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Effects of Money Demand on Trade Balance in Nigeria

Abstract: Previous studies appear to have concentrated on the effects of currency depreciation on trade balance and macroeconomic policy, while the relationship between money demand and trade balance is scantly documented in the literature. This paper therefore examines the effects of money demand on trade balance in Nigeria. For the analysis conducted, annual time series data covering the period ranging from 1986 to 2018 were used along with the Autoregressive Distributed Lag (ARDL) estimation technique. The long-run coefficient of money demand was positively signed and statistically significant at 5% level. The positive relationship exhibited by the coefficient of money demand in the long run had a significant influence on trade balance. Thus, this implied that a unit percent increase in money demand would lead to a 1.57% significant increase in trade balance. The implication of this finding was that money demand had significantly influenced trade balance, enhancing the production of goods and fostering investment, which had led to increased growth. The paper recommends that the Central Bank of Nigeria through the Monetary Policy Committee should amend qualitative and quantitative credit control policies with the aim of improving lending to enhance the flow of credit to the real and exporting sector of the economy in order to bring about the desired effect on trade balance. However, the study is limited to an analysis of the existence of the relationship between money demand and trade balance using the Nigerian data set.

Keywords: money demand, trade balance, money stock, domestic credit, ARDL

JEL: E41, E42, E51, E52, F14, F43

1. Introduction

Trade remains a crucial element needed for economic growth and sustainable development of a country. Trade balance is the net sum of trade accrued (a difference in monetary value between export and import) to a country in a year or at a particular point in time. It can be characterised by either trade surplus or trade deficit. Trade surplus occurs when the total revenue inflow from export of goods and services exceeds the total monetary outflow from import of goods and services, while trade deficit occurs when the outflow of domestic currency from import is more than the revenue inflow from export of goods and services.

The monetary approach to trade balance suggests that trade imbalances are essentially an adjustment mechanism which at equilibrium equates the money stock in existence to the quantity of money demanded in an open economy (Edet, Udo, Etim, 2017). When desire to hold money or demand for money increases, there will be an increase in the domestic money supply through increased domestic credit creation, by either the central bank or other financial institutions, which could lead to larger trade deficits. Currency depreciation occasioned by trade deficit, however, raises production costs along with domestic prices, and increases the demand for money, thereby leading to a temporary improvement in the balance of payments via increased trade balance (Cooper, 1971; Daniels, Vanhoose, 2005).

Studies on the relationship between money demand and trade balance are specifically important for many emerging and developing countries such as Nigeria, where trade flows continue to drive the balance of payments accounts due to the developing nature of its capital markets. In addition, changes in the stock of money and the demand for money, whether determined by exogenous or endogenous shocks, have been a common but controversial issue in most developing countries. Several governments of these countries have repeatedly used a stable money demand function as a means of correcting price instability, trade deficits or overvaluation of their exchange rates to increase trade competitiveness and revenue from exports (Rincón, 1999).

Decades leading to the 1980s witnessed an increase in government policies and academic research on the assessment of the impact of currency depreciation on trade balance, the "TATOO" debate on the stability of money demand function, and the examination of successes of competitive depreciations to solve trade imbalance (Momodu, Akani, 2016). The Nigerian economy has experienced structural changes since independence with the country battling with a series of economic problems such as external imbalance and double digit inflation rates with evidence showing rapid trade imbalance in the federal government current account (Sulaimon, Omotunde, Haorayah, 2017). The policy of recapitalisation in some sectors of the economy, growing government expenditure and cost of governance have increased the demand for money. The increased money demand means that

money demand variables can no longer be ignored in the models of trade balance in Nigeria. In attempt to solve the problem of external balance, the government has had severely embarked on currency devaluation, which is a sort of government intervention, with the expectation of improving trade balance.

The following previous studies have investigated the stability of money demand function: Tule et al. (2018), El-Rasheed, Abdulah, and Dahalan (2017), Iyoboyi and Pedro (2013) and Nduka, Chukwu, and Nwakaire (2013) who found stable money demand functions. Studies by Odior and Alenoghena (2016) found partial money demand functions. Some found mixed significant determinants and insignificant determinants of demand functions (Bitrus, 2011; Aiyedogbon et al., 2013; Farazmand, Ansari, Moradi, 2016). Despite the conflicting empirical evidence, studies on the effects of money demand on trade balance are sparse. The research question for this paper is: what effect does money demand have on trade balance in Nigeria? The paper aims to examine the effects of money demand on trade balance in Nigeria.

To estimate the model formulated for this study, the Autoregressive Distributed Lag (ARDL) estimation technique was used. The ARDL technique was developed by Pesaran, Shin, and Smith (2001) to investigate the short-run and long-run relationship among variables. The choice of this technique stems from the fact that it allowed for joint estimation of relationships between money demand and the trade balance induced movement in Nigeria. Thus, the model made a clear cut distinction between the long-run and short-run effects. Another justification for this technique was due to the fact that the result of the unit root test conducted indicated that the variables had a mixture of integration of order zero I(0) and one I(1). This technique also had advantages over the conventional cointegration techniques, being more efficient. The ARDL technique provided unbiased estimation of the long-run model, even in the presence of endogeneity resulting from the reverse causality that might exist among the variables.

