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Do money supply, interest rates, external debt and exchange rates explain inflation in Nigeria? An econometric approach

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Abstract

The recent jump up in the prices of goods and services in Nigeria despite government policy interventions has triggered new research towards finding solutions to curbing this economic menace. This study examines whether the interest rate, exchange rates, external debt and money supply can curb inflation in Nigeria. The proxy measures of the variables under study, such as; 3-month deposit rate (ITR3), naira\1 Us dollar exchange (EXR), government external debt (ETD), money supply (MS) and consumer price index (CPI) data used cover the period from January 1981 to December 2022. Statistical tools such as; order of integration, the Johansen co-integration test, vector error correction (VEC) model, and residual diagnostic test were adopted. The result shows that the variables except ITR3 are integrated order one and ITR3 is stationary in its normal level. The Johansen co-integration test indicates the existence of one co-integrating equation significant at 0.05 level. The estimates of the VEC model specify that of all the explanatory variables considered only 3-month deposit rate has a strong impact on inflation both in the short-run and long-run, while exchange rate has a weak effect on inflation. However, this result can form a basis to re-assess the monetary policy rate in order to control inflation in Nigeria.

Keywords: Exchange Rate; External Debt; Interest Rate; Money Supply; Inflation; VEC Model

1. Introduction

The current economic challenges in Nigeria necessitated by a sudden rise in the prices of goods and services have reawakened the need to deepen research on the actual missing link in our economic space regarding the inability to nip the rising inflation to board. The present scenario of a jump-up or hypo inflation over the past year has left us in doubt about whether the central bank and the monetary policy committee have an answer to the unstable price regime system that has bedeviled our economy.

In November 2016, CPI increased by 18.48% (year-on-year), 0.15% higher than the 18.33% rate recorded in October The proxy measure of inflation, such as the consumer price index (CPI), increased by 12.13% (year-on-year) in January 2020, which is 0.15% higher than its' rate (11.98%) in December 2019 [13]. In October 2023, it was reported by PUNCH newspaper that the headline inflation rate increased to 27.33% relative to the September 2023 headline inflation rate, which was 26.72% [14]. Consequently, the skyrocketing price level has tripled the poor standard of living for an average Nigerian who is living below 20 US dollars per month.

It has been speculated that the abrupt rise in the prices of goods and services is a result of fuel subsidy removal by this current government, arguing that the overnight increase in the petroleum pump price is a critical factor that stimulated inflation. Others hold the opinion that the present inflationary pressure is a backward drop in naira depreciation on the open market. However, inflationary pressure in Nigeria has persisted despite government monetary policy and strategic reforms. This is an indication of multifaceted causes, and this study has decided to examine some of the possible factors that may increase inflationary pressure in Nigeria.

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Several researchers have looked at the dynamics of inflation in relation to some macroeconomic factors, both in Nigeria and across the globe. For instance, [17] argued that an increase in public debt is typically inflationary in countries with large public debts and non-inflationary in countries with smaller public debts. Moreover, [15] posit that higher public debt contributes to higher inflation since domestic debt is usually larger than the monetary base in the run-up to high inflation episodes. [1] posit that an increase in the money supply generates inflationary pressures, which may even lead to hyperinflation.

The CPI measures the average change over time in prices of goods and services consumed by people for day-to-day living. [11] suggest a possible link between the wealth effect and the money supply. They posit that an increase in the price level as a result of the wealth effect will increase money demand, and hence the money supply will have to increase to accommodate the higher money demand. That is, both effects will then jointly lead to an increase in inflation as a result of higher public debt.

[9] opined that the interaction of exchange rates and domestic prices varied from one country to another. In the long run, the study shows that the exchange rate does not have a significant influence on inflation.

[12] conducted studies in 71 countries during 1962–2004 with VAR and found that the relationship between inflation and debt is weak in inflexible exchange rate regimes. Using a greater causality test analysis, [8] confirmed the existence of a long-run relationship between deficits and inflation and concluded that deficiencies contribute to inflation in developing countries in 13 selected Asian countries.

