



POLAC ECONOMIC REVIEW (PER)
DEPARTMENT OF ECONOMICS
NIGERIA POLICE ACADEMY, WUDIL-KANO



EFFECTS OF CURRENCY EXCHANGE RATE ON FOREIGN RESERVE POSITIONS AND IMPORTS IN NIGERIA

Yusuf, Kasim Mohammed

Department of Public Administration, College of Agriculture Ganye

Salihu, Ahmadu Yahaya

Department of Economics, Adamawa State University Mubi,

Abstract

The study is intended to establish a relationship between Nigeria's foreign reserve position and imports as independent variables and the exchange rate as a dependent variable spanning the period 1991-2022. An autoregressive distributive lag model was employed after preliminary investigations, which included the PP, ADF unit root test, and Johansen cointegration test. The model was found to be stable, and residuals are autocorrelated in the post-estimation test. The empirical findings show that in the short run, Nigeria's foreign reserve position and imports were statistically significant to the exchange rate, and that a percentage increase in the exchange rate will lead to an approximately 38 percent fall in Nigeria's foreign reserve position. Similarly, a percentage increase in the exchange rate will further increase Nigeria's import value by about 55 percent. However, none of the independent variables were found to be statistically significant in the long run. In conclusion, the study recommends a comprehensive approach to mitigate arbitrage opportunities and ensure the stability of the naira in the foreign exchange market.

Key words: Foreign Reserve Position, Exchange Rate, Imports, Arbitrage

JEL classification: F31, F4, C22

1. Introduction

International trade and economic stability are greatly influenced by the interdependence of imports, foreign reserves, and the exchange rate. Foreign reserves are considered a stockpile of assets held by a central bank in foreign currencies or other foreign-denominated assets. The impact on imports can be used to influence the exchange rate, making imports cheaper or more expensive. When imports become cheaper it is potentially increasing demand for foreign goods, but may also reduce exports due to their higher price in foreign markets and imports become more expensive, potentially decreasing demand, but may boost exports due to their lower price in foreign markets in terms of stronger and weaker currency respectively. Conversely, imports are defined as goods and services that are

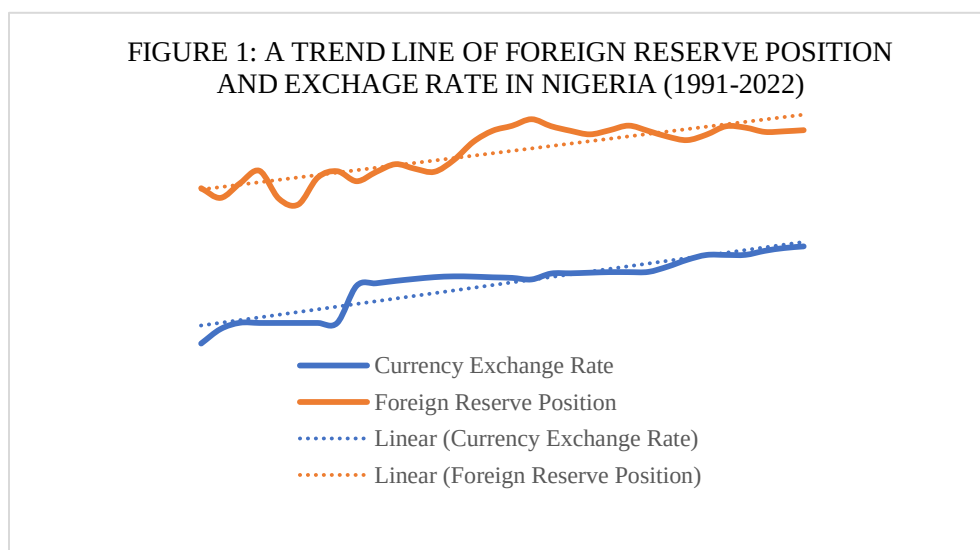
brought into a nation from overseas. Imports' effects on exchange rates consist of a greater need for foreign exchange to cover import costs implies that the value of the home currency would decline, which will reduce imports by the indigenous currency faces rising pressure from decreased demand for foreign exchange.

