Testing the Cointegrating Relationship between Foreign Exchange Rate Volatility and Government Health Expenditure

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Abstract

This paper examined the relationship between government health care expenditure and foreign exchange rate volatility in Nigeria for the period 1993-2022. We employed the multivariate cointegration technique proposed by Johansen and found the existence of at least one cointegrating vector describing a long run relationship between government health care expenditure and foreign exchange rate volatility. It is therefore suggested that an appreciable proportion of the national budget be allocated to the health care services to have a more robust health care programmes capable of fostering health development in Nigeria. The research was conducted with an objective to understand the dynamics between healthcare expenditures and the volatility in foreign exchange rate with a focus on Nigeria, enabling better policy making. The overall conclusion is that the Nigerian government health expenditure is largely dependent that its healthcare policy is not stable and sufficient is not largely dependent on volatility foreign exchange rate. However, government health expenditure is a concern for Nigeria.

1.0   Introduction

Healthcare expenditure is a function of income or resources available both in the private and the public sectors. On the other hand, healthcare spending in health insurance, investment in equipment, and government programs can stimulate the economy through enhancing the productivity of human capital (Siami-Namini, 2018). Because health is known as a determinant of human capital, and labor productivity, so, rises in healthcare expenditure will increase labor supply and productivity, and then lead to a higher income. A growing body of research studies indicates that variation in healthcare expenditure could be explained by variations foreign exchange of a country.

Exchange rate refers to the currency rate of one country in terms of currency of another country (Bagh *et al.*, 2017). Exchange rate volatility, which is generally defined as the risk associated with unpredicted movements in exchange rates, has a direct effect on a country's economic policy (Meniago & Eita, 2017). The exchange rate refers to a currency against another currency in the foreign exchange market. Specifically, it is used to verify the price of one currency expressed by other currencies. Fluctuations of exchange rate have a direct regulating effect on import and export trade between countries. Exchange rate is a prominent determinant of world trade, receiving much attention in the context of global imbalances. Past decades witnessed disputes on trade and exchange rate issues. Recent disputes on trade surplus and deficit between the United States of America (USA) and China is believed to be resolvable through adjustments to exchange rate by China. Disparity in Japanese's Yen exchange rate to the US dollar, favour Japan's trade surplus with the US (Hassan *et al.,* 2017).

According to Umaru *et al.* (2018), volatile exchange rate shatters the confidence of investors, destabilizes the capital movements, and slows down the process of trade which slows down the process of growth. Volatility refers to how exchange rate is settled on supply and demand of local currency vis-à-vis to foreign currency. Exchange rate volatility can impact affect the volume of imports, exports, reserve money, policy decisions, and disturbs the allocation of productive resources and the balance of payments. Exchange rate volatility provides chances to domestic investors to obtain higher profits, to invest in foreign currency (Umaru *et al.*, 2018).

The risk of foreign exchange management is globally well understood by the practitioners in the industry. Foreign exchange rate is unstable due to uncertainty over the interest rate, flow of capital from the foreign countries, recently problem of government policy and its uncertainty over the taxation of foreign fund flow. For the last two decades, global foreign exchange rates amid volatility against most of the currencies, especially with the globally traded currency of US dollar and Euro which turned out to be more volatile due to financial risks which shadow on the economy growth (Bahmani-Oskooee & Gelan, 2018). During this period Nigerian currency is not left behind the global problems, as it needs to manage its exchange rate volatility risk against global currencies. Nigerian foreign exchange rate which depreciated the most reaching all time low of ₦435 against US dollar on 2022, due to the effect of global financial crisis in US, European slowdown, and high crude oil price.

The historical trend of foreign exchange rate in Nigeria shows continuous depreciation of Nigerian naira against the US dollar and other major currencies. Foreign exchange rate of Nigerian currency shows historical depreciation of exchange value not only with the US dollar but also against the Pound Sterling, Euro, and Japanese Yen. The high volatile movement of these exchange rates has mostly influenced the corporate earnings and economic growth potential too the larger extend . Due to this high risk involvement in the exchange of foreign currencies, even from the early period of exchange system, this had direct impact on corporate profitability.