[18] investigated the relationship between the real exchange rate and inflation in Nigeria using the co-integration test, error correction model (ECM), and ARCH technique for the period between 1970 and 2010. This result showed that inflation has been susceptible to real exchange rate fluctuations in Nigeria.

[5] examined the impact of exchange rate volatility on inflation in Nigeria's economy between 1986 and 2010, using VECM. The VECM result indicated a negative shock between the exchange rate and inflation.

[7], in their study, affirm a long-run relationship between the interest rate and inflation rate. [2] also examines whether a long-run equilibrium relationship exists between interest rate and inflation in Nigeria using the framework of the Johansen cointegration test, the vector error correction model (VECM), and the Granger causality test. The results showed evidence of a long-run equilibrium relationship between the two variables, with strong evidence of unidirectional Granger causality flow from interest rate to inflation in the long run.

[3] considered the effects of the Treasury Bill Rate (TBR), one-month deposit rate (IMDR), three-month deposit rate (IIIMDR), six-month deposit rate (VIMDR), twelve-month deposit rate (XIIMDR), and prime lending rate (PLR) on inflation in Nigeria, with data spanning from January 2006 to April 2017. The results indicated that IIIMDR has a negative effect on inflation, significant at the 10% level, while XIIMDR and PLR have a positive effect on inflation, significant at 1% and 5%, respectively. TBR at lag 2 exacts a negative effect on current inflation that is significant at the 1% level. It is observed that among all the predictor variables considered, three months' deposit rate and Treasury bill rate have a direct effect on influencing inflation in the right direction in the long-run and short-run, respectively.

The present inflationary pressure and its persistency have triggered a new phase of research to unravel the effects of some macroeconomic factors on the upsurge in the price level of goods and services in Nigeria. The study looks at the impact of previous inflation, exchange rate, interest rates, government external debt outstanding, and money supply on inflation, the interaction between these variables using the VEC model approach, and also investigates whether these variables cause inflation in the long run.

2. Materials and Methods

The materials and methods used in the study, such as the method of data collection, variable measurement and definition, research design and framework, order of integration test, cointegration test, and vector error correction (VEC) model, are presented in this section.

2.1. Sources and Methods of Data Collection

The yearly time series data on Naira\1 US dollar, money supply, and interest rate are secondary data documented and published in the Central Bank of Nigeria ([6]) statistical bulletin, and the yearly inflation rate is obtained from World

Bank data ([16]). The data covers the period from January 1981 to December 2022, constituting 42 time series observations.

2.2. Variable measurement and definition

The variables under study are the exchange rate (EXR), which is measured using the Nara^1 US dollar exchange rate. Inflation is measured using the consumer price index (CPI), interest rate is measured using the 1-year deposit rate (ITR), government external debt outstanding (EXD), and money supply is the total value of money circulating in the country, and it's measured using the ratio of M3 to M2 (MS).

2.3. Model specification and estimation

One of the critical objectives of this study is to unravel the factors driving inflation in Nigeria, as all the interventions and monetary policy rates have not been able to curb inflationary pressure in Nigeria.

2.4. Research design and framework

The research design of the study is co relational in nature, and it is designed to apply models that will help in specifying the effects of the predictors on the explained variable both in the short-run and long-run. The research framework is of the form:

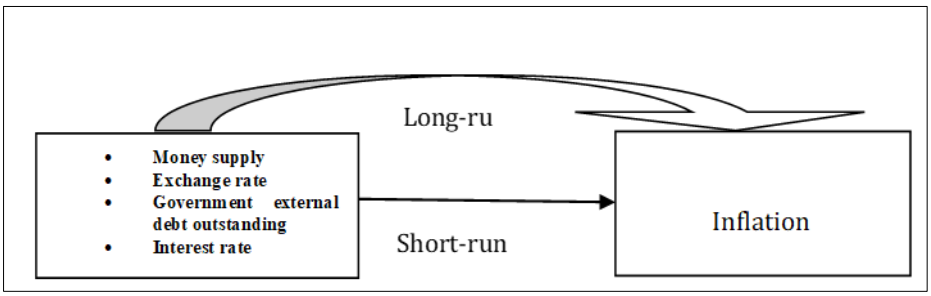

Figure1 Research framework

The long-run relation between these predictors and the response variable will be tested using the [10] co-integration test which will give way for the application of vector error correction (VEC) model for granger causality test.