Assets maintained as reserves in foreign currencies by a monetary authority are known as foreign exchange reserves. These reserves are used to influence monetary policy and / commitments, among them are foreign currencies, bank accounts, bonds, treasury bills, and other foreign government instruments. These assets are mainly held by governments and their agencies to supply emergency cash in the event that their national currency depreciates significantly, despite the fact that

these assets have many applications. Foreign exchange reserves are commonly referred to as international or external reserves (Central Bank of Nigeria, 2021).

The two primary conventions that are commonly employed to define the exchange rate are the direct and

indirect techniques. The value of domestic currency expressed in terms of one unit of foreign currency, such as N405=\$1, is the conversion rate when using the direct approach; however, when using the indirect convention, the value of



domestic currency expressed in terms of one unit of foreign currency, such as N1=\$0.004, is the exchange rate. These standards are important for discussing the performance of a currency, i.e., its appreciation or depreciation, in relation to the real exchange rate regime and when analysing the monetary policy of the nation. The exchange rate is supposed to rise or fall in accordance with the direct convention, which is in operation in Nigeria, based on the quantity of foreign money that is exchanged for naira. The mechanisms that establish exchange rates are known as exchange rate regimes. Fixed exchange rate systems and floating exchange rate systems are essentially the two extreme types of exchange rate regimes.

In a fixed exchange rate regime, the currency rate can be declared or fiat administered by the government or monetary authorities such as central banks. When exchange controls are in effect, rationing or allocation are typically utilised to distribute foreign money. This system depends on substantial external reserves to function. A floating or flexible exchange rate system on

the other hand, is one in which the foreign currency supply and demand determine the exchange rate. In this instance, the monetary authorities use the foreign exchange market to set the exchange rate. A decrease or rise in the value of a currency over time is referred to as appreciation or depreciation. When expressed in terms of a foreign currency, appreciation in the direct convention refers to the decline in the value of the home currency; in the floating or flexible exchange rate system, the opposite is true. In effective reserve management and exchange rates the primary goals are return, liquidity, and safety (capital preservation). Additionally, a lot of central banks utilise their foreign reserves to enter the foreign currency market and maintain the stability of exchange rates. In this instance, solid exchange rate management is based on effective reserve management

The average exchange rate and adjusted foreign reserve positions from 1991 to 2022 are depicted in Figure 1 as a linear trend line. The positive slopes of both trend lines suggest a positive correlation between the foreign

reserve position and the currency exchange rate. There is a clear correlation between the exchange rate and external reserves; according to Yemisi & Adeyinka (2023), the exchange rate significantly and favourably affects foreign reserves. The foreign reserve and exchange rate do, however, also have an inverse and significant relationship, see (Hayat & Jabbar, 2023; Rijoly et al., 2023). Direct convention expresses the exchange rate as the cost of the domestic currency in terms of one unit of foreign currency as is the case in Nigeria. Therefore, this study is determined to examine the statistical relationship between exchange rate, foreign reserve position and imports.

2. Literature Review

2.1 Conceptual Issues

Concept of Exchange Rate

The exchange rate is the cost of a currency expressed in terms of another currency. It is an essential macroeconomic indicator for evaluating the health of an economy overall. It remains a vital pricing component in all nations, serving as a tool to maintain global competitiveness as well as a nominal foundation for local prices (Mordi, 2006).

Concept of Foreign Reserves

Foreign reserves also known as reserve assets in the balance of payments are those foreign assets that are easily accessible to and under the control of a nation's monetary authorities. These consist of cash and other assets with foreign currency values, gold reserves, IMF reserves, and special drawing rights (SDRs). Through direct financing of international payments imbalances or indirect management of their magnitude, these reserves can be used to influence the country's currency's exchange rate by participating in foreign exchange markets (International Monetary Fund, 2004). Underlying the concept of reserve assets are the notions of "control," and "availability for use," by the monetary authorities". Official reserve assets are therefore different from other foreign currency assets that are not available to or within the control of the monetary authorities (Central Bank of Nigeria, 2021).

Concept of Imports

Import refers to the act of bringing in goods or services from a foreign country for use, sale, processing, re-export, or services. It is a fundamental component of international trade and can include a wide variety of products and services. The value of a country's imports is often used to calculate its balance of trade, which is the difference between the value of its exports and imports. Imports can have a significant impact on the economy, providing product diversity, lower prices, and access to resources that may not be available domestically (Johnson, 1987).

