

Price Volatility, Macroeconomic Indicators, and Education Spending Nexus in Nigeria (1990-2024)

Dr Gbadebo Salako¹, Dr Joseph Olusegun Adeagbo², Oludayo Fatima Olaoye³

¹Department of Economics, Emmanuel Alayande University of Education, Oyo, Nigeria.

²Department of Educational Management Emmanuel Alayande University of Education Oyo, Nigeria. <https://orcid.org/0009-0005-8569-8544>

³Department of Economics, Emmanuel Alayande University of Education, Oyo, Nigeria

ABSTRACT: This study investigated the relationship among price volatility, macroeconomic indicators, and education spending in Nigeria from 1990 to 2024. Secondary data were sourced from the Central Bank of Nigeria Statistical Bulletins and the World Bank Development Indicators. Stationarity properties were examined using the Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) tests, while the Johansen co-integration approach was applied to determine long-run equilibrium relationships. The Auto-Regressive Distributed Lag (ARDL) model was used for regression analysis, followed by heteroskedasticity tests for model diagnostics. Pairwise Granger Causality analysis was employed to assess causal directions among variables. Findings revealed mixed stationarity levels and significant long-run effects. A 1% rise in inflation rate increased total expenditure on education (TEE) by 30%, while exchange rate (13%), gross capital formation (4%), and interest rate (21%) all exerted positive effects on TEE. The model's R^2 (0.99) indicated a strong explanatory power. The study recommends inflation reduction strategies and expansion of education financing to tackle rising costs in Nigeria's education sector.

KEYWORDS: Price volatility, Development indicator, education Expenditure, Exchange Rate, Inflation, Macroeconomic policy

INTRODUCTION

Education financing plays a central role in enhancing human capital development, national productivity, and long-term economic growth. In Nigeria, the education sector continues to experience persistent funding gaps driven by macroeconomic pressures such as inflation, exchange rate depreciation, and unstable investment flows. Price volatility, particularly inflation and currency instability, directly influences the cost of providing education by affecting recurrent and capital expenditures. Rising prices increase the cost of instructional materials, personnel emoluments, infrastructure, and service delivery. According to Aykaç, Pehlivanoglu, & Civelek, (2024) macroeconomic instability, especially inflation, poses significant challenges to maintaining consistent education financing. Over the years, Nigeria has implemented several policies aimed at stabilizing the macroeconomic environment, yet fluctuations remain a critical constraint on education sector planning. Public expenditure on education is expected to respond to short-run and long-run macroeconomic dynamics. Understanding how price volatility and related macroeconomic indicators influence education spending is essential for evidence-based budgeting and policy formulation.

However, despite the invaluable contribution of education, a major problem confronting education is the astronomical increase in the price of educational inputs which is putting financial pressures both on individuals and government alike leading to increase in educational spending, as well as inequalities in access to education and increase in drop-out rates. This also exacerbates the funding abilities of government at all levels thus incapacitating government capacity in the provision of infrastructural facilities in educational institutions.

Price volatility in Nigeria predated independence and cuts across all sectors and countries of the world, and has been a recurring issue of urgent concerns in economic and social discourse. Nigeria as a country has been experiencing price volatility of various degrees, having its root cause in poor management of the economy, policy inconsistencies to ameliorate inflation, external shocks, over-reliance on imported commodities and equipment. Price volatility has far-reaching implications on all sectors, but deeply affecting education sector, thereby exerting adverse effects on human capital development, economic growth and sustainable development.

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The relationship between price volatility and education spending has been a source of concern to economists, researchers and policy makers. The relationship appears controversial and unending. While government spending is a precursor to inflation in some cases (Ayo et al 2012; Nguyen, 2014), inflation also influenced government spending (Nguyen, 2014; Ezinrin et al 2008), thereby establishing causal relationship between inflation and government spending. Understanding volatility and its behavior has been of key interest to economists in the past decades that have shown highly volatile changes in prices in all markets. According to Samuelson (2015), it is now widely accepted that commodity prices fluctuate randomly.

