



Capital Expenditures and Economic Development in Nigeria: The Moderating Effect of Inflation Rate

Ekpo, Esther Bruno¹, Achema Friday², Prof Joseph Uchenna Waleke³

¹The School of Postgraduate Studies, Veritas University Abuja

²Department of Accounting, Veritas University Abuja

³Nasarawa State University, Keffi

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*Corresponding Author: Ekpo, Esther Bruno

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Abstract	Original Research Article
This study examines the relationship between capital expenditure and economic development in Nigeria with specific attention to inflation's moderating effect. Using the Human Development Index (HDI) as a measure of economic development, capital expenditure as a percentage of GDP as the independent variable, and inflation rate as the moderating variable, this study provides a full analysis of Nigeria's development path over twenty-five years of democratic governance. The findings reveal that despite modest increases in capital expenditure during certain periods, Nigeria's HDI showed only gradual improvement, rising from 0.445 in 1999 to 0.567 in 2024, maintaining the country's classification in the medium human development category. The study demonstrates that persistent inflationary pressures, which averaged 12.64% during the period, significantly moderated the effectiveness of capital spending on development outcomes. The considerable fluctuations in capital expenditure, ranging from 1.12% to 5.21% of GDP, further illuminate the inconsistent approach to development financing in Nigeria. This study contributes to the discourse on development economics by highlighting how macroeconomic instability can undermine public investment effectiveness in developing economies. The findings emphasize the need for integrated policy approaches that simultaneously address capital investment adequacy, macroeconomic stability, and institutional effectiveness to achieve sustainable economic development in Nigeria. This study recommended that increasing and stabilizing capital expenditure above 5% of GDP, implementing more effective inflation management strategies, and enhancing project selection and implementation processes to maximize development impact. Keywords: Capital Expenditure, Economic Development, Human Development Index, Inflation, Public Investment, Nigeria.	

1. INTRODUCTION

Economic development represents a fundamental goal for developing nations like Nigeria, encompassing improvements in living standards, structural economic transformation, and enhanced social welfare. Since gaining independence in 1960, Nigeria has implemented various economic policies aimed at stimulating sustainable growth and development. Among these policies, government capital expenditure has been identified as a critical instrument for driving economic progress (Oyinlola & Akinnibosun, 2013). Capital expenditure, which involves government spending on infrastructure, education, healthcare, and other long-term investments, is theoretically expected to

generate positive externalities that stimulate economic development.

The relationship between capital expenditure and economic development has attracted considerable attention in development economics literature. The Keynesian theory posits that government spending has a multiplier effect on aggregate demand, which in turn stimulates economic activity and development (Jhingan, 2010). When governments invest in infrastructure projects such as roads, power supply, and telecommunications, they create enabling environments for private sector growth, enhance productivity, and improve overall economic performance. Ogujiuba and Adeniyi (2005) argue that capital expenditure in developing economies like

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Nigeria is crucial for addressing market failures and providing public goods that would otherwise be underprovided by the private sector.

However, the efficacy of capital expenditure in promoting economic development is not automatic but depends on various macroeconomic conditions. Inflation rate, which represents a sustained increase in the general price level, is one such condition that may significantly influence the relationship between capital expenditure and economic development. High inflation rates can erode the real value of government investments, distort resource allocation, and create uncertainty that discourages long-term planning (Fischer, 1993). When inflation rises, the purchasing power of allocated capital funds diminishes, potentially reducing the quality and quantity of completed projects. Conversely, moderate inflation may stimulate economic activity by encouraging consumption and investment before prices increase further.

In Nigeria, both capital expenditure patterns and inflation rates have exhibited considerable volatility over the past several decades. Government capital spending has often been influenced by fluctuations in oil revenue, political cycles, and changing development priorities (Akanbi & Schoeman, 2010). Similarly, inflation rates have shown significant variations, with periods of hyperinflation and relative stability. Between 1990 and 2020, Nigeria's inflation rate ranged from single digits to over 70 percent during economic crises, presenting a complex environment for capital expenditure planning and implementation (Central Bank of Nigeria, 2021).

The interaction between capital expenditure and inflation in shaping economic development outcomes is particularly relevant in the Nigerian context. Despite substantial allocations to capital projects over the years, the country continues to face significant development challenges, including inadequate infrastructure, high poverty rates, and limited industrial capacity (Okonjo-Iweala, 2018). This disparity between expenditure and outcomes raises important questions about the conditions under which capital spending effectively translates into meaningful development.

This study examines the moderating effect of inflation rates on the relationship between capital expenditure and economic development in Nigeria. By focusing specifically on these three variables, this study seeks to provide understanding of how macroeconomic conditions influence the effectiveness of government investments.

Objectives of the Study

The primary objective of this study is to examine the relationship between capital expenditure and economic development in Nigeria, with a specific focus on how inflation rate moderates this relationship. The specific objectives are to:

- i. assess the effect of capital expenditure on economic development in Nigeria over the period under review.
- ii. examine the effect of inflation rate on economic development in Nigeria.
- iii. To analyze how inflation rate moderates the relationship between capital expenditure and economic development in Nigeria.

Statement of Hypotheses

Based on the objectives above, the following null hypotheses were formulated to guide this study

- i. H₀₁: Capital expenditure has no significant effect on economic development in Nigeria.
- ii. H₀₂: Inflation rate has no significant effect on economic development in Nigeria.
- iii. H₀₃: Inflation rate does not significantly moderate the relationship between capital expenditure and economic development in Nigeria.

Significance of the Study

This study is significance for various stakeholders in Nigeria's economic. For policymakers and government officials, the study provides empirical evidence on how inflation affects the effectiveness of capital expenditure, thereby offering guidance for fiscal policy formulation and implementation. Understanding this relationship can help the government optimize the timing, magnitude, and composition of capital expenditures to achieve maximum development impact even in challenging macroeconomic environments.

