Bank Credit and Aggregate Import Demand in Nigeria: A Cointegration Analysis

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Abstract: This study reformulated the aggregate import demand for Nigeria by including a financial variable (bank credit) into the traditional import demand function for the period 1970-2009. The Johansen Multivariate cointegration analysis was used to estimate the function. The result obtained from the study shows no evidence of the existence of cointegrating relations between bank credit and import demand. This shows that bank credit is found to be insufficient as a policy instrument for long term import demand in Nigeria. Thus, the financial variable should not be included in modelling the aggregate import demand for Nigeria.

Keywords: Aggregate import demand; Bank credit; Cointegration; Nigeria

JEL Classification: C22, C32, F14

1 Introduction

Nigeria's aggregate imports have grown substantially since the country's political independence in 1960. The growth of imports according to Egwakhide (1999) is attributable to several factors. These include the need to pursue economic development, the expansion in crude oil export that considerably raised foreign exchange earnings and the over-valuation of the local currency, which artificially cheapened imports in preference to local production and the astronomical expansion of domestic absorption which has to be satisfied by imports. Estimating import demand function is still popular in empirical research because of its relevance for trade and exhange rate policy formulation.

The relevance of aggregate imports demand has led to several studies trying to explain the behaviour of aggregate import demand function in Nigeria. Among such studies are Olayide (1968), Ajayi (1975), Khan (1974), Fajana (1975), Mouka (1982), Obadan (1986), Yekini (1999) Egwaikhide (1999), Aliyu (2005), Omotor (2010) and Babatunde and Egwakhide (2010). These studies adopted the traditional formulation of import demand equation, the volume of imported demanded to real

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income and relative price variables and have undoubtedly provided considerable insights into the quantitative effects of aggregate economic activity (proxied by real income) and import prices relative to domestic prices on total imports. These studies have presented different and yet interesting findings on the nature and influence of different variables determining the level of Imports demand functions in Nigeria.

Following Craigwell (1994) and Tang (2004, 2006), this study aims at estimating aggregate import behaviour for Nigeria by including bank credit variable as an additional determinant for import.

This study contributes to empirical literature by formulating an augumented import demand function which includes a financial variable (bank credit). The inclusion of the bank credit variable as an additional factor for explaining aggregate import demand is to accommodate increase in spending which includes spending on imported goods, which are not produced domestically. In other words, imports, like any other form of expenditure, have to be financed by bank credit, moreso when the domestic output have high import contents such as raw material or immediate goods which are not produced locally or lack of perfect substitutes, an increase in domestic demand might increase the need for bank loans for production. The knowledge of these association will enable us obtain a more complex picture of the effects and nature of bank credit for an importing country's-demand for import. The study also employed a correct economic activity variable i.e,. gross domestic product (GDP) minus real export as proposed by Senhadji (1998) and used by Tang (2006) rather than GDP as used in conventional import demand functions. Empirical evidence on the long-run relationship between bank credit and the behaviour of import demand is mixed and inconclusive. While Craigwell (1994) found that bank credit is an important variable in explaining the behaviour of aggregate import demand for Barbados. This was supported by Tang (2004) for Japan and Tang (2006) for Singapore, Indonesia and Thailand. However, Tang (2006) found no evidence of existence of cointegrating relations between bank credit and import demand for Malaysian and Philippines and concludes that bank credit should not be included in modelling Malaysian and Philippines import demand.

The structure of the study is as follows. Section 2 describes the methodolgy which includes the model specification, data and the estimation procedure. The empirical results are reported in section 3. Section 4 which is the last section concludes the study.

2. Methodology

The conventional formulation of the aggregate import demand function of the imperfect substitute model of Goldstein and Khan (1985) relates the quantity of imports to real income (or activity variables) and relative prices of imports (ratio of import prices to domestic prices). The imperfect substitution model is rooted in the assumption that a demand function is homogeneous of degree zero in price. In line with the above proposition and following the lead of Tang (2006) an augmented version of the aggregate import demand function for Nigeria can be written as:

$$M_t = M_t(YE_t, RP_t, CR_t) \tag{1}$$

Where M_t is the desired quantity of imports demanded at period t, YE_t is the activity variables proposed by Senhadji (1998) that is calculated by real GDP minus real exports. RP_t is the ratio of import price index to domestic price level (relative price of imports), and CR_t is the volume of bank credit