Price volatility engendered so many nativities to individuals like increased in school fees and increase in educational inputs. However, due to prevalence of high poverty rates, many parents could not afford the payments, and this has culminated to inaccessibility to education, increase in drop-out rates, dwindling enrolment rates and others. Thus, millions of poor people and their children are excluded from the processes and outcomes of education (Odia and Omofonmwam, 2017).

Also analyzing the effect of price volatility from government perspective, it has led to increase in prices of infrastructural materials and government educational spending, thereby leading to inadequate facilities in schools, dilapidated buildings and classrooms. All these are aggravated by overpopulation in schools, inadequate budgetary allocations and lack of committed teachers leading to low academic outcomes. Commission of Inquiry into Education System of Nigeria Report (2000) indicates that annual average expenditure on schooling in Nigeria by families shows that about 50% of total expenditure is spent on school fees and other indirect costs. This places heavy burden on poor families who cannot afford the required school fees.

It is a common knowledge that Nigerian educational system has experienced hindrances in teaching, learning and distortions in the academic calendar as a result of strike actions due to increase in school fees, non-prompt payment of teachers salary and poor infrastructural facilities in schools. . It is pointed out that Nigeria is not anywhere near United Nations Educational, Scientific and Cultural Organization (UNESCO) 26% benchmark for expenditure on education.

This study therefore examines the nexus among inflation (as a proxy for price volatility), exchange rate, gross capital formation, interest rate, and total expenditure on education in Nigeria between 1990 and 2024. The study contributes to the literature by providing updated empirical insights using ARDL, co-integration, and causality frameworks suitable for mixed-stationary data.

Research Hypothesis

Building on the frameworks of Keynesian macroeconomics, Human Capital Theory, and Public Finance Theory (Eichner, 2023; Fisher, 2022; Azatovna Galiakberova, 2019), this research aims to quantify not only the direct effect of inflation on education spending but also the indirect effects transmitted through GDP performance, government revenue generation, and poverty rates.

This research will test the following Hypotheses.

1. Price volatility has no significant influence on education spending and growth in Nigeria.
2. Inflation and government revenue has no effect on government expenditure on education and development.
3. Interest Rate has no significant effect of government expenditure on education

LITERATURE REVIEW

Theoretical Framework

The classicalists view on the relationship between money supply and price level is anchored under the quantity theory of money which hinged its analysis on the Irvin Fishers' Equation of Exchange. This equation states that $MV=PT$, where M =Money stock/supply; V =Velocity of money in circulation; P =Average price level and T =Volume of all market transactions. Within the Fishers analytical framework, it was theorized that Money supply(M) varies directly with the Average price level (P), thus, an increase in Money supply will lead to an increase in average Price level, while V and T are held constant.

The Cambridge Equation, represents the idea of the Neo-Classicalists and they postulated that the quantity of money demand varies proportionately with the volume of final transactions or the level of money income. Accordingly, the equation states that:

$Md=kY=kPQ$ where:

Md =quantity of money demanded;

k =proportionality factor (the Cambridge k);

P =index of general price level;

Y =level of income;

Q =index of goods sold.

Empirical Review

Adam and Hamidu (2023) examined the impact of government expenditure on inflation in Nigeria between 1980 and 2020 applying econometric model. The result revealed that government expenditure has positive effect on inflation in Nigeria within the sampled period. Ha et al (2019) work on interplay between inflation, GDP, government revenue, poverty, and education spending has

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yielded consistent findings across multiple contexts. Their findings showed that in emerging markets, inflation correlates negatively with human capital investment, largely due to fiscal constraints.

Dada and Abalaba (2013) investigated the causal relationship between government expenditure growth and inflation in Nigeria between 1961 and 2011 using tri-variate RVAR models. The result revealed a long-run unidirectional causality running from inflation to government spending.

