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Balance of payments constrained growth in developing economies: The case of Nigeria

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Abstract

This study examines balance of payments constrained growth in Nigeria. In this context, our analysis is based on the theoretical underpinnings of the Original and Expanded Thirlwall's model derived from the Harrods Foreign Trade Multiplier. Instructively, Nigeria has witnessed prolonged balance of payments problem, which has resulted to serious macroeconomic imbalances, and hence generated problems of economic development. This paper adapts the Ordinary Least Squares (OLS) econometric technique to analyze empirical data, which has been first examine for unit roots using the Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests. Thus, a co-integration regression has been used to examine the long run relationship among the variables. Also the short-run Vector Error Correction model is used to determine the speed of the adjustment to equilibrium. In this context of analysis, the results show that, all the variables in the model contributed 71 per cent to changes in economic development. Hence, to stimulate economic growth and sustainable economic development, Nigeria must reduce the demand for imports and increase the supply for exports, through balance of payments constraint alleviating strategies, such as export-based growth policy.

Keywords: Economic growth in Nigeria; Balance of payments constraints; Thirlwall model for developing countries

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1. Introduction

Lima et al., (2008) observed that aggregate demand plays an important role in determining economic growth in the long run. One major argument is that, accumulations of potential output are demand-determined (Satterfield, 2003). Given this scenario, Lima et al. (2008) argues that the Keynesian demand-oriented approach that emphasizes the external constraint on growth is the replica of balance of payments constrained growth. Balance of payments constrained growth can be defined as "the situation where the performance of a country's constrained growth can be defined as "the situation where the performance of a country in foreign markets as well as the response of the world to this performance constrained the growth of the country to a rate less than the rate required for addressing domestic economic problems" (Adewuyi and Adeoye, 2000). These problems according to McCombie and Thirlwall (1994) and Hussain (1999) include: the prevalence of unemployment, underemployment high import demand by Nigerians, low export, the existence of idle resources and low capacity utilization. The balance of payments constrained growth model is an alternative to supply-oriented model. It was developed by Thirlwall (1979), and extended by Thirlwall and Hussain (1982). These models considered both demand and supply factors. These works maintained that trade financial liberalization and export promotion strategies are necessary but not sufficient to lead to better growth performance.

The relationship that exists between the growth rate of output and the ratio of exports growth to the income elasticity of demand for imports is known as Thirlwall's Law. Thirlwall's Law implies that a country's growth rate will rise only when the growth rate of world income increased. It should be stressed that the balance of payments constrained growth approach, despite being demand-oriented, does acknowledge the importance of the supply characteristics of goods according to Thirlwall's analysis. It has been argued that there is not much difference between export-led growth model and the balance of payments constrained growth model since both focuses on the role of foreign sector in the growth process. The original Thirlwall's model implies that the only sure and long-term solution to increase a country's growth rate, which is consistent with balance of payments equilibrium, is to diversify the economy. In this sense, Thirlwall's model emphasizes that the Dynamic Harrod foreign trade multiplier determines long-term economic growth. It argues that it is demand factors that induce economic growth.

All the strategies used by the Nigerian government ever since did not contribute to a modification of the production condition, even more the foreign constraint, hence, the prolonged unfavourable balance of payments. For this reason an avalanche of questions has been raised, which this study seeks to address. Why is it that there has not been any improvement between balance of payments and economic growth in Nigeria? What are the constraints associated with balance of payments? Do long-run deficits of balance of payments affect economic growth in Nigeria?

Finally, theoretical and empirical literatures have focused on supply factors when studying balance of payments constraint and economic growth determinations for a very long time. For example, Solow (1956) acknowledged that, the endogenous growth theory assumes that the growth rate of per capita income is

determined solely by supply side factors, contrary to Thirlwall's law, which focused on the demand side factors. This study analyses both demand and supply side factors as determinants of the Nigerian economic growth between 1970 and 2010, using the framework introduced by Thirlwall (1979) and Thirlwall and Hussain (1982). That said, the focus of this research is to examine the effect of balance of payments constrained growth in the Nigerian economy. The paper is organized as follows: the theoretical framework and literature review are discussed in section three; the model specification in section four; presentation and analysis of results in section five and section six zeros in on summary and conclusion.