The market determined exchange rate system was introduced in Nigeria via second tier foreign exchange market, thus the naira exchanges rate has exhibited the features of continuous depreciation and instability (Nwobia *et al.*, 2020). The instability and continued depreciation of the naira in the foreign exchange market has resulted in declines in the standard of living of the

populace, increased cost of production which also leads to cost push inflation. It has also tended to undermine the international competitiveness of non-oil exports and make planning and projections difficult on both micro and macro level of economy (Nwobia *et al.*, 2020).

Exchange rate movements and exchange rate uncertainty are important determinants of international transactions fluctuations according to Bahmani-Oskooee and Gelan (2018).

The persistent variation in real exchange rate have been a source of concern to stakeholders in recent times and this has attracted the interest of scholars to investigate its consequence on the economy. For instance, available data from the National Bureau of Statistics (2020) affirmed that the official exchange rate in Nigeria have been on the downward trend. Before the pronouncement of recession in Nigeria, the naira to US dollars' (USD) rate in 2010 was ₦150.30 to US$1 (Yusufa *et al.*, 2022).

However, in 2015 and 2016 when the country entered recession, it moved from ₦192.44 to 1 USD to N253.49 to 1 USD, putting GDP growth rate at risk, as the cost of imported raw materials increased. Similarly, from 2017 to 2020, the exchange rate in Nigeria further depreciated to ₦379.10 from ₦305.79. This has further declined to ₦412.05 in the first quarter of 2021, while it is currently sold at about ₦470 at the parallel market (Yusufa *et al.*, 2022).

Foreign exchange rates are among the most important prices in international monetary markets

(Rahim et al, 2018). Wong (2017) defines foreign exchange (FOREX) or foreign currency as a foreign currency or payment instrument used to carry out or finance financial economic transactions internationally and which have official exchange rates at the central bank (Patnaik *et al.*, 2017). From several currency circulating in the world, there are only two types of currencies, namely hard currency and soft currency (Opaluwa *et al.,* 2012). Changes in exchange rates can be caused by four things, depreciation, appreciation, devaluation and revaluation.

The exchange rate or exchange rate of one currency against another currency is part of the foreign exchange process. The term foreign currency refers to the actual foreign currency or various claims on the currency, such as bank deposits or promissory notes traded. Exchange rate is a monetary indicator that is important because exchange rate fluctuations may influence fiscal policy (Patnaik & Pundit, 2019).

1.1   Statements of problem

Given the importance of health services, policy makers in Nigeria have been giving considerable attention to the issue of how public expenditure on health can be increased so as to ameliorate health care problems. And in line with this, expenditure on health care has been on the increase since independence. The inadequate allocation of the national budget to the health sector is being worrisome and as such this study attempts to find answers to the following questions. How has government expenditure on health transmitted to the health sector development? What is the relationship between government health care expenditure and foreign exchange rate fluctuation in Nigeria?

There is growing agreement in the literature that prolonged and substantial exchange rate misalignment can create severe macroeconomic disequilibria and the correction of external balance will require both exchange rate devaluation and demand management policies. The

main intuition behind this is that an increase in exchange rate volatility leads to uncertainty which might have a negative impact on trade flows.

The foreign exchange market faces the risks of transaction exposure, translation exposure, and operating exposure which seems to be part of the exchange rate determination. But these exchange rate movements had influenced over the corporate profitability. Firms in the international business needs to face the risks of exchange rate volatility over its import or export of raw materials, cash inflows and outflows of business transactions, which need to be managed at every level of its business operations.

According to Gopinath *et al*. (2020), exchange rate is an essential endogenous element that impacts economic performance due to its impact on macroeconomic variables such as outputs, imports, export prices, interest rates, and inflation. They went on to say that depending on the exchange rate system (fixed or floating) implemented in a country, the exchange rate can be a useful factor in balance of payment adjustments, management of crises linked with pressure for currency revaluation, fulfilling of internal policy objectives, ability to adapt to external shocks, maintenance of foreign exchange reserves, driving of investments, and handling of speculation and level of discipline in economic management.

