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Assessing the Dynamic Innovations of Sele Monetary Policy Measures on General Investment in Nigeria: A VAR Approach

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Abstract

The paper focused on appraising the dynamic innovations of sele monetary policy measures on general investment in Nigeria. Monetary policy measures remain central in promoting general economic stability. Thus, the paper has primarily investigated the dynamic innovations of selected monetary policy measures (real interest rate and money supply) on investment growth in Nigeria. The variables employed are money supply as dependent variable, interest rate and investment as independent variables. The Augmented Dickey Fuller (ADF) Test result reveals that all the variables tested were not stationary at level I(0) but stationary at first difference I(1). Time series data from 1980-2022 period was used to estimate the relationship, using the VAR approach. Forecast error variance decomposition and impulse response functions were estimated to examine the dynamic effects of various innovations (shocks) on investment growth. The data used were sourced directly from Central Bank of Nigeria Statistical Bulletin. Inverse of roots of VAR characteristic Polynomial shows that the model is stable. The results reveal that fundamental shocks of investment variable are associated with its own innovation and that of real interest rate and money supply. The study thus recommends appropriate interest rate policies and periodic increase in money supply to stimulate and sustain investment growth in Nigeria.

Keywords

Innovations, Impulse Response, Variance Decomposition, Investment, Monetary Policy

1. Introduction

Issues relating to monetary policy have hence received a lot of focus among economists, lenders and borrowers due to their importance in the economy. One of the most popular measures is interest rates which shows the price for borrowing and helps in the movement of funds between savers and borrowers where it denotes the amount a borrower is willing to pay for the use of money. These rates are very important in the process of credit creation and which helps for institutions like corporate, bank, mutual fund, insurance company and other inter-mediary bodies to perform their roles professionally [1]. Therefore, interest rates affect almost all the economic activities within any given economy in a very significant manner. As noted by Oliver [2], interest rates affect demand for and distribution of any available credit consequently influencing consumption trends and structure and volume of investments. High interest rates reduce borrowing result-

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ing to slow growth of the economy, while low interest rates increases borrowing and leads to economic growth, this is so since many businesses will be willing to invest due to the low cost of borrowing [3].

However, higher interest rates minimise profit margin. In today's economy, money is employed as a tool of exchange of both goods and services. People normally have some amount of extra cash from the expenditure of goods and services to be reinvested in the economy. To enable this, the price at which individuals and businesses are willing to exchange money or Medium of exchange – the use of money entails the cost for using money often known as the interest rate. Thus, it is possible to focus on interest rates either as the price of funds or the rate of the received interest for borrowed funds. In any case, the field is concerned with the time value of money meaning the fact that most people prefer to have money today not tomorrow [4].

The result shows that credit market conditions can hamper interest rate policies and especially in the developing world. However, Odhiambo & Akinboade [5] opine that there is a possibility of improving the real interest rate could spur savings and also improve on efficiency of investments hence stimulating the level of economic growth. Adebiyi [6] opined that one of the goals of any economy is to achieve sustainable economic growth, nonetheless this is a night mare due to the instability and increasing interest rates. Engaging the topic of economic sustainability, Haron [12] affirm that the volatility and slope of the interest rate is an influential factor in the financial liberalization that determines the rate of economic growth. High interest rate environment also forms part of the factors that Darrat and Dickens [15]. were of the opinion influenced the performance and returns of investments.

In Nigeria, the interest rate is still one of the highest in Africa averaging 13 percent depending on the type of loan that one wants to secure. 5% to 28. 3% in 2023. The interest rates on the commercial bank loans went high as 32 % in 2023 [19], which can be blamed squarely on the government's macroeconomic policy incompetence characterized by adoption of ineffective and unproductive economic policies. These have led to the sustained and increasing budget deficits which different governments have been trying to finance through borrowing. This borrowing in turn has increased the money supply base and put more pressure on inflation and increase the interest rates again. Drawing from the Keynesian model of the economy, airticles such as the crowding out hypothesis explain the existence of a direct cause effect relationship between budget deficits and interest rates. This theory avers that use of more borrowing by the government to finance budget deficits could lead to boost in real interest rates for the economy and this dampened the economy lending capabilities hence reducing investments. On the other hand the Ricardian neutral or equivalence theory maintains that deficit financing by increasing the money supply does not have a profound vitiating impact on the interest and investment levels

However, according to another view, the so called gains in deficit financing are associated with higher interest rates and on the overall investment performance and hence on economic growth and the expansion of the money supply. This paper also seeks to investigate the short-run and long-run relationship between interest rate and money supply and their first and second variance decompositions on investment growth in Nigeria.

