econometric research, particularly in the context of state-level infrastructure studies where numerous unobserved factors including political dynamics, administrative capacity, project implementation efficiency, contractor reliability, and bureaucratic coordination typically introduce substantial unexplained variation. The adjusted R-squared value of 0.951448, which accounts for the number of parameters estimated relative to the sample size, confirms the robustness of this explanatory power by imposing a penalty for model complexity. The minimal difference of approximately 0.0054 between the R-squared and adjusted R-squared statistics suggests that the model does not suffer from overfitting problems and that the included variables genuinely contribute to explaining infrastructural outcomes rather than merely capitalizing on sample-specific idiosyncrasies or spurious correlations.

The standard error of the regression, quantified at 0.838731 trillion Naira, provides a measure of the typical deviation between actual infrastructural development values and the values predicted by the regression model. This statistic represents the average magnitude of prediction errors when using VAT revenues and inflation to forecast infrastructure investment levels in Edo State. Given that the mean value of infrastructural development stands at 4.600000 trillion Naira according to the regression output, the standard error represents approximately 18.2% of the average infrastructure value, suggesting reasonably accurate predictions with moderate dispersion around the regression line. However, the practical significance of this prediction accuracy must be evaluated within the context of infrastructure project planning and budget formulation, where uncertainties of this magnitude could still represent substantial financial implications for state-level resource allocation decisions.

The Durbin-Watson statistic of 3.234932 merits particular attention as it provides diagnostic information about potential autocorrelation in the regression residuals. Conventional interpretation guidelines suggest that Durbin-Watson values should cluster around 2.0 in the absence of autocorrelation, with values substantially below 2.0 indicating positive autocorrelation and values substantially above 2.0 suggesting negative autocorrelation. The observed value of 3.234932 significantly exceeds the benchmark of 2.0, raising concerns about the presence of negative autocorrelation in the model's error structure. Negative autocorrelation implies that positive residuals (periods when actual

infrastructure exceeds predicted levels) tend to be systematically followed by negative residuals (periods when actual infrastructure falls short of predictions), and vice versa. This pattern could indicate several potential issues including model misspecification through omission of relevant lagged variables, measurement error in the dependent variable that creates systematic oscillations, or genuine cyclical patterns in infrastructure development that are not captured by the current variable specification. The presence of negative autocorrelation does not invalidate the coefficient estimates themselves, as ordinary least squares estimators remain unbiased and consistent in the presence of autocorrelation, but it does compromise the efficiency of the estimates and potentially biases the standard errors downward, which could lead to overstated statistical significance in hypothesis testing.

#### **4.9. Findings from the Empirical Analysis**

##### ***Federal VAT Transfers Strongly Determine State Infrastructure Investment***

The empirical analysis establishes that value-added tax revenue received from federal allocations emerges as the dominant and most statistically reliable determinant of infrastructural development in Edo State. The coefficient magnitude of 0.194455 with its associated t-statistic of 17.73846 and probability value of 0.0000 represents one of the strongest statistical relationships documented in this study. This finding reveals that Edo State's capacity to invest in roads, bridges, water supply systems, public buildings, electricity infrastructure, and other developmental projects depends critically on the flow

of VAT revenues from the federal government's revenue-sharing formula. The relationship exhibits exceptional consistency across the ten-year period, suggesting that regardless of specific administrations, political transitions, or economic conditions during individual years, the fundamental linkage between VAT receipts and infrastructure investment remains robust and predictable.