The study has contributed to knowledge by filling the empirical gap identified from the existing literature through examining the effect of money demand on trade balance. Particularly, the interaction between money demand and trade balance has received little focus in the literature, especially in the case of Nigeria. This study, therefore, has contributed to the literature by investigating the effects of money demand and its transmission to trade balance, and has revealed a positive link between money demand and trade balance.

The rest of the paper is structured as follows: section two reviews the literature on money demand and trade balance, section three reports research methodology, section four presents the empirical analysis and results, and section five provides the discussion and conclusions, while section six gives recommendations.

2. Brief review of the literature

According to the Monetarist view, increases in money supply propel real money balance above levels considered optimal by economic agents, resulting in increased expenditure out of a given income, thus stimulating imports, increasing money demand and causing trade balance to deteriorate (Anoke, Odo, Ogbonna, 2016). The approach emphasises that disequilibrium in trade balance is associated with disequilibrium between the demand for and supply of money, which are determined by variables such as income, the interest rate, the price level (both domestic and foreign), and the exchange rate.

The monetary approach proposes that in a monetised economy the money demand function and the money supply process should play a central role in the balance of payments analysis and, hence, in the determination of its trade flow components, particularly in the long-run (Mussa, 1974). Paganelli (2006) argues that money is not the cause of trade in general but excess money demand and supply can change the trade pattern through changes in the price level which make domestic goods less attractive compared to foreign goods. The effect of this is the deterioration of trade balance with depreciation of domestic currency, which means that the domestic supply of money decreases (Tang, 2018).

This approach also projects the balance of payments as regards the international reserve in relation to imbalances prevailing in the money market. Simply because an increase in money supply in a fixed exchange rate system will cause an increase in expenditure and consumption in the form of increased purchases of foreign goods and services by domestic residents. To finance such purchases, a great deal of the foreign reserve will be used up, thereby depleting the balance of payments. As the foreign reserve flows out, money supply will continue to diminish until it equals money demand, at which point, monetary equilibrium is restored and the outflow of foreign exchange reserve is stopped.

In their study, Hassan and Suryadi (1993) examined the effects of foreign interest rates, the domestic rate depreciation, and the credit constraint of the demand for money in Indonesia. They found that M_0 (currency) and M_1 (currency plus demand deposits) money demand equations were significantly related to expected currency depreciation but were unrelated to foreign interest rates. Fielding (1994) investigated money demand in four African Countries – Cameroon, Nigeria, Ivory Coast, and Kenya. The study used cointegration techniques and the extension of the classical money demand function to include terms reflecting the variability of real rates of return and to facilitate the construction of dynamic models which successfully explain the evolution of money demand over 15 years. Variability terms were significant in all of the four countries investigated.

Bahmani and Kutan (2010) examined how stable the demand for money was in emerging economies. They considered the experiences of Armenia, Bulgaria,

the Czech Republic, Hungary, Poland, Russia, and the Slovak Republic using quarterly data covering the period between 1993: Q1 and 2006: Q4. The bounds testing approach to Error-Correction Modeling (ECM) and Cointegration was confirmed in all countries under study with the application of CUSUM. They concluded that money demand was stable in those countries. Iyoboyi and Pedro (2013) estimated the narrow money demand function of Nigeria from 1970 to 2010 using the Autoregressive Distributed Lag (ARDL) bounds test approach to cointegration for the analysis. They found cointegration relations among the narrow money demand, real income, short-term interest rate (STIR), real expected exchange rate devaluation (REER), expected inflation rate (EIR), and foreign real interest rate (FRIR). In the period under investigation, the real income and interest rate were significant variables explaining the demand for narrow money in Nigeria, although the real income was a more significant factor in both the short and long term.

Also, Odior and Alenoghena (2016) investigated the relationship between real money balances (demand for money) and real income, bonds, equities, stocks, interest rates, and the inflation rate in Nigeria with annual time series spanning 32 years, from 1981–2013. Methodologically, the study modelled a standard money demand function and employed the ADF-Fisher Chi-square and Phillips-Perron test statistic to test for the unit root, the Engle-Granger single-equation to test for the cointegration, and the Generalised Linear Model (GLM). The study found that the money demand function was partially stable in Nigeria for the sample period and that real money demand positively responded to an increase in real income after real depreciation, inflation and past real money demand, but negatively to a rise in interest rate spreads.