Co-integration test using Johansen is of the form;

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-1} + \mathrm{A} X_t + a_t \qquad (1)$$

where $\Pi + 1 = \Lambda_1 + \Lambda_2 + \cdots + \Lambda_p$, $\Gamma_i = -\left(\Lambda_1 + \Lambda_2 + \cdots + \Lambda_p\right)$, X_t stands for the d- vector of deterministic variables, the variable y_t is I(1) k-vector, The number of *r* co-integrating equations depends on the number of trace statistics that is greater than the critical values. The random error vector a_t is assumed to be independent and identically distributed with mean zero and variance σ^2. Π is the coefficient matrix that represents number of co-integrating vector. The null hypothesis states that, there are at most *r* co-integration equations.

The VEC model specification for this study is of the form;

$$\Delta cpi_t = \alpha_c + \beta_c ECT_{t-1} + \sum_{i=1}^{p} \delta_{ci} \Delta cpi_{t-1} + \sum_{j=1}^{q} \phi_{cj} \Delta exr_{t-1} + \sum_{k=1}^{r} \eta_{ck} \Delta itr_{t-1} + \sum_{l=1}^{s} \lambda_{cl} \Delta etd_{t-1} + \sum_{m=1}^{w} \nu_{cm} \Delta ms_{t-1} + a_{ct} \quad (2)$$

$$\Delta exr_t = \alpha_d + \beta_d ECT_{t-1} + \sum_{i=1}^{p} \delta_{di} \Delta cpi_{t-1} + \sum_{j=1}^{q} \phi_{dj} \Delta exr_{t-1} + \sum_{k=1}^{r} \eta_{dk} \Delta itr_{t-1} + \sum_{l=1}^{s} \lambda_{dl} \Delta etd_{t-1} + \sum_{m=1}^{w} \nu_{dm} \Delta ms_{t-1} + a_{dt} \quad (3)$$

$$\Delta itr_t = \alpha_e + \beta_e ECT_{t-1} + \sum_{i=1}^{p} \delta_{ei} \Delta cpi_{t-1} + \sum_{j=1}^{q} \phi_{ej} \Delta exr_{t-1} + \sum_{k=1}^{r} \eta_{ek} \Delta itr_{t-1} + \sum_{l=1}^{s} \lambda_{el} \Delta etd_{t-1} + \sum_{m=1}^{w} \nu_{em} \Delta ms_{t-1} + a_{et} \quad (4)$$

$$\Delta_t etd = \alpha_f + \beta_f ECT_{t-1} + \sum_{i=1}^{p} \delta_{fi} \Delta cpi_{t-1} + \sum_{j=1}^{q} \phi_{fj} \Delta exr_{t-1} + \sum_{k=1}^{r} \eta_{fk} \Delta itr_{t-1} + \sum_{l=1}^{s} \lambda_{fl} \Delta etd_{t-1} + \sum_{m=1}^{w} \nu_{fm} \Delta ms_{t-1} + a_{ft} \quad (5)$$

$$\Delta_t ms = \alpha_g + \beta_g ECT_{t-1} + \sum_{i=1}^{p} \delta_{gi} \Delta cpi_{t-1} + \sum_{j=1}^{q} \phi_{gj} \Delta exr_{t-1} + \sum_{k=1}^{r} \eta_{gk} \Delta itr_{t-1} + \sum_{l=1}^{s} \lambda_{gl} \Delta etd_{t-1} + \sum_{m=1}^{w} \nu_{gm} \Delta ms_{t-1} + a_{gt} \quad (6)$$

