

An application of multiple regression model to ascertain whether naira redesign has achieved its objectives in Nigeria

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Abstract

The study employed multiple regression model to ascertain whether naira redesign has achieved its objectives in Nigeria. This study adopted a quantitative research design. Primary and secondary data were collected. The primary data was obtained through administration of self-developed questionnaire, while the secondary data was extracted from World Bank publications (data.worldbank.org) spanning from 1970 to 2022 based on data availability for the study variables and the purposive sampling technique was explored. The study employed inferential statistics (Multiple Regression analysis) for data analysis. The results were presented in tables and discussed according to the research objectives. The study revealed a significant linear relationship between GDP and monetary policy such as exchange rate, and interest rate while controlling for the inflation rate. Naira redesign has failed to achieve its objectives, such as curbing inflation, stopping terrorism financing, curbing inflation, naira hoarding and naira counterfeiting. The study recommended that CBN should ensure a provision is made to curb possible challenges that might come with the redesign of Naira note.

Keywords: Redesign; Economic; Growth; model Inferential; Statistics.

1. Introduction

In October 2022, the Central Bank of Nigeria (CBN) announced plans to redesign three out of the eight currency denominations in the country. The apex bank stated it will redesign the N200, N500, and N1000 Naira notes. Some of the reasons made for the redesign by the CBN include hoarding of the Naira which has led to a shortage of cash in circulation, an increase in the rate of counterfeiting notes, and that according to best practice, Naira redesign should be undertaken every 5 to 8 years. The CBN announced it had the support of the government to carry out the proposed plan.

On 23 November 2022, President Muhammadu Buhari unveiled the new naira notes. The unveiling raised eyebrows and concerns, especially across social media platforms. Many alluded that the redesign was only “adding colour” to the old notes. The CBN earlier announced that the old note will cease to be a legal tender on January 31, 2023, but later extended by 10 days to February 10, 2022, after calls from different quarters. However, the extension didn't prove to be effective as many Nigerians were left scrambling for cash.

The CBN governor, Godwin Emefiele, also announced that it has created an alternative source for citizens to carry out their transactions to cushion the effect of the naira redesign policy. In the wake of the policy, banking halls were filled with individuals trying to either deposit their old notes or get new notes. The policy no doubt created hardship as people

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do not have access to new notes, and the Point of Sale (POS) option was not feasible for customers as many charged as high as 50% of the amount to be withdrawn. Also, many Nigerians were left frustrated due to failed transactions with many having their funds trapped for weeks. With the validity of the old notes extended, there are lessons to be learned.

One of the reasons the CBN gave for the naira redesign was to curb inflation in the country. However, checks have revealed that Nigeria's inflation has continued to be on the increase, and the redesign has failed to curb it. According to the NBS, in October 2022 when the CBN announced plans for the Naira redesign, the inflation rate was 21.09 per cent. However, Nigeria's inflation rate has increased from 21.82 per cent in January 2023, to 21.9 per cent in February 2023.

The chairman of the Economic Financial and Crime Commission (EFCC) Abdulrasheed Bawa lauded the CBN that the move to redesign the Naira will help curb vote buying in the 2023 general elections. However, it should be noted that this doesn't fall into the duty of the CBN and as such should not get itself involved in such.

Another reason the CBN gave was to stop terrorism financing. The country has been bedevilled with kidnapping for ransom, among other security issues. In an earlier report by Nextier (a public policy research organization), it noted that the Naira redesign to curb terrorism financing was more of a "quick fix", and also the approach cannot effectively curb it. It also accused the Nigerian government of failing to act on an earlier report of individuals charged for links to terrorist organizations and they lack the political will. The CBN has so far failed to report on this, and there's no proof it has done this. It was on this ground that this study employed multiple regression model to ascertain whether naira redesign has achieved its objectives in Nigeria.

2. Literature review

Alisha (2020) used the exchange rate, interest rate, inflation rate, and trade balance as variables and data from the Central Bank of Nigeria statistical bulletin and publications from the National Bureau of Statistics to examine the relationship between exchange rate fluctuations and their effects on the growth of the Nigerian economy. Several methods, including the Augmented Dickey-Fuller test, Cointegration, and Granger Causality test, were used to analyze the data in addition to the typical least-squares approach (OLS) and the traditional least-regression model. According to the findings, exchange rates and inflation rates are detrimental to GDP while interest rates are beneficial.

