

Influence of Monetary Policy on International Trade: Cointegration and Error Correction Mechanism

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Abstract: This study examines the influence of monetary policy on international trade in Nigeria. Sources of data are Central Bank of Nigeria (CBN) and World Development Indicator (WDI) 2021. The study uses Cointegration and Error correction mechanism to analyse the data. The cointegration result shows that there is a longrun relationship between international trade and monetary policy in Nigeria. The Error correction mechanism shows that all the variables are statistically significant at 5% level except for interest rate. Based on the coefficient of determination (R^2) result, the study concludes that there are other non-monetary instruments that influence international trade not captured by the study. Fiscal policy should supplement the monetary agency through the CBN should regulate the monetary policy towards increasing the country's productivity as this will lead to increase in export and also create employment.

Keywords: Monetary policy, International trade, Fiscal policy, Productivity, ECM, Cointegration

JEL Classification: E52, P33, E62

1. Introduction

Nigeria is an import-dependent economy and thus is experiencing stagnant growth, unstable business cycles, and economic volatility (Falaye and Babatunde, 2021). This leads to unemployment, inflation, inefficiency, and disequilibrium in the balance of payments. The government has to regulate and manage the economy in various ways to maximize the welfare of the citizens by ensuring that resources are efficiently allocated and employed (Yennu, 2018). The government creates laws and regulations to regulate

and manage the conduct of economic activity in their countries to create an enabling environment for economic growth and development. To achieve the goals of income distribution and resource allocation, the Nigerian government primarily employs two types of macroeconomic policies (Aluko and Magaji, 2020). Monetary and fiscal policy instruments are the macroeconomic tools. Monetary policy is a macroeconomic tool that the Nigerian government use through its central bank to influence the cost and availability of credit to achieve long-term economic growth and development.

International trade is a critical driver of economic growth that results in a constant rise in human status by raising people's expectations and wants (Azeez, Dauda and Aluko, 2014). International trade is crucial in rebuilding the economic and social elements of participating countries all around the world, particularly in developing countries, because no country has ever grown without it (Magaji and Muhid, 2018). The improvement in the trade balance, on the other hand, is not easily apparent. Before it improves, it must go through various changes, which are initially brought about by trade balance deterioration during currency depreciation. It is related to the fact that trade contracts are initially locked over historical exchange rates, resulting in a delayed response of the trade balance to improvement, which is known as the J-Curve effects (Ashamu, 2020). International trade facilitates the efficient production of products and services by allocating resources to countries with a comparative advantage (Ricardo, 2004). Furthermore, its impact on a country's economy is not only confined to quantitative gains but includes structural improvements and the facilitation of foreign capital flows.

Over the years, the central bank of Nigeria have roll out different monetary tools such as money supply, open market operation, interest rate, exchange rate and trade openness to help regulate and improve the economic activities (Magaji, Anthony, Musa and Salisu, 2019). However, the improvement in the trade balance is not readily observable as this has always been unfavourable balance of trade disequilibrium despite the monetary policy efforts. The problem of interest for this research is that what is the influence of monetary policy on international trade in Nigeria? This study becomes significant as it examines the influences of monetary policy on international trade in Nigeria.

1.2. Statement of the problem

In Nigeria, one of the main goals of monetary policy is to keep economic growth stable. Over the years, the Nigerian government has used the Central Bank of Nigeria

to implement various monetary policies to promote economic growth. Despite the increased focus on monetary policy manipulation in Nigeria, the country's economic growth remains an issue. High unemployment, low investment, high inflation, and an unstable foreign exchange rate are examples of these issues. These challenges have contributed to Nigeria's rapid drop in economic growth. As a result, it is vital to highlight Nigeria's monetary policy and assess its contributions to the international trade in the country.

The economy has gone through periods of boom and contraction, it is clear that the stated growth in international trade is not sustainable, as seen by rising poverty levels among the population (Ashamu, 2020). The question is, what is the influence of money supply on the performance of international trade in Nigeria? To what extent has exchange affect international trade in Nigeria? Does interest rate have any impact on international trade in Nigeria?