where $\beta_h (h = c, d, e, f \text{ and } g)$ are the coefficients of the lagged error correction term (ECT) that measure adjustment for the long-run co-integrating relationship, the symbol Δ is demoting difference operator and the $e_h (h = c, d, e, f \text{ and } g)$ are random disturbance terms and it is assumed to be uncorrelated with mean zero. $\delta_{hi}, \phi_{hj}, \eta_{hk}, \lambda_{hl}$ and ν_{hm} are the parameter coefficients of the changes in CPI, EXR, ITR, ETD and MS respectively . These parameter coefficients measures short-run effects and we test whether they are equal to zero(granger non-causality) respectively.

2.5. Integration order test

[4] introduced order of integration test (OIT) which offers an alternative way of unit roots testing and it is as presented in (7) below;

$$\left.\begin{aligned} y_t &= \theta_0 + \theta_1 trend + \sum_{j=1}^{3} \phi_j y_{t-j} + a_t \\ y_t &= \theta_0 + \sum_{j=1}^{3} \phi_j y_{t-j} + a_t \\ y_t &= \sum_{j=1}^{3} \phi_j y_{t-j} + a_t \end{aligned}\right\} \quad (7)$$

The first model in (7) is adopted when there is an evidence of a trend in the underlying data series. The second model in (7) is applied when there is no evidence of trend in the series; the trend parameter θ_1 may or may not be significant. The third model in (7) is applied with the exclusion of the intercept θ_0 and the trend term. The stochastic error term $a_t \sim N(0, \sigma^2)$. The ϕ_i $(i = 1, 2, 3)$ are the autoregression coefficients.

Test conditions are;

For I(1); $|\phi_1| \geq 1, |\phi_2| < 1, |\phi_3| < 1$ and $\left|\frac{\phi_1}{\phi_2}\right| > 1$

For I(2); $|\phi_1| > 1, |\phi_2| \geq 1, \frac{|\phi_1|}{|\phi_2|} > 1$

Test Hypothesis

Generally, hypothesis is stated as; $H_0 : \phi_i < 1$ versus the alternative H_a :atleast one of the ϕ's is greater than or equal to one.

3. Results

This section will present the results discussion of data analysis such as variables time plots, order of integration test, cointegration test, VEC model estimation and residual diagnostic tests.

3.1. Variable time plots

The time plots of the changes in the variables under study are presented below;