Furthermore, El-Rasheed, Abdulah, and Dahalan (2017) investigated the effect of monetary uncertainty (MUC) on the stability of money demand function in Nigeria using the Autoregressive Distributed Lag (ADL) Cointegration technique for the period of 1980–2014. The demand for money in Nigeria was specified as a function of income, the domestic interest rate, inflation, the nominal exchange rate, and MUC. The results from the bounds testing indicated that MUC, income, the domestic interest rate, inflation, the exchange rate, and broad money (M2) were co-integrated. Tule et al. (2018) examined broad money (M2) demand and its stability in Nigeria using quarterly time series data from 1985: Q1–2016: Q4. The study used the Autoregressive Distributed Lag (ARDL) bounds testing procedure. The results indicated that a stable long-run relationship existed between M2 and its determinants including GDP, stock prices, foreign interest rates, and the real exchange rate.

Empirically, the reviewed studies focused mainly on depreciation effect, substitution effect on trade balance, money demand function and money demand stability without due regard for the effect of money demand on trade balance, a variable which this study intends to consider and incorporate to test the level of their

relationship with the Nigerian economy. Methodologically, this study discovered that the Autoregressive Distributed Lag (ARDL) model, due to its advantages over simple regression models, had not been really utilised using the Nigeria dataset and the variables of interest we incorporated. Few of the studies that used this method, such as Iyoboyi and Pedro (2013), Tule et al. (2018), only estimated the money demand function and examined money demand stability respectively. This obvious omission justifies a critical empirical investigation of the actual effect of money demand on trade balance in Nigeria. Hence, the study answers the question: what effect does money demand have on trade balance in Nigeria? The null hypothesis states that: money demand has no significant effect on trade balance in Nigeria. However, the study only tests the existence of the relationship and not the direction of the relationship which is outside of the scope of this study. Therefore, the study expects a positive relationship between money demand and trade balance.

(Hypothesis: there is no significant relationship between money demand and trade balance in Nigeria.)

3. Theoretical framework/methodology

The disequilibrium framework was originally put forth by the seminal papers of Fleming (1962) and Mundell (1963) and later by Dornbusch (1976). It has become a conventional answer to currency depreciation that is usually analysed within the Mundell-Fleming model.

Further extension of the Mundell-Fleming model, which is otherwise known as the IS-LM-BOP model, is an extension of the Keynes's IS-LM model. Hence, this study adopts the Keynesian IS-LM (monetary) theory. The traditional IS-LM model deals with autarky, while the modern Mundell-Fleming model describes a small open economy. The formal monetary approach to the balance of payments model based on Johnson (1977) and Dhliwayo (1996) specifies a money demand function, a money supply identity, and an equilibrium condition.

The model consists of the following set of equations:

$$M^S = \left(R + DC\right), \tag{3.1}$$

$$M^d = L\left(Y, P, I\right), \tag{3.2}$$

$$M^S = M = M^d, \tag{3.3}$$

where M^s = money supply (aggregate money stock); M^d = money demand; Y = level of real domestic income; P = price level; I = rate of interest; and M = equilibrium stock of money; DC = domestic credit; IR = international reserves; CU = currency; R = bank reserves; MB = monetary base; m = money multiplier; D = depos-

its. Following the theoretical framework and in line with the work of Dhilwayo (1996), Agbola (2004) and Alawattage (2009), this study postulates trade balances as a function of money demand, Nigeria's international reserve, and lending rate, its degree of openness, domestic income, domestic price level, and interest rate.

$$\ln TB_{it} = \beta_i + \beta_1 \ln MD_{it} + \beta_2 RES_{it} + \beta_3 RL_{it} + \beta_4 \text{OPEN} + \beta_5 \ln Y_t + \beta_6 P + \beta_7 IR + \varepsilon_{it}, \tag{3.4}$$

where the variables log*TB* is the logarithm of trade balance to capture the effects of transactions and precautionary demand for money on the external sector; log*MD* is the logarithm of money demand (the stock of nominal money), i.e. the value of total money in circulation in the Nigerian economy in a given period; *RES* is the Nigerian international reserves; *IR* is the deposit interest rate (the interest rate on money itself), *RL* is the lending interest rate (a proxy for the rate of return on assets outside of money); *OPEN* is the degree of openness to international trade, measured as (Export + Import)/GDP; log*Y* is the real GDP as a proxy to capture transactions and precautionary demand for money; *P* is the domestic price level (Apergis, 2015).

The study used the Autoregressive Distributed Lag (ARDL) estimation technique owing to the fact that the preliminary test conducted showed that the variables had a mixture of integration of order zero I(0) and I(1).

Secondary annual time series data used in the study were subjected to preliminary econometric tests for heteroscedasticity, serial correlation, normality and stability before applying the Bounds Test for cointegration using the Autoregressive Distributed Lag (ARDL) model. The use of the bounds testing technique is predicated on three validations. Firstly, Pesaran, Shin, and Smith (2001) advocate the use of the ARDL model for the estimation of level relationships because the model suggests that if the order of the ARDL has been identified, the relationship may be estimated by the OLS method. Secondly, the bounds test for cointegration permits a mixture of I(1) and I(0) variables as regressors. In other words, the order of integration of appropriate variables may not necessarily be the same, hence the ARDL technique has the advantage of not requiring a specific identification of the order of the underlying data. Thirdly, the technique is fit for small or finite sample sizes (Pesaran, Shin, Smith, 2001). In such a situation, the application of the ARDL approach to cointegration will give realistic and efficient estimates because the ARDL is a dynamic single model equation and of the same form with the ECM.