1.3. Objective of the Study

The main objective of this study is to examine the influence of monetary policy on international trade in Nigeria, while the specific objectives are to: Examine the relationship between of money supply and international trade in Nigeria; to investigate the relationship between exchange rate and international trade in Nigeria; and to check whether interest rate have any impact on international trade in Nigeria.

1.4. Hypotheses of the Study

The following are the hypotheses to be tested in the study

- HO₁: There is no significant influence of money supply on international trade in Nigeria.
- HO₂ There is no significant influence of exchange rate on international trade in Nigeria.
- HO₃ Interest rate does not have any significant impact on international trade in Nigeria

2. Literature Review and Theoretical Framework

2.1. Concept of Monetary policy

According to the CBN (2014), monetary policy refers to the monetary authority's deliberate efforts to control the value, availability, and cost of money in the economy

to achieve specific goals. Monetary policy is a macroeconomic tool used by the monetary authority to ensure efficient economic management to achieve planned and desired goals (Imoughela, 2014). It means that monetary policy establishes the foundations for achieving specific macroeconomic goals.

According to Afolabi, Adeyemi, Salawudean, and Fagbemi (2018), monetary policy is a critical tool for economic stabilization since it regulates the cost and availability of money or credit. It helps by regulating the monetary policy variable aids in the reduction of economic distortions. In the view of Okwo, Eze, and Nwoha (2016), monetary policy is a formal effort by the government to regulate the money in its economy in order to achieve particular economic objectives.

From the foregoing, monetary policy is a mechanism used by the apex bank of the country to regulate the economy. This regulation can either be to expand or contract the economy depending on the objective of the apex bank authority. The authority make use of mechanism such as open market operation, interest rate, bank reserve, exchange rate and money supply to influence operations of the nation's economy.

2.2. Concept of International Trade

International trade is sometimes known as 'foreign trade' (Azeez, Dada and Aluko, 2014). It refers to a country's inflow (import) and outflow (export) of goods and services (Falaye and Babatunde, 2021). Imports and exports account for a large portion of a country's gross domestic product (GDP), hence international trade is linked to economic growth. Foreign trade development has a significant impact on GDP growth in an open economy (Li, Chen & San, 2010).

As a result, it is a system that connects nations around the world through service flows, commodity commerce, and factor movements (Alfred, 2018). It is another development technique for increasing human living conditions without harming society's worth (Shivneil and Priteshni, 2017). According to the same author, overseas commerce provides a feasible platform for expanding the market base of domestic companies and enhancing domestic capacity utilization, both of which are critical for supporting economic growth.

2.2. Empirical Review

Ogar, Nkamare and Emori (2014) evaluated the impact of fiscal and monetary policy instruments on the growth of the Nigerian economy from 1986 to 2010. The study's

goal was to identify the monetary and fiscal policy instruments that have a major impact on Nigeria's economic growth. In the data analysis, the study employs the ordinary least squares (OLS) method. According to the findings, money supply has a considerable positive impact on economic growth. The study also discovers that the exchange rate has a positive impact on Nigeria's economic performance.

Azeez *et al.* (2014) examine the impact of international trade on Nigeria's economic growth in the twenty-first century. The model characterized economic growth as a function of international trade as proxied by imports, exports, and trade openness. Annual time series data from 2000 to 2012 were gathered and analyzed using the Ordinary Least Squares (OLS) estimation approach. According to the findings, international commerce has a strong positive impact on economic growth. Imports, exports, and trade openness all have a significant impact on the economy.

Usman and Adejare (2015) examine the impact of monetary policy on industrial growth in Nigerian economy. The study uses secondary data obtained from central bank of Nigeria statistical bulletin covering the period of 1970 to 2010. Their study employs Multiple regression analysis to analyze data on variables such as manufacturing output, Treasury Bills, Deposit & leading and Rediscount Rate. They were all found to have significant effects on industrial Growth with the Adjusted R² of 0.8156 (81.56%).