2. Literature Review

This section reviews related literature with respect theoretical and empirical perspective to establish the research gap and relevance of the current study.

2.1. Theoretical Review

Monetary theories try to explain variables which determine monetary variables behavior. These theories differ because of differences of opinion as to whether they exert positive or negative impacts on real economic phenomenon.

2.1.1. Mundell–Fleming Model

The Mundell-Fleming model which is also referred to as IS-LM-BP model was formulated in the 1960's by Robert Mundell and Marcus Fleming as outlined by Olivier [2]. This model holds well for a small open economy where capital is perfectly mobile that is the domestic interest rate is given by the interest rate in the world market and is slightly different from the closed economy model. The events that endogenously expand government expenditure shifts the IS curve up and the LM curve remains stationary with higher interest and output levels. But in the model of a small open economy with perfect mobility of capital and flexible exchange rate regime, the domestic interest rate is determined on the basis of horizontal BOP line. As a result, from LM equation there is a level of output that bring the money market into equilibrium for the given rate of interest [7].

Dennis Robertson's theory of interest rates on loanable funds is in line with the neoclassical theory that propounds that long-term interest rates are the outcome of savings and investments equilibrium. As cited by Robertson, interest rate is the price which ensures the availability of loanables at a place where demand and availability of the loan able funds are equal [10]. Demand for credit spurges out when investments are made in fixed assets such as capital equipment, buildings and other assets if the expected rate of profit is higher than interest rate then this credit is available past or current savings. In this context, some of them have made a generalization of the interest rate as being elastic in nature. The loanable funds theory views the interest rate as a function of four key variables: Savings, Investments, Hoarding and Money supply are all the terms that can collectively fall under the same umbrella as defined by Ogumuyiwa and Ekone [11].

2.1.2. Keynesian Theory of Liquidity

The Mundell Fleming model which is known as IS-LM-BP model was sets up by Robert Mundell and Marcus Fleming Olivier in 1960s. This model is used in small open economy with perfect mobility of capital and in this sense domestic interest rate is an exogenous variable, different from the small closed economy model. For instance, let us consider a case whereby government expenditure is high because of other factors that have not been considered in a model. This circumstance is defined as an increase in the IS curve and a decrease in the LM line, the same remaining impassive to this shift and leading to the emergence of high interest rates and high output level. But in an open economy with perfect mobility of capital and a fully convertible currency however the domestic interest rate is explained by the horizontal BOP curve. As such the LM equation which anchors the interest rate and output in the money market is still relevant [4].

Dennis Robertson gave the neoclassical formulary model of interest rates and as per this model the long term interest rate is primarily influenced by the balance between saving and investments. This theory posit that the interest rate is the price which substitutes demand with supply of money for loans [8]. Credits for investments including the purchase of capital goods or buildings is defined by the estimated rate of profit and interest rate with credit being financeded by above referred anterior savings. The interest rate, is also considered a price with the characteristic of elastic demand. The loanable funds theory posits that the interest rate is a function of four key variables: Some of the forms that it can assume include savings, investments, hoarding and money supply as pointed out by Ogumuyiwa and Ekone [11].

This is in support of Keynesian liquidity preference theory that posited that interest rates equally have more to do with demand and supply forces within the money market and not any real factors. This theory is generally coined as an inventory-theoretical model of determination of interest rate since it primarily centers on the short-term money supply and money demand or the liquidity preference. Following the Keynesians' reasoning, low interest rates within an administered cost negatively affect savings and therefore reduce demand for investment. On the other hand, real interest rates are expected to be inverse related to borrowings while a direct effect is expected on savings and thus investments. When interest rates rise people with available liquidity are willing to increase saving and investing by placing the funds in a bank where it will be productively used. As a result, there is an improvement in the amount of funds available for investment thus leading to an improvement in the volumes of productive investments [16].

2.1.3. Financial Liberalization Theory

The theory of financial liberalization provided by McKinnon and Shaw [21] maintain that regulating the interest rates leads in attainment of low or negative real interest rates depressing growth in developing countries. Financial repres-

sion is similar, to deliberately keep interest rates low and hampering both saving and the quality of investment because funding undertaken in such an environment tend to be substandard. McKinnon and Shaw call for liberalization of the interest rates so that the rates rise in order to promote saving and investment more and this will facilitate economic growth. Their theory forms the basis of analysis for this study that focuses on the evaluation of investment performance in Nigeria after the implementation of Structural Adjustment Programme which deregulated the interest rates, with the view of ascertaining the directional flow of investment during this period.