It would be appropriate to develop our understanding of the interdependence of government health expenditure and the Nigerian foreign exchange market with major trade and financial partners such as the US, UK, Europe, and Japan. In other words, to what extent, the exchange market pressures from these four countries (US, UK, Europe, and Japan) have amplified the foreign exchange markets in Nigeria and government spending on health facilities

Foreign exchange rates have fluctuated significantly over the past decades and these fluctuations have continued to be of truly vast importance. One of the most challenging questions in this regard is to be able to distinguish between short- and long-term effects of some influences on exchange rate fluctuation. For example, if the dollar exchange rate plays an important role in improvement in government health expenditure, it is important to know if it has a short-run or a long-run effect, or both. In the same way, in cases where there is evidence of possible impacts, it is important to be able to compare dollar depreciation with appreciation or depreciation impacts on capital investment in government health sector. Given these considerations this paper intends to contribute to the existing literature on the determinants of growth in infrastructural health facilities in two important ways

According to economic theory, the government can raise aggregate demand and boost economic growth through an increase in expenditure on infrastructure, technology and human capital development. However, increases in government expenditure may be counter-productive on government health expenditure because of the crowding out effects on fluctuation in exchange rate. Exchange rate volatility can deter government expenditure due to a reduction in inflows and in the value of the reserves, which may affect the healthcare facilities and governement spending behavior on health development, ceteris paribus.

1.2 Objectives of the study
The broad objective of the study is to investigate the effect of foreign exchange rate volatility on federal government health expenditure in Nigeria, while the specific objectives are to:

i.   investigate the causal effect of Naira/Dollar exchange rate volatility on federal government health expenditure in Nigeria;

ii. examine the causal relationship between Naira/Euro exchange rate volatility and federal government health expenditure in Nigeria;

iii. evaluate the effect of Naira/Pound exchange rate volatility on federal government health expenditure in Nigeria; and

iv. assess the influence of Naira/Yen exchange rate volatility on federal government health expenditure in Nigeria.

1.3   Research Hypotheses

This study is designed to test the following hypotheses:

H_{01}- Naira/Dollar exchange rate volatility has no significant causal effect on federal government health expenditure in Nigeria;

H_{02}- Naira/Euro exchange rate volatility has no significant causal relationship with federal government health expenditure in Nigeria;

H_{03}- Naira/Pound exchange rate volatility has no significant effect on federal government health expenditure in Nigeria;

H_{04}- Naira/Yen exchange rate volatility have no significant influence on federal government health expenditure in Nigeria.

2.1   Theoretical Review

2.11   The neoclassical growth models

The neoclassical growth models, like that of Solow (1956), indicate that investments in the healthcare sector would improve the quality of human capital and in turn raise the bars of economic growth. Nelson and Phelps (1966) and Romer (1990), using the endogenous growth model, further stressed the interdependence of economic growth and healthcare expenditures, which happens through channels of continuous technological progress. The basic route that is suggested by many economists for the causality of health status and economic growth to play the part is that of the former leading to an increase in productivity of the labour force that can be expected to live healthier and longer, which would in turn grease the wheels of economic growth. Further, Grossman (1972) developed a model in which illness prevents work and, therefore, the cost of ill health is lost labour time. However, there may also be an effect of ill health on workers' productivity.

The dual gap model (Chenery and Strout, 1966) which states that for a country to achieve a given target of growth rate, such growth may be limited to availability of domestic savings (investment limited growth) or foreign exchange (trade limited growth) (Obi, 2015). The Dual-Gap theory was also analysed by Ayadi and Ayadi (2008). They were of the view that investment, a function of savings, requires not only domestic savings for economic growth and development, but should be a complemented with foreign goods and services. An increase in investment with no corresponding savings increase, should be financed by foreign borrowing with the attendant foreign exchange volatility.