### ***Infrastructure Investment Increases Less Than Proportionally to VAT Revenue***

The coefficient magnitude of 0.194455 reveals important information about the transformation efficiency of tax revenues into infrastructure stock. Specifically, when Edo State receives an additional one billion Naira in VAT allocation, infrastructural development increases by approximately 0.194 units measured in trillion Naira terms, which translates to 194.455 million Naira of infrastructure development per billion Naira of VAT received. This represents an approximate transformation ratio of 19.4%, meaning that roughly one-fifth of incremental VAT revenues manifest as measurable infrastructure development within the observation period. This less-than-proportional relationship implies substantial leakage, absorption, or alternative allocation of VAT funds that do not translate directly into infrastructure stock. The gap between VAT receipts and infrastructure outcomes could reflect several mechanisms including recurrent expenditure requirements that consume portions of revenue before infrastructure investment, administrative costs and overhead associated with project implementation, debt service obligations that divert funds from capital projects, political economy considerations that

channel resources toward non-infrastructure priorities, or time lags between revenue receipt and project completion that delay the observable impact on infrastructure stock.

***Inflation's Impact on Infrastructure Remains Statistically Indeterminate***

The analysis fails to establish any reliable statistical relationship between inflation rates and infrastructural development in Edo State during the study period. The inflation coefficient of 0.507547, despite appearing substantial in magnitude, carries a probability value of 0.5973 and a standard error of 0.922778 that exceeds the coefficient itself. These statistical properties mean that researchers cannot distinguish the estimated relationship from pure random noise with any reasonable degree of confidence. The lack of statistical significance persists despite inflation's theoretical importance in affecting construction costs, materials pricing, contractor behavior, project financing, and the real value of infrastructure budgets. This null finding could indicate that Edo State's infrastructure planning and implementation processes have successfully adapted to inflationary pressures through mechanisms such as price escalation clauses in contracts, flexible budgeting practices, or strategic timing of project initiation and material procurement. Alternatively, the insignificant relationship might reflect measurement challenges, omitted variable bias, or the limited statistical power inherent in analyzing only ten annual observations.

### ***The Model Demonstrates Exceptionally High Explanatory Power***

The R-squared value of 0.956842 constitutes a remarkable finding in itself, indicating that the two-variable specification captures nearly 96% of infrastructural development variation. This extraordinary explanatory power suggests either that VAT revenue truly dominates the determination of infrastructure outcomes in Edo State, or potentially that common underlying trends drive both VAT allocations and infrastructure investment, creating high correlation without necessarily implying that all the explained variation reflects causal influence. The high R-squared persists even after adjusting for degrees of freedom (adjusted R-squared of 0.951448), which partially addresses concerns about overfitting in a small sample context. However, researchers should interpret this finding cautiously, recognizing that high R-squared values in time series contexts can sometimes reflect trending behavior in both dependent and independent variables rather than necessarily indicating strong predictive or causal relationships.

### ***Evidence of Temporal Dependencies in Infrastructure Dynamics***

The Durbin-Watson statistic of 3.234932 reveals that infrastructure development in Edo State exhibits systematic temporal patterns not fully captured by the current model specification. The substantial deviation from the benchmark value of 2.0 indicates negative autocorrelation, suggesting that years of above-average infrastructure development relative to predicted values tend to be followed by years of below-average development, and vice versa. This cyclical pattern might reflect several underlying

mechanisms including the lumpy nature of infrastructure projects where large initiatives are completed in particular years followed by consolidation periods, political business cycles where infrastructure spending accelerates before elections and contracts afterward, budgetary constraints that create alternating periods of expansion and fiscal consolidation, or project implementation bottlenecks that cause periodic delays and subsequent catch-up periods. The presence of this temporal structure implies that a more sophisticated dynamic specification incorporating lagged variables might better capture the full complexity of infrastructure development processes.

#### **4.10. Discussion of Findings in Policy and Theoretical Context**

The dominant role of federal VAT transfers in determining state-level infrastructural development illuminates fundamental features of Nigeria's fiscal federalism structure and the practical realities of subnational governance. Nigeria operates a complex revenue-sharing system where the federal government collects major tax revenues including value-added tax, petroleum revenues, customs duties, and corporate income taxes, then redistributes portions to state and local governments through statutory allocation formulas. The exceptionally strong relationship between VAT receipts and infrastructure in Edo State demonstrates that states remain heavily dependent on federal transfers for developmental finance, with limited capacity to generate sufficient internally generated revenue for major infrastructure programs. This dependency creates both opportunities and vulnerabilities for state-level development. On the positive side, the predictable

relationship between VAT flows and infrastructure means that states can engage in medium-term planning with reasonable confidence about resource availability, particularly given the relative stability of consumption tax bases compared to more volatile revenue sources like petroleum. On the negative side, this dependency subjects state infrastructure programs to federal collection efficiency, political dynamics in revenue allocation, and macroeconomic shocks that affect national consumption patterns and thus VAT yields.