A log linear specification of import demand equation is written as:

$$LM_t = \alpha_0 + \alpha_1 LYE_t + \alpha_2 LRP_t + \alpha_3 LCR_t + \varepsilon_t \tag{2}$$

Where ε_t is the residuals series and L is natural logarithmic form

Economic theory expects that the signs of the coefficients be as follows: $\alpha_1>0$ or <0, $\alpha_2<0$ and $\alpha_3>0$. This is based on Keynes argument that an increase in domestic activity will stimulate imports yielding positive income elasticity. On the other hand, if an increase in domestic activity is due to an increase in the production of import-substitute goods, imports may actually fall, resulting in negative income elasticity. An increase in import price relative to domestic price levels will hurt import volume, yielding negative price elasticity. Lastly, a Credit variable is expected to be positively related to import flows.

2.1. Data Description and Source

The study uses annual data from 1970 – 2009; the sources of the data are the Central Bank of Nigeria (CBN) Statistical Bulletin, 2009 and the International Monetary Fund, International Financial Statistics CD, ROM (IMF/IFS, 2011). The description of the data is as follows:

The quantity of imports demanded (Mt) is real import; that is nominal import deflated by import price index. Volume of import was sourced from the CBN Statistical bulletin, 2009 and divided by US export price index (used as a proxy for import price index) – sourced from IMF/IFS, 2011. The activity Variable (YE_t), based on Senhadji (1998), is derived as Gross Domestic Product (GDP) minus exports then deflated by GDP deflator yielding a variable in real terms. All the data used for the calculation was sourced from CBN Statistical Bulletin, 2009. Relative Price of Import (RP_t) is the ratio of import price index to GDP deflator. We used the export price index of US to proxy Nigeria's import price index. This is sourced from the IMF/IFS CD ROM, 2011. Real bank credit is defined as the nominal value of credit from Nigeria deposit banks deflated by GDP deflator. We used Private sector credit as a proxy; this was sourced from the CBN Statistical Bulletin, 2009.

2.2. Method of Analysis

The cointegration technique will be employed to estimate the variables in this study. To carry out the cointegration analysis, two steps are required: these are testing for order of integration and the cointegration.

2.2.1. Unit Root Test

The first step involves testing the order of integration of the individual series under consideration. Researchers have developed several procedures for the test of order of integration. The most popular ones are Augmented Dickey-Fuller (ADF) test due to Dickey and Fuller (1979, 1981), and the Phillip-Perron (PP) due to Phillips (1987) and Phillips and Perron (1988). Augmented Dickey-Fuller test relies on rejecting a null hypothesis of unit root (the series are non-stationary) in favour of the alternative hypotheses of stationarity. The tests are conducted with and without a deterministic trend (t) for each of the series. The general form of ADF test is estimated by the following regression

$$\Delta y_t = \alpha_0 + \alpha_1 y_{t-1} + \sum_{i=1}^{n} \alpha \Delta y_i + e_t \qquad (3)$$

$$\Delta y_t = \alpha_0 + \alpha_1 y_{t-1} + \sum_{n=1}^{n} \alpha_1 \Delta y_i + \delta_t + e_t \qquad (4)$$

Where:

Y is a time series, t is a linear time trend, Δ is the first difference operator, α_0 is a constant, n is the optimum number of lags in the dependent variable and e is the random error term the difference between equation (1) and (2) is that the first equation includes just drift. However, the second equation includes both drift and linear time trend pp.

2.2.2. The Cointegration Analysis

The second step is to test the presence or otherwise of cointegration between the series of the same order of integration through forming a cointegration equation.