For academic researchers, this study contributes to the existing body of knowledge on fiscal policy effectiveness in developing economies by specifically examining the interactive effects between capital expenditure and inflation. The focus on these three variables—economic development, capital expenditure, and inflation rate—provides a focused analysis that clarifies their interdependencies, filling a gap in the literature where previous studies may have included numerous variables that complicated the interpretation of relationships.

For international development partners and financial institutions such as the World Bank and International Monetary Fund, the findings offer insights into the conditions under which external funding for capital projects in Nigeria and similar economies might yield optimal development outcomes. This knowledge can inform lending strategies and technical advice provided to developing nations.

For the private sector, understanding how public capital expenditure affects economic development under different inflationary regimes provides valuable information for investment planning and business strategy formulation. Private investors can better anticipate the enabling environment created by public investments and adjust their expectations based on prevailing inflation trends.

Scope of the Study

This study focuses specifically on the relationship between capital expenditure, inflation rate, and economic development in Nigeria. The chronological scope spans from 1981 to 2022, covering a period of significant economic transformations, policy shifts, and macroeconomic fluctuations in Nigeria. This timeframe includes various political regimes, structural adjustment programs, oil price shocks, and monetary policy frameworks, providing a comprehensive context for analyzing the variables of interest.

In terms of conceptual scope, economic development is

operationalized using Human Development Index (HDI) as the dependent variable, which captures improvements in education, health, and standard of living beyond mere economic growth. Capital expenditure is measured using annual federal government capital spending as published by the Central Bank of Nigeria, while inflation rate is measured using the annual Consumer Price Index (CPI) percentage change. The study deliberately limits its analysis to these three variables to provide clarity on their specific interrelationships, avoiding the complexity introduced by multiple variables that might obscure the moderating effect of inflation. However, it acknowledges that other factors such as institutional quality, political stability, and external economic conditions also influence economic development in Nigeria.

Organization of the Study

This study is structured into five sections to ensure comprehensive coverage. Section One: Introduction – This section introduces the research topic, provides theoretical underpinnings, establishes the problem statement, outlines the research objectives, presents the hypotheses, discusses the significance of the study, and defines its scope. Section Two: Literature Review – This section examines existing theoretical and empirical literature on the relationship between capital expenditure and economic development, the impact of inflation on economic development, and studies that have investigated the interactive effects between fiscal policy and inflation in Nigeria and other developing economies. Section Three: Methodology – This section details the research design, model specification, variable measurement, data sources, and analytical techniques employed to test the stated hypotheses. The moderating variable analysis framework is particularly emphasized to explain how the interaction between capital expenditure and inflation is examined. Section Four: Results and Discussion – This section presents the empirical findings from the data analysis, including descriptive statistics, correlation analysis, regression results, and moderation analysis. The findings are interpreted in light of the research objectives and compared with previous studies to highlight convergences and divergences. Section Five: Conclusion and Recommendations – This final section summarizes the key findings, draws implications for theory and practice, offers policy recommendations for optimizing capital expenditure in various inflationary environments, acknowledges the limitations of the study, and suggests directions for future research.

2. LITERATURE REVIEW

Capital Expenditure

Capital expenditure represents government spending on assets and infrastructure that provide long-term benefits to the economy. According to Aigheyisi and Oaikhenan (2020), capital expenditure encompasses government investments in physical assets such as roads, bridges, power generation facilities, water supply systems, hospitals, schools, and other infrastructure that enhance productive capacity. Babatunde

(2022) conceptualizes capital expenditure as a vital fiscal policy instrument that governments employ to stimulate economic activity, create employment opportunities, and improve citizens' quality of life. In the Nigerian, capital expenditure is typically classified into administrative, economic, social services, and transfers categories (Adamu and Hajara, 2021). The Federal Ministry of Finance (2023) reports that between 1999 and 2024, Nigeria's capital expenditure allocations have fluctuated significantly, reflecting changing fiscal priorities, oil revenue volatility, and competing demands for public resources. Oyinlola and Adedeji (2023) note that the actual implementation rate of budgeted capital expenditure in Nigeria has averaged approximately 65% over the study period, highlighting challenges in budget execution.

Economic Development

Economic development extends beyond mere economic growth to encompass improvements in human welfare and quality of life. Sen (2021) conceptualizes economic development as the expansion of people's capabilities and freedoms, including access to education, healthcare, employment opportunities, and political participation. The United Nations Development Programme (UNDP) operationalizes this concept through the Human Development Index (HDI), which combines indicators of life expectancy, education, and per capita income (UNDP, 2024). Adegboye and Williams (2023) distinguish between economic growth and economic development, noting that while growth pertains to increases in output, development encompasses structural transformation, poverty reduction, and improved living standards. In the Nigerian context, Nwafor and Okoye (2022) observe that despite periods of strong economic growth, particularly during oil booms, corresponding improvements in human development indicators have often been modest, suggesting a disconnection between growth and broader development outcomes.

Inflation

Inflation represents a persistent increase in the general price level of goods and services in an economy. According to Oduntan and Olaniyi (2023), inflation can be conceptualized both as a monetary phenomenon resulting from excess money supply and as a structural issue arising from supply-side constraints. The Central Bank of Nigeria (CBN, 2024) categorizes inflation based on its magnitude: creeping inflation (less than 3%), moderate inflation (3-10%), and high inflation (above 10%). Adeniran and Yusuf (2020) identify multiple dimensions of inflation in the Nigerian context, including food inflation, core inflation, and imported inflation, each with distinct drivers and implications. Musa and Ibrahim (2022) conceptualize inflation as a potential moderator of fiscal policy effectiveness, noting that high and volatile inflation may erode the real value of government spending and create uncertainties that discourage private investment, thus potentially undermining the impact of capital expenditure on economic development.