2.12   Purchasing Power Parity

The purchasing power parity (PPP) shows the association between prices and exchange rate. The origin of the PPP theory can be traced to the Salamanca School in Spain back in the Sixteenth century. However its development as a theory of exchange rate could be attributed to the work of Cassel. Cassel first recommended PPP as a theory of adjusting pre–World War I exchange rates parities. He proposed this theory for countries that resolved to return to the gold standard system after the war ended. Some modification became important because some countries that abandoned the gold standard system in 1914 experienced different inflation rates during and after the war. As an exchange rate determination theory, the simple and most powerful form of PPP (i.e. absolute PPP) was based on the law of one price". The Absolute PPP suggests that exchange rate would amend to equate the prices of national baskets of goods and services between two nations. This occurs as a result of the market forces determined by arbitrage. The purchasing power parity (PPP) is also referred to as the inflation theory of exchange rates. This theory proposes that the exchange rate would adjust so that the price of a specific good or service will be unchanged no matter where you buy it. Consequently, the PPP theory is oftentimes regarded as the „law of one price". It can be

stated with the equation:

> It is simply stated as E = P /P*
>
> Where;
>
> E = Nominal exchange rate
>
> P = Domestic prices in domestic currency
>
> P* = Foreign prices in foreign currency

The equation suggests that E depends mostly on the factors that affect domestic price level. Therefore, „E"

could be said to be determined by endogenous factors (factors derived from within). Another version of PPP theory

restates the equation in terms changes in the nominal exchange rate to changes in relative prices. This is known as

> relative PPP: Showing that;
>
> % ΔE = %ΔP - %ΔP*
>
> Where %Δ = Percentage change

2.2   Empirical Review

Cruz and Zavaleta (2021) used data of selected economies of Latin America for the period 1990-2017, to provide empirical evidence regarding the effect of disaggregate government spending in the exchange rate. Our results indicate that government investment depreciates the exchange rate whereas government consumption, on the other hand, appreciates it. Both effects are, however, rather small. Our findings support recent literature showing that the relationship among government spending and the exchange rate is ambiguous, challenging the general accepted idea that government spending inevitably appreciates the exchange rate, having thus negative effects

on the tradable sector and on growth. Overall, our results allow us to suggest that growth can be stimulated particularly via government investment without detrimental effects on the exchange rate.

Ehikioya (2019) examined exchange rate volatility and its effect on economic growth in Nigeria. The study employed the GARCH model and the system GMM estimation technique to analyse data for the period 1980-2017. The study offered evidence that exchange rate volatility persists throughout the study period, which suggests that periods of high (low) exchange rate shocks tend to be followed by periods of high (low) exchange rate shocks for a prolonged period. The result of the empirical analysis shows that exchange rate volatility negatively and significantly influences the economic growth of Nigeria. This result is in tandem with previous studies as reported by Alagidede & Ibrahim (2017). The implication of this result is that the Nigerian economy is susceptible to exchange rate volatility. The result also implies that exchange rate volatility is an important influencing factor, which needs to be weighed in making decisions.

Nwobia *et al.* (2020) examined the effect of exchange rate fluctuation on Nigeria external trade from 2000 to 2019. The study made use of secondary data sourced from central bank of Nigeria statistical bulletin of various issues from 2000 being the year of monetary authority regime of flexible exchange rate to 2019. The correlation and regression analysis of the Ordinary Least Square (OLS) were used to analyze the data. The result shows that the three variables; exchange rate, balance of payment, and inflation rate have significant effect on the Gross Domestic Product (GDP) and external trade of Nigeria; Exchange rate has a negative effect on the GDP because as it increases, the external trade is negatively affected.

Ndubuaku *et al.* (2019) investigated the impact of exchange rate fluctuation on selected economic sectors of the Nigerian economy. The study covered the agricultural (AGDP), manufacturing (MGDP), petroleum (PGDP) and service sector (SGDP) of the Nigerian economy. The petroleum sector represented the oil sector while the agricultural (AGDP), manufacturing (MGDP), and service sector (SGDP) represented the non-oil sector. The main objective of the study was to determine whether exchange rate fluctuations had a significant impact on the selected sectors of the economy. These sectors were invariably the largest contributors to the GDP. The time scope covered 1981-2016. Data for the study were obtained specifically from CBN statistical bulletin (2016). The data were analysed using the Auto Regressive Distributed Lagged (ARDL) model. The study concluded that there was no significant impact of exchange rate on AGDP, MGDP and SGDP respectively. However, there was a positive and significant impact of exchange rate on PGDP. The study recommended that Nigeria's economy should be diversified to enable the non-oil sector to become significant foreign exchange earners.