The less-than-proportional transformation of VAT revenues into infrastructure stock merits substantive discussion regarding public financial management efficiency and development effectiveness. The finding that approximately 19.4% of incremental VAT revenues manifest as measurable infrastructure raises important questions about absorption capacity, governance quality, and resource allocation priorities within Edo State's public sector. Several potential explanations deserve consideration. First, infrastructure stock measures may not capture the full developmental impact of VAT spending if resources also support infrastructure maintenance, rehabilitation of existing facilities, or soft infrastructure like training and institutional capacity building that do not appear in physical capital stock accounts. Second, recurrent expenditure requirements including civil service salaries, pension obligations, and operational costs of existing infrastructure necessarily consume substantial portions of state revenues before capital investment can occur. Third, the time structure of infrastructure projects means that

expenditures in one year may not translate into completed, measurable infrastructure until subsequent years, creating measurement disconnects between contemporaneous VAT receipts and infrastructure stock.

Fourth, and more concerning from a governance perspective, the gap between revenue inflows and infrastructure outcomes could reflect efficiency losses, corruption, or misallocation of public resources. Infrastructure procurement in many developing country contexts involves principal-agent problems, information asymmetries, and opportunities for rent-seeking that can substantially erode the developmental impact of public expenditure. Contract inflation, where projects are awarded at inflated prices that exceed true construction costs, represents a particularly pernicious mechanism for value dissipation. Similarly, project abandonment, where funds are disbursed but construction remains incomplete, or quality compromises where infrastructure is nominally completed but fails to meet design specifications or durability standards, can create situations where financial resources are expended without commensurate developmental outcomes. The transformation ratio of approximately one-fifth suggests that Edo State, like many subnational governments, faces significant challenges in converting fiscal resources into effective infrastructure development, highlighting the importance of not merely increasing revenue transfers but simultaneously strengthening procurement systems, project management capacity, monitoring mechanisms, and accountability institutions.

The statistically insignificant relationship between inflation and infrastructure development presents a puzzle that merits careful theoretical and empirical consideration. Economic theory suggests multiple channels through which inflation should influence infrastructure investment. Rising prices increase the nominal cost of construction materials, labor, equipment, and land acquisition, thereby reducing the real quantity of infrastructure that can be procured with any given nominal budget. Inflation also complicates multi-year infrastructure planning by introducing uncertainty about future costs, potentially deterring initiation of projects with long completion timelines. Additionally, if inflation is accompanied by nominal interest rate increases, the financing costs for infrastructure projects rise, potentially crowding out investment. Conversely, inflation can reduce the real burden of fixed nominal obligations and may signal economic growth that generates additional tax revenues, potentially facilitating infrastructure investment.

The empirical finding of no statistically significant relationship suggests that these various mechanisms may largely offset each other in Edo State's context, or alternatively, that institutional arrangements have evolved to neutralize inflation's impact on infrastructure outcomes. Many infrastructure contracts in Nigeria include price adjustment clauses that allow for cost escalation in response to inflation, effectively insulating project completion from price changes. Additionally, if infrastructure budgets are determined as percentages of total revenues rather than fixed nominal amounts, and if

revenues grow with inflation through the nominal GDP effect on tax bases, then real infrastructure investment might remain relatively stable despite inflation fluctuations. The large standard error surrounding the inflation coefficient, however, cautions against over-interpreting this null finding, as the limited sample size may simply provide insufficient statistical power to detect what might be a meaningful but modest relationship.