Lawal (2016) examines the effect of monetary policy operations on the performance of Nigeria's manufacturing sector from 1980 to 2015. The Ordinary Least Squares (OLS) method was used in the study to evaluate the connection between the variables in the model. Error Correction Model (ECM) was used to determine the short-run dynamics of the model's regressor coefficients and the speed of adjustment. The results revealed that broad money supply is positively and significantly related to manufacturing output in both short run and long run. Exchange rate exerted significant positive effect on manufacturing output in the long run, but its effect in the short run is negative.

Magaji, Jimaza and Ayo (2018) examine the effect of monetary policy variables on net export of Nigeria. The study employed Auto Regressive Distributed Lag (ARDL) bounds cointegration test and its associated ARDL short run and long run coefficients test and Pairwise Granger causality test to analyse the data. The results also show that money supply (LMS) has positive insignificant effect on net export of Nigeria while total export (LTEXP) has positive significant effect on net export

of Nigeria. Similarly, the results showed that interest rate (INR), exchange rate (LEXCR), foreign direct investment (LFDI) and total import (TIMP) have negative insignificant effect on net export of Nigeria.

Chiaraah (2019) examine monetary Policy and Trade Openness in Ghana. The study employed the co-integration approach with quarterly data from 2002 to 2016 to assess the relationship between trade openness and effectiveness of monetary policy in affecting inflation and output. The result shows that as the degree of trade openness increases, monetary policy become less effective in reducing the rate of inflation and causes domestic output to decline in the long-term. Though the study's finding confirms the theoretical relationship between trade openness and inflation and output, the finding also indicates that when monetary policy is considered, the negative effect of trade openness on inflation is mitigated.

Ashamu, (2020) examines the impact of monetary policy on foreign trade in Nigeria covering the period from 1981 to 2017. The study used secondary data collected from the Central Bank of Nigeria. The study used Error Correction Model (ECM) techniques. The result shows that the error correction term (speed of adjustment towards equilibrium) value of -0.53581 is significant at 5% and implies that there is a long run causality running from monetary policy activities measures of foreign trade.

Odungweru and Ewubare (2020) examine the effect of monetary policy on Nigerian international trade from 1980 to 2017. Total trade was used to represent foreign trade, and the independent variables were money supply, minimum rediscount rate, cash reserve ratio, exchange rate, interest rate, and inflation rate. Time series data on the variables of the study were obtained from the Central Bank of Nigeria's annual reports from 1980 to 2017. The ADF stationary test reveals that the variables in the study were stable at both levels and at first difference. The regression result shows that there exist a long run relationship between the independent variables and total trade. It also revealed exchange rate exerts a significant positive effect on Total Trade in the long run while Minimum rediscount rate exerts a significant negative effect on total trade in the long run.

Astuti and Udjianto (2022) examine the effect of monetary policy and international trade on economic growth and inflation in four ASEAN countries (Indonesia, Malaysia, the Philippines, and Thailand). Panel data analysis and vector autoregression were used in the study. According to the impulse response results,

monetary policy with an interest rate policy instrument harms economic growth in the short run but benefits it in the long run. An expansionary monetary policy has effectively accelerated economic growth in the short run, and vice versa. International trade has a short-term positive impact on economic growth in ASEAN-4 countries and a long-term negative impact. A price puzzle regarding the effect of interest rates on inflation is revealed by panel data analysis. Similarly, the impact of international trade on inflation is positive. Increased exports stimulate increased aggregate demand and prices.

Gap is created in the existing literature as up to date data is not yet employed to see the influence of key monetary instruments on international trade in Nigeria.

2.3. Theoretical Framework

The Keynesian theory of monetary policy and the classical theory of foreign trade serve as theoretical foundations for this study. These theories establish the relationship between monetary policy and foreign trade in an open economy, as well as the principles underpinning such trade. Keynes' (1936) monetary analysis is based on the principles of effective demand. Changes in output and employment, according to Keynes, are determined by changes in aggregate demand. As a result, monetary policy tends to have some real effects on output growth.