Gatawa and Mahmud (2017) analysed short and long-run impacts of exchange rate fluctuations on agricultural exports volume in Nigeria. The time scope covered 1981-2014. The GARCH was used to estimate the volatility of exchange rates, and other diagnostic tests. The ARDL was the technique of analysis. The results revealed that official exchange rate had a significant impact on agricultural export volumes.

Jibrin *et al.* (2017) studied the impact of exchange rate fluctuation on gross domestic product (GDP) and other macroeconomic aggregates in ECOWAS. The study period was from 1990 to 2014 for a sample of ten (10) West African countries. The ten (10) countries included Benin Republic, Burkina Faso, Cape Verde, Gambia, Ghana, Guinea, Guinea Bissau, Liberia,

Nigeria and Sierra Leone. The Ordinary Least Square (OLS) was employed for analysis. The result showed that exchange rate had a significant impact on GDP in four countries namely Benin, Guinea Bissau, Liberia and Nigeria.

2.3   Gap Identification

It can be said that the relationship between government spending and private investment is a controversial issue from both theoretical and empirical perspectives. From the past literature, we see that numerous studies have been done on the effect of fluctuation in international lending rate on the government infrastructural expenditure. We scanned throughout the literature, and we reported all the studies which we were able to find on the basis of covering period, country specification, method used, and mixed empirical results. At a glance, what one sees from is that the empirical findings of the studies are highly controversial. Some empirical studies reveal that the effects of international lending interest rate fluctuation on government infrastructural expenditure (Anyanwu *et al.,* 2017; Barguellil *et al.,* 2018; Chipeta *et al.,*2017; Gevorkyan, 2019; Jibrin *et al.,* 2017; Nwobia *et al.*, 2020; Okonkwo *et al.*, 2017) is negative while the others bring into light positive (Alagidede & Ibrahim, 2017; Bahmani-Oskooee & Gelan, 2018; Bostan & Firtescu, 2018; Ehikioya, 2019; Gatawa & Mahmud, 2017; Isola *et al.*, 2016; Ndubuaku *et al.*, 2019; Umaru *et al.*, 2018), or insignificant results (Bagh et al., 2017; Cruz & Zavaleta, 2021; Kalu *et al.*, 2019) depending mainly on a number of factors such as models implemented, study period, country specification, term length, components of government infrastructural spending considered.

Realizing the significance of population health and its relation to the national economy, academicians and researchers have been conducting studies for more than two decades to investigate the linkage between healthcare expenditure and foreign exchange rate volatility. Most of the studies are, however, focused on developed countries. These studies are focused on the developing countries however, in particular to Nigeria are limited. As per the author's knowledge very less studies have been done using macro data by incorporating health expenditure and foreign exchange rate volatility analysis in Nigeria. Moreover, the existing results on the relationship between health expenditure and foreign exchange rate fluctuation are inconclusive. This study helps ease this debate around the relationship between health expenditure and exchange rate fluctuation by providing new evidence, and we apply some advance econometric methods in order to get accurate results. The effectiveness of health expenditure is generally considered true, but it relies on the foreign exchange rate variability of each nation whether additional investment would have a greater or less effect on the economy of that nation.

3.0   Methodology

This section discusses the econometric techniques that will be used to achieve the objectives of the study. This chapter comprises the research design, sources and methods of data collection, estimating techniques, model specification, variable description and measurement and expected contribution to knowledge.

3.1 Research Design

The research design for the study will be *ex post facto* and cross-sectional research analysis of annual multivariate time series data due to the nature of proposed data. The study will examine the historical data in order to understand the current state of government health expenditure in Nigeria and causal connections with foreign exchange rate fluctuation.

3.2 Sources and Methods of Data Collection

All the data that will be used in this research will come from secondary sources. Annual time series data for Nigeria will be used from 1993 to 2022. The time series data will be sourced from statistical bulletins from Nigerian Bureau of Statistics (NBS) and Budget Office of the Federation.

3.3 Estimating Techniques

This section comprises the descriptive and inferential statistics that the study shall employ to achieve its objectives.