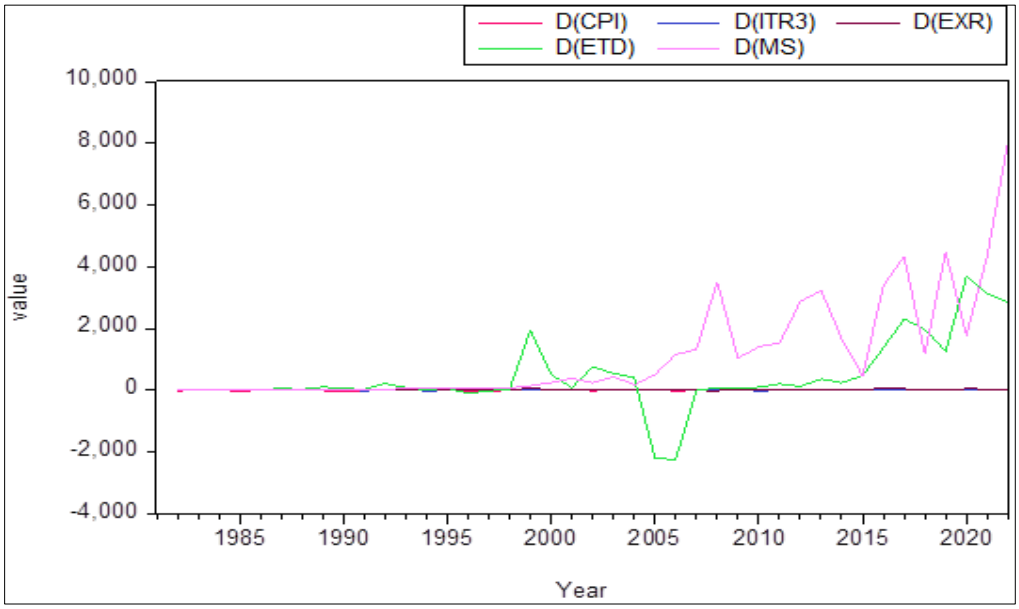

Figure 2 Variables time plot from 1981 -2022

The changes in CPI (which is a measure of inflation rate) tend to align with changes in three month interest rate (ITR3) and exchange rate (EXR) rather than external debt outstanding and money supply (MS).

3.2. Estimates of order of integration test

The result of order of integration test using AAR(3) model is summarized in Equation(7) – ((15) as presented below;

$$\begin{aligned} &\mathrm{CPI}_t = 13.4973 - 0.2179tr + 0.8504CPI_{t-1} - 0.5037CPI_{t-2} + 0.1996CPI_{t-3} + e_t \\ &\text{p - val.} \quad (0.0638)\ (0.2824) \quad (0.0000) \qquad (0.016) \qquad (0.2314) \end{aligned} \tag{7}$$

The estimated AAR(3) OIT in (7) showed that CPI_t has one near unit root problem and it is considered to be integrated order one(I(s1)) as $|\beta_1| \to 1, |\beta_2| = |-0.5038| < 1$, $\beta_3 = 0.1996 < 1$ and $\frac{|\beta_1|}{|\beta_2|} = \frac{0,8504}{|-0.5037|} = 6.6883 > 1$. Therefore, first differencing is adequate to make CPI_t stationary or I(0).

$$\begin{aligned} &\Delta\mathrm{CPI}_t = 1.0836 - 0.0418tr + 0.1089\Delta CPI_{t-1} - 0.4818\Delta CPI_{t-2} - 0.0369\Delta CPI_{t-3} + e_t \\ &\text{p - val.} \quad (0.8392) \quad (0.8391) \quad (0.5302) \qquad (0.0050) \qquad (0.8269) \end{aligned} \tag{8}$$

All the coefficients of $\beta_i (i = 1,2,3)$ are all strictly less than 1 in absolute values. Hence, $\Delta\mathrm{CPI}_t$ is I(0) or stationary. The symbol Δ denotes difference operator.

$$\begin{aligned} &\mathrm{EXR}_t = -6.3571 + 0.7560tr + 1.2507\mathrm{EXR}_{t-1} - 0.4767\mathrm{EXR}_{t-2} + 0.2194EXR_{t-3} + e_t \\ &\text{p - val.} \qquad (0.5124)\ (0.3045) \quad (0.0000) \qquad (0.0774) \qquad (0.2459) \end{aligned} \tag{9}$$

The estimated AAR(3) OIT in (9) showed that EXR_t is integrated order one(I(1)) as $|\beta_1| = 1{,}25971 > 1, |\beta_2| = |-0.4767| < 1,$ and $\beta_3 = 0.2194 < 1$. Therefore, first differencing is adequate to make EXR_t stationary.

$$\begin{array}{l}\Delta \mathrm{EXR}_t = -6.4559 + 0.7500tr + 0.2387\Delta \mathrm{EXR}_{t-1} - 0.2141\Delta \mathrm{EXR}_{t-2} - 0.0584\Delta EXR_{t-3} + e_t \\ \text{p - val.} \qquad (0.3679)\ (0.0254) \qquad (0.1790) \qquad (0.2321) \qquad (0.7521)\end{array} \tag{10}$$

In (10), all the coefficients of $\beta_i (i = 1,2,3)$ are all strictly less than 1 in absolute values. Hence, $\Delta \mathrm{EXR}_t$ is I(0) or stationary. The symbol Δ denotes difference operator.