2. The Nigerian balance of payments and economic growth

Macroeconomic problems and financial management in Nigeria is complicated by balance of payments instability attributable mostly to its oil dominated export earnings. Over the last three decades, there has been growing trend in the fluctuations of the Nigeria's balance of payments. Balance of payments crisis distorts the working of the entire system because it creates disequilibrium between the supply and demand for money (Nwani, 2003). The Nigerian economy has been experiencing balance of payments deficit for most of the years. However, the country had surplus in 1970-1975, this of course was largely due to the oil boom of the 70s, sooner there was oil glut in the international market. It leads to drastic cut in oil prices hence reduces the export of oil, thereafter, the balance of payments showed negative balance for quite some time. Also there was surplus in 1978 – 1980, 1990 – 1995, 1997, 2001 – 2002 and 2004 respectively, the rest of the period showed that, the balance of payments was in deficits.

The different economic measures put in place by various governments in the 1980s could not turn around the ugly nature of the balance of payments. For example, the Nigerian exports promotion policy, import substitution industrialization, exchange rate policy and lately Structural Adjustment Programme (SAP). The worst of all is the transitional period of democracy (1999-2010), balance of payments continued to showed red, though the government have tried to change the course of the balance of payments, but up till date there is still no improvement, probably is as a result of the angle (supply side) the government have been concentrating, this research work has given us a new leeway to the understanding and possible correction of the balance of payments in Nigeria.

In assessing the growth performance of the Nigerian economy, it is clearly shown that, growth performance of the Nigerian economy is a function of domestic production, consumption and foreign transaction in goods and services. However, the foreign trade has been acknowledged as the engine of growth and development, but in Nigeria it is hard to accept such a hypothesis. Over the years, the Nigerian Gross Domestic Product (GDP) has suffered serious setback. According to the NEEDS document (2004), Nigerian GDP grew by an average of 2.8 per cent in the 1990s while the per capita growth rate was zero. However, the average growth rate for the 1999-2003 period was about 3.6 per cent - with a per capita growth rate of 0.8 per cent per annum which is far lower than 4.2 per cent per capita growth rate needed to significantly reduced poverty. This implies that the level of economic growth in Nigeria is grossly inadequate. Most of the shortcomings in the Nigerian macroeconomic performance are as a result of neo-colonisation, its

backward technology, reduction in exports, demographic and social conditions, ethnic and tribal divisions, inadequate infrastructure, lack of financial prudence and dependence on primary commodities for export (Collier and Gunnings, 1999; Iyoha, 2000; Sach and Warner, 1995).

3. Literatures: Thirlwall's growth model

The Thirlwall's model emphasized that, the Dynamic Harrod Foreign Trade Multiplier determine long-term economic growth. The model stresses that demand factors induced economic growth. In an open economy, the dominant constraint on demand is balance of payments. The basic idea of Thirlwasll's approach is how balance of payments affects the growth performance of an economy. This model links trade to growth because exports pull demand. Apparently, trade represents a vital constraint to economic growth when there are balance of payments problems. Nevertheless, even open new endogenous growth models, like those of Grossman and Helpman (1992) focus only on trade and economic growth and neglect balance of payments constraints. A one-gap model of the Keynesians and Structuralists school reveals the existence of demand and external constraints in an open economy. Interestingly, Thirlwall's approach emphasizes that neither trade nor financial liberalization nor strategies of export promotion can necessarily lead to better economic growth performance. The Keynesians and Structuralists schools take into consideration both current and capital account equilibrium. To this extent one should consider not only exports of goods and services, but also the income elasticity of demand for imports.