The basic idea behind cointegration is that if, in the long-run, two or more series move closely together, even though the series themselves are trended, the difference between them is constant. It is possible to regard these series as defining a long-run equilibrium relationship, as the difference between them is stationary (Hall and Henry, 1989). A lack of cointegration suggests that such variables have no long-run relationship: in principle they can wander arbitrarily far away from each other (Dickey et. al., 1991). We employ the maximum-likelihood test procedure established by Johansen and Juselius (1990) and Johansen (1991). Specifically, if Y_t is a vector of n stochastic variables, then there exists a p-lag vector auto regression with Gaussian errors. Johansen's methodology takes its starting point in the vector auto regression (VAR) of order P given by

$$y_t = \mu + \Delta_1 y_{t-1} + --- + \Delta p \ \ y_{t-p} + \varepsilon_t \tag{5}$$

Where:

Y_t is an nx1 vector of variables that are integrated of order commonly denoted 1(1) and ε_t is an nx1 vector of innovations.

This VAR can be rewritten as

$$\Delta y_t = \mu + \eta_{yt-1} + \sum_{i-1}^{p-1} \tau_i \Delta y_{t-1} + \varepsilon_t \tag{6}$$

Where

$$\Pi = \sum_{i-1}^{p} A_{i-1} \quad \text{and} \quad \tau_i = -\sum_{j=i+1}^{p} Aj$$

To determine the number of co-integration vectors, Johansen (1988, 1989) and Johansen and Juselius (1990) suggested two statistic test, the first one is the Trace test (λ trace). It tests the null hypothesis that the number of distinct cointegrating vector is less than or equal to q against a general unrestricted alternatives q = r. the test is calculated as follows:

$$\lambda \text{ trace (r)} = -T \sum_{i=r+1} \text{In} \left(1 - \hat{\lambda}_t\right) \tag{7}$$

Where:

T is the number of usable observations, and the $\lambda_{1,s}$ are the estimated eigenvalue from the matrix.

The Second statistical test is the maximum eigenvalue test (λ max) that is calculated according to the following formula:

λ max (r, r + 1) = -T In (1 – λr + 1) (8)

The test concerns a test of the null hypothesis that there is r of co-integrating vectors against the alternative that r + 1 co-integrating vector.

3. Empirical Analysis

As discussed in the previous section, the analysis begins with the test for unit roots in the data. We use both the Augmented Dickey Fuller (ADF) and Phillips – Perron (PP) tests to find the existence of unit root in each of the time series. The results of both the ADF and PP tests are reported in Table 3.1 and 3.2.

Table 3.1. ADF and PP Stationarity test at level

Variables	ADF (Intercept)	ADF (Intercept & Trend)	PP (Intercept)	PP (Intercept & Trend)
LM	-0.127(-3.610)*	-1.840(-4.211)*	-0.061(-3.610)*	-1.849(-4.211)*
LYE	-2.633(-2.607)***	-2.113(-4.211)*	-2.500(-3.610)*	-1.717(-4.211)*
LRP	-5.241(-3.610)*	-5.490(-4.211)*	-5.245(-3.610)*	-5.481(-4.211)*
LCR	-0.384(-3.615)*	-4.892(4.211)*	-0.615(-3.610)*	-4.870(-4.211)*

Note: * denotes Significance at 1% level. Figures within parenthesis indicate critical values. Mackinnon (1991) critical value for rejection of hypothesis of unit root applied.

Source: Author's Estimation using Eviews 6.0.

The result in table 3.1 shows that the log of activity variable was stationary (ADF intercept) at 10 percent significance while log of credit achieved stationarity at 5 percent. All the other variables appear non stationary at levels. This can be seen by comparing the observed values (in absolute terms) of both the ADF and PP test statistics with the critical values (also in absolute terms) of the test statistics at the 1%, 5% and 10% level of significance. As a result of the non stationarity of the other variables, we differenced them once and both the ADF and PP test were conducted on them. The result is shown in table 3.2.

Table 3.2. ADF and PP Stationarity test first difference

Variables	ADF (Intercept)	ADF (Intercept & Trend)	PP (Intercept)	PP (Intercept & Trend)
LM	-7.083(-3.615)*	-7.035(-4.219)*	-7.031(-3.615)*	-6.987(-4.219)*
LYE	-5.188(-3.626)*	-7.086(-4.234)*	-7.740(-3.615)*	-14.337(-4.219)*
LRP	-6.464(-3.621)*	-6.399(-4.226)*	-14.678(-3.615)*	-15.232(-4.219)*
LCR	-9.887(-3.615)*	-6.389(4.226)*	-12.377(-3.615)*	-13.351(-4.219)*

Note: *denotes Significance at 1% level. Figures within parenthesis indicate critical values. Mackinnon (1991) critical value for rejection of hypothesis of unit root applied.