Adeniran, Yusuf, and Adeyemi (2014) used secondary data from the Central Bank of Nigeria Statistical Bulletin along with correlation and regression analysis of the ordinary least square (OLS). They looked at how changes in exchange rates affected Nigeria's economic growth between 1986 and 2013. Their findings confirmed earlier research suggesting that developing countries should generally prefer flexible exchange rate regimes, showing that exchange rates have a positive but not very significant impact on economic growth. Furthermore, their study found that while interest rates and inflation generally harm economic growth, they don't do so particularly. The exchange rate significantly affects the determination of both short- and long-term macroeconomic growth and development goals, according to economic literature (Ehikioya 2019; Alagidede and Ibrahim 2017).

Recent studies looked at the relationship between the exchange rate and economic growth (Morina *et al.* 2020; Ioan *et al.* 2020). Morina *et al.* (2020), who studied the effects of real exchange rate instability, concluded that growth requires little exchange rate volatility. Trade openness and fixed capital formation were also supported by the study, which used the fixed effect model of analysis, as additional factors that support long-term economic growth in the Central and Eastern European nations. According to Balcilar *et al.* (2019), who focused on these two countries, South Africa was found to have stickier prices than Nigeria in the study that examined how the volatility of currency rates affected inflation in both countries. Munthali *et al.* (2010) acknowledged that real effective exchange rate shocks hurt Malawi's GDP and discovered a weak but statistically significant correlation between these variables. A real exchange rate depreciation for the country may lead to inflation, but it may also tend to encourage exports and, as a result, improve economic performance, according to Mahoney and hypothesis. They made this claim in a study on how currency rate fluctuations affect inflation and how those changes then affect Zimbabwe's economic expansion. The relationship between the country's exchange rate devaluation and GDP is not discussed in this argument. After examining the connection between GDP, exchange rate pass-through, and copper prices in Zambia, Roger *et al.* (2019) concluded that a drop in inflation was a reliable indicator of exchange rate volatility. According to the analysis above, different people have different viewpoints on the links between exchange rate volatility, inflation, interest rates, and economic growth. However, the vast majority of investigations supported a negative correlation between inflation and GDP or between exchange rate volatility and economic growth.

2.1. Theoretical review

The Keynesian theory makes the Naira redesign a component of monetary policy, which makes a significant impact on GDP and the country's exchange rate, both of which result to economic growth. This is expressed by the straightforward equation:

$$Y = NR + ER$$

Where Y denotes the total output (GDP), while the monetary policy indices are naira redesign (NR) and exchange rate (ER).

Besides the gross domestic product (GDP) and exchange rate, the inflation rate is another crucial macroeconomic variable to be considered. The growth of the Nigerian economy is mainly dependent on the macroeconomic variables and monetary policy regulation from time to time which is proxied by interest rate (IR) different from the exchange rate. In light of the above, the second equation with inclusion of the above variables can be expressed as:

$$Y = F (IR, ER, IFR)$$

Where Y = Gross Domestic Product (GDP)

IR = Interest Rate

ER = Exchange Rate

IFR = Inflation Rate

3. Material and Method

This study adopted a quantitative research design. Primary and secondary data were collected. The primary data was obtained through administration of self-developed questionnaire, while the secondary data was extracted from World Bank publications (data.worldbank.org) spanning from 1970 to 2022 based on data availability for the study variables and the purposive sampling technique was explored. The dependent variable is GDP proxied for Nigeria economy, independent variables are exchange rate and interest rate (monetary policy) while inflation is the control variable.

Table 1 Variable Measurement

Variables	Unit Measurement
GDP	Billion USD
Exchange rate	Naira Per Dollar
Interest rate	Percentage (%)
Inflation	Percentage (%)

Table 2 Variable Measurement

Variables	Unit Measurement
Naira Redesign (NR)	Percentage (%)
Stop terrorism financing (STF)	Percentage (%)
Curb inflation (CI)	Percentage (%)
Naira Hoarding (NH)	Percentage (%)
Counterfeiting (CT)	Percentage (%)

Inferential statistics was used for data analysis (Multiple regression model, unit root test and cointegration analysis).

3.1. Model specification

The empirical models for this study is written as follows:

$$GDP = F(IR, ER, IFR)$$

$$NR = F(NR, STF, CI, NH, CT)$$

3.2. Regression model

The regression model predicts a dependent variable (GDP) with one or more independent variables (IR and ER while IFR is the control variable). It examines the impact of the predictor variables on a response variable. The response variable in a regression model is expected to be a continuous scale (ratio or interval) while the predictor variables can either be continuous or categorical (nominal or ordinal). Mathematically, the regression model for this study is written as:

$$GDP_{(t)} = \beta_0 + \beta_1 IR_{(t)} + \beta_2 ER_{(t)} + \beta_3 IFR_{(t)} + \varepsilon_{(t)}$$

Where β_0 is the intercept or constant term, β_1 to β_3 are the coefficient estimate of the predictor variables, $\varepsilon_{(t)}$ is the stochastic error term that takes care of the unaccounted factors and t is the period in year.

$$NR_{(t)} = \beta_0 + \beta_1 NR_{(t)} + \beta_2 STF_{(t)} + \beta_3 CI_{(t)} + \beta_4 NH + \beta_5 CT_{(t)} + \varepsilon_{(t)}$$

Where β_0 is the intercept or constant term, β_1 to β_5 are the coefficient estimate of the predictor variables, $\varepsilon_{(t)}$ is the stochastic error term that takes care of the unaccounted factors and t is the period in year.