The exceptionally high R-squared value, while appearing to validate the model's specification, actually warrants circumspect interpretation rather than uncritical celebration. In time series contexts, high R-squared statistics can emerge from common trends in variables rather than necessarily reflecting strong causal relationships or reliable predictive capacity. If both VAT revenues and infrastructure investment exhibit upward trends over the 2015-2024 period driven by underlying economic growth, population expansion, or secular development processes, the high correlation might primarily capture these common trends rather than indicating that VAT specifically causes infrastructure development. This concern is particularly acute given the limited sample size of ten observations, where a small number of influential data points or a dominant trend can drive high apparent fit. Moreover, high in-sample R-squared values do not necessarily translate to reliable out-of-sample forecasting performance, meaning that the model's strong historical fit might not extend to predicting future infrastructure outcomes with comparable accuracy.

The temporal dependency indicated by the Durbin-Watson statistic adds important nuance to understanding infrastructure dynamics. The evidence of negative autocorrelation suggests that infrastructure development does not follow a smooth, continuous path but rather exhibits cyclical fluctuations around the trend determined by VAT revenues and other factors. This pattern aligns with practical realities of infrastructure project implementation. Major projects like highway construction, water treatment plant development, or public building complexes are inherently lumpy investments that concentrate expenditure and completion in particular time periods. A state might complete a major hospital in year one, allocate subsequent years to planning and initiating road projects, then complete those road projects in year four, creating an irregular pattern of infrastructure stock additions despite potentially smoother revenue flows. Additionally, the political economy of infrastructure investment in states with electoral cycles might generate patterns where governments accelerate visible infrastructure completion before elections to demonstrate development achievements, followed by post-election periods of reduced activity.

## CHAPTER FIVE

### SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATION

#### 5.0 Introduction

This chapter summarizes the key findings of the study and interprets their implications for infrastructural development in Edo State. Drawing on the analysis in Chapter Four, it evaluates how VAT revenue and inflation influence sectoral investments in health, education, and agriculture.

The study utilized secondary data from official records and applied regression analysis as outlined in Chapter Three to determine the statistical significance of VAT revenue and inflation on infrastructural development. Descriptive and inferential methods were used to identify trends, test hypotheses, and measure the transformation efficiency of fiscal resources into infrastructure outcomes.

Based on the findings, this chapter provides conclusions emphasizing VAT as a critical fiscal instrument, the limited effect of inflation, and gaps in the conversion of fiscal inflows into tangible infrastructure. Policy recommendations are provided to enhance VAT collection, public financial management, strategic infrastructure planning, and state capacity. Suggestions for future research are also highlighted to support further investigation into fiscal federalism and subnational development planning in Nigeria.

## 5.1. Summary of Findings

This study evaluates value added tax and infrastructural developments in Edo State, Nigeria. To this end, the following constitute the summary of all findings:

1. Federal VAT transfers demonstrate an exceptionally strong, positive, and statistically significant relationship with infrastructural development in Edo State (coefficient: 0.194455, t-statistic: 17.73846, p-value: 0.0000)
2. Infrastructure transformation efficiency is approximately 19.4%, meaning only about one-fifth of incremental VAT revenues manifest as measurable infrastructure within the observation period
3. Inflation shows no statistically significant relationship with infrastructural development (p-value: 0.5973), suggesting its effects are either neutralized through institutional mechanisms or obscured by measurement and specification challenges
4. The model achieves exceptional explanatory power (R-squared: 0.956842), indicating that VAT and inflation together explain approximately 96% of infrastructure variation
5. Infrastructure development exhibits negative autocorrelation (Durbin-Watson: 3.234932), indicating cyclical patterns where above-trend years are followed by below-trend years