Source: Author's Estimation using Eviews 6.0.

The above table reveals that all the variables were stationary at first difference. On the basis of this, the null hypothesis of non-stationarity is rejected and it is safe to conclude that the variables are stationary. This implies that the variables are integrated of order one.

3.2. Cointegration test Result

With the confirmation of the stationarity of the variables, we proceed to examine the presence (or non-presence) of cointegration among the variables. When a cointegration relationship is present, it means that the variables share a common trend and long-run equilibrium as suggested theoretically. We started the cointegration analysis by employing the Johansen and Juselius multivariate cointegration test. Table 3.3 and 3.4 shows the result of the cointegration test.

Table 3.3. Unrestricted Cointegration Rank Test (Trace)

Lags interval (in first difference): 1 to 1

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.424297	36.95820	47.85613	0.3495
At most 1	0.195393	15.97596	29.79707	0.7140
At most 2	0.183334	7.714718	15.49471	0.4964
At most 3	0.000494	0.018781	3.841466	0.8909

Trace test indicates no cointegrating eqn(s) at the 0.05 level

*denotes rejection of the hypothesis at the 0.05 level

**Mackinnon-Haug-Michelis (1999) p-values

Table 3.4.Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Lags interval (in first difference): 1 to 1

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.424297	20.98224	27.58434	0.2773
At most 1	0.195393	8.261244	21.13162	0.8870
At most 2	0.183334	7.695937	14.26460	0.4105
At most 3	0.000494	0.018781	3.841466	0.8909

Max-eigenvalue test indicates no cointegrating eqn(s) at the 0.05 level

*denotes rejection of the hypothesis at the 0.05 level

**Mackinnon-Haug-Michelis (1999) p-values

From the result shown in both tables 3.3 and 3.4, trace statistic revealed the presence of no cointegrating vector and maximum Eigenvalue statistic also indicated no cointegration at the 5 percent level of significance, suggesting that there is no long run relationship between the variables tested. Though no cointegrating vector was found, we go ahead to ascertain the relationship between aggregate import demand and bank credit in Nigeria by normalizing the estimates of the unconstrained cointegrating vector. Normalizing on this vector for import demand yields:

$$LM = 1.000 + 0.056LYE + 11.575LRP - 3.050LCR$$

From the normalised equation, the long-run relationship between import demand and economic activity is positive as expected. This result is consistent with economic theory, and it shows how important import is to the economy of Nigeria. In fact, Nigeria has been correctly labelled an 'import dependent economy'. The relative price variable is positively related to import demand; theory predicts that relative price should have a negative relationship with import. Thus, the costlier the domestic goods compared to imported goods, the more the increase in import demand. However, this did not hold for Nigeria as relative price revealed a positive relationship. Nigeria, like most developing countries, has a taste for foreign goods which most often does not depend on price. The country is very much dependent on foreign goods that the price tends to inelastic; the manufacturing industry imports raw materials and intermediate goods, government officials prefer to use foreign facilities and product from abroad and the poor in the society is not left out as anything foreign is often regarded as the best in the country.

Finally, the long run relationship between import demand and bank credit is negative. This result is contrary to economic expectation. The bank credit variable is expected to be positively related to import flows. The result shows that Nigerian banks do not play a significant role in financing this important sector of the economy. This means that Bank credit is found to be insufficient as a policy instrument for long term import demand in Nigeria.

4. Conclusion

The traditional formulation of import demand equation relates the volume of import demand to real income and relative price variables. Following the studies of Craigwell (1994) and Tang (2004, 2006), this study reformulates the import demand function by including a financial variable (bank credit) to the traditional formulation. The equation was estimated using the cointegration analysis. The result of the study found no empirical evidence of the existence of cointegrating relations between import demand and bank credit. The coefficient of the cointegration analysis shows a positive relation between import demand and economic activity; a positive relation between import demand and relative prices and a negative relation between import demand and bank credit. The result from the study shows that Nigerian banks do not play a significant role in financing this important sector of the economy. This means that Bank credit is found to be insufficient as a policy instrument for long term import demand in Nigeria.

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