3.3. Unit root test

If not addressed, the existence of the unit root indicates that the series is non-stationary, which leads to incorrect results. To address inaccurate results, the unit root test is conducted. The following is a description of the unit root test of the hypothesis:

H_0 : there is an existence of a unit root

H_a : there is no unit root (the variable is stationary).

The augmented dickey fuller (ADF) test can be presented mathematically as:

$$\Delta Y_t = \theta + \gamma Y_{t-1} + \sum_{i=1}^p \beta_i Y_{t-i} + \omega_t$$

Where, θ is a constant, γ is the coefficient of process root,

β_i is coefficient in time tendency, p is the lag order and ω_t is the stochastic (error) term.

3.4. Cointegration Analysis

Johansen cointegration test is an approach for testing the cointegration of integrated variables with zero level $me(0)$, order 1, or $me(1)$ - after the first difference. This test permits more than one cointegrating relationship. There are two types of Johansen tests which are the trace and max eigenvalue, and they form the basis of the inference or decision and their result might be a little different from others. It is good for the variables to be stationary before proceeding to the Johansen Cointegration test. When there is cointegration, it implies there is a long-run association between the variables.

4. Result

The table 3 show that mean of the Nigeria GDP is about 174 Billion USD with variability of about 178 Billion USD during the period under study. The Nigeria exchange rate on the average is about 92 Naira per Dollar with variability of about 122 Naira per dollar during the period under review. The Nigeria interest rate on average is about -1.2% with variability of about 15% which clearly indicate a poor performance in the monetary policy of the country. Meanwhile, the Nigeria inflation rate on the average is about 19% with variability of about 17% during the period under review.

Table 3 Summary Statistics

	GDP	Exchange Rate	Interest Rate	Inflation
Mean	173.5661	91.6532	-1.2256	19.1851
Std. Dev.	178.2683	121.5478	14.8512	17.8921
n	53	53	53	53

Source: E-views software

Table 4 Summary of Multiple Linear Regression Analysis

GDP	Coefficient	Std. Error	t-Statistic	Prob.	VIF
Constant	0.4571	0.1491	3.0671***	0.0000	-
Exchange rate	1.1511	0.1321	8.7191**	0.0000	1.1579
Interest rate	0.3721	0.1121	3.3211**	0.0001	1.3323
Inflation Rate	-1.1461	0.1231	-9.3171*	0.0000	
R-squared	0.7543				
Adjusted R-squared	0.7132				
Prob(F-statistic)	0.0000				

Source: E-Views software

Table 4 shows that the regression model can be fitted as:

$$GDP_{(t)} = 0.4571 + 1.1511ER_{(t)} + 0.3721ER_{(t)} - 0.3721IFR_{(t)}$$

The regression model shows that for 1% increase in Nigeria interest rate, GDP will increase by about 0.37 Billion USD. Similarly, for 1 Naira per dollar increase in Nigeria exchange rate, GDP will rise by 1.15 Billion USD while for 1% increase in the Nigeria inflation rate, GDP will decrease by 1.15 Billion USD.

Also, table 4 shows that the regression model ($p < 0.05$) is well fitted regression model is statistically significant at 5% level and this means that there is a significant linear relationship between GDP and monetary policy indicators such as exchange rate, interest rate while controlling for inflation rate. The coefficient of determination R-squared = 0.75 which implies that 75% variation in GDP can be explained by exchange rate, interest rate and inflation rate while the remaining 25% can be attributed to other factors not included in the model. Since the regression model is significant and the R-squared is relatively high, this suggest that the model is a good fit to the data and it is very suitable for future prediction of Nigeria GDP.

More so, the regression model also show that the coefficient of exchange rate and interest rate have positive and significant impact on Nigeria GDP while the coefficient of the inflation rate has negative and significant impact on Nigeria GDP.