Empirical Review
Capital Expenditure and Economic Development

The relationship between capital expenditure and economic development has been extensively studied, with mixed findings across different contexts. Okafor and Ezeaku (2021) examined the impact of capital expenditure on human development in Nigeria from 2000 to 2020 and found a positive but modest relationship, with sectoral differences in effectiveness. Their analysis revealed that capital spending on education and healthcare had stronger positive impacts on HDI compared to spending on general administration. In a cross-country study of 45 developing economies, Zhang and Rodriguez (2023) documented a significant positive relationship between public infrastructure investment and human development outcomes, with the relationship being stronger in countries with better governance indicators. Similarly, Adeosun and Onakoya (2022) investigated the link between capital expenditure and economic development in selected African countries and found varying impacts depending on the quality of institutions and the efficiency of public expenditure management systems. Focusing specifically on Nigeria, Balogun and Adekunle (2021) analyzed the relationship between capital expenditure and HDI from 1990 to 2019 and identified a positive but lagged relationship, suggesting that the development impacts of capital spending may take time to materialize. However, Chukwuemeka (2023) reached somewhat different conclusions, finding that while capital expenditure on economic services positively affected economic growth, its impact on broader human development indicators was limited, possibly due to implementation challenges and leakages in the public expenditure system.

Inflation and Economic Development

The empirical literature on inflation and economic development reveals complex relationships. Osakwe and Ibhagui (2022) studied 60 developing economies from 2000 to 2020 and found a non-linear relationship between inflation and economic development, with moderate inflation (below 11%) having a neutral or slightly positive effect on development indicators, while high inflation (above 11%) had increasingly negative effects. This brink effect suggests that the impact of inflation may depend on its magnitude. In the Nigerian context, Nweke and Eze (2021) examined the relationship between inflation and HDI from 1990 to 2020 and found a negative relationship, particularly during periods of high inflation. Their study suggested that inflation disproportionately affected lower-income households, exacerbating income inequality and undermining development progress. Supporting this finding, Danladi and Akomolafe (2022) documented a negative relationship between inflation volatility and social welfare indicators in Nigeria, highlighting the harmful effects of unpredictable price movements on household consumption and investment decisions. Globally, the International Monetary Fund (IMF, 2023) has identified a negative correlation between persistent high inflation and human development outcomes across developing economies, with the relationship being stronger in countries

with larger informal sectors and weaker social protection systems. These characteristics are prominent in Nigeria, suggesting that inflation may significantly undermine development outcomes in the country.

The Moderating Effect of Inflation on Capital Expenditure and Economic Development

The empirical literature specifically addressing the moderating effect of inflation on the relationship between capital expenditure and economic development is relatively scant but growing. Agbede and Johnson (2021) analyzed data from 12 West African countries from 2001 to 2020 and found that high inflation significantly reduced the effectiveness of public investment in driving human development outcomes. Their study indicated that when inflation exceeded 12%, the positive impact of capital expenditure on HDI diminished substantially. Focusing on Nigeria, Ogbuagu and Ewubare (2023) investigated how inflation moderated the relationship between government capital spending and development indicators from 1999 to 2022. Their findings revealed that periods of high inflation coincided with reduced effectiveness of capital spending, particularly for projects with longer gestation periods. They attributed this to factors such as cost escalation, implementation delays, and the erosion of real spending power. Akpan and Udoka (2022) examined the complex interactions between fiscal policy, inflation, and development outcomes in Nigeria from 1981 to 2021. Their analysis revealed that inflation acted as a significant moderator, with the relationship between capital expenditure and HDI being stronger during periods of low inflation (below 10%) and weaker during periods of high inflation (above 15%). This suggests that macroeconomic stability is an important prerequisite for effective capital spending. These empirical findings collectively suggest that inflation plays a significant moderating role in the relationship between capital expenditure and economic development, with high inflation potentially undermining the effectiveness of public investment in driving development outcomes. The Nigerian experience appears consistent with this pattern, highlighting the importance of considering inflation dynamics when assessing the impact of fiscal policy on development.

Theoretical Review
Keynesian Theory of Public Expenditure

The Keynesian theory, developed by John Maynard Keynes, provides a framework for understanding the role of government spending in economic development. According to this theory, public expenditure serves as a critical tool for stimulating aggregate demand, particularly during economic downturns (Keynes, 1936). Akinlo and Odusanya (2023) note that Keynesian theory justifies expansionary fiscal policy, including increased capital expenditure, as a means of promoting economic growth and development. The theory suggests that government spending has a multiplier effect, whereby an initial increase in expenditure generates a more than proportional increase in national income through

successive rounds of spending (Morakinyo and Sibanda, 2022). In the context of developing economies like Nigeria, Uzoma and Odili (2022) argue that the Keynesian perspective supports substantial capital expenditure to address infrastructure deficits and stimulate economic activity, particularly given the limitations of monetary policy in such contexts. However, critics of Keynesian theory point to potential downsides of expansionary fiscal policy, including inflation, crowding out of private investment, and public debt accumulation (Ademola and Badejo, 2023). These critiques highlight the importance of considering the broader macroeconomic context, including inflation dynamics, when implementing Keynesian-inspired policies.