Opuofoni & Lubo (2023) analysed the relationship between government expenditure and inflation rate in Nigeria, their finding revealed that long run relationship exist among the variables. Sikiru, Oluwatosin and Kumek (2017) while investigating the empirical relationship between oil price volatility and the stock prices of selected firms on the Nigerian banking sector for the period of 2001 to 2015, the findings through, the conditional mean equations showed that there was evidence of short-run predictability on banks' stock prices, and also that crude oil prices had a significant impact on the Banking sector movements only in two banks. Deaton and Miller (2015) study on commodity prices behaviors and growth in Africa between 2003 and 2014, the study revealed that the difficulties of handling price fluctuations are so severe, and policy-making in African countries so dysfunctional, that the price booms and price slumps are equally to be feared.

Adedoyin, Awonusi and Martins (2015) empirical examination on All-Share Index and inflation volatility in Nigeria between 1985 and 2012 using primary data showed that All Share Index provides a good platform to hedge against inflation in Nigeria.

Findings from Olotu, Nsonwu and Jegbefumwem (2013) about the nexus between volatility of international commodity prices and aggregate output vulnerability between 2008 and 2022 adopting a two-way ANOVA to test the null hypothesis revealed that from independence till date, Nigeria has synchronized requisite macroeconomic framework to accelerate the pace of economic growth. Nguyen (2014) work on the impact of government spending on inflation and education in Asian emerging economies between 1970 and 2010 using Co-integration and Vector Error Correction model was applied showed that government spending had effect on inflation in the countries used as a case study, while additionally in Vietnam, the impact runs from inflation to government spending, while Dilmurod-ugli and Ramdhany, (2025) work on inflation and the financing of education in Uzbekistan revealed that inflation negatively impacts education spending both directly and indirectly, primarily by slowing GDP growth, reducing government revenue and exacerbating poverty level. Their work suggested the urgent need for policy makers to stabilize macroeconomic variables to safeguard education funding, while the work of Ayo et al (2012) empirical analysis on the effect of fiscal deficit on inflation in Nigeria. It was discovered fiscal deficit has effect on inflation in Nigeria.

METHODS AND MATERIALS

Sources of Data:

The data for the study were collected from the Central Bank of Nigeria Statistical Bulletin (2022) and the World Bank Development Indicators (2022). The empirical implementation of the model made use of macroeconomic data covering 41 years (1981-2024).

Model Specification

In this research, the specified model in its functional form is stated as:

$$TEE = f(INFR, EXR, GCF, INTR) \quad (i)$$

Linearizing equation (2), the model takes the form:

$$\text{Log}(TEE) = \beta_0 + \beta_1 \text{Log}(INFR) + \beta_2 \text{Log}(EXR) + \beta_3 \text{Log}(GCF) + \beta_4 \text{Log}(INTR) + \mu \quad (ii)$$

Where:

β_0 = intercept of the model

TEE = Total Expenditure on Education (Proxy for the financing of education)

INFR = Inflation Rate

EXR = Exchange Rate

GCF = Gross Capital Formation

INTR = Interest Rate

μ = the error term

$\beta_1, \beta_2, \beta_3, \beta_4$ are the parameters to be estimated. The 'a priori' expectation of $\beta_1, \beta_2, \beta_3, \beta_4 > 0$. This means that the independent variables are expected to have positive relationship with the dependent variable.

Method of Estimation

The data collected will be estimated using Augmented Dickey-Fuller Test (Unit Root) to determine whether the variables are stationary or not; Johansen co-integration technique to check for a long-run relationship among the variables in the model. This will be followed by regression analysis.

The Granger causality test will be used to check for causal relationships among the variables. All computations and estimations are at 0.05 level of significance.