3.3.1 Descriptive Statistics and Normality Tests Multivariate Time Series Data

The following descriptive statistics, mean, median, percentage, variance, standard deviation, standard error and coefficient of variation, will be used to summarize the data. Normality of the data will be tested by skewness, kurtosis, Shapiro-Wilk test, Kolmogorov-Smirnov test and Jarque-Bera (JB) test.

3.3.2 Inferential Statistics for Multivariate Time Series Data

The particular statistics that shall be employed to test the study's hypotheses and various diagnostic tests are discussed here.

3.3.2.1 Diagnostic Tests

The study will use the following diagnostic test to resolve the following econometric time series problems: Non-stationarity (Unit root)-Dickey Fuller(DF), Augmented-Dickey-Fuller(ADF), Phillips-Perron(PP) and Kwiatkowski–Phillips–Schmidt–Shin (KPSS) tests; Heteroscedasticity-Breusch-Pagan test, white test and Ramsey-Reset test; Autocorrelation-Durbin-Watson test; Multicollinearity-Variance Inflation Factors (VIF).

Table 1. Description of the Variables, Sources and Expected Signs

Variables	Symbol	Measurement	Sign	Source
Dependent variable				
Federal Government Health Expenditure (Proxy for Government Health	FGHE	Summation of federal government expenditure on health development	+/-	Cruz & Zavaleta (2021); Piabuo & Tieguhong (2017); Şen *et al.* (2018);

Expenditure				
Independent variable				
Naira/Dollar exchange rate volatility	NDV	Average Exchange rate of Naira to US Dollar: Average Exchange Rate (₦/$) Naira to Dollar	+/-	Bagh *et al.* (2017); Bahmani-Oskooee & Gelan (2018)
Naira/Euro exchange rate volatility	NEV	Average Exchange rate of Naira to Euro: Average Exchange Rate (₦/€) Naira to Euro.	+/-	Bostan & Firtescu (2018)
Naira/Pound exchange rate volatility	NPV	Average Exchange rate of Naira to Pound: Average Exchange Rate (₦/£) Naira to Pound	+/-	Ehikioya (2019). Yusufa *et al.* (2022)
Naira/Yen exchange rate volatility	NYV	Average Exchange rate of Naira to Japanese Yen: Average Exchange Rate (₦/¥) Naira to Yen	+/-	Gevorkyan (2019); Ndubuaku *et al.* (2019).

Source: The authors' compilation, 2023.

This study investigates the effect of government borrowings on capital project spending of the Federal Government of Nigeria. It solely utilized secondary data in its development. The quantitative data for the three variables of the study were sourced from the Central Bank

Bulletin, National Bureau of Statistics (NBS) and Budget Office of the Federation, which consists of data on federal period of 30 years (1993-2022) and data on federal government health expenditure (a proxy for government health development) of the federal

government for the same period. Quasi-experimental design was employed in the development of this study.

Ordinary Least Square (OLS) regressions analysis was utilized in the analysis of data and solution to research model formulated below with t-statistics and F-statistics for various hypotheses tests. The analysis was done electronically with the aid of E-view statistical package. The study adopted 5% level of significance; to ascertain the validity of the time series data (i.e. whether the data are stationary or non-stationary and whether the variables co-integrate), the Dickey Fuller Unit Root and Johansen Cointegration tests techniques were adopted.

3.4   Model Specification

The study proposed examination of the causal relationship between foreign exchange rate volatility and federal government health expenditure;

Foreign exchange rate volatility is segregated into Naira/Dollar exchange rate volatility, Naira/Euro exchange rate volatility, Naira/Pound exchange rate volatility and Naira/Yen exchange rate volatility.

FGHE=f(NDV,NEV,NPV,NYV) ………………………………………………………(1)

The proposed model is adapted from work of Bahmani-Oskooee, M., & Gelan, A. (2018)

    FGHE=β_0+β_1NDV+β_2NEV+β_3NPV+ β_4NYV + ε ………………...(2)
    Where;

    FGHE represents Federal Government Health Expenditure (Proxy for Government Health Expenditure (Dependent variable),

    NDV represents Naira/Dollar exchange rate volatility (Independent variable)
    NEV represents Naira/Euro exchange rate volatility (Independent variable)
    NPV represents Naira/Pound exchange rate volatility (Independent variable)
    NYV represents Naira/Yen exchange rate volatility (Independent variable)
    β_0, β_1, β_2, β_3, and β_4 are regression coefficients to be estimated.
 ε is Error term.