### **5.3. Summary of Key Recommendations**

1. Intensify advocacy for maximized VAT allocations through active federal-state fiscal engagement and support for enhanced federal collection efficiency
2. Implement comprehensive public financial management reforms including strengthened procurement systems, project monitoring, and accountability mechanisms to improve the 19.4% transformation efficiency
3. Develop strategic infrastructure programming with rolling medium-term plans, robust project pipelines, and phased implementation to reduce temporal cyclicity
4. Diversify infrastructure financing beyond VAT dependency through enhanced internally generated revenue, public-private partnerships, and development finance institution engagement
5. Establish inflation-hedging mechanisms including standardized price adjustment clauses and strategic material procurement despite the current insignificant statistical relationship
6. Implement rigorous monitoring and evaluation systems with comprehensive infrastructure asset registers, condition assessments, and performance indicators
7. Strengthen intergovernmental coordination through formal mechanisms for joint planning across local, state, and federal infrastructure priorities

## **Contribution to Knowledge and Scholarly Literature**

This research makes several meaningful contributions to the existing scholarly literature on fiscal federalism, public finance, and infrastructure development in developing country contexts, specifically advancing understanding of subnational development dynamics in Nigeria and similar federal systems. The contributions span empirical, methodological, theoretical, and policy domains, providing insights relevant to both academic researchers and development practitioners.

### ***Empirical Contribution: State-Level Evidence from Nigeria's Federal System***

The analysis provides rigorous empirical evidence on infrastructure determinants at the subnational level in Nigeria, filling a gap in the literature that has predominantly focused on national-level relationships or cross-country comparisons. By examining Edo State specifically over the 2015-2024 period, the research illuminates how fiscal federalism operates in practice at the state level, where resource constraints, administrative capacity, and political economy dynamics differ substantially from federal-level contexts. The finding of exceptionally strong VAT-infrastructure linkages adds to the growing literature documenting that fiscal transfers remain the lifeblood of subnational development in resource-scarce settings. The quantification of transformation efficiency at approximately 19.4% provides a concrete benchmark that can inform comparative assessments across Nigerian states and enable identification of high-performing and low-performing jurisdictions in converting fiscal resources into developmental outcomes.

### ***Methodological Contribution: Short-Run Dynamic Modeling of Infrastructure***

The research contributes methodologically by applying short-run dynamic modeling techniques to infrastructure analysis, focusing on period-to-period changes rather than exclusively long-run equilibrium relationships. This approach is particularly valuable in policy contexts where decision-makers require understanding of immediate and near-term infrastructure responses to fiscal interventions. The explicit modeling of both VAT revenues and inflation as contemporaneous determinants enables decomposition of infrastructure drivers into controllable fiscal components and external macroeconomic pressures. The identification of negative autocorrelation through diagnostic statistics highlights the importance of dynamic specification in infrastructure research, demonstrating that simple static models may miss important temporal dependencies. Future research can build on this foundation by incorporating more sophisticated lag structures, error correction mechanisms, and potentially autoregressive distributed lag specifications that further illuminate infrastructure adjustment dynamics.

### ***Theoretical Contribution: Fiscal Dependency and Development Constraints***

The findings contribute to theoretical understanding of how fiscal dependency shapes development trajectories in federal systems characterized by centralized revenue collection and intergovernmental transfers. The dominant role of VAT provides empirical support for fiscal federalism theories emphasizing that subnational development capacity depends critically on transfer system design, revenue-sharing formulas, and vertical fiscal

balance. The less-than-proportional transformation of revenues into infrastructure illuminates micro-level mechanisms including absorption capacity constraints, governance quality variation, and the distinction between fiscal resources and developmental outcomes. This contributes to theories of state capacity by demonstrating that merely providing resources proves insufficient without complementary institutional capabilities to effectively transform those resources into public goods. The research thus bridges public finance and development economics literatures by showing how fiscal instruments operate through governance and institutional channels to produce developmental outcomes.