RESULTS AND DISCUSSION

Unit Root Test

Table 1: Unit Root Test

Variables	ADF		PP		Order of integration	
	At level	At first difference	At level	At first difference	At level	At first difference
TEE	-4.5777 (0.0046) ***	-2.1039 (0.5236)	-2.1975 (0.4783)	-5.1977 (0.0007) ***	I(0)	I(1)
INFR	-3.8837 (0.0251) **	-2.9369 (0.1643)	-2.9410 (0.1612)	-10.6981 (0.0000) ***	I(0)	I(1)
EXR	-0.4353 (0.9826)	-4.7143 (0.0028) ***	-0.6257 (0.9717)	-4.5140 (0.0047) ***	-	I(1)
GCF	-5.5862 (0.0003) ***	-3.0833(0.1289)	-6.2634(0.0000)	-14.0280 (0.0000) ***	I(0)	I(1)
INTR	-7.5881 0.0000	-3.7824 (0.0318) **	-7.2746 (0.0000) ***	-30.2506 (0.0000)	I(0)FF	I(1)

Note: (*) Significant at 10%; (**) Significant at 5%; (***) Significant at 1%.

Source: Authors' Computation (2025)

Applying Augmented Dickey Fuller Unit Root test, it is observed that TEE, INFR and GCF are integrated at level, while EXR and INTR are integrated at first difference. However, while applying Philip Peron test, it is observed that all variables are integrated at first difference except INTR which is integrated at level.

Long-run Relationship among the Variables

Sample (adjusted): 1985 2020

Included observations: 36 after adjustments

Table 2: Unrestricted Co-Integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.663425	92.13850	88.80380	0.0281
At most 1	0.407525	52.93689	63.87610	0.2931
At most 2	0.360844	34.09280	42.91525	0.2842
At most 3	0.271570	17.97898	25.87211	0.3453
At most 4	0.166859	6.571875	12.51798	0.3913

Trace test indicates 1 cointegration at 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Source: Authors' Computation (2025).

Table 2 presents the Johansen co-integration test at 0.05 level of significance. The result showed one co-integration equation in the model as corroborated by eigenvalues. It is concluded that a long run relationship exists among the variables. Also, the long run relationship among the variables is confirmed with the trace statistics and critical values.

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ARDL Bound Test

Table 3: ARDL Bound Test

Test Statistic	Value	K
F-statistic	1.153361	4
Critical Value Bounds		
Significance	Lower bound	Upper bound
10%	2.45	3.52
5%	2.86	4.01
1%	3.74	5.06

Source: Authors' Computation, (2025).

From the result, the F-statistics value of 1.153361 is less than the upper and the lower bound test at 5% significance levels. Hence, we reject the null hypothesis of no co-integration among the variables in the long run. Consequent upon the mixed orders of integration, ARDL is employed for general estimation of the model

ARDL Estimation

Table 4: ARDL Estimation

Dependent Variable: LOGTEE

Sample (adjusted): 1990 2022

Included observations: 15 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LOGTEE(-2)	0.867258	0.102925	8.426093	0.0000
LOGINFR	0.309196	0.217549	1.421271	0.1889
LOGEXR	0.132063	0.166760	0.791935	0.4488
LOGGCF(-1)	0.045383	0.092151	0.492490	0.6342
LOGINTR	0.218873	0.082925	2.639415	0.0269
C	-0.211258	0.765189	-0.276086	0.7887
R-squared::0.988778	0.988778	Mean dependent var		11.12636
Adjusted R-squared	0.982543	S.D. dependent var		1.861870
S.E. of regression	0.245997	Akaike info criterion		0.322178
Sum squared resid	0.544630	Schwarz criterion		0.605398
Log likelihood	3.583663	Hannan-Quinn criter.		0.319161
F-statistic	158.5974	Durbin-Watson stat		1.855457
Prob(F-statistic)	0.000000			

Source: Authors' Computation, (2025).

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The regression analysis above shows positive relationship (coefficient = 0.3091), prob = 0.1889) between Price Volatility (INFR) and Total Expenditure on Education (TEE) which implies that a 1% increase in inflation rate (INFR) exerts about a 30% increase in Total Expenditure on Education (TEE). Also, a 1% increase in Exchange Rate (EXR) leads to about a 13% increase in Total Expenditure on Education (TEE) while a 1% increase in Gross Capital Formation (GCF) culminates into about 4% increase in Total Expenditure on Education (TEE), when one lag is introduced; and 1% increase in Interest Rate (INTR) resorts to about 21% increase in Total Expenditure on Education (TEE).