The paper used an ARDL framework of order:

$$\ln(TB)_t = \beta_0 + \sum_{i=1}^{P_1} \beta_i \Delta \ln(TB)_{t-1} + \sum_{i=1}^{P_2} \beta_i \Delta \ln(MD)_{t-1} + \sum_{i=1}^{P_3} \beta_i \Delta RES_{t-1} + \sum_{i=1}^{P_4} \beta_i \Delta LR_{t-1} + \sum_{i=1}^{P_5} \beta_i OPEN_{t-1} + \sum_{i=1}^{P_6} \beta_i \Delta \ln Y_{t-1} + \sum_{i=1}^{P_2} \beta_i \Delta P_{t-1} + \sum_{i=1}^{P_2} \beta_i \Delta IR_{t-1} + \lambda_1 TB_{t-1} + \lambda_2 MD_{t-1} + \lambda_3 RES_{t-1} + \lambda_4 LR_{t-1} + \lambda_5 OPEN_{t-1} + \lambda_6 Y_{t-1} + \lambda_7 P_{t-1} + \lambda_8 IR_{t-1} + \varepsilon_t, \quad (3.5)$$

where Δ is a first difference operator and ε_t is an identically and independently distributed white noise error term. In equation (3.5), the term with the summation sign represents the error correction dynamics while the second part (the term with λ_s in the equation) corresponds to the long-run relationship. The null hypothesis in equation (3.5) exists when $\lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = \lambda_6 = 0$, which indicates the non-existence of the long-run relationship.

The ARDL method estimated $(P + 1)^k$ number of regressions in order to obtain the optimal lags for each variable, where P is the maximum number of lags to be used and k is the number of variables in the equation. The paper makes use of secondary data, which are annual time-series. The data covered a period of 33 years, 1986 to 2018. Data were sourced from Central Bank of Nigeria (CBN) various statistical bulletins, National Bureau of Statistics (NBS) Annual Reports and International Financial Statistic (IFS) data. The variables that were used in the study were selected on the basis of their theoretical importance, usefulness as a measure of the key construct of the study, namely, currency depreciation, money demand and trade balance, and findings from their usage in the existing empirical literature. The E-views 10 econometric software package was used to analyse the data.

4. Empirical analysis

Table 1 presents the descriptive analysis of the time series properties of the variables included in the models. The table shows that the mean values of interest rate (*IR*), money demand (*MD*), degree of openness (*OPEN*), domestic price level (*P*), Nigerian international reserves (*RES*), lending rate (*RL*), trade balance (*TB*) and domestic income (*Y*) stood at 7.40 percent, ₦5,755.584 billion, 5259.31 percent, ₦58.52, ₦18,398.79 billion, 18.76 percent, ₦8,474.284 billion, ₦35,965.39 billion respectively.

The standard deviation of interest rate (*IR*), money demand (*MD*), degree of openness (*OPEN*), domestic price level (*P*), Nigerian international reserves

(*RES*), lending rate (*RL*), trade balance (*TB*) and domestic income (*Y*) from their respective long-term mean values every year point stood at, 5.42 percent, ₦7,600.335 billion, 1189.55 percent, ₦57.91, ₦16,731.78 billion, 3.80 percent, ₦9,134.485 billion, and ₦19,496.87 billion respectfully. The probability value of Jarque-Bera statistics for all the variables shows their distribution level at mean zero and constant variance, while all variables are positively skewed to the right. This reveals that money demand and trade balance are normally distributed among all the incorporated variables of interest.

The graphical representation of the data to analyse the effects of currency depreciation on trade balance is shown in Figure 1. It reveals that trade balance reached its peak of ₦362,527,115 billion in 1994 when the money demand level was ₦19.445,452 billion, indicating a growth rate of about 300 per cent. This sudden increase in trade balance could be partly due to an increase in crude oil price in the international oil market, the import restriction policy of the time to promote exportation, and a loss in competitiveness of the sub-region's products in the Nigerian market. Generally, the data oscillated throughout the period, which reflected that financial data in Nigeria exhibited random walk and structural breaks. The money demand showed a reverse trend which could be a result of persistent expansionary fiscal policy and excess liquidity in the system with increased money demand. Overall, the study observed critically that the differences in the volatility of money demand and trade balance reflected the outcome of the various policies adopted by the government in the management of the Nigerian economy.