2.2 Empirical Review

According to Onwuka and Igweze, (2014), the USD/Naira exchange rate is impacted by foreign reserves. Their models have consistently demonstrated that the USD/Naira exchange rate is significantly influenced by external reserves. There is a direct correlation between the foreign debt, external reserve, and USD/Naira exchange rate.

In a study, Yemisi and Adeyinka, (2023) used the real interest rate, non-oil export, inflation, exchange rate, and external reserve as independent factors and the external reserve as the dependent variable. We used time series data from 1980 to 2020. The Bound Auto Regressive Distributed Lag (ARDL) co-integrating test methodology was utilised for assessment purposes. The Granger causality test further demonstrated a unidirectional causal relationship between exchange rate and foreign reserves, supporting the findings that the exchange rate has a positive and significant impact on foreign reserves.

Okolie et al., (2023) addressed the aim of examining the effect of foreign exchange rates on the foreign reserves. The dependent variable was regressed on the two independent variables using an ex-post facto research approach using dynamic ARDL model bounds tests. The researchers obtained all pertinent data from the Central Bank of Nigeria (CBN) throughout an eight-year period. According to the analysis, foreign currency

rates have a conflicting impact on Nigeria's foreign reserves between 2015 and 2022.

Four methods of panel data estimation were employed by Hayat and Jabbar, (2023) to study a subset of South Asian Association for Regional Corporation (SAARC) countries: Generalised Method of Moment (GMM), Fixed Effect (FE), Pooled Ordinary Least Square (POLS), and Random Effect (RE). The researchers set out to investigate how the foreign exchange reserve affected the exchange rate between 2000 and 2020. Based on the projected outcomes, the foreign exchange reserve has a noteworthy influence on the exchange rate during the examined period.

Examining the existence and nature of the relationship between the exchange rate and foreign exchange reserves was a main objective in a study of Viorica and Tatiana, (2022) Following the revelation of the study, it was highlighted that through the application of Johansen cointegration tests, between the pairs of variables foreign exchange reserve and official exchange rate there is at least one cointegration relationship. Therefore, a long-term relationship is highlighted.

The co-integrating link between import, income, real exchange, and exchange rate volatility was discovered by Akçay and Akçay, (2023) in their study. Common correlated effects are used to evaluate the impacts of income, real exchange rate, and volatility on imports (CCE). The panel's conclusions show that anytime there is instability in emerging countries, long-term imports are significantly and negatively impacted. It is evident that likes and inclinations lean towards imported items, and that rising incomes cause imports to rise.

An autoregressive framework is used in the analysis to capture the shock and explain its long-term influence on a country's foreign exchange reserves by Rijoly et al., (2023). The results of the VECM study show that imports have a negative impact on national foreign exchange reserves, and the exchange rate has a substantial impact. The shock is evaluated from the

primary variables of national foreign exchange, such as exports, imports, and exchange rates, for the period 2000-2019.

The relationship between imports, foreign direct investment (FDI), exchange rates, and Rwanda's economic growth from 1980 to 2020 is examined econometrically by Nyabyenda et al., (2022). Long-term stability is observed in the relationship between the variables in the macro-econometric model provided in this study. The analysis of the short- and long-term relationships was done using the Error Correction Model (ECM) and Johansen co-integration tests. The results show that the factors have a long-term relationship; over time, imports have a significantly positive impact on Rwanda's economic growth, whereas FDI and exchange rate have a significantly negative impact. The short-term VECM results show that Rwanda's economic growth is being positively but only slightly influenced by all of the model's variables.

3. Methodology

The analysis procedure for this study was carried out in three phases. To begin with the pre-estimation test, conduct the unit root tests using Phillips-Perron and Augmented Dicky-Fuller both at level and at first difference. This becomes expedient to avoid spurious regression and ensure that none of the data series becomes integrated of order 2. In addition, a Johansen cointegration test was conducted to show cointegrating relationships; prior to the test, an appropriate lag length was chosen through lag length criteria. Furthermore, the ARDL model was used to analyse the long-run and short-run coefficients of the variables. Lastly, CUSUM and CUSUM of squares were plotted to show recursive residuals for the stability of the model, and the Breusch-Godfrey serial correlation LM test was employed to indicate that the estimated variances of the regression coefficient were reliable and not biased.