Endogenous Growth Theory

Endogenous growth theory, developed by economists such as Romer (1986) and Lucas (1988), emphasizes the role of human capital, knowledge, and technological progress in driving sustainable economic growth and development. Unlike neoclassical growth models, which treat technological change as exogenous, endogenous growth theory views technological progress as an outcome of economic activities, including public and private investment in education, research, and development. Akinwale and Olaniyan (2021) argue that endogenous growth theory provides a rationale for government capital expenditure on education, healthcare, and research infrastructure, as these investments enhance human capital formation and technological capabilities. In the Nigerian context, Okeahalam and Nwankwo (2023) suggest that the theory supports targeted capital spending in sectors that promote knowledge acquisition, innovation, and productivity growth. Endogenous growth theory also acknowledges the importance of institutional quality and macroeconomic stability in ensuring the effectiveness of investments in human capital and technology (Iyoha and Oriakhi, 2022). This theoretical perspective thus provides insights into how factors such as inflation might moderate the relationship between capital expenditure and economic development.

Wagner's Law of Increasing State Activities

Wagner's Law, formulated by Adolph Wagner in the late 19th century, posits that public expenditure tends to grow both absolutely and relatively to national income as economic development progresses (Wagner, 1893). According to this law, the expansion of government activities, including capital expenditure, is a natural consequence of economic development rather than its cause (Iheanacho, 2022). Edame and Akpan (2021) note that Wagner's Law suggests a positive correlation between economic development and public expenditure, with the causality running from development to expenditure rather than vice versa. In the Nigerian context, Obafemi and Udofia (2023) argue that Wagner's Law may explain the historical pattern of government spending during oil booms but fails to account for the quality and effectiveness of such expenditure in driving sustainable development. Critics of Wagner's Law point to its limited applicability in

developing economies with weak institutional frameworks and significant economic challenges (Adekunle and Bakare, 2022). However, the law remains relevant for understanding the long-term relationship between economic development and the expansion of government activities.

New Institutional Economics

New Institutional Economics (NIE), associated with scholars such as North (1990) and Williamson (2000), emphasizes the role of institutions in economic performance and development. This theoretical perspective suggests that the effectiveness of economic policies, including capital expenditure, depends significantly on the quality of institutions that govern their implementation (Acemoglu and Robinson, 2022).

In the context of public expenditure and development, NIE highlights the importance of governance structures, property rights, transaction costs, and contract enforcement in determining the effectiveness of government investment (Osabuohien and Efobi, 2023). For Nigeria, Lawal and Awoyemi (2022) argue that institutional weaknesses, including corruption, bureaucratic inefficiency, and weak accountability mechanisms, have often undermined the development impact of capital expenditure.

NIE also provides insights into how inflation might moderate the relationship between capital expenditure and economic development. According to Adeyemi and Olaleye (2021), high inflation can be viewed as a symptom of institutional weakness, particularly in monetary policy management, which creates an unfavorable environment for effective public investment. This perspective aligns with empirical findings on the moderating effect of inflation on the relationship between capital expenditure and development outcomes.

Theoretical Framework: Endogenous Growth Theory

This study adopts the endogenous growth theory as its theoretical framework due to its relevance to understanding the relationship between capital expenditure, inflation, and economic development in Nigeria. The endogenous growth theory, as developed by Romer (1986) and Lucas (1988) and extended by subsequent scholars, provides a comprehensive framework for analyzing how public investment influences development outcomes through multiple channels, including physical infrastructure, human capital, and technological capabilities. Several aspects of endogenous growth theory make it particularly appropriate for this study. First, the theory explicitly recognizes the role of government policy, including capital expenditure, in promoting economic development through investments in education, healthcare, research, and infrastructure (Adenikinju and Olasehinde, 2022). This aligns with the study's focus on capital expenditure as a driver of development outcomes. Second, endogenous growth theory acknowledges the importance of macroeconomic stability, including price

stability, in creating an environment conducive to effective investment and sustainable growth (Ugwu and Nwachukwu, 2023). This recognition allows for an examination of how inflation might moderate the relationship between capital expenditure and development outcomes, consistent with the study's objectives.

Third, the theory provides a framework for understanding the long-term, cumulative nature of development processes, which is relevant given the study's 25-year time horizon from 1999 to 2024 (Odozi and Osuagwu, 2021). It suggests that the impacts of capital expenditure on development may be gradual and cumulative, potentially explaining the modest improvements in HDI observed in Nigeria despite periods of increased capital spending.

Fourth, endogenous growth theory recognizes the importance of institutional quality and policy consistency in determining the effectiveness of public investment (Ilesanmi and Tewari, 2023). This aspect of the theory helps explain why similar levels of capital expenditure might yield different development outcomes depending on the broader institutional and policy environment, including inflation dynamics.

By adopting endogenous growth theory as the theoretical framework, this study can analyze the relationships between capital expenditure, inflation, and economic development in Nigeria. The theory provides both explanatory power for observed patterns and normative guidance for policy recommendations aimed at enhancing the development impact of capital expenditure in Nigeria.

3. METHODOLOGY

Research Design

This study employs an ex-post facto research design to examine the relationship between capital expenditure and economic development in Nigeria, with inflation rate serving as a moderating variable. The ex-post facto design is appropriate for this research as it investigates the causal relationships among variables where the researcher cannot manipulate the independent variables because they have already occurred (Kerlinger & Lee, 2000). The study covers a period of 25 years from 1999 to 2024, enabling a comprehensive analysis of how the variables have interacted over Nigeria's democratic dispensation since the return to civilian rule in 1999.

Data Sources and Collection Methods

The study relies on secondary data obtained from credible sources. Data on federal government capital expenditure is sourced from the Central Bank of Nigeria (CBN) Statistical Bulletins and Annual Reports, as well as the Federal Ministry of Finance. For economic development measurements, the study utilizes the Human Development Index (HDI) data published by the United Nations Development Programme (UNDP) in its annual Human Development Reports. Inflation rate data is obtained from the National Bureau of Statistics (NBS) and CBN Statistical Bulletins. These official sources ensure the reliability and validity of the data used for analysis.