Unlike the classical theorists, Keynes advocates the government's role in stimulating output and aggregate demand via the central bank's indirect role. Monetary policy can influence output and employment through changes in interest rates, which stimulate investment. Although Keynesian economists acknowledge that monetary policy can be helpful in stimulating output, they emphasize large fiscal stimulus, which involves increased government spending or tax cuts, because monetary policy appears insufficient in facilitating overall economic revival through production and output growth. According to Keynes, the ultimate goal of monetary expansion is to meet an unmet demand for money (Jahan, Mahmud and Papageogiou, 2014). This focuses primarily on the decline in interest rates, which increases investors' access to funds and thus stimulates investment.

The main flaw in Keynes' theory is the assumption that interest rates are the only channel through which monetary policy influences demand. Mishkin (2011), on the other hand, outlines changes in the exchange rate, financial asset prices, and bank lending capacity as some other channels through which monetary policy can stimulate overall demand. The doctrine of comparative advantage underpins much

of the classical theory of international trade. It asserts unequivocally that trade in a two-country model is facilitated by differences in overall advantage in terms of technology, economy, social status, and so on. He went on to mention another important factor that influences comparative advantage. Differences in climate and environment, according to Ricardo (2004), tend to result in differences in comparative advantages; these differences in comparative advantages lead to trade. As a result, both the business climate and the environment play an important role in foreign trade. So, if the business climate is favourable for foreign interests based on a country's current monetary policies, this may go a long way toward encouraging foreign trade. Furthermore, Ricardo obtains the result in the context of a model of two countries, two commodities, and one factor of production that a country will tend to export the commodity in which it has a comparative advantage and import the commodity in which it has a comparative disadvantage. Because comparative costs are the inverse of comparative advantage, the classical theory can be easily expressed in terms of comparative costs. Specifically, the theory now states that a country will tend to export the commodity with the lower comparative cost in autarky and import the product with the higher comparative cost in pre-trade isolation.

3. Methodology

3.1. Model Specification

To examine the relationship between international trade and monetary policies in Nigeria, the study adopted the model of Ashamu (2020) with a modification. The model for this study is given as:

$$TT = \beta_0 + \beta_1 MS + \beta_2 ER + \beta_3 IR + U_t$$

TT denotes Total trade proxy for international trade, MS denotes Money supply, ER denotes exchange rate and IR denotes interest rate spread. β_0 is the intercept. $\beta_1 - \beta_3$ are the slope of the coefficients of the model and U_t is the error term.

3.2. Sources of Data

The data used for this study were sourced from Central Bank of Nigeria (CBN) 2021 and World Development Indicator (WDI) 2021. The study period covered 1981-2021.

4. Data Analysis

4.1. Unit Root Stationarity Test

Augmented Dickey Fuller Unit Root Stationarity Result

<i>Variables</i>	<i>ADF (T-Statistics)</i>	<i>Critical value of the ADF Test, at 5% Level of significance</i>	<i>Number of differencingI (d)</i>	<i>Result</i>
TT	-5.983511	-2.938987	I(1)	Stationary
MS	-6.158164	-3.529758	I(1)	Stationary
ER	-5.319931	-3.529758	I(1)	Stationary
IR	-6.629242	-3.533083	I(1)	Stationary

E-view version 9.0 Computation

The five variables (TT, MS, ER and IR) were subjected to unit root test using the Augmented Dickey-Fuller (ADF) test. The result shows that all four variables were found to be stationary at first difference i.e. integrated of order one; I(1). Since none of the variables were stationary at level I(0), the Johansen co-integration test was used to test for co-integration and long run relationship among the series.

4.2. Co-integration Test

To determine the long-run equilibrium relationship between international trade and monetary policy, co-integration test was conducted and decomposed into the Trace Statistic. The asterisk indicates the rejection of no co-integration at 5%.