Table 1. Descriptive statistic

	IR	*MD*	*OPEN*	*P*	*RES*	*RL*	*TB*	*Y*
Mean	7.403594	5755.584	5259.310	58.51780	18398.79	18.75847	8474.284	35965.39
Median	4.952500	1457.700	5100.381	37.79266	9197.605	17.96500	3241.500	27112.63
Maximum	18.80000	23433.60	7959.177	195.9020	53000.36	29.80000	26232.50	75757.00
Minimum	1.410000	27.40000	3330.311	0.876848	1429.590	10.50000	14.90000	15237.99
Std. Dev.	5.423479	7600.335	1189.549	57.90920	16731.78	3.791365	9134.485	19496.87
Skewness	0.761688	1.099770	0.143485	0.918030	0.723142	0.956424	0.704772	0.712317
Kurtosis	2.006471	2.725934	2.160594	2.726236	2.056634	4.568608	1.951174	2.069040
Jarque-Bera	4.410368	6.550786	1.049273	4.594755	3.975570	8.159354	4.115800	3.861694
Probability	0.110230	0.037802	0.591770	0.100522	0.136999	0.016913	0.127722	0.145025
Sum	236.9150	184178.7	168297.9	1872.570	588761.2	600.2710	271177.1	1150892.
Sum Sq. Dev.	911.8377	1.79E+09	43865799	103957.7	8.68E+09	445.6080	2.59E+09	1.18E+10
Observations	33	33	33	33	33	33	33	33

Source: own elaboration

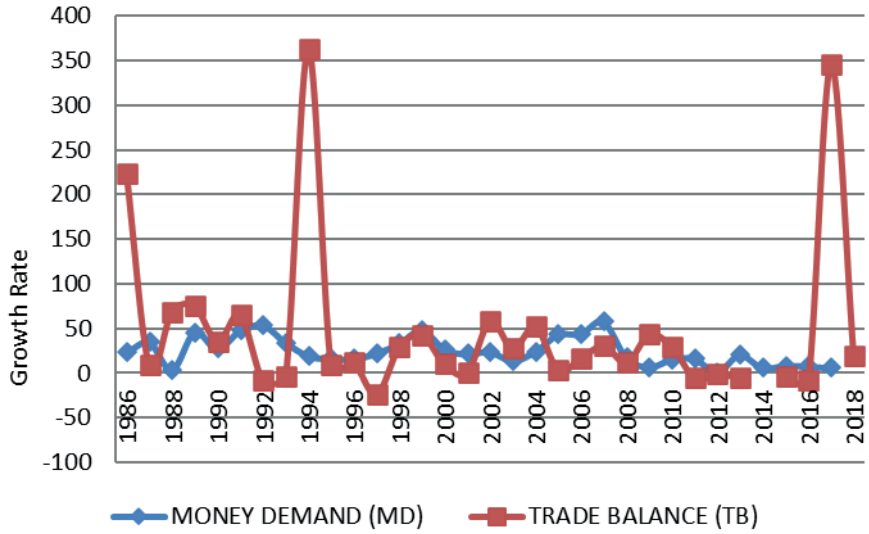

Figure 1. Money demand and trade balance
Source: own elaboration

4.1. Correlation matrix

The correlation matrix shown in Table 2 expressed the partial correlation of money demand and trade balance variables employed for this paper in Nigeria within the period of 1986–2017. The table shows the magnitude, strength and direction of their linear relationship, with some negative linear relationships. It indicates the existence of a variable showing positive correlation between the foreign reserve and the domestic price (0.666749), the lending rate and the interest rate (0.502763), which is in line with the economic theory because correlations among the explanatory variables neither violate any assumptions nor affect the unbiasedness of the regressors' coefficients (Wooldridge, 2013).

Table 2. Correlation Matrix

Correlation	*IR*	log(*MD*)	*OPEN*	*P*	*RES*	*REXRD*	*RL*	log(*TB*)
IR	1.000000							
log(*MD*)	–0.254740	1.000000						
OPEN	0.190439	–0.433914	1.000000					
P	–0.685823	0.203355	–0.604574	1.000000				
RES	–0.410492	0.488017	–0.195627	0.666749	1.000000			
RL	0.502763	–0.322390	0.005574	–0.366436	–0.401093	–0.061375	1.000000	
log(*TB*)	–0.448507	0.370500	–0.367677	0.205874	0.342776	–0.179065	–0.245067	1.000000
log(*Y*)	–0.371358	0.269215	–0.527527	0.463170	0.493195	–0.229176	–0.327088	0.401491

Source: own elaboration

4.2. Unit-root test results

Table 3 shows the results of the unit-root test using the Augmented Dickey Fuller (ADF) approach. The results show that the variables had a mixture of integration of order zero I(0) and one I(1). Specifically, the lending rate (*RL*) and trade balance (*TB*) were stationary at 5% significance level while the interest rate (*IR*), money demand (*MD*), domestic price level (*P*), domestic income (*Y*), Nigerian International reserve (*RES*) and trade openness (*OPEN*) were all stationary at first difference at 5% significance level. Having noted that the variables were of different orders of integration and first difference, the study therefore applied the Autoregressive Distributed Lag technique (ARDL) in line with the work of Pesaran, Shin, and Smith (2001) since one of the dependent variables (money demand) is non-stationary; none of the variables is I(2) in normal condition (ADF test); and none of the variables is I(2) in a structural break.