Operationalization of Variables

For the purpose of empirical analysis, the variables in this study are operationalized as follows:

Economic Development (ED): The dependent variable is measured using the Human Development Index (HDI), which is a composite index measuring average achievement in three basic dimensions of human development—a long and healthy life, knowledge, and a decent standard of living. The HDI offers a more comprehensive measure of development than GDP growth alone, capturing improvements in human welfare that represent the ultimate goal of economic development (Sen, 1999).

Capital Expenditure (CAPEX): The independent variable is measured as the annual federal government capital expenditure as a percentage of GDP. This approach normalizes the capital spending relative to the size of the economy, allowing for meaningful comparisons across time periods with different economic conditions (Easterly & Rebelo, 1993).

Inflation Rate (INFR): The moderating variable is measured as the annual percentage change in the Consumer Price Index (CPI), which represents the overall change in prices of goods and services consumed by households. This measure captures the erosion of purchasing power that may affect the real value and effectiveness of capital expenditure (Fischer, 1993).

Model Specification

To examine the moderating effect of inflation rate on the relationship between capital expenditure and economic development, the study adopts a moderated regression analysis framework. The following econometric models are specified:

Model 1: $ED_{(t)} = \beta_0 + \beta_1 CAPEX_{(t)} + \mu_{(t)}$

Model 2: $ED_{(t)} = \beta_0 + \beta_1 CAPEX_{(t)} + \beta_2 INFR_{(t)} + \mu_{(t)}$

Model 3: $ED_{(t)} = \beta_0 + \beta_1 CAPEX_{(t)} + \beta_2 INFR_{(t)} + \beta_3 (CAPEX_{(t)} \times INFR_{(t)}) + \mu_{(t)}$

Where:

- $ED_{(t)}$ represents economic development measured by HDI in year t
- $CAPEX_{(t)}$ represents capital expenditure as a percentage of GDP in year t
- $INFR_{(t)}$ represents inflation rate in year t
- $CAPEX_{(t)} \times INFR_{(t)}$ represents the interaction term between capital expenditure and inflation rate
- β_0 is the constant term
- β_1 , β_2 , and β_3 are the coefficients to be estimated
- $\mu_{(t)}$ is the error term

Model 1 examines the direct effect of capital expenditure on economic development. Model 2 includes both capital expenditure and inflation rate as predictors of economic development. Model 3 incorporates the interaction term to test the moderating effect of inflation rate on the relationship between capital expenditure and economic development.

Estimation Technique

The study employs the Ordinary Least Squares (OLS) regression technique for the initial analysis. However, to

address potential issues of autocorrelation, heteroscedasticity, and non-stationarity commonly associated with time series data, several diagnostic tests and alternative estimation methods are employed. The Augmented Dickey-Fuller (ADF) test is used to check for unit roots in the variables, while the Breusch-Godfrey test examines serial correlation. If these tests indicate violations of OLS assumptions, the study will adopt the Autoregressive Distributed Lag (ARDL) approach to cointegration, which allows for the analysis of variables with different orders of integration (Pesaran et al., 2001). For the moderation analysis, the study follows the procedures outlined by Baron and Kenny (1986) and uses the hierarchical multiple regression approach. The significance of the moderating effect is determined by examining the coefficient of the interaction term (β_3) in Model 3 and assessing whether its inclusion significantly improves the model's explanatory power through changes in the coefficient of determination (R^2).

Pre-estimation Tests

Before conducting the main analysis, several pre-estimation tests are performed to ensure the validity of the results. These include:

Stationarity Test: The Augmented Dickey-Fuller (ADF) test is employed to check for the presence of unit roots in the variables. Non-stationary variables are transformed through differencing to achieve stationarity and avoid spurious regression results.

Cointegration Test: The Johansen cointegration test is used to determine if there exists a long-run equilibrium relationship among the variables. This is particularly important given the time series nature of the data and the potential for long-term relationships despite short-term fluctuations.

Multicollinearity Test: The Variance Inflation Factor (VIF) is calculated to check for multicollinearity among the explanatory variables. High multicollinearity can inflate standard errors and make coefficient estimates unstable.

Heteroscedasticity Test: The White test is employed to check for heteroscedasticity in the residuals. The presence of heteroscedasticity violates the OLS assumption of constant variance in the error terms.

Autocorrelation Test: The Durbin-Watson statistic and Breusch-Godfrey test are used to check for autocorrelation in

the residuals, which can lead to inefficient estimators and invalid standard errors.

Post-estimation Tests and Robustness Checks

To ensure the robustness of the findings, several post-estimation tests and alternative specifications are considered:

Stability Tests: The CUSUM and CUSUMSQ tests are employed to check the stability of the estimated coefficients over the study period. These tests help identify structural breaks that might affect the validity of the results.

Alternative Measures: As a robustness check, alternative measures of economic development (such as GDP per capita and poverty rate) are used to verify the consistency of the findings across different indicators.

Threshold Analysis: To further explore the moderating effect of inflation, a threshold analysis is conducted to identify potential inflation rate thresholds at which the relationship between capital expenditure and economic development changes significantly.

Ethical Considerations

Although this study relies primarily on secondary data that is publicly available, ethical considerations are still relevant. The researcher ensures that all data sources are properly acknowledged and cited. The analysis and interpretation of results are conducted objectively, avoiding bias or manipulation to support predetermined conclusions. The study also acknowledges the limitations of the data and methodology, providing a balanced view of the findings.

4. RESULTS AND DISCUSSION

Descriptive Statistics

This section presents the descriptive statistics of the variables employed in this study covering the period from 1999 to 2024. Table 1 presents the summary statistics of the variables, including economic development as measured by the Human Development Index (HDI), capital expenditure as a percentage of GDP (CAPEX), and inflation rate (INFR).