$$\begin{array}{l}\mathrm{ITR3}_t = 6.8463 - 0.1183tr + 0.4885\mathrm{ITR3}_{t-1} - 0.0872\mathrm{ITR3}_{t-2} + 0.2314\mathrm{ITR3}_{t-3} + e_t \\ \text{p - val.} \qquad (0.0069)\ (0.0151)\ (0.0051) \qquad (0.6382) \qquad (0.1489)\end{array} \tag{11}$$

In (11), all the coefficients of $\beta_i (i = 1,2,3)$ are all strictly less than 1 in absolute values. Hence, $\mathrm{ITR3}_t$ is I(0) in its normal level.

$$\begin{array}{l}\mathrm{ETD}_t = -299.98 + 20.1253tr + 1.6723\mathrm{ETD}_{t-1} - 0.7318\mathrm{ETD}_{t-2} + 0.0963ETD_{t-3} + e_t \\ \text{p - val.} \qquad (0.3445)\ (0.1998)\ (0.0000) \qquad (0.0272) \qquad (0.6595)\end{array} \tag{12}$$

Equation(12) shows that ETD_t is integrated order one(I(1)) as $|\beta_1| = 1{,}6723 > 1, |\beta_2| = |-0.7318| < 1,$ and $\beta_3 = 0.0963 < 1$. Therefore, first differencing is adequate to make ETD_t stationary.

$$\begin{array}{l}\Delta \mathrm{ETD}_t = -333.6096 + 22.5905tr + 0.6877\Delta \mathrm{ETD}_{t-1} - 0.1990\Delta \mathrm{ETD}_{t-2} + 0.3128\Delta ETD_{t-3} + e_t \\ \text{p - val.} \qquad (0.3000)\ (0.1998) \qquad (0.0002) \qquad (0.3309) \qquad (0.1155)\end{array} \tag{13}$$

In (13), all the coefficients of $\beta_i (i = 1,2,3)$ are all strictly less than 1 in absolute values. Hence, $\Delta \mathrm{ETD}_t$ is I(0) in its normal level.

$$\begin{array}{l}\mathrm{MS}_t = -594.7285 + 58.5625tr + 0.8422\mathrm{MS}_{t-1} - 0.1028\mathrm{MS}_{t-2} + 0.3964\mathrm{MS}_{t-3} + e_t \\ \text{p - val.} \qquad (0.2562)\ (0.0683) \qquad (0.0003) \qquad (0.6979) \qquad (0.0813)\end{array} \tag{14}$$

In (14), MS_t has one near unit root problem and it is considered to be integrated order one (I(1)) as $|\beta_1| \to 1, |\beta_2| = |-0.1028| < 1,$ $\beta_3 = 0.3964 < 1$ and $\frac{|\beta_1|}{|\beta_2|} = \frac{0{,}8422}{|-0.1028|} = 8.1926 > 1$. Therefore, first differencing is adequate to make MS_t stationary or I(0).

$$\begin{array}{l}\Delta \mathrm{MS}_t = -1030.809 + 78.9660tr + 0.0912\Delta \mathrm{MS}_{t-1} - 0.0118\Delta \mathrm{MS}_{t-2} + 0.4042\Delta \mathrm{MS}_{t-3} + e_t \\ \text{p - val.} \qquad (0.1221)\ (0.0547) \qquad (0.6849) \qquad (0.9589) \qquad (0.0871)\end{array} \tag{15}$$

In (15), all the coefficients of $\beta_i (i = 1,2,3)$ are all strictly less than 1 in absolute values. Hence, ΔMS_t is I(0) or stationary. The symbol Δ denotes difference operator.

3.3. Co-integration test and VEC model estimates

The results of the Johansen co-integration test and the VEC model as specified in Equations (2) – (6) are presented in Table 1 and Table 2 below.