3.1 Model Specification

An ARDL is a least squares regression containing lags of the dependent and explanatory variables. ARDLs are usually denoted with the notation ARDL (p), where p is

the number of lags of the dependent variable, is the number of lags of the first explanatory variable, and is the number of lags of the -th explanatory variable.

An ARDL model can be written as:

To specify an ARDL model, you must determine how many lags of each variable should be included that is specify and. fortunately; simple model selection

procedures are available for determining these lag lengths. For the purpose of this study an ARDL model can be estimated via least squares regression, standard Akaike, Schwarz and Hannan-Quinn information criteria was used for model selection.

4. Results and Discussion

Table 1: Phillips-Perron (PP) and Augmented Dickey-Fuller (ADF) Unit Root Test

PHILLIPS-PERRON (PP) UNIT ROOT TEST							
		At Level			At First Difference		
		LEXR	LFRP	LIM	d(LEXR)	d(LFRP)	d(LIM)
With Constant & Trend	<i>t-Statistic</i>	-2.5113	-2.1691	-2.0612	-5.4895	-9.8033	-5.5027
	<i>Prob.</i>	0.3208	0.4892	0.5461	0.0005	0.0000	0.0005
		no	no	No	***	***	***
AUGMENTED DICKEY-FULLER (ADF) UNIT ROOT TEST							
		At Level			At First Difference		
		LEXR	LFRP	LIM	d(LEXR)	d(LFRP)	d(LIM)
With Constant & Trend	<i>t-Statistic</i>	-10.7805	-1.6744	-2.1081	-5.4227	-3.8591	-3.2863
	<i>Prob.</i>	0.0000	0.7358	0.5193	0.0006	0.0285	0.0899
		***	no	no	***	**	*

Source; Author's computation using EViews 9. Notes: (*), (**), (***) Significant at 10%, 5%, 1%. and (no) Not Significant

The Philips-Perron and Augmented Dicky-Fuller unit root tests were performed with the trend and intercept at level and at first difference, as shown in Table 1 above, in order to determine stationarity. In the PP unit root test, LEXR, LFRP, and LIM were only significant at 1 percent and stationary at the first difference. However, in the ADF unit root test, LFRP and LIM were stationary at first difference and significant at 5 percent and 10 percent, respectively, whereas only LEXR is stationary at level and significant at 1 percent. Thus, it may be inferred that the study's variable stationary is a combination of I(0) and I(1).

Table 2: Johansen Cointegration Test.

Trace Test				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.739206	67.58451	29.79707	0.0000
At most 1 *	0.640027	32.63986	15.49471	0.0001
At most 2 *	0.208365	6.075015	3.841466	0.0137
Maximum Eigenvalue				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.739206	34.94464	21.13162	0.0003
At most 1 *	0.640027	26.56485	14.26460	0.0004
At most 2 *	0.208365	6.075015	3.841466	0.0137

Source; Author's computation using EViews 9.

The results of the Johansen cointegration test, the trace test, and the maximum eigenvalues, as displayed in Table 2, point to a cointegrating equation at the 0.05 level, which indicates three cointegrating equations.

Additionally, a combination of variable stationarity at order of integration at level I (0) and at first difference I (1) supports the use of the Auto Regressive Distributive Lag (ARDL) model for this study

Table 3: Short Run Relationship Between Exchange Rate, Foreign Reserve Position and Imports.

Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LFRP)	-0.378225	0.119387	-3.168061	0.0040
D(LIM)	0.552242	0.143554	3.846940	0.0007
CointEq(-1)	-0.113377	0.079364	-1.428569	0.1655

Source; Author's computation using EViews 9.

The foreign reserve position and exchange rate were found to be statistically significant and adversely correlated; a percentage rise in the exchange rate will result in an approximately 38 percent fall in the foreign reserve position. In Nigeria, the Naira is expressed in terms of US dollars, using a direct approach to exchange rates. Consequently, a rise in exchange rates corresponds to a devaluation of the Naira, leading to a reduction in the foreign reserve