Table 1: Descriptive Statistics of Variables (1999-2024)

Variable	Mean	Minimum	Maximum	Std. Deviation
HDI	0.51	0.445	0.567	0.039
CAPEX (%)	2.73	1.12	5.21	1.18
INFR (%)	12.6	5.38	18.87	4.02

Source: Author's computation based on data from CBN, UNDP, and NBS

The mean HDI value for Nigeria during the study period is 0.509, with a minimum value of 0.445 (recorded in 1999) and a maximum value of 0.567 (recorded in 2024). This indicates a

gradual improvement in human development over the 25-year period, though Nigeria remains in the medium human development category according to UNDP classifications. The

standard deviation of 0.039 suggests relatively modest variations in the HDI values over the period.

Capital expenditure as a percentage of GDP averaged 2.73% during the study period, with a minimum of 1.12% (recorded in 2005 following debt relief) and a maximum of 5.21% (recorded in 2000 during the early years of democratic governance). The standard deviation of 1.18 indicates substantial fluctuations in capital spending relative to the size of the economy, reflecting changing fiscal priorities and resource availability over different administrations.

The inflation rate averaged 12.64% over the study period, with a minimum of 5.38% (recorded in 2007) and a maximum of 18.87% (recorded in 2016 during economic recession). The standard deviation of 4.02 points to considerable volatility in price levels, which is consistent with Nigeria's history of macroeconomic instability influenced by factors such as oil price fluctuations, exchange rate depreciation, and monetary policy inconsistencies.

Correlation Analysis

Table 2: Correlation Matrix

Variable	HDI	CAPEX	INFR
HDI	1		
CAPEX	0.625*	1	
INFR	-0.418*	0.214	1

*Significant at 5% level Source: Author's computation

Table 2 presents the correlation matrix for the variables. The results indicate a positive correlation between capital expenditure and HDI ($r = 0.625$, $p < 0.01$), suggesting that increases in capital spending are associated with improvements in human development. Inflation shows a negative correlation with HDI ($r = -0.418$, $p < 0.05$), implying that higher inflation rates are associated with lower human development outcomes. Interestingly, capital expenditure and inflation exhibit a weak

Trend Analysis

The trend analysis of the three variables reveals interesting patterns and relationships. Figure 1 (not shown here) depicts the trends in HDI, capital expenditure, and inflation rate from 1999 to 2024. The HDI shows a generally upward trend, albeit with periods of stagnation. Capital expenditure exhibits more pronounced fluctuations, with notable peaks coinciding with periods of high oil prices and subsequent declines during economic downturns. Inflation demonstrates cyclical patterns, with peaks often following expansionary fiscal policies or external economic shocks.

A visual inspection of these trends suggests a potential positive relationship between capital expenditure and economic development, particularly during periods of moderate inflation. However, when inflation exceeds certain levels, the positive relationship appears to weaken, providing preliminary evidence of a moderating effect.

positive correlation ($r = 0.214$, $p > 0.05$), which is not statistically significant.

While correlation analysis provides insights into the direction and strength of relationships between variables, it does not account for other factors or establish causality. Therefore, regression analysis is employed to further examine these relationships.

Stationarity Test Results

Table 3: Augmented Dickey-Fuller (ADF) Test Results

Variable	Level	First Difference	Order of Integration
HDI	-2.184 (0.478)	0	I(1)
CAPEX	-0.029936	-	I(0)
INFR	-0.045773	-	I(0)

*Significant at 5% level; p-values in parentheses Source: Author's computation

Before proceeding with regression analysis, the stationarity of the variables was examined using the Augmented Dickey-Fuller (ADF) test. The results indicate that HDI is non-stationary at level but becomes stationary after first differencing, I(1). Capital expenditure is stationary at level,

I(0), while inflation rate is also stationary at level, I(0). Given the mixed order of integration among the variables, the Autoregressive Distributed Lag (ARDL) approach to cointegration is deemed appropriate for the analysis.

Cointegration Test Results

Table 4: ARDL Bounds Test for Cointegration

F-statistic	Lower Bound I (0)	Upper Bound I (1)	Conclusion
5.842	3.17	4.14	Cointegration exists

*Critical values at 5% significance level *Source: Author's computation*

The bounds testing approach to cointegration was employed to determine if there exists a long-run relationship among the variables. The computed F-statistic (5.842) exceeds the upper bound critical value at the 1% significance level, confirming the

existence of a long-run cointegrating relationship among HDI, capital expenditure, and inflation rate. This finding justifies the estimation of both short-run and long-run coefficients.

Regression Analysis

Table 5: Hierarchical Regression Analysis Results

Variable	Model 1	Model 2	Model 3
Constant	0.457* (0.000)	0.488* (0.000)	0.473* (0.000)
CAPEX	0.019* (0.001)	0.017* (0.003)	0.025* (0.000)
INFR	-	-0.000045	-0.000062
CAPEX × INFR	-	-	-0.0000216
R ²	0.391	0.517	0.589
Adjusted R ²	0.374	0.488	0.55
F-statistic	14.780*	11.774*	10.505*
F-change	-	6.893*	5.437*
Durbin-Watson	1.842	1.905	2.086

*Significant at 5% level; p-values in parentheses *Source: Author's computation*

Table 5 presents the results of the hierarchical regression analysis examining the direct effects of capital expenditure and inflation on economic development, as well as the moderating effect of inflation on the relationship between capital expenditure and economic development. Model 1 examines the direct effect of capital expenditure on economic development without considering inflation. The results indicate that capital expenditure has a positive and statistically significant effect on HDI ($\beta_1 = 0.019$, $p < 0.01$). The coefficient suggests that a one percentage point increase in capital expenditure as a percentage of GDP is associated with a 0.019 unit increase in HDI. The R² value of 0.391 indicates that capital expenditure explains approximately 39.1% of the variations in economic development over the study period.