Table 3. Augmented Dickey Fuller unit root results

Variables	Level	First Difference	Order of Integration
IR	–0.9875	–6.2007	I(1)
ln*MD*	–1.9483	–3.3552	I(1)
ln*P*	–1.1399	–3.8824	I(1)
ln*RES*	–0.7860	–7.5311	I(1)
ln*Y*	0.1268	–3.4566	I(1)
OPEN	–2.9467	–5.1682	I(1)
RL	–4.5286	–	I(0)
TB	–3.5727	–	I(0)

Source: own elaboration

5. Presentation of research results

5.1. Results of the relationship between money demand and trade balance in Nigeria

Table 4 showed the results of the Autoregressive Distributed Lag of order (1, 2) on the effect of money demand on trade balance in Nigeria. The explanatory power of the model explained 60.8 per cent of the total variations in the total balance. This showed that 39.2 per cent of the total variations in the trade balance was not explained, indicating that all the explanatory variables played major roles in explaining significant changes in the trade balance of the Nigerian economy. Thus, the model had high goodness fit. The value of the F-statistic showed that the joint

explanatory variables significantly explained the trade balance at 5% significance level. Thus, the model was statistically significant at 5% level. The value of the Durbin-Watson d* statistic was approximately 2, indicating that the model had no serial autocorrelation problem.

Table 4. Autoregressive distributed lag results

Dependent Variable: log(*TB*)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.***
log(*TB*(–1))	0.374655**	0.184890	2.026371	0.0570
log(*MD*)	0.247224	0.514259	0.480740	0.6362
log(*MD*(–1))	–0.526088	0.736371	–0.714433	0.4836
log(*MD*(–2))	1.258532	0.642708	1.958170	0.0651
log(*RES*)	–0.185175	0.133555	–1.386500	0.1816
RL	–0.020437	0.019719	–1.036417	0.3130
OPEN	–1.93E–05	6.46E–05	–0.298111	0.7689
log(*Y*)	0.138481	1.039582	0.133209	0.8954
P	–0.015963**	0.004799	–3.325995	0.0036
IR	0.019918	0.039225	0.507791	0.6174
C	0.001934	8.373509	0.000231	0.9998
R-squared	0.608977	F-statistic		2.959046
Adjusted *R*-squared	0.403175	Durbin-Watson stat		1.789612

** Significant at 5% level.

Source: own elaboration

Table 5 shows that the F-statistic value (5.8173) in the ARDL Bound test was significantly higher than the critical value bounds of I(0) Bound and I(1) Bound at 5% significance level. This shows that the variables in the model have a long-run co-movement among themselves. Hence, there is a long-run relationship among the variables. Thus, the variables have a long-run co-movement and a long-run relationship.

Table 6 explained the short-run relationship between money demand and trade balance in Nigeria. This was confirmed by the negative coefficient of Error Correction variable (*CointEq*(–1)) characterised by 5% significance level which explained the speed of adjustment that made short-run periods converge to long-run periods. This result showed that it would take all the variables 20 years to converge from a short-run to long-run relationship.

The short-run coefficient of money demand had a positive sign and was statistically insignificant at 5% level while its lagged coefficient had a negative sign and was statistically significant at 10% level. The positive sign exhibited by the coefficient of money demand showed that a unit percent increase in demand for money would lead to a 0.25 per cent increase in trade balance, but this increase

had no significant impact on the growth of the economy. Hence, money demand had no significant effect on trade balance in Nigeria in the short-run while the coefficient of lagged money demand had a significant impact. The impact, however, had an inverse effect on the growth of trade balance, and consequently deterred the growth of the economy.

Table 5. Long-run co-movement results

ARDL Bounds Test		
Test Statistic	Value	*k*
F-statistic	5.817304	1
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	4.04	4.78
5%	4.94	5.73
2.5%	5.77	6.68
1%	6.84	7.84

Source: own elaboration

The short-run coefficients of federal reserve, lending rate, openness to world trade and price level were negatively signed and statistically insignificant at 5% level except the price level. The negative signs exhibited by these variables (federal reserve, lending rate and openness to world trade) showed that there was an inverse relationship between these variables (federal reserve, lending rate and openness to world trade) and trade balance, and that these relationships also contributed to the growth of trade in Nigeria to a statistically insignificant degree. Meanwhile, the negative and significant effect of price level showed that a unit percent decrease in the price level would lead to a 0.02% decrease in trade balance in the short run. Furthermore, the short-run coefficients of domestic output and the interest rate had positive signs and were statistically insignificant at 5% level. The direct effect exhibited by domestic output and interest rate showed that a unit per cent increase in the domestic output and the interest rate would lead to 0.14% and 0.02% insignificant increases in trade balance respectively in the short run.