3.5 *A-priori* Expectation
$\frac{dCIT}{d\text{FGHE}} > 0$:connote that Naira/Dollar exchange rate volatility is expected to exert positive or negative relationship with federal government health expenditure in Nigeria.
$\frac{dVAT}{d\text{FGHE}} > 0$: connote that Naira/Euro exchange rate volatility is expected to exert positive or negative relationship with federal government health expenditure in Nigeria.

$\frac{dPIT}{dFGHE} > 0$:connote that Naira/Pound exchange rate volatility is expected to exert positive or negative relationship with federal government health expenditure in Nigeria.

$\frac{dPPT}{dFGHE} > 0$:connote that Naira/Yen exchange rate volatility is expected to exert positive or negative relationship with federal government health expenditure in Nigeria.

Figure 1: Conceptual Framework
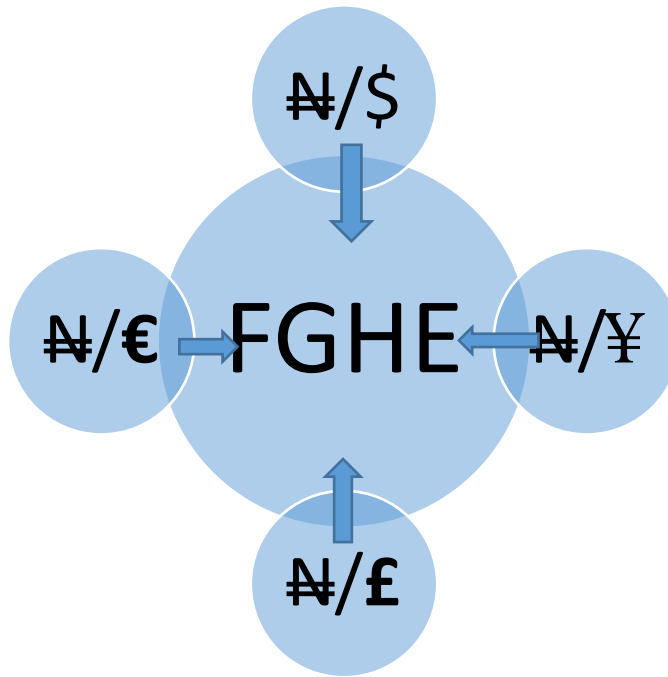
Source: Author's conceptualisation 2023

4.0   Data Analysis

Table 2. Result of Bound Test (cointegration of the variables)

Bound Test				Bound Test
Test Statistic	Value	K	Lower Bound	Upper Bound
F-Statistic	138.2672	4	2.62	3.79

Source:The authors.
Note:

Null hypothesis: No long-run relationship exists.

The result of bound test presented in Table 2 shows that the value of F-statistic lies above the upper bound value of Pesaran test statistic, an indication that the null hypothesis, that there is no long-run relationship among the variables, is to be rejected. This guarantees the conduct of error correction needed for the estimation of long-run dynamics.

Table 3. Result of ADF Unit Root Test of the Variables

Variables	Level Form Phillips–Perron 5% Critical Value	Test Statistics	Phillips–Perron 5% Critical Value	Phillips–Perron Test Statistics	Order of Integration
FGHE	−2.9252	1.4266	−2.9266	−6.7825	I(1)
NDV		−1.8851	−2.9266	−4.0993	I(1)
NEV		1.5583	−2.9266	−5.9532	I(1)
NPV		29.2914			I(1)
NYV		−2.1720	−3.5107	−7.1228	I(1)

Table 4. Result of Long-Run Model

Variable	Coefficient	Std. Error	T-Statistic	Prob.
FGHE				
NDV	−10.6256*	1.2677	−8.3817	0.0000
NEV	−0.2537**	0.1463	−1.7338	0.0903
NPV	11.7754	8.6453	1.3621	0.1804
NYV	5.0261*	0.7885	6.3745	0.00000
C	1.4043*	0.5458	2.5729	0.0137
R-squared = 0.968380	213735.5	220498.8	0.9693	0.3379

F-statistic = 257.2565   Adj. R-squared = 0.964616

Durbin–Watson statistic = 1.986027   Prob (F-statistic) = 0.000000

Notes: Dependent Variable: FGHE. * significant at 5%; **significant at 10%.