A traditional version of Thirlwall, (1979) model can be presented in the following three equations:

$$X = \lambda (P_d - P_f) + Pz \quad (1)$$

$$M = \alpha (P_d - P_f) + \Pi Y \quad (2)$$

$$X + P_d = M + P_f \quad (3)$$

where, P, Π, and $\alpha > 0$ and $\lambda < 0$, P = income elasticity of exports, Π = income elasticity of imports, λ = price elasticity of imports, α = price elasticity of imports, X = the growth rate of real exports, M = the growth rate of real imports, Z = the growth rate of the rest of the world real income, Y = the growth rate of real domestic income, $(P_d - P_f)$ = the rate of growth of relative prices (rate of growth of domestic prices less rate of growth of prices in the rest of the world). It should be noted that equation (1) and (2) are export and import demand functions, respectively, while equation (3) is current account equilibrium.

Solving equation (3) for the growth of real income:

$$Y^* = [(1 + \lambda - \alpha)/ \Pi]((P_d - P_f) + (P/ \Pi)Z \quad (4)$$

or substituting for the growth rate of the world real income, Z from equation (1) yields:

$$Y^* = [(1/\Pi)(1 - \alpha)]((P_d - P_f) + 1P/\Pi)X \quad (5)$$

Supposing the Marshall-Lerner condition holds or that relative prices are constant if measure in common currency, then $(P_d - P_f) = 0$, equation (5) becomes:

$$Y^* = (1/\Pi)\, X \quad (6)$$

Equation (6) is balance of payments constrained growth. This is the equation of Thirlwll's law, according to Grossman and Helpman (1992, p.14) it states that, "the higher the income elasticity of demand for imports (Π) the lower the balance of payments equilibrium growth rate".

3.1. Thirlwall's model for developing countries

Empirical evidence for developing countries revealed that Thirlwall's model is an efficient framework for analyzing economic growth in relation to a country's international payments position. The Thirlwall's model takes into consideration only the current account position. Although in the long term, current account equilibrium is extremely important for the balance of payments position, many developing countries are affected by capital flows.

McCombie and Thirlwall (1994) pointed out that, "the growth experience of the developing countries over the last thirty years has been even more diverse than that of the developed countries, and can hardly be explained by reference to differences in the autonomous rate of growth of factor supplies". Jayme Jr (2003) concluded that, "as long as these characteristics are considered, countries in which capital inflows are important for balance of payments equilibrium should include current account imbalance in the model". Due to the obvious shortcomings of the first model in explaining growth performance of developing countries, the second-generation (BPCG) model, incorporated foreign capital flows and terms of trade.

Jayme (2003) and Thirlwall and Hussain (1982) confirmed the empirical relevance of the first and second-generation BPCG models for the case of developing countries including Nigeria. Equation (3) above can be rewritten to include capital flows.

$$P_dX = P_fME \quad (7)$$

where: X =Quantity of export, P_d = Price of exports in the home currency, M = Quantity of imports, P_f = Price of imports in the foreign currency, E = Exchange rate

The condition of balance of payments equilibrium is then given as:

$$P_d + X = P_f + m + e \quad (8)$$

where: the lower case letters show rates of change in the variables. That is, the rate of growth of the value of exports equals the rate of growth of the value of imports (Elitok and Campbell, 2008 p. 10).

The import function is given as:

$$M = a\left(\frac{P_f E}{P_d}\right)^{\text{ϖ}} Y^{\pi} \quad (9)$$

where a, ϖ, Y, and π are constant, the price elasticity of the demand of imports, the domestic income and the income elasticity of the demand for imports, respectively. (Elitok and Campbell, 2008 p. 10).

The rate of growth of imports is then:

$$M = \text{ϖ}\,(p_f + e - p_d) + \pi y \quad (10)$$

Changes of the variables are represented by the lower case letters.