4.2.1. Johansen's Cointegration Result

Unrestricted Cointegration Rank Test (Trace)

<i>Hypothesized No. of CE(s)</i>	<i>Eigenvalue</i>	<i>Trace Statistic</i>	<i>0.05 Critical Value</i>	<i>Prob.**</i>
None *	0.596868	82.01432	63.87610	0.0007
At most 1 *	0.389288	46.58313	42.91525	0.0206
At most 2 *	0.374299	27.35107	25.87211	0.0325
At most 3	0.207393	9.064669	12.51798	0.1764

Trace test indicates 3 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)

<i>Hypothesized No. of CE(s)</i>	<i>Eigenvalue</i>	<i>Max-Eigen Statistic</i>	<i>0.05 Critical Value</i>	<i>Prob.**</i>
None *	0.596868	35.43118	32.11832	0.0189
At most 1	0.389288	19.23206	25.82321	0.2899
At most 2	0.374299	18.28640	19.38704	0.0717
At most 3	0.207393	9.064669	12.51798	0.1764

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 above results show the Trace and Max Eigen Statistics. The result indicated that there is a long-run equilibrium relationship between international trade (IT), money supply (MS), exchange rate (ER) and interest rate (IR) in Nigeria. Shocks can arise in the short-run to prevent the variables from reaching a state of equilibrium in the long run. In other words, the variables possess the characteristics that would cause them to converge in the long-run.

4.3. Error Correction Mechanism

Given the fact that the variables are co-integrated, the study estimates the long-run and short-run dynamics in the error correction model in order to capture the speed of adjustment to equilibrium in case of any shock that might arise in the independent variables.

4.3.1. Error Correction Estimates

Dependent Variable: D(IT)

Method: Least Squares

Date: 06/10/22 Time: 00:49

Sample (adjusted): 1982 2021

Included observations: 40 after adjustments

<i>Variable</i>	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-Statistic</i>	<i>Prob.</i>
C	340866.7	417553.5	0.816343	0.0198
D(MS)	1421.923	254.1031	5.595850	0.0000
D(ER)	-83179.92	18851.86	-4.412292	0.0001
D(IR)	117278.6	193999.2	0.604531	0.5494

ECM(-1)	-0.456056	0.093852	-4.859285	0.0000
R-squared	0.614273	Mean dependent var		1039370.
Adjusted R-squared	0.570190	S.D. dependent var		3115250.
S.E. of regression	2042356.	Akaike info criterion		32.01357
Sum squared resid	1.46E+14	Schwarz criterion		32.22468
Log likelihood	-635.2715	Hannan-Quinn criter.		32.08991
F-statistic	13.93442	Durbin-Watson stat		1.522509
Prob (F-statistic)	0.000001			

Eviews 9.0 Computation

The above result shows error correction mechanism. The result indicates that the magnitude of the estimated coefficient of the error correction term suggests a high speed of adjustment to any disequilibrium in the short run. In other words, the estimated ECT_{t-1} is equal to -0.456056 which states that the departure from the equilibrium is adjusted by -46% per year. This implies that monetary policy instruments and international trade have long-run causality.

Also, the result shows that TT, MS and ER are all significant at 5% level except for IR. This implies that monetary policies have positive significant influence on international trade, except for exchange rate (ER) which has a negative but significant influence on international trade.

The value of the coefficient of determination (R^2) 0.61 indicates that all of the specified independent variables account for approximately 61% of the total variation in period under study, with the remaining 39% due to changes in the behavioural patterns of other variables that the study did not capture especially fiscal related variables. This implies that they are other variables that influence International trade outside the once captured by the study.

5.1. Conclusion

The main objective of this study is to examine the impact of monetary policy on international trade in Nigeria for the period of 1981 to 2021. In line with this main objective, specific objectives were developed which sought to examine the relationship between international trade and money supply, exchange rate, interest rate in Nigeria. Based on the findings from this study, we conclude that there is a significant influence of monetary policy on international trade in Nigeria. Also, it concludes that they are other monetary instruments especially fiscal ones that influence international trade that the study did not capture. Our finding reveals the need to supplement monetary

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