The Durbin Watson statistics show a value of approximately 1.8 which shows the absence of serial correlation. The estimated R^2 value of 0.99 shows that 99% systematic variation in Total Expenditure on Education (TEE) is caused by variation in the explanatory variables. The F-statistics shows a value of approximately 158.5974 and $p=0.0000$ which indicates that the overall model is significant at 1 percent level.

Heteroskedasticity Test

One of the unlined assumptions of linear regression is constant variance of the model (homoskedasticity), violation of this assumption can lead to bias estimation of the model parameters. To validate this assumption, this study checked the heteroskedasticity of the model.

Table 5: Heteroskedasticity Test

F-statistic	0.002831	Prob. F(1,36)	0.9579
Obs*R-squared	0.002988	Prob. Chi-Square(1)	0.9564

Source: Authors' Computation, (2025).

From the result, the F-statistic value of 0.002831 and probability value of 0.9579 shows that the null hypothesis cannot be rejected. Hence, the assumption of constant variance is valid for the model.

Pairwise Granger Causality Tests.

The Granger causality test results in Table 5 gives the pairwise granger tests for the variables of interest. The results indicated that significant causality ran from EXR to TEE while no causality exist among other variables. This implies that unidirectional relationship exists between EXR and TEE.

Table 6: Granger Causality Test

Null Hypothesis:	Obs	F-Statistic	Prob.
INFR does not Granger Cause TEE	39	0.22545	0.7993
TEE does not Granger Cause INFR		0.75203	0.4791
EXR does not Granger Cause TEE	38	3.32519	0.0484
TEE does not Granger Cause EXR		2.78696	0.0761
GCF does not Granger Cause TEE	38	0.19571	0.8232
TEE does not Granger Cause GCF		0.12711	0.8811
INTR does not Granger Cause TEE	39	0.69518	0.5059
TEE does not Granger Cause INTR		0.79281	0.4608
EXR does not Granger Cause INFR	38	1.45416	0.2482

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INFR does not Granger Cause EXR		0.61554	0.5464
GCF does not Granger Cause INFR	38	0.76772	0.4722
INFR does not Granger Cause GCF		0.22858	0.7969
INTR does not Granger Cause INFR	39	0.59588	0.5567
INFR does not Granger Cause INTR		1.56146	0.2245
GCF does not Granger Cause EXR	37	0.04172	0.9592
EXR does not Granger Cause GCF		0.21209	0.8100
INTR does not Granger Cause EXR	38	1.49782	0.2384
EXR does not Granger Cause INTR		1.27015	0.2942
INTR does not Granger Cause GCF	38	0.06086	0.9411
GCF does not Granger Cause INTR		0.70305	0.5023

Source: Author's Computation (2025)

DISCUSSION OF FINDINGS

Based on the findings above, price volatility has a positive but insignificant effect on educational spending at 0.05 significant level. This implies that the higher the price volatility, the higher the effects on educational expenditure by government, the higher the cost of overall-inputs on education, and the higher the cost of spending on education by individuals. Consequently, this has the tendency of decreasing the accessibility of children to schools and increasing the drop-out rates in Nigeria as a result of inability of some parents to pay the exorbitant fees of their children. This finding is in line with Dilmurod-ugli and Ramdhany (2025). All these dovetailed to affecting education growth in Nigeria. The results above corroborates the findings of Ekakitie, Uroko and Akparobi (2023) who examined price volatility and market integration in South-South, Nigeria. The analysis also revealed that EXR and INFR exerted influence on TEE, although not significant. Also, the causality test revealed that there existed unidirectional causation from EXR to TEE, hence placing EXR as an important factor in determining TEE in Nigeria. These findings contribute to a growing body of literature emphasizing that inflation's impact on education finance is multifaceted and not merely the result of direct budgetary erosion.