2.2. Empirical Review

The discussion evaluates the current available literature and shows that there is significant literature on the link between interest rates and investment in the developed world. However, these few research works that have examined this relationship have done so over a short period of time and most of the research works done in Nigeria are focused on how interest rates affect the value of the naira. There has been a myriad research done on the relationship between money and growth with most of them containing empirical evidence. For example, Nouri and Samimi [6] on the role of monetary policy on economic growth for Iran from 1974 to 2017 by employing the technique of Ordinary Least Squares (OLS). According to their findings, they affirmed that money supply has an affirmative and statistically significant effect with the level of economic growth in Iran. Other scholar like Asemoglu and Zilibotti [9] and Mansor [10] have also indicated similar results pointing toward a positive correlation between money supply and economic growth.

Several research has attempted to analyse the money supply-growth nexus in Nigeria. Ogunmuyiwa and Ekone [11] employed money supply in order to analyse its effect on economic growth for Nigeria using data obtained from 1980 to 2014. Using quantitative method such as OLS, Granger Causality, MDMA they discovered that money supply has a positive effect on growth but not so much for GDP growth rates between contractionary and expansionary money supply. The similar result has been observed by Ojo [12], Odedokun [13] and Okedokun [14].

Jaymeh and Drabi [15] analyzed effects of some macroeconomic factors like; Interest rate, money supply and inflation on the Jordanian economy. From their findings, they showed that interest rates influence Jordan's economy while inflation influenced the real growth rate. In a similar study, Busari [23]. (2017) examined the relationship of interest rate on Nigeria's economy for year 1990 to 2013. The discoveries supported the hypothesis that interest rates did not greatly affect the economic growth; however, the study advised that lower interest rates could indeed help the Nigerian economy in that it may have a positive effect on investment.

Harswari and Hamza [17] examined the effects of interest

rate on some Asian countries' economy. The study participated twenty out of forty-eight countries from which they used Convenience sampling method. The results also revealed that interest rates yielded a negative and significant effect on the GDP, and inflection on the other hand, affected the FDI with a statistic insignificance. Moyo and Pierre [19] looked into the relationship of interest rate reforms on SADC countries' economic performance from 1990 to 2015 determining that interest rate reforms enhance economic performance in SADC countries. Sim [22] also studying the relationship on how changes in interest rates affect the economic growth of Kenya and found that the coefficient of determination of real interest rate on economic growth was very low.

This paper has shown that the link between interest rates and economic growth is still an area that requires research more in light of the literature presented above. In their studies Mahmudul and Gazi [3] vindicated the fact that high interest rate reduces investment due to higher cost of capital. High interest rate tells the economic agents to save more in order to get higher returns while low interest rates mean cheaper borrowing cost and consequently more investment. Companies usually go for the capital they need to buy new plants or machinery, fabrics and other materials they hope will yield some kind of profit. But if the cost of borrowing such as the interest rate is greater than the expected return on investments, then such investments would not make any economic sense. Hence, it is expected that reductions in interest rates will create investment [20].

Interest rates therefore have a central role to play in the economy given that they affect accumulation of savings, a decisions to invest in financial and real assets as well as the channel through which funds flow from those who have excess finance to those who have a shortage of it, all facilitated through financial intermediaries such as the MDBs, Financial markets, insurance firms, and mutual funds among others. Interest rates have an impact on consumers' expenditure, savings and borrowing capability as well as business output and capital investment. Many firms, in their strategic planning, have exhibited behavior that is apparent in the equilibrium or disequilibrium state of the goods and money market sectors. The goods market presents the income and interest rate at equilibrium and the money market presents the money demand and supply and represents credit market. Consequently, any disequilibrium in these markets will require a change in interest rates as has been shown [1].

To investigate on the effect of interest rates on investment with particular reference on interest and inflation rates, Obute [4] investigated investment behavior in Nigeria for the period 1976 to 2016. At the end, most of the hypotheses tested in this work indicated that investment behavior has a positive and significant influence on interest and inflation rates. In a similar vein, Christiano [27] attempted to analyze the relationship between interest rates and investment in Jordan by using cointegration techniques for the period 1990–2015 and found that real interest rate has a negative impact on

investment. However, it was realized that an increment in the real interest rate by one percent leads to a decrease in the investment spending by more than 44 percent. Moreover, in a study that attempted to examine the factors that explain private investment in the least developed countries in the period 1975 to 1987, Maiga [18] discovered that the real deposit interest rate has an adverse effect on private investment.