Table 1 Johansen Co-integration test

Date: 04/13/24 Time: 16:59				
Sample (adjusted): 1983 2022				
Included observations: 40 after adjustments				
Trend assumption: Linear deterministic trend				
Series: CPI EXR ETD ITR3 MS				
Lags interval (in first differences): 1 to 1				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.720196	96.01388	69.81889	0.0001
At most 1	0.467391	45.06724	47.85613	0.0893
At most 2	0.289116	19.86855	29.79707	0.4318
At most 3	0.143529	6.218709	15.49471	0.6697
At most 4	0.000533	0.021338	3.841466	0.8838

The estimate of Johansen co-integration in Table 1 shows that the value of the trace test indicates 1 co-integrating equation at the 5% level. The null hypothesis of no co-integrating equation is rejected.

Table 2 Estimates of the VEC Model

Vector Error Correction Estimates					
Date: 04/10/24 Time: 18:04					
Sample (adjusted): 1983 2022					
Included observations: 40 after adjustments					
Standard errors in ( ) & t-statistics in [ ]					
Cointegrating Eq:	CointEq1				
D(CPI(-1))	1.000000				
ITR3(-1)	-1.588003				
	(0.63005)				
	[-2.52045]				
D(EXR(-1))	-0.393654				
	(0.16352)				
	[-2.40733]				
D(ETD(-1))	0.003063				
	(0.00309)				
	[0.99138]				
D(MS(-1))	-0.002451				
	(0.00201)				
	[-1.21937]				

C	23.19578				
Error Correction:	D(CPI,2)	D(ITR3)	D(EXR,2)	D(ETD,2)	D(MS,2)
CointEq1	-0.750800	0.095875	0.344511	1.370812	5.548330
	(0.16409)	(0.02815)	(0.21337)	(8.34009)	(13.8873)
	[-4.57559]	[3.40613]	[1.61465]	[0.16436]	[0.39953]
C	0.372500	-0.038219	0.641980	71.01331	202.2585
	(2.60849)	(0.44746)	(3.39186)	(132.581)	(220.765)
	[0.14280]	[-0.08541]	[0.18927]	[0.53562]	[0.91617]
R-squared	0.355233	0.233898	0.064203	0.000710	0.004183
Adj. R-squared	0.338266	0.213737	0.039576	-0.025587	-0.022023
Sum sq. resids	10342.44	304.3368	17487.14	26718332	74080425
S.E. equation	16.49756	2.829994	21.45199	838.5189	1396.240
F-statistic	20.93603	11.60175	2.607080	0.027016	0.159621
Log likelihood	-167.8602	-97.34266	-178.3644	-324.9972	-345.3932
Akaike AIC	8.493008	4.967133	9.018219	16.34986	17.36966
Schwarz SC	8.577452	5.051577	9.102663	16.43430	17.45410
Mean dependent	0.372500	-0.038219	0.641980	71.01331	202.2585
S.D. dependent	20.28046	3.191550	21.88952	827.9931	1381.114
Determinant resid covariance (dof adj.)		7.77E+17			
Determinant resid covariance		6.01E+17			
Log likelihood		-1102.548			
Akaike information criterion		55.87739			
Schwarz criterion		56.51072			
Number of coefficients		15			

The VEC estimates in Table2 indicate that the CPI in the short-run relates negatively with the EXR and the ITR3 in Nigeria at lag 1 as t –values are significant at the 5% level. The result also reveals that CPI does not relate with ETD and MS in the short-run as the t-values are less than 1.645, respectively. The coefficients of ECT in Table2 reveal that among all the explanatory variables considered in this study, only the 3-month deposit rate (ITR3) relates with CPI in the long-run, as the t-statistic (3.40613) is significant at 5% level, indicating long-run Granger causality existing from ITR3 to CPI. The result also shows that the EXR has weak long-run effect on inflation (CPI) and it is significant at 10% level. The accounted explained variation in the CPI is 35.5% according to the R-squared.