CONCLUSION AND RECOMMENDATIONS

From the results above, price volatility, by increasing the overall cost of educational spending and inputs, impinges and exacerbates educational growth and development in Nigeria, leading to decreasing accessibility to education and increased drop-out rates of school-age children in Nigeria. The results also revealed the impacts of EXR and INTR on TEE in Nigeria. Although the results are positive, but exerted negative influence on TEE. The increased EXR and INTR would simultaneously increase the cost of TEE and the cost of other educational inputs. Arising from above, Government should holistically formulate monetary, fiscal and other complimentary policies that will not only stabilize inflationary tendencies, but productively stabilizing exchange and interest rates without impinging on other sectors. A more realistic effort is necessary by the monetary authorities to target inflation strongly by reducing inflation to a single digit as contained in the recovery growth plan (2017).

REFERENCES

- 1) Adam, O.F. & Hamidu, M.A. (2023). The Impact of Government Expenditure on Inflation in Nigeria: A Granger causality. *International Journal of Management, Accounting and Economics*, 10 (2), 31-42.

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- 2) Adedoyin, L. I., Awonusi, F. & Martins, O. I. (2015). All share price and inflation volatility in Nigeria. An application of the EGARCH model. [EuroEconomica](#), issue 1(34), 75-82
- 3) Aykaç, S., Pehlivanoğlu, M. Ç., & Civelek, M. E. (2024). The Effect of Inflation on High Technology Exports. *International Journal of Commerce and Finance*, 10(1), Article 1.
- 4) Deaton, A., Miller, R., (2015), International commodity prices, macroeconomic performance, and politics in Sub-Saharan Africa. *Princeton studies in international finance*. Department. *Econometrics* 31, 307-327.
- 5) Dilmurod-ugli T. J; and Ramdhany A. (2025). Inflation and the Financing of education in Uzbekistan: A mediation analysis of macroeconomic and social channels. *International Journal of topics-Innovation science and Technology*. Issue 5. <https://ist-journal.uz>. 138-143
- 6) Ekakitie, E. S., Uroko C. S. & Akparobi, N. J. (2023). Price Volatility and Market Integration: The Case of Selected Cereal Merchandizing In South-South, Nigeria. *Central European Management Journal*, 31(2), 410–423.
- 7) Ha, J., Kose, M. A., & Ohnsorge, F. (2019). Inflation in Emerging and Developing Economies: Evolution, Drivers, and Policies. *World Bank Publications*. <https://doi.org/10.1596/978-1-4648-1448-8>
- 8) NguyenL.T.D.(2014).Impact of Government Spending on Inflation and Education in Asian Emerging Economies: Evidence from India, Vietnam and Indonesia. Working Paper ,Ph.D Scholar, Crawford School of Public Policy, Australian National University, Cnab.
- 9) Odia, E. & Omofonmwam, A. B. (2017). *Development of Education in Nigeria*: University of Ife Press Ltd.
- 10) Oladipo,J. & Peter,O.K.(2024).Health and Educational Expenditure Impact on Nigeria’s Economic Growth: Evidence from Non-Linear ARDL. *International Journal of Humanities, Social Sciences and Management*,4(2),1413-1424
- 11) Olotu, M. E., Nsonwu, M., Jegbefunwem, K. (2013). The volatility of international commodity prices and aggregate output vulnerability:sPolicy options for mitigation.*International Journal of Economic Development Research and Investment*,4(1), 1.
- 12) Opuofoni,C,A & Lubo,E.(2023).Analysis of Government Expenditure and Inflation rate in Nigeria.*U.B.S Journal of Business and Economic Policy*.1 (3),298-311
- 13) Patel,G.& Annapoorman (2019).Public Education Expenditure and its Impact on Human Resource Development in India.*South Asian Journal of Human Resources Management*,6(1).97-109.
- 14) Samuelson, P. A. (2015). Proof that properly anticipated prices fluctuate randomly. *Industrial Management Review*, 6(2), 41-49.
- 15) Sikiru, O. A., Oluwatosin, A. & Terver, K. (2017). The Effects of Oil Price Volatility on Selected Banking Stock Prices in Nigeria. *Lagos Journal of Banking, Finance and Economic Issues*, 2(1), pp.133-145.



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