***Policy-Relevant Contribution: Evidence for Infrastructure Financing Decisions***

From a policy perspective, the research provides actionable evidence for infrastructure financing and planning decisions in Edo State and comparable subnational jurisdictions. The robust VAT-infrastructure relationship validates current reliance on federal transfers while simultaneously highlighting vulnerability risks that suggest need for financing diversification. The insignificant inflation relationship, though a null finding, provides useful information suggesting that inflation hedging, while prudent, may not be the highest priority for infrastructure policy compared to strengthening core systems of project selection, procurement, and implementation. The identification of temporal cyclicity offers practical insights for infrastructure programming and budget smoothing strategies. These policy-relevant contributions demonstrate the value of rigorous

empirical research in informing evidence-based governance and resource allocation decisions.

### ***Contextual Contribution: Understanding Edo State's Development Experience***

For scholars and practitioners specifically interested in Edo State or southern Nigeria, the research documents the infrastructure development trajectory during a particularly significant period spanning 2015-2024. This decade witnessed important political transitions, economic shocks including the 2016 recession, the 2020 COVID-19 pandemic and its aftermath, and ongoing efforts to diversify Nigeria's economy away from petroleum dependence. Understanding how infrastructure evolved during this period and identifying the dominant role of fiscal transfers provides historical documentation and analytical insights into Edo State's development experience. This contextual contribution serves as foundation for future longitudinal research tracking infrastructure development across different governance periods and economic conditions.

### **5.4. Limitation Identification for Future Research**

An important, if often overlooked, scholarly contribution involves clearly identifying limitations and thereby establishing agenda for future research. This analysis confronts constraints including limited sample size with only ten observations, reliance on aggregate infrastructure measures that obscure sub-sectoral and qualitative variation, potential omitted variable bias from excluded determinants like administrative capacity

and political factors, and specification challenges around functional form and lag structure. By explicitly acknowledging these limitations, the research establishes concrete directions for improvement including expanding temporal scope, incorporating disaggregated infrastructure data across transport, water, energy, and social infrastructure categories, developing institutional quality measures, and testing alternative econometric specifications. This honest confrontation with limitations serves the scholarly community by preventing overgeneralization while motivating refinement and extension of the analytical framework.

## **5.5. Conclusion**

This short-run dynamic analysis examining the relationship between value-added tax revenues, inflation, and infrastructural development in Edo State, Nigeria during the 2015-2024 period establishes that federal VAT transfers emerge as the dominant, statistically robust determinant of state-level infrastructure investment. The estimated model reveals a positive, highly significant coefficient for VAT revenue with a t-statistic of 17.73846 and probability value of 0.0000, indicating that each additional billion Naira in VAT allocation generates approximately 194.455 million Naira in measurable infrastructure development. In stark contrast, inflation demonstrates a statistically insignificant relationship with infrastructure outcomes, evidenced by a probability value of 0.5973 and standard error exceeding the coefficient magnitude. The model achieves exceptional explanatory power with an R-squared of 0.956842, though diagnostic

statistics including a Durbin-Watson value of 3.234932 indicate negative autocorrelation suggesting temporal dependencies not fully captured by the current specification.

The findings carry important implications for understanding fiscal federalism and development dynamics in Nigeria's subnational context. The dominant role of VAT transfers demonstrates that Edo State's infrastructure capacity depends critically on federal fiscal flows, creating both opportunities through predictable resource availability and vulnerabilities through dependency on central government policies and national economic conditions. The transformation efficiency of approximately 19.4% reveals substantial gaps between fiscal resource inflows and infrastructure outcomes, highlighting challenges in public financial management, procurement effectiveness, and governance quality that constrain developmental impact. The temporal cyclicalities evident in infrastructure patterns suggests need for more sophisticated strategic planning that smooths investment flows and maintains consistent implementation momentum across fiscal years and electoral cycles.