The export function is given as

$$X = b\left(\frac{P_d E}{P_d}\right)^{\eta} Z^{\varepsilon} \quad (11)$$

where: b, ε, Z and ŋ are constants, the income elasticity of the demand for exports, the world income and the price elasticity of demand for exports, respectively. (Elitok and Campbell, 2008 p. 10).

The rate of growth of exports is given as:

$$x = \eta\,(Pd - P_f - e) + \varepsilon Z \quad (12)$$

By substituting the rate of growth of imports (10) and the rate of growth of exports (12) into the balance of payments equilibrium condition (8), the result is balance of payments equilibrium growth rate, as specified by Elitok and Campbell, (2008, p.13):

$$Yt = \frac{(1 + \eta + \psi)\,(Pd - P_f - e) + \varepsilon Z}{\pi} \quad (13)$$

The Second Generation BPCG model was developed a few years after Thirlwall's model. Research shows that, Thirlwall model performs better in developed countries than in developing countries. Hence, the inclusion of capital flows and terms of trade in the second generation model for developing countries (Elitok and Campbell (2004). According to this model balance of payments in its initial disequilibrium is stated as follows:

$$P_d X + F = P_f m E \quad (14)$$

where: P_d =Domestic price of exports, X =Value of exports, M = Value of imports, P_f = Foreign price of imports, E = Exchange rate, F = Value of nominal capital flows measured in domestic currency. F >0 indicates capital inflows and F <0 indicates capital outflows (Elitok and Campbell (2004, p.12).

In the rate of change form, equation (8) becomes:

$$\Phi\,(P_d + x) + (1 - \Phi)f = P_f + m + e \quad (15)$$

where again the lower-case letters represents rates of growth of the variables and Φ equals the share of exports and (1 – Φ) shows the share of capital flows both as a proportion of total receipts. Hence, $\Phi = P_d X/R$, where R = the total oversees receipts,

$R = P_dX + F$, and $(1 - \Phi) = F/R$

By substitute the rate of growth of the imports function (10) and exports function (12) into the rate of change form of the current account disequilibrium (15), we get the balance of payments constrained growth rate, which is as follows:

$$Y_2 = \frac{(\Phi\eta + \psi)(P_d - e - P_f) + (p_d - e - P_f) + \Phi\varepsilon Z + (1 - \Phi)(f - P_d)}{\pi} \quad (16)$$

The equation (16) specifies the predicted Balance of Payments Constraint output growth rate as the ratio of the weighted sum of export earnings, relative prices and net capital inflows to the income elasticity of the demand for exports. Under the assumption of constant relative prices, $P_d = P_f + e$, equation (16) reduces to:

$$y_2 = \frac{\Phi\varepsilon Z + (1 - \Phi)(f - P_d)}{\pi} \quad (17)$$

As before, this same assumption reduces equation (12) $\varepsilon Z = x$, and so we can re-write (17) as follows:

$$Y_2 = \frac{\Phi x + (1 - \Phi)(f - P_d)}{\pi} \quad (18)$$

If we assume that in the long run prices are stable, and capital flows are negligible, we have;

$$Y^{bt} = \frac{\beta y^* t}{\pi} = \frac{1}{\pi} xt \quad (19)$$

Equation (19) states that balance of payments growth rate is equal to the growth of world income multiples by the ratio of the income elasticities of demand for exports and imports. This is the same to the growth rate of exports divided by the income elasticity of the demand for imports. This equation is the balance of payments constrained growth model or Thirlwall's law. It was derived from Dynamic Harrod Foreign Trade Multiplier.