To examine the factors affecting private investment, Oliver [2] analyzed the case of Pakistan and discovered that increased real interest rate reduces private investment. Obasaju and Bowale [26] employed a structural VAR model to estimate several endogenous variables and among these were production, real interest rates, exchange rates and stock indices. The study also showed that there was a negative correlation between share prices and interest rates. Hosing also analyzed the interest and exchange rate correlation to the rate of return on equities through regression model analysis with interest rates which he said affected the rate of return on equities.

Rangarajan and Arif [28] used data from Jordan from 1988 to 2020 and also got negative and significant co-efficient of interest rate for share prices of the markets across the countries; Australian, Bangladeshi, Canadian, Chilean, Colombian, Germany, Italian, Jamaican, Japanese, Malaysian, Mexican, Philippines, South African, Spanish and Venezuelan. In six out of the sample countries, findings made showed a negative and significant correlation between the interest rate changes and the changes in stock prices.

In the context of developed countries, Sims [22] employed different techniques and provided that in the post–war period in the United States, nominal income was caused only by money supply in a unidirectional manner as money Granger-caused prices and income. Further, in a more recent study by Geweke et al. [24] empirical evidence verifiable the existence of a relationship between inflation and money supply growth. Also, Bernanke and Blinder [25] and Cristiano [27] observed that a premature and undesired policy increase in interest rates leads to the contraction in monetary stock and economic transactions and, therefore, lowers inflation rates in the long run. According to Asemogu and Zilibotti [9], in contrast to what was performed before, long-horizon asset predictability tests estimates using the OLS methodology are less accurate than those that adopt the VAR technique. For India, Rangarajan and Arif [28] in their study concerning money supply, real output change does not invent more response than money supply, but inflation rate does. Thus, they emphasized that for continuing the inflation process and economic activity fluctuations' sustenance, both the structural and the monetary aspects are vital.

Similarly, Busari [23] established that money demand in Nigeria particularly in the short-run depends on the previous periods short-run money demand and the percent change in GDP in the previous period. However, since the deposit rate in this case is three-month deposits and inflation rate has an inverse relationship with both the short-run money demand.

Mokuolu [21] recently employed a fractional cointegration approach to investigate the Fisher Hypothesis employing data from 33 developed and developing nations. Conclusively, the study established that there is a long-run relationship indicating that nominal interest rate correlates with expected inflation rates, hence in line with Busari's research. From this study, it was deduced that direction and the level of the money behaviour has no effect on the fluctuations of real output with respect to its potential level. However, Odhiambo and Akinwoade [5] examined empirically interest rate, saving and investments in Nigeria within the period 1993-2020 employing the two-step least squares technique. Their outcomes pointed out that even a decline in real interest rate by at least 1 per cent would not stimulate a parallel rise in domestic investment.

2.3. Model Specification

The research, therefore, seeks to evaluate the determinant of investment growth in Nigeria with focus on the effects of monetary policy shocks. As these shocks are time varying, the Vector Auto Regressive model is considered suitable in this analysis, in line with Sims (1986). Thus, this study uses a liberalization model as postulated by Acha [20] which is derived from Mundell and Fleming liberalization theories. The VAR model is specified as follows:

$$V_t = \sum_{k=1}^{\infty} A_{11} V_{t-1} + U_t \qquad (1)$$

The variables captured in the VAR model specified for this study are based on the strength of the neoclassical and monetary theories which allude to the fact that monetary policy measure are catalysts for increased investment and economic growth. Thus, the VAR model of multivariate form is specified.

Specifying a VAR Model

$$y_t = \alpha_1 + b_{11} y_{t-1} + b_{12} X_{t-1} + b_{13} F_{t-1} + U_t$$

$$X_t = \alpha_2 + b_{21} X_{t-1} + b_{22} X_{t-1} + b_{23} F_{t-1} + V_t$$

$$F_t = \alpha_3 + b_{31} F_{t-1} + b_{32} y_{t-1} + b_{33} X_{t-1} + W_t$$

In matrix form

$$\begin{pmatrix} y_t \\ X_t \\ F_t \end{pmatrix} = \begin{pmatrix} a_1 \\ a_2 \\ a_3 \end{pmatrix} + \begin{pmatrix} b_{11} & b_{12} & b_{13} \\ b_{21} & b_{22} & b_{23} \\ b_{31} & b_{32} & b_{33} \end{pmatrix} \begin{pmatrix} y_{t-1} \\ X_{t-1} \\ F_{t-1} \end{pmatrix} + \begin{pmatrix} U_t \\ V_t \\ W_t \end{pmatrix}$$