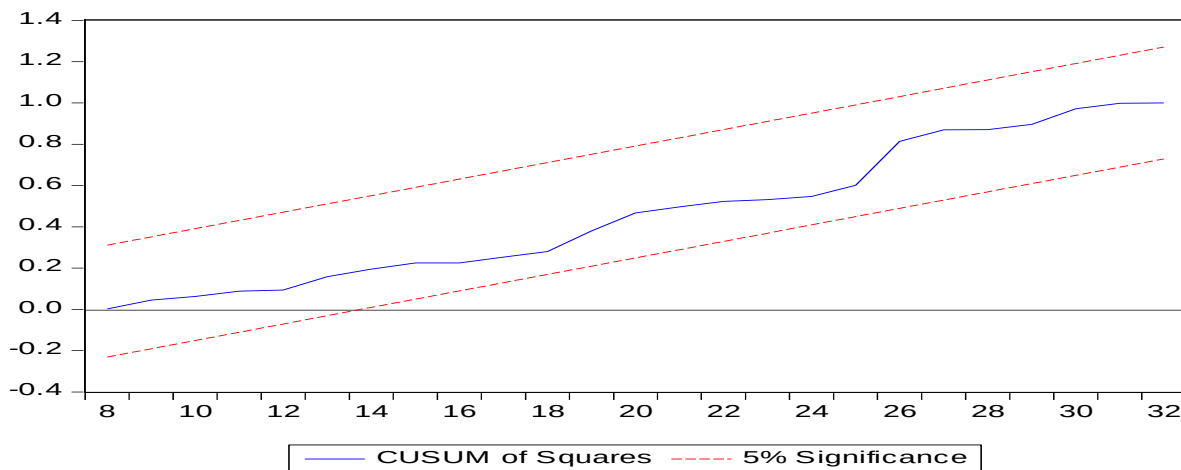
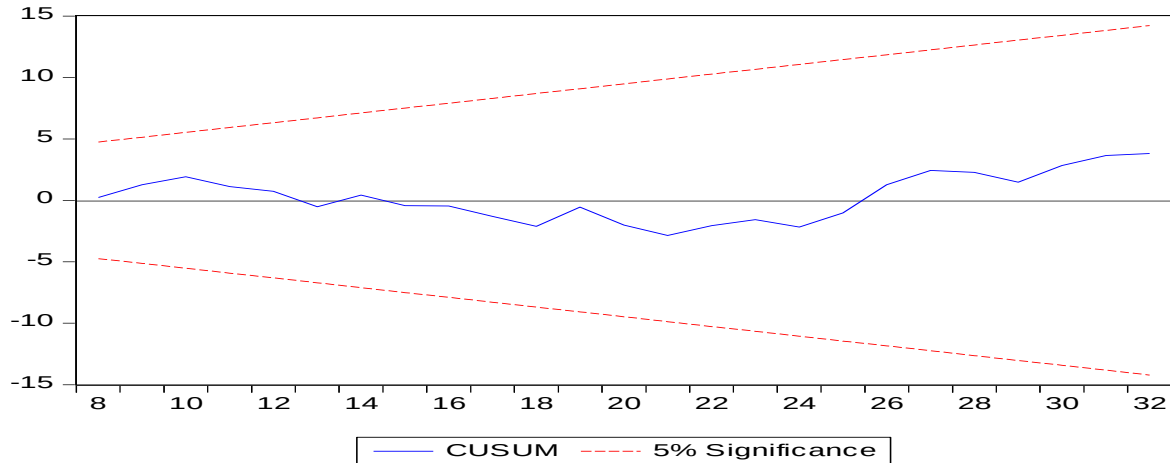
position. Table 3 above establishes a positive and statistically significant relationship between the exchange rate and imports. Specifically, a percentage increase in the exchange rate leads to a 55 percent increase in the value of imports. However, as previously said, a rise in exchange rates is directly devaluing the naira, which provides support for the finding that imports and exchange rates have a positive connection.

4.1 Post Estimation Test

4.1.1 Recursive Residuals

This shows a plot of the recursive residuals about the zero line. Plus, and minus two standard errors are also

shown at each point. Residuals outside the standard error bands suggest instability in the parameters of the equation.



The cumulative sum is plot together with the 5% critical lines. The test finds parameter instability if the cumulative sum goes outside the area between the two critical lines. The CUSUM of squares test also provides a plot against and the pair of 5 percent critical lines. As with the CUSUM test, movement outside the critical lines is suggestive of parameter or variance

instability. This test clearly indicates stability in the equation during the sample period.