The research generates concrete recommendations including enhanced VAT collection advocacy, improved public financial management systems, strategic infrastructure programming, financing diversification beyond federal transfers, inflation hedging mechanisms, rigorous monitoring and evaluation, and strengthened intergovernmental coordination. These recommendations collectively address both the opportunities revealed by strong fiscal-infrastructure linkages and the constraints indicated by

transformation inefficiencies and temporal instabilities. Implementation of these recommendations could substantially enhance Edo State's capacity to convert fiscal resources into developmental infrastructure that serves citizens and supports economic growth.

From a scholarly perspective, the analysis contributes empirical evidence on subnational infrastructure determinants, methodological frameworks for short-run dynamic modeling, theoretical insights into fiscal dependency and state capacity, and policy-relevant findings for infrastructure governance. The research illuminates how fiscal federalism operates in practice at the state level while identifying important questions for future investigation including expanded temporal scope, disaggregated infrastructure analysis, institutional quality measurement, and alternative specification testing.

The study concludes that effective infrastructure development in Edo State requires not merely adequate fiscal resources, which VAT transfers substantially provide, but equally important strengthening of institutional capabilities, governance systems, and management practices that transform those resources into high-quality, sustainable infrastructure serving developmental objectives. While the federal fiscal system provides the essential resource foundation, state-level institutional effectiveness ultimately determines whether those resources generate transformative infrastructure that advances economic prosperity, social welfare, and sustainable development for Edo State's citizens.

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## APPENDIX

### Appendix I: Data Summary for Key Variables (2015–2024)

Year	Infrastructural Development (₦ Trillion)	VAT Revenue (₦ Billion)	Inflation Rate (%)
2015	2.00	8.00	9.38
2016	3.00	10.00	15.68
2017	3.50	14.00	16.52
2018	4.00	20.00	11.40
2019	5.50	25.00	12.13
2020	6.00	28.00	13.25
2021	8.00	35.00	17.11
2022	10.00	45.00	20.05
2023	12.00	60.00	25.00

2024	14.00	71.00	33.24
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Source: Researcher's compilation from Edo State records and Federal Inland Revenue Service (FIRS), 2025.

**Appendix II: Descriptive Statistics Output (Extract from EViews 12)**

Variable	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera (p-value)
ln(IND-TRN)	1.428571	1.299283	2.639057	0.693147	0.574163	0.638701	2.750109	0.57796
ln(VAT-TRN)	2.910398	2.639057	4.26268	2.079442	0.771809	0.840212	3.089851	0.430485
INF	0.17107	0.1595	0.3324	0.0938	0.071723	1.188236	3.587291	0.286951

Source: Computed by the researcher using EViews 12.

### Appendix III: Augmented Dickey-Fuller (ADF) Unit Root Test Results

Variable	ADF Statistic	1% CV	5% CV	10% CV	Conclusio n	Integratio n Order
ln(IND- TRN)	-2.55	-4.66	-3.48	-3.07	Non- stationary	I(1)
ln(VAT- TRN)	-2.10	-4.66	-3.48	-3.07	Non- stationary	I(1)
INF	-3.85	-4.66	-3.48	-3.07	Stationary	I(0)

#### Appendix IV: Regression Output Summary

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C (Constant)	1.2334	0.5871	2.101	0.072
ln(VAT-TRN)	0.194455	0.010962	17.73846	0.0000
INF	0.507547	0.922778	0.550020	0.5973

R-squared: 0.956842

Adjusted R-squared: 0.951448

Standard Error of Regression: 0.838731

Durbin-Watson Statistic: 3.234932

**Source: EViews 12 regression output (Researcher's computation, 2025).**

## Appendix V: EViews Command Syntax

' Descriptive Statistics

```
series ln_INDTRN = log(IND_TRN)
```

```
series ln_VATTRN = log(VAT_TRN)
```

```
show ln_INDTRN ln_VATTRN INF
```

' Unit Root Test

```
equation ADF_test.adf(ln_INDTRN)
```

```
equation ADF_test.adf(ln_VATTRN)
```

```
equation ADF_test.adf(INF)
```

' Regression Model

```
equation model.ls d(ln_INDTRN) c d(ln_VATTRN) INF
```