Table 6. Short-run results of the relationship between money demand and trade balance

Dependent Variable: log(*TB*)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Probability**
log(*MD*)	0.247224	0.514259	0.480740	0.6362
log(*MD*(–1))	–1.258532	0.642708	–1.958170	0.0651
log(*RES*)	–0.185175	0.133555	–1.386500	0.1816
(*RL*)	–0.020437	0.019719	–1.036417	0.3130
(*OPEN*)	–0.000019	0.000065	–0.298111	0.7689

Dependent Variable: log(*TB*)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Probability**
log(*Y*)	0.138481	1.039582	0.133209	0.8954
(*P*)	–0.015963	0.004799	–3.325995	0.0036
(*IR*)	0.019918	0.039225	0.507791	0.6174
CointEq(–1)	–0.625345	0.184890	–3.382262	0.0031
R-squared	0.608977		F-statistic	2.959046
Adjusted *R*-squared	0.403175		Durbin-Watson stat	1.789612

Source: own elaboration

Table 7 showed the results of the long-run relationship between money demand and trade balance. The long-run result had no serial correlation problem as evidenced by the value of Durbin Watson d*-statistic, and the explanatory variables significantly explained the influence money demand had on trade balance (dependent variable) as evidenced by the value of F-statistic.

The long-run coefficient of money demand was positively signed and statistically significant at 5% level. The positive relationship exhibited by the coefficient of money demand in the long run had a significant influence on trade balance. Thus, this implied that a unit per cent increase in money demand would lead to a 1.57% significant increase in trade balance. The implication of this finding was that money demand had a significant influence on trade balance, enhancing the production of goods and fostering investment, which had led to increased growth.

The long-run coefficients of Federal Reserve, lending rate and openness to world trade were negatively signed and statistically insignificant at 5% level while the coefficient of price level was equally negative but statistically significant at 5% level. The negative signs exhibited by these variables (federal reserve, lending rate and openness to world trade) showed that there was an inverse relationship between these variables (federal reserve, lending rate and openness to world trade) and trade balance, and that these relationships contributed to the growth of trade in Nigeria to a statistically insignificant degree. Meanwhile, the negative and significant effect of price level showed that a unit per cent decrease in the price level would lead to a 0.03% decrease in trade balance in the long run. Furthermore, the long-run coefficients of domestic output and interest rate had positive signs and were statistically insignificant at 5% level. The positive effect exhibited by domestic output and interest rate showed that a unit per cent in the domestic output and the interest rate would lead to a 0.22% and 0.03% insignificant increase in trade balance respectively in the long run.

Table 7. Long-run results of the effect of money demand on trade balance

Dependent Variable: log(*TB*)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
log(*MD*)	1.566605**	0.386780	4.050374	0.0007
log(*RES*)	–0.296116	0.231064	–1.281532	0.2154
RL	–0.032682	0.031062	–1.052142	0.3059
OPEN	–0.000031	0.000105	–0.293206	0.7725
log(*Y*)	0.221448	1.678856	0.131904	0.8964
P	–0.025526**	0.009124	–2.797555	0.0115
IR	0.031851	0.063664	0.500301	0.6226
C	0.003093	13.389974	0.000231	0.9998
R-squared	0.608977		F-statistic	2.959046
Adjusted *R*-squared	0.403175		Durbin-Watson stat	1.789612

** Significant at 5% level.

Source: own calculations

Table 8 showed the diagnostic tests results that confirmed the authenticity of the results derived from the ARDL technique. The tests were in four folds: the normality test, serial correlation LM test, heteroscedasticity test, and stability test. The tests were carried out to check whether the series were normally distributed, free from the serial autocorrelation problem, had constant variance or suffered from functional form misspecification when the model did not properly account for the relationship between the dependent and observed explanatory variables. The value of the Jarque-Bera statistic showed that the data were normally distributed since its value was statistically insignificant at 5% level. Furthermore, the result of the serial correlation LM test using the Breusch-Godfrey method indicated that the time series data had no serial autocorrelation problem since the value of the statistic was not statistically significant at 5% level. The result of the heteroscedasticity test using the Breusch-Pagan-Godfrey technique showed that the data had constant variance as evidenced by the F-statistic value at 5% level that was not statistically significant. Finally, the results of stability test using the Ramsey RESET (Regression Equation Specification Error Test) test revealed that the series had no evidence of non-linearity since its F-statistic value was statistically significant at 5% level.

The results of the Autoregressive Distributed Lag on the effect of money demand on trade balance in Nigeria revealed that the short-run coefficient of money demand had a positive sign and was statistically insignificant at 5% level. The positive sign exhibited by the coefficient of money demand showed that a unit percent increase in demand for money would lead to a 0.25 per cent increase in trade balance, but this increase had no significant impact on the growth of the economy. Hence, money demand had no significant effect on trade balance in Nigeria in the short run while the coefficient of lagged money demand had a significant impact.

The impact, however, had an inverse effect on the growth of trade balance, and consequently deterred the growth of the economy. The positive relationship exhibited by the coefficient of money demand in the long run had a significant influence on trade balance. Thus, this implied that a unit per cent increase in money demand would lead to a 1.57% significant increase in trade balance. The implication of this finding was that money demand had a significant influence on trade balance.