Table 3 Serial correlation test

VEC Residual Serial Correlation LM Tests						
Date: 04/10/24 Time: 18:00						
Sample: 1981 2022						
Included observations: 38						
Null hypothesis: No serial correlation at lag h						
Lag	LRE* stat	df	Prob.	Rao F-stat	Df	Prob.
1	33.18866	25	0.1264	1.412598	(25, 64.7)	0.1347

2	23.50713	25	0.5480	0.935220	(25, 64.7)	0.5594
3	23.42406	25	0.5528	0.931381	(25, 64.7)	0.5642
Null hypothesis: No serial correlation at lags 1 to h						
Lag	LRE* stat	df	Prob.	Rao F-stat	Df	Prob.
1	33.18866	25	0.1264	1.412598	(25, 64.7)	0.1347
2	61.42035	50	0.1291	1.293325	(50, 58.1)	0.1718
3	94.44010	75	0.0641	1.292384	(75, 37.7)	0.1950
*Edgeworth expansion corrected likelihood ratio statistic.						

In Table 3, the serial correlation test showes that the probability value of the test statistic is not significant up to the 3rd lag, implying absence of serial correlation in the estimated residuals of the VEC model. This indicates that model is adequate.

Table 4 Hetroskedasticity test

VEC Residual Heteroskedasticity Tests (Levels and Squares)					
Date: 04/10/24 Time: 18:06					
Sample: 1981 2022					
Included observations: 40					
Joint test:					
Chi-sq	df	Prob.			
15.33985	30	0.9877			
Individual components:					
Dependent	R-squared	F(2,37)	Prob.	Chi-sq(2)	Prob.
res1*res1	0.011156	0.208712	0.8126	0.446235	0.8000
res2*res2	0.018978	0.357887	0.7015	0.759125	0.6842
res3*res3	0.013717	0.257303	0.7745	0.548699	0.7601
res4*res4	0.022306	0.422072	0.6588	0.892231	0.6401
res5*res5	0.034806	0.667128	0.5192	1.392235	0.4985
res2*res1	0.020380	0.384874	0.6832	0.815201	0.6652
res3*res1	0.050766	0.989397	0.3814	2.030637	0.3623
res3*res2	0.027274	0.518723	0.5995	1.090974	0.5796
res4*res1	0.015567	0.292546	0.7481	0.622685	0.7325
res4*res2	0.000786	0.014549	0.9856	0.031432	0.9844
res4*res3	0.007313	0.136292	0.8730	0.292530	0.8639
res5*res1	0.000773	0.014303	0.9858	0.030902	0.9847
res5*res2	0.006868	0.127945	0.8803	0.274737	0.8716
res5*res3	0.022180	0.419642	0.6604	0.887210	0.6417
res5*res4	0.010266	0.191892	0.8262	0.410642	0.8144

The result in Table4 shows the combine hetroskedasticity test in the estimated VEC model residuals. Since the probability values are not significant, it implies that the residual mean and variance are invariant over time. Hence, the model is adequate

4. Discussion of results

The empirical evidence from this study reveals that exchange rate (EXR) and 3-month deposit rate (ITR) have a negative impact on CPI (which is a proxy measure of inflation) both in the short-run and long-run and this is significant at 5% level and 10%, respectively. The finding agrees with that of [3] for Nigeria. The finding also agrees with that of [7] and [2] who affirm a long-run relationship between interest rate and inflation rate.

The result also reveals that external debt (ETD) and money supply (MS) have no influence on CPI in Nigeria. This finding is contrary to that of [1] who holds the opinion that increase in money supply generates inflationary pressures which may even lead to hyperinflation.

5. Conclusion

The finding shows that both in the short-run and long-run, the 3-month deposit rate and the exchange rate have effects on the inflation in Nigeria, significant at 5% and 10%, respectively. This implies that the 3-month deposit rate has a strong impact on inflation while exchange rate has a weak effect on inflation. Consequently, a rise in the 3-month deposit rate has a reduction effect on inflation in Nigeria. Contrary to our expectations, money supply and external debt outstanding have no effect on inflation in Nigeria. Therefore, among the explanatory variables considered in this study, we opine that a 3-month deposit rate can be more effective in curbing inflationary pressure in Nigeria.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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