Assumption: The variables ivt, ms_t, and int_t are stationary. The error terms are white noise

$$ivt_t = \alpha_1 + \sum_{k=1}^{k=4} b_{11} Ivt_{t-1} + \sum_{m=1}^{m=4} b_{21} Ms_{t-1} + \sum_{p=1}^{p=4} b_{13} int_{t-1} + U_t$$

$$Ms_t = \alpha_2 + \sum_{k=1}^{k=4} b_{21} Ms_{t-1} + \sum_{m=1}^{m=4} b_{22} Ivt_{t-1} + \sum_{p=1}^{p=4} b_{23} int_{t-1} + V_t$$

$$int_t = \alpha_3 + \sum_{k=1}^{k=4} b_{31} int_{t-1} + \sum_{m=1}^{m=4} b_{32} Ivt_{t-1} + \sum_{p=1}^{p=4} b_{33} Ms_{t-1} + W_t$$

3. Results and Findings

3.1. Unit Root Test Result

To determine the stationarity of the time series data, the Augmented Dickey Fuller (ADF) Unit Root Test was conducted and the result presented in Table 1:

Table 1. Augmented-Dickey Fuller (ADF) test- Trend and Intercept.

Variables	Level t-Statistic	Prob*	Order of Integration	1st Difference t-Statistic	Prob*	Order of Integration
IVT	-1.609641	0.7693	I(0)	-5.003271	0.0014	I(1)
INT	-1.358360	0.8562	I(0)	-4.788832	0.0203	I(1)
MS	-1.503995	0.8091	I(0)	-3.319501	0.0293	I(1)

Source: Author's computation, using E-views 10.0; Prob* of Variable stationary @ 5%

3.2. ADF Result

The ADF result in Table 1 reveals that all the variables tested were not stationary at level I(0) but stationary at first difference I(1). Implying that all series captured in the model are integrated of order one.

Table 2. Result of Johanssen Cointegration.

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.414932	30.04800	29.79707	0.0468
At most 1	0.148302	6.998845	15.49471	0.5778
At most 2	0.002238	0.096337	3.841466	0.7563

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.414932	23.04915	21.13162	0.0265
At most 1	0.148302	6.902508	14.26460	0.5007
At most 2	0.002238	0.096337	3.841466	0.7563

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

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

The Johansen cointegration result reveals a one cointegration equation at both trace test and maximum eigen value, those implying the existence of long run relationship amongs the variables.

Table 3. Lag length criteria result.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1408.284	NA	3.08e+25	67.20402	67.32814	67.24951
1	-1271.968	246.6674	7.19e+22	61.14134	61.63782	61.32332
2	-1225.907	76.76786	1.24e+22	59.37655*	60.24538*	59.69501*
3	-1202.579	35.54762	6.39e+21	58.69425	59.93545	59.14920
4	-1184.159	25.43802*	4.22e+21*	58.24565	59.85920	58.83708

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

Lag	LogL	LR	FPE	AIC	SC	HQ

HQ: Hannan-Quinn information criterion

Table 4. Vector Autoregressive Estimates Standard errors in ( ) and t- values in [ ].

	IVT	MS	INT
IVT(-1)	0.295461	-0.897180	2.32306
	(0.31290)	(1.12588)	(6.63206)
	[-0.94427]	[-0.79687]	[3.35251]
IVT(-2)	0.422826	0.895595	-2.63106
	(0.11639)	(0.41879)	(2.41106)
	[-3.63289]	[2.13852]	[-1.07511]
MS(-1)	-0.153319	1.788205	1.67E-06
	(0.09922)	(0.35703)	(2.1E-06)
	[-1.54518]	[5.00856]	[0.79920]
MS(-2)	0.100739	-1.010584	1.04E-06
	(0.21599)	(0.77716)	(4.5E-06)
	[5.09636]	[-1.30035]	[0.22959]
INT(-1)	0.5442.47	67847.73	0.545236
	(9555.89)	(34384.3)	(0.20097)
	[4.65079]	[1.97322]	[2.71308]
INT(-2)	-0.3141.49	3201.605	-0.282095
	(14371.2)	(51711.0)	(0.30224)
	[-2.30610]	[0.06191]	[-0.93336]
C	-75.77492	-8092.560	0.654237
	(24936.1)	(89725.8)	(0.52442)
	[-0.00304]	[-0.09019]	[1.24754]

Source; Authors' estimation (2024)

3.3. Vector Auto-regression Result

The VAR result shows that both lagged values of investment, IVT (-1) and IVT (-2), and has positive impact on current investment level. Money supply on the other hand shows that the first lag MS(-1) has negative impact on investment. However, the second lag shows a positive impact on investment growth. Real interest rate in the first lag INT (-1) has positive impact on investment but reveals a negative impact on investment in the second lag.