Dependent variable: FGHE

Method: Least Squares

Date: 02/15/2023   Time: 11:02

Sample: 1993- 2022

Included observation: 30

Source:

4.1   Model Analysis and Test of hypotheses

The result of the model analysis is as indicated on table 4. The results show that the Adjusted R-Square value = 0.968380 (i.e. 97%). This shows that the explanatory or independent variables included in the model (Naira/Dollar exchange rate volatility; Naira/Dollar exchange rate volatility; Naira/Dollar exchange rate volatility; Naira/Dollar exchange rate volatility) accounted for 97% variation in the dependent variable (federal government health expenditure). The remaining unexplained is taken care of by U, the error term. The four independent variables jointly influence the dependent variable significantly. This was consolidated with the result of the joint signified by the F-statistics (Prob) which showed value falling within the significance region of 0.00 to 0.05 and the t-stat (prob) of the constant (C) which falls within the significance region 0.00 – 0.05; indicating a case of joint significant impact of the explanatory variables on null hypothesis of the study which states that the However, taking the explanatory (independent) variables jointly, the above result shows that the first explanatory variables have a negative but insignificant relationship (impact) with (on) the dependent variable (federal government health expenditure). This is signified by the value of t-statistic (prob) which falls outside the significance region of 0.00 – 0.05 or 0% to 5%. It thus indicates that the null hypotheses of the study is accepted with the conclusion that foreign exchange rate volatility has no significant relationship with federal government health expenditure.

4.2   Discussion of Findings

From the result of the analysis above, we found that: health expenditure undertaken by Nigerian federal government for the period under review did not show any significant relationship with foreign exchange rate fluctuation in the economy. This result agrees with the finding of (Anyanwu *et al.,* 2017; Barguellil *et al.,* 2018; Chipeta *et al.,*2017; Gevorkyan, 2019; Jibrin *et al.,* 2017; Nwobia *et al.*, 2020; Okonkwo *et al.*, 2017) is negative, which concluded that since causation between foreign exchange rate fluctuation and government health expenditure could not be established in Nigerian context, no significant relationship exists between the two variables. However, it disagrees with findings from most of the scholars reviewed which hold that either a positive relationship exists between foreign exchange rate volatility and federal government health expenditure while the others bring into light positive (Alagidede & Ibrahim, 2017; Bahmani-Oskooee & Gelan, 2018; Bostan & Firtescu, 2018; Ehikioya, 2019; Gatawa & Mahmud, 2017; Isola *et al.*, 2016; Ndubuaku *et al.*, 2019; Umaru *et al.*, 2018)

This study found a negative and insignificant relationship between exchange rate volatility and the economic growth of Nigeria. The study demonstrates that the exchange rate may be one of the factors responsible for the Nigeria sluggish and unstable health development in Nigeria. The adverse effect of exchange rate volatility on government health expenditure might be due to the over-reliance of the Nigerian budget expenditure on the global market forces.

5.0   Conclusion and Recommendation

This paper examined the relationship between government health care expenditure and foreign exchange rate volatility in Nigeria for the period 1993-2022. We employed the multivariate

cointegration technique proposed by Johansen and found the existence of at least one cointegrating vector describing a long run relationship between government health care expenditure and foreign exchange rate volatility. It is therefore suggested that an appreciable proportion of the national budget be allocated to the health care services to have a more robust health care programmes capable of fostering health development in Nigeria. The research was conducted with an objective to understand the dynamics between healthcare expenditures and the volatility in foreign exchange rate with a focus on Nigeria, enabling better policy making. The overall conclusion is that the Nigerian government health expenditure is largely dependent that its healthcare policy is not stable and sufficient is not largely dependent on volatility foreign exchange rate. However, government health expenditure is a concern for Nigeria.

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