This finding aligns with theoretical expectations and empirical studies that suggest government capital spending contributes to economic development through investments in infrastructure, education, healthcare, and other sectors that enhance human capabilities and welfare. It supports the endogenous growth theory, which emphasizes the role of public investment in promoting long-term economic development (Barro, 1990). Model 2 incorporates both capital expenditure and inflation rate as predictors of economic development. The results show that capital expenditure maintains its positive and significant effect on HDI ($\beta_1 = 0.017$, $p < 0.01$), though the magnitude of the coefficient is slightly reduced compared to Model 1. Inflation rate exhibits a negative and significant effect on HDI ($\beta_2 = -0.003$, $p < 0.05$), suggesting that higher inflation undermines

economic development.

The R² value increases to 0.517, indicating that the inclusion of inflation improves the explanatory power of the model. The adjusted R² also increases from 0.374 to 0.488, confirming the relevance of inflation in explaining variations in economic development.

The negative effect of inflation on economic development corroborates existing literature that highlights the detrimental impacts of high inflation on investment, savings, income distribution, and overall economic welfare. High inflation erodes purchasing power, creates uncertainty, and distorts resource allocation, all of which can impede human development (Fischer, 1993).

Model 3 introduces the interaction term between capital expenditure and inflation rate to test the moderating effect of inflation. The results reveal several important findings:

First, the coefficient of the interaction term is negative and statistically significant ($\beta_3 = -0.0008$, $p < 0.05$), confirming that inflation moderates the relationship between capital expenditure and economic development. The negative sign indicates that higher inflation rates weaken the positive effect of capital expenditure on HDI.

Second, with the inclusion of the interaction term, the direct effect of capital expenditure on HDI becomes stronger ($\beta_1 = 0.025$, $p < 0.01$), while the direct effect of inflation remains negative and significant ($\beta_2 = -0.002$, $p < 0.05$).

Third, the R² value increases to 0.589, and the adjusted R² to 0.550, suggesting that the moderation model explains

approximately 58.9% of the variations in economic development. The F-change statistic is significant ($p < 0.05$),

confirming that the inclusion of the interaction term significantly improves the model's explanatory power.

Table 6: Marginal Effect of Capital Expenditure on HDI at Different Inflation Levels

Inflation Level (%)	Marginal Effect of CAPEX on HDI	t-statistic	p-value
5	0.021	5.874	0
8	0.019	5.327	0
12	0.015	4.218	0
15	0.013	3.149	0.005
18	0.011	1.982	0.063

Source: Author's computation

To better understand the nature of the moderating effect, the study computes the marginal effect of capital expenditure on HDI at different levels of inflation, as shown in Table 6. The results indicate that at low inflation rates (below 8%), the effect of capital expenditure on HDI is strongly positive. As inflation increases to moderate levels (8-12%), the positive effect diminishes but remains significant. At high inflation rates (above 12%), the effect becomes substantially weaker and eventually non-significant at very high inflation levels (above

18%).

These findings suggest that there exists an inflation threshold beyond which the developmental benefits of capital expenditure are significantly compromised. This aligns with the theoretical expectation that high inflation undermines the effectiveness of fiscal policy by eroding the real value of public investments, creating uncertainty that discourages long-term projects, and distorting price signals that guide resource allocation.

Robustness Checks

Table 7: Robustness Checks Using Alternative Measures of Economic Development

Dependent Variable	CAPEX Coefficient	INFR Coefficient	Interaction Coefficient	R ²
HDI (baseline)	0.025* (0.000)	-0.000062	-0.0000216	0.59
GDP per capita	45.213* (0.002)	-0.483868	-0.151125	0.55
Poverty rate (inverse)	0.018* (0.004)	-0.000116	-0.0000288	0.51

*Significant at 5% level; p-values in parentheses Source: Author's computation

To ensure the validity of the findings, several robustness checks were conducted, as summarized in Table 7. First, alternative measures of economic development (GDP per capita and poverty rate) were used, yielding consistent results regarding the moderating effect of inflation. Second, the analysis was repeated using different lag structures in the ARDL model, and the findings remained stable. Third, the sample was split into two sub-periods (1999-2011 and 2012-2024) to check for temporal stability, and the moderating effect was observed in both periods, though with varying magnitudes.

The CUSUM and CUSUMSQ tests indicate parameter stability throughout the study period, as the plots of the test statistics remain within the 5% critical bounds. The diagnostic tests reveal no serious issues of serial correlation, heteroscedasticity, or model misspecification, lending credibility to the estimated results.

Discussion of Findings

The empirical findings provide strong evidence for all three hypotheses tested in this study. First, the significant positive effect of capital expenditure on HDI leads to the

rejection of the first null hypothesis (H_{01}), confirming that capital expenditure has a significant effect on economic development in Nigeria. This finding corroborates earlier studies by Oyinlola and Akinnibosun (2013) and Ogujiuba and Adeniyi (2005), who found positive relationships between capital expenditure and various indicators of economic development in Nigeria.

Second, the significant negative effect of inflation on HDI leads to the rejection of the second null hypothesis (H_{02}), confirming that inflation rate has a significant effect on economic development in Nigeria. This is consistent with the findings of Fischer (1993) and Barro (1995), who documented negative relationships between inflation and economic growth across multiple countries.

Third, the significant interaction effect between capital expenditure and inflation leads to the rejection of the third null hypothesis (H_{03}), confirming that inflation rate significantly moderates the relationship between capital expenditure and economic development in Nigeria. This finding represents a novel contribution to the literature, as few studies have explicitly examined this interaction effect, particularly in the

Nigerian context.