All the coefficient estimates are in elasticity form with investment lags with elasticity of 0.29, and 0.44. Money sup-ply lags with 0.15, and 0.10, real interest rate with 0.54 and 0.3 respectively. The result implies that all the variables exert some level of impact on investment growth level in Nigeria.

Application of the forecast error variance decomposition was used for both short run and long run factors for each variable due to shocks within the system. This method shows what proportion of the forecast error variance of a variable is due to its own innovations and to innovations in other endogenous variables. The above tables depict the variance decomposition after 10 years, the first three years being in short-run and the sixth and the tenth in the long-run on the basis of ordering of variables.

Table 5. Variance Decomposition of Investment (IVT).

Period	S.E	IVT	INT	MS
1	190319.1	100.0000	0.000000	0.000000
2	219228.7	75.37344	24.54125	0.085307
3	346154.1	30.4819.3	10.53489	58.98318
6	1160027.2	5.152485	14.75663	80.09089
10	2463611.1	4.336395	28.30501	67.35860

As the figure above shows, the own shock of IGT contributed to 100 percent of the variation of IVT in the first period using variance decomposition. But by the last period the contribution is as low as 4 at the end of 10-time periods horizon. 34%. This analysis indicates that the impact of the other two variables is relatively small though MS has the biggest impact at 67 percent. 35%, in the tenth period.

Table 6. Variance Decomposition of Interest rate (INT).

Period	S.E	IVT	INT	MS
1	2.143964	4.281704	95.71830	0.000000
2	2.703673	5.198832	86.64485	8.156314
3	3.198053	5.434620	74.80401	19.76139
6	4.954962	4.778025	50.72111	44.50086
10	7.321039	4.744382	44.95058	50.30504

The same trend is seen with the real interest rate (INT); own shocks dominate the total variation. Initially, 95. 71% of the variation is thus attributed to its own shocks in the first period but reduces to 44. 95% by the tenth period The reaction of audience to the dish will also depend on its presentation and arrangement as indicated on the next page. The effect of the other two variable is therefore relatively small with exports (MS) accounting for 8%. 15% of the variation.

Table 7. Variance Decomposition of Money supply (MS).

Period	S.E	IVT	INT	MS
1	2.143944	4.281704	95.71830	0.000000
2	2.703673	5.198832	86.64485	8.156314
3	3.198053	5.434620	74.80401	19.76137
6	4.95496	4.778035	50.72111	44.50086
10	7.321039	4.774382	44.95058	50.30504

