

An Empirical Analysis of Construction Material Cost Fluctuations and Their Impact on Project Delivery Timelines in Nigeria

RICHARD FEMI TIMOTHY

University of Abuja, Nigeria, Faculty of Social Science: Department of Economics

Abstract- *This study investigates the empirical relationship between fluctuations in construction material costs and project delivery timelines in Nigeria. Using quantitative data drawn from construction projects executed between 2010 and 2023, the research assesses how material price volatility affects schedule adherence and project efficiency. The analysis employs correlation and multiple regression techniques to model the relationship between material cost fluctuations, macroeconomic instability, and project time performance. The results reveal a strong positive correlation between material cost variability and project delays, confirming that input price instability significantly prolongs project execution. Inflation and exchange rate volatility amplify these effects, while effective project management practices reduce their magnitude. The findings align with the temporal-economic interaction framework developed by Eke et al. (2016–2023), emphasizing the interdependence of time, cost, and behavioural adaptation in production systems. The study concludes with policy recommendations advocating for local material production, monetary stabilization, and adaptive project management to enhance construction efficiency and sustainability.*

Keywords: *Construction Costs, Material Price Fluctuation, Project Delivery, Empirical Analysis, Nigeria, Time–Cost Interaction*

I. INTRODUCTION

Construction projects represent a significant component of national economic development, particularly in developing economies such as Nigeria, where infrastructure provision drives employment, industrial growth, and social advancement. However, the persistent challenge of project delays remains a major impediment to realizing these objectives. Among the various factors contributing to such delays, fluctuations in the cost of construction materials have emerged as a central determinant. Over the past decade, Nigeria's construction industry has faced recurrent cost shocks linked to inflationary pressures, currency depreciation, and global commodity market volatility. These fluctuations

disrupt procurement schedules, distort budgeting accuracy, and strain contractor cash flows—ultimately leading to extended project delivery timelines. The phenomenon has become more pronounced during periods of macroeconomic instability, particularly between 2016 and 2021, when cement and steel prices doubled within short intervals. This paper empirically examines how such material cost fluctuations affect the timely completion of construction projects in Nigeria. It situates the analysis within the theoretical framework of time–cost interdependence, an evolving paradigm advanced by Eke et al. (2016–2023), which conceptualizes time as both an economic variable and a behavioural function of cost stability.

II. LITERATURE REVIEW

The interrelationship between cost dynamics and temporal efficiency has received increasing scholarly attention in recent years. Eke and Osi (2023) emphasized that modern economic systems operate within “digital time economies” where production efficiency depends on synchronized cost–time coordination. They argued that disruptions in cost predictability lead to temporal distortions that ripple across sectors. This conceptualization aligns with the challenges faced in construction, where fluctuating material prices alter scheduling decisions and resource allocation patterns. Similarly, Eke, Osi, Sule, and Musa (2023) explored monetary transmission mechanisms in the context of hybrid currency models, showing that state control of exchange and digital fiat dynamics affects real-sector cost performance. Their findings underscore the macroeconomic underpinnings of cost fluctuations observed in Nigeria's construction market, where exchange rate depreciation increases the cost of imported materials and extends delivery timelines.

III. METHODOLOGY

The study adopts a quantitative, empirical research design to investigate the influence of construction material cost fluctuations on project delivery timelines. The analysis utilizes secondary data collected from 45 medium- and large-scale construction projects across Nigeria, covering the period 2010–2023. Complementary macroeconomic data on inflation and exchange rate movements were obtained from the Central Bank of Nigeria and the National Bureau of Statistics. The dependent variable is Project Delivery Timeline (PDT), measured as the percentage deviation between actual and planned project duration. The key independent variable is Material Cost Fluctuation (MCF), represented by the standard deviation of quarterly price indices for cement, steel, and bitumen. Control variables include Inflation (INF), Exchange Rate Volatility (EXR), and Project Management Efficiency (PM).

IV. RESULTS AND DISCUSSION

Descriptive statistics indicate that the average project duration exceeded initial schedules by 21.7%, with notable spikes in delay recorded during periods of high inflation and currency instability. Cement and steel exhibited the highest volatility indices (CV = 0.42 and 0.48, respectively), underscoring their susceptibility to market shocks. Correlation analysis revealed a strong positive association ($r = 0.67$, $p < 0.01$) between material cost fluctuations and project delivery timelines, suggesting that cost volatility substantially prolongs completion times. The regression analysis produced the following model: $PDT = 2.41 + 0.62MCF + 0.24INF + 0.18EXR - 0.11PM + \epsilon$. The coefficient of MCF (0.62) was positive and significant at the 1% level, indicating that a 1% increase in material cost volatility leads to a 0.62% increase in project duration.

V. CONCLUSION AND POLICY RECOMMENDATIONS

The study concludes that material cost fluctuations exert a significant and quantifiable influence on project delivery timelines in Nigeria's construction sector. The positive and significant relationship between cost variability and delivery delay confirms that project inefficiencies are primarily driven by input price instability, compounded by inflation and currency depreciation. To mitigate these effects,

several policy and managerial interventions are recommended, including the establishment of a Construction Material Price Index (CMPI), expansion of domestic production capacity for cement and steel, adoption of price adjustment clauses, and enhanced monetary policy coordination. Ultimately, the study affirms that addressing cost fluctuation is not only a financial necessity but also a temporal imperative. Aligning Nigeria's construction management practices with the time–cost equilibrium model proposed by Eke et al. (2016–2023) offers a sustainable pathway toward efficient, timely, and resilient project delivery.

REFERENCES

- [1] Eke, C. I. (2016). An Economic Assessment of Nigeria's Smartphone Data Bundle Consumption, Subscriber Resource Constraints and Dynamics: The Case of Abuja and Lagos States. *Journal of Telecommunication System Management*.
- [2] Eke, C. I. (2019). Teledensity and Economic Growth in Nigeria: An Impact Assessment. *Bingham Journal of Economics and Allied Studies*, 2(2), 120–131.
- [3] Eke, C. I., Magaji, S., & Ezeigwe, G. C. (2020). An Economic Assessment Model of Employment/Dynamics Capacity Development and Household Telecommunication Expenditure in Nigeria. *Journal of Economics and Sustainable Development*, 11(2), 107–115.
- [4] Eke, C. I., & Osi, M. U. (2023). The Gathering Clouds: The Case of Time and Digital Economics. *East African Journal of Business and Economics*, 6(1), 226–232. <https://doi.org/10.37284/eajbe.6.1.1310>
- [5] Eke, C. I., Osi, U. M., Sule, M., & Musa, I. (2023). State Control of Digital-Fiat-Electronics Currency Transmission in an Economy: The Case of Hybrid Currency. *Asian Journal of Economics, Finance and Management*, 92–96.