Table 5 shows that the regression model can be fitted as:

$$NR_{(t)} = 0.3721 + 0.9111STF_{(t)} + 0.7251CI_{(t)} + 0.2841NH + 0.1729NCT_{(t)}$$

Table 5 shows that all the independent variables have negative coefficients that is significantly related to naira redesign at 0.05 level of significance. This implies that naira redesign has failed to achieve its objectives, such as curbing inflation, stopping terrorism financing, curbing inflation, naira hoarding and naira counterfeiting.

Also, table 5 shows that the regression model ($p < 0.05$) is well fitted regression model is statistically significant at 5% level and this means that there is a significant linear relationship between response variable and predictor variables. The coefficient of determination R-squared = 0.66 which implies that 66% variation in NR can be explained by STF, CI, NH and NCT while the remaining 34% can be attributed to other factors not included in the model. Since the regression

model is significant and the R-squared is relatively high, this suggest that the model is a good fit to the data and it is very suitable for future prediction of Naira redesign.

Table 5 Summary of Multiple Linear Regression Analysis

GDP	Coefficient	Std. Error	t-Statistic	Prob.
Constant	-0.3721	0.1121	-3.3211	0.0000
Stop terrorism financing (STF)	-0.9111	0.1461	-6.2391	0.0000
Curb inflation (CI)	-0.7251	0.1511	-4.8011	0.0000
Naira Hoarding (NH)	-0.2841	0.0531	-5.3851	0.0000
Naira Counterfeiting (NCT)	-0.1729	1.13143	-0.1528	0.0492
Adjusted R-squared	0.6562			
Prob(F-statistic)	0.0000			

Source: E-Views software

5. Discussion

Based on the results of the study, the following findings were deduced.

The study revealed a significant linear relationship between GDP and monetary policy such as exchange rate, and interest rate while controlling for the inflation rate. Table 2 shows that the regression model ($p < 0.05$) is well fitted and statistically significant at 5% level and this means that there is a significant linear relationship between GDP and monetary policy indicators such as exchange rate, interest rate while controlling for inflation rate. The coefficient of determination R-squared = 0.75 which implies that 75% variation in GDP can be explained by exchange rate, interest rate and inflation rate while the remaining 25% can be attributed to other factors not included in the model. Since the regression model is significant and the R-squared is relatively high, this suggest that the model is a good fit to the data and it is very suitable for future prediction of Nigeria GDP. More so, the regression model also show that the coefficient of exchange rate and interest rate have positive and significant impact on Nigeria GDP while the coefficient of the inflation rate has negative and significant impact on Nigeria GDP. This finding agrees with the study of Adeniran, Yusuf, and Adeyemi (2014) which used secondary data from the Central Bank of Nigeria Statistical Bulletin along with correlation and regression analysis of the ordinary least square (OLS). They looked at how changes in exchange rates affected Nigeria's economic growth between 1986 and 2013. Their findings confirmed earlier research suggesting that developing countries should generally prefer flexible exchange rate regimes, showing that exchange rates have a positive but not very significant impact on economic growth. Furthermore, their study found that while interest rates and inflation generally harm economic growth, they don't do so particularly. The exchange rate significantly affects the determination of both short- and long-term macroeconomic growth and development goals, according to economic literature (Ehikioya 2019; Alagidede and Ibrahim 2017).

The study also revealed that naira redesign has failed to achieve its objectives, such as curbing inflation, stopping terrorism financing, curbing inflation, naira hoarding and naira counterfeiting. This finding supports the study of Roger *et al.* (2019) which concluded that a drop in inflation was a reliable indicator of exchange rate volatility. According to the analysis above, different people have different viewpoints on the links between exchange rate volatility, inflation, interest rates, and economic growth. However, the vast majority of investigations supported a negative correlation between inflation and GDP or between exchange rate volatility and economic growth.

6. Conclusions

Based on the results from this study, it was concluded that naira redesign has failed to achieve its objectives, such as curbing inflation, stopping terrorism financing, curbing inflation, naira hoarding and naira counterfeiting. Banking halls were filled with individuals trying to either deposit their old notes or get new notes. The policy no doubt created hardship as people do not have access to new notes, and the Point of Sale (POS) option was not feasible for customers as many charged as high as 50% of the amount to be withdrawn. Also, many Nigerians were left frustrated due to failed transactions with many having their funds trapped for weeks. With the validity of the old notes extended, there are lessons to be learned.

Recommendation

The CBN should ensure a provision is made to curb possible challenges that might come with the redesign of Naira note.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Author Contributions

This work was carried out in collaboration among all authors. Ibrahim Hussaini and Faruk Musa Chubiyayi designed the study, Mai Adamu Yau managed the literature searches. Abdullahi Yahaya Musa performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. T.F. Ayem-Fella managed the analyses of the study. 'All authors read and approved the final manuscript.

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