4.1.2 Serial Correlation Test

The test accepts the hypothesis of no serial correlation up to order two. The Q-statistic and the LM test both indicate that the residuals are autocorrelated, and the

equation should not be re-specified before using it for hypothesis tests and forecasting

5. Conclusion and Recommendation

Over the years, the apex bank has engaged in reforms in international transactions to restrict the exploitation of the arbitrage opportunity, as the arbitrage gap between the exchange rate at official and parallel market rates has pose challenges to the stability of the currency and the overall economy. The consequences of arbitrage include a lack of foreign exchange supply, devaluation of the currency, and a huge burden on the

apex bank to support the currency as the differences in exchange rates are about 0.6 times higher in the parallel market. This study established that an increase in exchange rate, or, in other words, the devaluation of the currency, will lead to fall in foreign reserve position as reserves are used to influence the country's currency's exchange rate by participating in foreign exchange markets. The study further recommends a comprehensive approach to mitigate arbitrage opportunities and ensure stability of the naira in the foreign exchange market.

References

- Akçay, M. P., & Akçay, F. (2023). The Effect of Exchange Rate Volatility on Import: Evidence from Emerging Markets. *Academic Review of Economics and Administrative Sciences*, 16(03), 800–810.
<https://doi.org/10.25287/ohuiibf.1259895>
- Central Bank of Nigeria. (2021). *Exchange Rate Management in Nigeria* (H. Mahmud & O. O. Duke (eds.)). Central Bank of Nigeria.
www.cbn.gov.ng
- Hayat, M. U., & Jabbar, A. (2023). Impact of Foreign Exchange Reserve on Exchange Rate in Selected South Asian Economies. *Pakistan Journal of Economic Studies*, 5(2), 353–376.
<https://journals.iub.edu.pk/index.php/pjes>
- International Monetary Fund. (2004). International Reserves and Foreign Currency Liquidity: Guidelines for a Data Template. In *International Reserves and Foreign Currency Liquidity: Guidelines for a Data Template*. International Monetary Fund, Publication Service.
<https://doi.org/10.5089/9781589061958.069>
- Johnson, O. (1987). Currency Depreciation and Imports . *Finance and Development*, 24(2), 18–21.
- Mordi, N. O. (2006). Challenges of Exchange Rate Volatility in Economic Management in Nigeria. In *The Dynamics of Exchange Rate in Nigeria*. *Central Bank of Nigeria Bullion*, 30(3), 17–25.
- Nyabyenda, R., Nayak, R. R., & Murekeyimana, T. (2022). The Error Correction Model of FDI , Import and Exchange Rate in Economy of Rwanda. *Nternational Journal of Research in Engineering, IT and Social Sciences*, 12(08), 24–34. <http://indusedu.org>
- Okolie, P. I. P., Osam, M., & Ezeamama, M. C. (2023). Impact of Exchange Rate on Foreign Reserves and Diaspora Remittances in Nigeria 2015-2022. *European Review in Accounting and Finance*, 7(February), 1–17.
<https://doi.org/10.5281/zenodo.7682496>
- Onwuka, E. M., & Igweze, A. H. (2014). Impact of External Reserve and Foreign Debt on Naira Exchange. *JOURNAL OF INTERNATIONAL ACADEMIC RESEARCH FOR MULTIDISCIPLINARY*, 2(6), 416–423.

- <https://www.researchgate.net/publication/286186374>
- Rijoly, J. C. D., Louhenapessy, D. J., & Panggabean, A. J. (2023). The Autoregressive Analysis of Indonesian National Foreign Exchange Reserves 2000-2019 Period. *Berkala Kajian Ekonomi Dan Studi Pembangunan*, 18(1), 164–177.
<https://doi.org/http://dx.doi.org/10.21107/mediatrend.v17i1.15706>
- Viorica, L., & Tatiana, D. (2022). Relationship Between Exchange Rate and Foreign Exchange Reserves. *International Journal of Innovative Technologies in Economy*, 4(40), 0–6.
<https://doi.org/10.31435/rsglobal>
- Yemisi, A. D., & Adeyinka, A. E. (2023). Nexus between Exchange Rate and Foreign Reserves on Economic Growth in Nigeria (1980-2020). *Journal of Economics, Finance and Management Studies*, 06(09), 4442–4452.
<https://doi.org/10.47191/jefms/v6-i9-33>