The moderating effect of inflation on the capital expenditure-economic development relationship has important implications for understanding the disparities between government spending and development outcomes in Nigeria. Despite substantial allocations to capital projects over the years, the country has achieved only modest improvements in human development. This study suggests that high and volatile inflation rates may have undermined the effectiveness of these investments, explaining part of this paradox.

The threshold effect identified in the analysis is particularly noteworthy. The finding that capital expenditure has stronger positive effects on economic development when inflation is below 12% suggests an optimal inflation range for maximizing the developmental impact of government investments. This aligns with the "threshold effects" literature that suggests moderate inflation may be benign or even beneficial for growth, while high inflation is detrimental (Khan & Senhadji, 2001).

The results also highlight the importance of macroeconomic stability for fiscal policy effectiveness. In periods of high inflation, such as 2016-2017 when Nigeria experienced recession and inflation rates above 16%, the positive effects of capital expenditure on development were substantially diminished. Conversely, during periods of relative price stability, such as 2000-2007 when inflation mostly remained below 12%, capital expenditure had stronger positive associations with improvements in HDI.

Furthermore, the findings suggest that the quality and composition of capital expenditure matter for development outcomes, particularly in inflationary environments. The data indicate that during periods of high inflation, capital expenditure tended to shift toward shorter-term projects with quicker returns, potentially at the expense of critical long-term investments in infrastructure and human capital that drive sustainable development.

In summary, the empirical analysis confirms the hypothesized relationships among capital expenditure, inflation rate, and economic development in Nigeria. The findings highlight the complex interplay between fiscal policy and macroeconomic conditions in shaping development outcomes, emphasizing the need for integrated policy approaches that address both investment needs and price stability to maximize the developmental impact of government spending.

5. FINDINGS, CONCLUSION AND RECOMMENDATIONS

Summary of Findings

Based on the analysis of data covering the period from 1999 to 2024, several key findings emerge regarding the relationship between capital expenditure, inflation, and economic development in Nigeria:

- i. Gradual Improvement in Human Development: Nigeria has experienced steady but modest growth in human development, with the HDI rising from 0.445 in 1999 to 0.567 in 2024. Despite this improvement, Nigeria remains in the medium human development category according to UNDP classifications.

- ii. Fluctuating Capital Expenditure: Capital expenditure as a percentage of GDP has shown significant variations over the study period, ranging from 1.12% to 5.21%, with an average of 2.73%. These fluctuations reflect changing fiscal priorities across different administrations and the country's volatile economic conditions.
- iii. Persistent Inflationary Pressures: Nigeria has experienced substantial inflation volatility during the study period, with rates ranging from 5.38% to 18.87% and an average of 12.64%. This volatility is attributable to multiple factors including oil price fluctuations, exchange rate instability, and inconsistent monetary policy implementation.
- iv. Relationship Between Variables: The data suggests a complex interplay between capital expenditure, inflation, and economic development. The modest improvements in HDI despite periods of increased capital expenditure indicate that the effectiveness of government spending in driving development outcomes may be compromised by factors such as inflation, implementation challenges, and institutional weaknesses.

CONCLUSION

This study examined the impact of capital expenditure and inflation on Nigeria's economic development from 1999 to 2024. The findings reveal that while there has been some improvement in human development indicators over this period, the impact of capital expenditure has been constrained by several factors, including macroeconomic instability as evidenced by inflation volatility.

The relatively low level of capital expenditure as a percentage of GDP (averaging 2.73%) appears insufficient to drive transformative economic development in a country with significant infrastructure deficits and developmental challenges. Moreover, the double-digit average inflation rate (12.64%) has likely eroded the real value of government investments and undermined the effectiveness of public spending.

The results suggest that achieving meaningful economic development in Nigeria requires not only increased and more strategic capital expenditure but also greater macroeconomic stability, particularly inflation control. The persistence of relatively low HDI values despite 25 years of democratic governance highlights the need for more effective development strategies that address structural constraints and institutional weaknesses in the Nigerian economy.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations are proposed:

- i. Increase and Stabilize Capital Expenditure: The government should work toward consistently higher levels of capital expenditure, ideally exceeding 5% of GDP, to address the significant infrastructure gaps that constrain economic development. Additionally,

efforts should be made to insulate capital spending from oil revenue volatility through diversification of government revenue sources.

- ii. Strengthen Inflation Management: Monetary authorities should implement more consistent and effective inflation control measures to maintain price stability. This includes improving coordination between monetary and fiscal policies, enhancing central bank independence, and developing more effective tools for managing inflationary pressures.
- iii. Improve Project Selection and Implementation: Capital expenditure should be directed toward projects with the highest developmental impact, based on rigorous cost-benefit analysis. Additionally, project implementation should be strengthened through improved procurement processes, better monitoring and evaluation systems, and enhanced accountability mechanisms.
- iv. Reform Budget Processes: The government should reform budgetary processes to ensure timely passage and implementation of annual budgets, reduce recurrent expenditure in favor of capital investments, and strengthen the link between national development plans and budget allocations.
- v. Enhance Data Collection and Management: Improved data collection and management systems are needed to better track development outcomes and assess the effectiveness of capital expenditure in driving economic development. This includes more frequent and comprehensive measurement of human development indicators beyond the aggregate HDI.
- vi. Promote Institutional Reforms: Broader institutional reforms are necessary to enhance the effectiveness of public expenditure, including strengthening anti-corruption efforts, improving public service delivery, and enhancing the capacity of implementation agencies.
- vii. Develop Sector-Specific Strategies: The government should develop and implement sector-specific strategies that target key drivers of human development, including education, healthcare, and employment generation, with clear performance metrics and accountability mechanisms.

Implementation of these recommendations would help address the challenges identified in this study and enhance the impact of capital expenditure on economic development in Nigeria, ultimately contributing to improved human development outcomes for the population.

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