However, when it comes to the variance decomposition of money supply, the same is different from the norm of high variation. While its own shocks are End of the fixed exchange rate policy regime that constituted 0 In the first period the R-squared ranged from 00% to a mere 50. to increase by 30 percent by the tenth period. The other two variables also play a substantial role albeit to a lesser extend with the real interest rate (INT) accounting for 44 percent. Ketford et al., (2009) found that.95% of the variation in the tenth period.
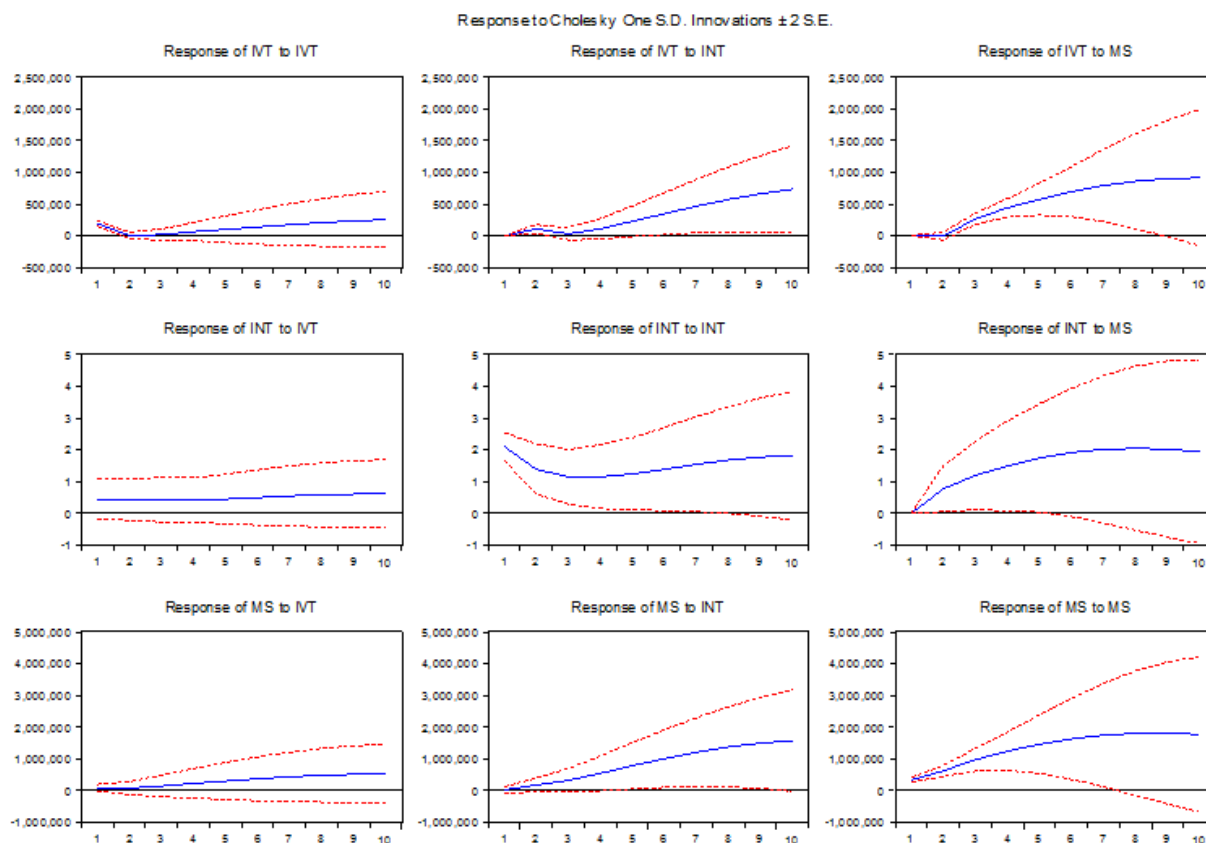
Figure 1. *VAR system impulse response function (IRF) analysis.*

The new coupled VAR system impulse response function (IRF) analysis is illustrated in figure 1 in response to one standard deviation impulse of investment, money supply, and interest rate. Investment fruits in the first period experience a positive, though insignificant, response to money supply and concern interest rate from the first to the fifth period., positively affects the performance for the next fifth period and continues this positive effect up to the tenth period. Likewise, positive shock in money supply leads to very highly significant and positive effects on interest rate and investment growth rate starting from the first period and up to period 10. Thus, these findings imply that investment change, money supply, and interest rate have an impact on investment growth. The use of impulse response functions also paints the picture that reveals that investment growth responds positively according to the time of the shock to money supply and the interest rate.
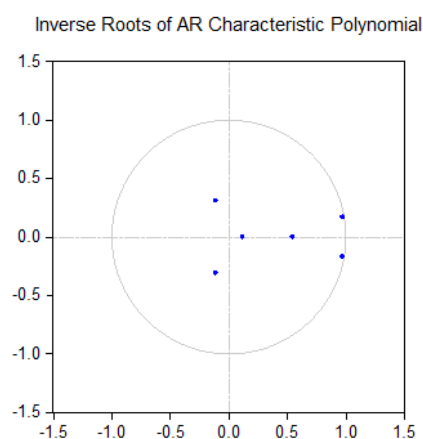
3.4. Stability of the Model