Table 8. Diagnostic tests results for the effect of money demand on trade balance

Tests	Statistic	Values	Probability
Normality	Jarque-Bera	1.5448	0.4619
Serial Correlation LM	Breusch-Godfrey	1.0746	0.3635
Heteroskedasticity	Breusch-Pagan-Godfrey	2.1186	0.0763
Stability	Ramsey RESET	7.3577	0.0130

Source: own calculations

5.2. Discussion of findings

The positive relationship exhibited by the coefficient of money demand in the long run showed that money demand had a significant influence on trade balance and validated the alternative hypothesis of this study. With this finding, the study rejects **hypothesis I**: (H_0: There was no significant relationship between money demand and trade balance in Nigeria). Hence, money demand significantly affected changes in the trade balance in Nigeria for the years reviewed. This result was consistent with previous studies in developed, emerging and developing economies such as: Tsen (2011), Iyoboyi and Pedro (2013), Alhanom (2016), and Odior and Alenoghena (2016).

6. Conclusions and policy recommendations

this paper evaluates the effects of money demand on trade balance in Nigeria. The study makes use of ex-post facto research design and secondary annual time series data from 1986 to 2018, obtained from the 2018 Central Bank of Nigeria (CBN) statistical bulletin. To achieve the objectives of the study and address the stated hypothesis, preliminary diagnostic tests of the data series were conducted through the use of ADF unit root tests. The results of the Autoregressive Distributed Lag of order (1, 2) on the effect of money demand on trade balance in Nigeria showed that the explanatory power of the model explained 60.8 per cent of the total variations in trade balance. This showed that 39.2 per cent of the total variations

in trade balance was not explained, indicating that all the explanatory variables played major roles in explaining significant changes in the trade balance of the Nigerian economy. Thus, the model has high goodness fit. The value of the F-statistic shows that the joint explanatory variables significantly explained the trade balance at 5% significance level. Hence, the model was statistically significant at 5% level. The value of the Durbin-Watson d* statistic is approximately 2, indicating that the model has no serial autocorrelation problem.

The study has thus confirmed that money demand had a strong and positive relationship with trade balance over the analysed years. The study has empirically shown that a unit percent increase in money demand will lead to a 2% increase in trade balance. It is evident from these findings that money demand significantly influenced trade balance in Nigeria in the analysed period. Economic agents demanded more money in order to purchase more goods either locally or internationally. This enhanced the production of goods, increased exportation and fostered investment, thereby increasing growth and economic development.

The paper recommends that the Central Bank of Nigeria through the Monetary Policy Committee should amend qualitative and quantitative credit control policies with the aim of enhancing the flow of credit to the real and exporting sector of the economy to bring about the desired effect on trade balance. This was evident due to the fact that a unit percent increase in money demand led in the short run to a 2 per cent significant increase in trade balance, and hence to increasing economic growth. In the long run, a unit percent increase in money demand led to a 1.01% significant increase in trade balance. Also, the Federal Ministry of Trade and Investment should enhance export of internationally competitive goods through implementing export promotion policies. However, the study is limited to an analysis of effects of money demand on trade balance using the Nigerian data set, the study did not look for the bi-causal relationship between the variables. Hence, the paper also suggests that other methodologies, such as the vector autoregressive model-VAR or S-VAR, could be used for further studies on the causal relationship between these economic variables.

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Wpływ popytu na pieniądz na bilans handlowy w Nigerii

Streszczenie: Prowadzone przez różnych autorów badania koncentrują się na wpływie deprecjacji waluty na bilans handlowy oraz politykę makroekonomiczną, podczas gdy związek między popytem na pieniądz a bilansem handlowym jest słabo udokumentowany w literaturze. W niniejszym artykule przeanalizowano wpływ popytu na pieniądz na bilans handlowy w Nigerii. Do analizy wykorzystano szeregi czasowe dla danych rocznych z okresu od 1986 do 2018 roku oraz autoregresyjny model o rozłożonych opóźnieniach (ARDL). Długookresowy współczynnik popytu na pieniądz miał znak dodatni i był statystycznie istotny na poziomie 5%. Pozytywne skorelowanie współczynnika popytu na pieniądz w dłuższej perspektywie miało znaczący wpływ na bilans handlowy. Oznaczało to, iż wzrost popytu na pieniądz o 1,57% prowadził do znacznego wzrostu bilansu handlowego o 1,57%. W konsekwencji można stwierdzić, iż popyt na pieniądz miał znaczący wpływ na bilans handlowy, prowadząc do zwiększenia produkcji towarów i promowania inwestycji, co zaowocowało zwiększonym wzrostem. Artykuł zawiera rekomendację, aby Bank Centralny Nigerii, za pośrednictwem Komitetu Polityki Pieniężnej, zmienił jakościową i ilościową politykę kontroli kredytowej tak, żeby usprawnić akcję kredytową i zwiększyć przepływ kredytów do eksportującego sektora gospodarki, w celu uzyskania pożądanego wpływu na bilans handlowy.

Słowa kluczowe: popyt na pieniądz, bilans handlowy, zasoby pieniężne, kredyt krajowy, ARDL

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