Figure 2. *Inverse Roots Characteristic Polynomial.*

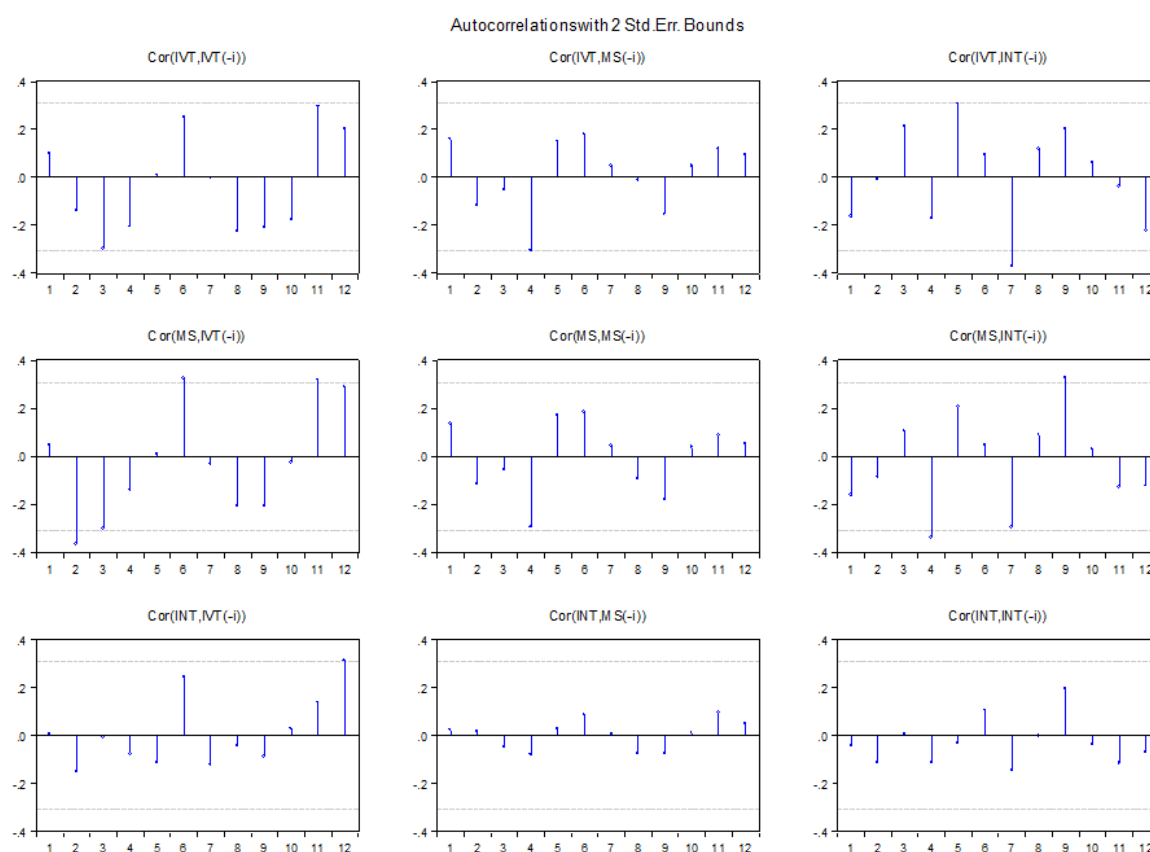| **Endogenous variables: IVT INT MS**	
Root	**Modulus**
0.972225 - 0.168578i	0.986732
0.972225 + 0.168578i	0.986732
0.546144	0.546144
-0.112553 - 0.308668i	0.328549
-0.112553 + 0.308668i	0.328549
0.118910	0.118910

No root lies outside the unit circle.

VAR satisfies the stability condition.

The stability result showed that all the points lie within the circle and the modulus are all greater than 5%, which satisfies the stability condition of the model.

Table 9. VAR Residual Serial Correlation LM Tests.

Lags	LM-Stat	Prob
1	27.68131	0.0011
2	62.84620	0.0000
3	23.44302	0.0053
4	29.70157	0.0005

Probs from chi-square with 9 df.

Figure 3. Autocorrelation with 2 stl Eπ. Bounds.

The serial correlation test shows the absence of no serial correlation as all fall the blue lines falls within the 2 standard error bonds which is a region of no autocorrelation.

4. Conclusion and Recommendation

From the investigation in the study, conclusions are drawn as well as recommendations.

4.1. Conclusion

Using time series data of 1980 to 2022, the paper assessed the effects of innovations and variance decompositions of real interest rate and money supply on investment growth in Nigeria. To estimate the relationship the study used Vector Autoregressive

(VAR) methods of estimation. ADF was employed to test for stationarity of the series and Johansen cointegration tests used and the appropriate lag selection for the time series data.

The findings from the forecast error variance decomposition suggest that most of the variation in the variables is accounted for by own shocks. Similar to the variance decomposition, the impulse response analysis of investment, real interest rate and money supply to these innovations shows a similar pattern. Further, several diagnostic checks were conducted, the results of which vindicated the efficiency, and resilience of the model.

4.2. Recommendations

On the basis of the analysis, the following recommendations are made.

1. Low interest rate policies that stimulate investment should be encouraged as investment drives economic growth.
2. Limited control in Money supply as an influential economic variable that would spur aggregate demand and by extension increase in investment growth.

Abbreviations

MS   Money Supply
INT   Interest Rate
IVT   Investment
ADF   Augmented Dickey Fuller
IRF   Impulse Response Function
HG   Hannan-Quinnin Information Cretirion
SC   Schwarze Information Cretirion
AIC   Akaike Information Cretirion

Conflicts of Interest

The authors declare no conflicts of interest.

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