The equation implies that, a country π growing above yb will run a balance of payments deficit, which would harm its future growth prospects; conversely a country growing below yb will run a balance of payments surplus. The balance of payments constrained growth yb is the maximum growth rate a country can achieve while keeping the balance of payments in equilibrium, and provided that real exchange rate and net capital inflows is negligible. The equation further suggests that export can lift a balance of payments constraint on demand and therefore permit faster growth if factors supplies are available to be utilized. According to him, since trade deficits cannot be indefinitely sustained, an economy's long-run growth rate is determined by the growth rate of its exports and the income elasticity of its exports, that is, $y = x/\pi$, (Thirlwall's Law). He concluded that, in the long run no country could grow faster than the rate consistent with the balance of payments equilibrium, on the current account, unless it can finance its ever-growing deficits, which in general it cannot.

The extended version of Thirlwall (1979) model by Thirlwall and Hussain (1982) included capital flows and the terms of trade, which involve a better fit for less developing countries. The model and its extensions

allow for a multitude of analysis concerning the question of debt sustainability, the need for accelerated economic growth, the necessity to bridge the financing gap, the importance of utilizing foreign aid effectively. In line with post-Keynesian theory the Hussain-Thirlwall (H-T) model is a true alternative to the traditional, neo-classical and neo-liberal explanations of the growth rate differences among nations based on resource availability and the supply factors, labour force, capital stock and technology progress. The H-T model implies that an export expansion is crucial not only in making growth possible but also sustainable. One of the problems of African countries is that they need manufacture capital and consumer goods to grow faster. If the domestic production cannot satisfy such an increase in demand, it will spill over into imports demand and raise the income elasticity of demand for imports (μ), which is already very high in many African countries. The model emphasized that; the rate of economic growth of a country depends on its balance of payments constraints.

Exports are the most important growth –inducing force as they provide foreign exchange to pay for the required imports for economic growth. In contrast, consumption, investment and public expenditure are growth–inducing but they all have an import-content. Further investigation of the effect of balance of payments constraint on the growth record of Spain during the period 1950-2000 was more revealing. Bairam (1988) argues that the overall results indicate that balance of payments constraint was an important factor in the Spanish growth record. His work applies the model to a large sample of industrialised countries and concluded that the overall economic performance depends upon the values of its income elasticity of exports and imports. Anderson (1993) carried out an extensive study with wider coverage; he applied a co integration technique to Thirlwall's model for 16 European countries over the period 1960-1990. His conclusion reveals that growth rate of their real GDP was indeed constrained by balance of payments thereby providing empirical support to the long-term model.

Interestingly, in Africa, there have been some few studies that investigate the relevance of Thirlwall's law or Thirlwall and Hussain model noted earlier to the dismal growth performance of African countries. In an empirical study of growth differences between African and Asian countries Hussain (1999) used Thirlwall-Hussain (1982) model to explain the low growth rates experienced by African countries in terms of their low export expansion relative to the import required for the process of growth. According to him African poor performance is due to the low magnitude of the Dynamic Harrod Foreign Trade Multipliers. He concluded that this is a direct outcome of their dependence on primary commodity exports.

Finally, Hussain (1999) applied the Thirlwall-Hussain model to 24 African countries as a reaction to the failure of Harrod-Domar model to explain the performance of savings, investment and growth. The result of Hussain (1999) study revealed that given the terms of trade, export volume, and initial imbalance in the current account, all the countries in the sample required large inflows of foreign resources.

4. Model specification

In specifying the models to be adopted in this research work, we took into consideration and/or arguments stated in the theories as well as empirical evidence of the balance of payments in the Nigerian economy.

There are so many determinants of annual growth rate of Gross Domestic Product and that of balance of payments. However, due to scarcity of data, these factors was trimmed down to a considerable level or integrated into the models. The balance of payments constrained growth equation is an offshoot of the second-generation balance of payments constrained growth model propounded by Thirlwall (1979) and Thirlwall and Hussain (1982). This model states that Growth in real income is a function of real export, real exchange rate, net foreign capital inflows and terms of trade. The theoretical statement can be reduced to a functional relation as follows:

$$\Delta LGDP = f(\Delta LNEER, \Delta LEXPO, \Delta LNFCI, TOT) \quad (4.1)$$

Equation 4.1can be specified as:

$$\Delta LGDP = \lambda_0 + \lambda_1 \Delta LNEER + \lambda_2 \Delta LEXPO + \lambda_3 NFCI + \lambda_4 TOT + \mu_1 \quad (4.2)$$

where: $\lambda_0 > 0$, $\lambda_j > 0$ $j = 1, 2, 3, 4$, $\Delta LGDP$ = Log of Gross Domestic Product, $\Delta LNEER$ =Log of Exchange Rate, $\Delta LEXPO$ =Log of Real Export, NFCI = Log of Net Foreign Capital Inflow, TOT = Terms of Trade, λ_0 = Constant term, λ_1 - λ_4 = Parameters to be estimated, μ_1 = Stochastic error term

This study adopted the Ordinary Least Squares (OLS) econometric technique. Before estimation, it would be useful to determine the underlying properties or processes that generate our time series variables, whether the variables are stationary or non-stationary. Macroeconomic data often appear to possess a stochastic trend that can be removed by differencing the variables. Hence, co-integration technique, the Augmented Dickey Fuller (ADF), and Phillips- Perron (PP) tests are also used to test for the order of integration. We assumed a linear relationship between the dependent variable and the independent variables in all the equations specified.

5. Presentation and analysis of results

As Hieke (1997) and Ateseglo (1997) stressed that, traditional econometric procedures are not sufficient predictors of BOPCG, even if one estimates equations by means of the first difference. Therefore, before presenting the main econometric results, the unit root test and the Johansen-Juselius co-integration test are presented in table 5a and 5b, respectively. Based on the findings of Table 5a among most of the variables, we then apply Johansen-Juselius co-integrating test admitting a drift (constant) and no time trend in the data. Hence, we proceed to test for co-integration of the variable in Table 5b.

Table 5b, the truce statistic indicates 2 co-integration equations at 5 per cent level. In the same vein Maximum Eigen value test indicates one co-integrating equation at 5 per cent level. Hence, the null hypothesis of no co-integration relationship among the variables in the model is rejected. This implies that, there exists a unique long run relationship among the variables. Since there is at least one co-integrating relationship among the variables based on the truce test and Eigen value test, the identified co-integrating equation(s) can then be used as an error correcting term and will form the error correction variable in the Error Correction model (ECM). So far the results shows that, the variable in the model tend to move together in the long run as predicted by economic theory. In the short run deviations from this relationship could

occur due to shocks from any of the variables. The vector error correction model (VECM) shows how the system adjusts to the long run equilibrium implied by the co-integrating equation.

The parsimonious model presented in Table 5c shows that, the constant term conforms to the economic apriori expectation. If for instance all the independent variables are held constant, real gross domestic product will increase by 0.028742 per cent. The results in our Balance of Payments Constraint Growth equation indicate that, the coefficients for exchange rate and lagged exchange rate (Δ LNEER (-1) for one period are consistent with the economic apriori expectations. Similarly, the coefficient for lagged export for one year is also consistent with the economic expectation. The lagged Net Foreign Capital Inflow (NFCI(-1) for one period has a negative sign and does not conform to the economic expectation. The Error Correction Model (ECM) has the correct sign and it confirmed stability in the adjustment process with 62 per cent of the RGDP disequilibrium of the previous year slack adjusting towards its long run equilibrium in one year. All the variables including the ECT were statistically significant at 5 per cent level except lagged NFCI.

In sum all the variables contributed significantly to changes in Real Gross Domestic Product, except and of course the lagged NFCI. The coefficient of multiple determinations (R^2) was very high with 71 per cent variation in RGDP accounted by all the independent variables; it shows a strong goodness of fit in the model. The F-statistic of 16.269783 is greater than the F-tabulated of 4.86, hence, the adjusted coefficient of multiple determinations (R^2) and the overall model is statistically significant. The Durbin-Watson statistic was given as 2.377120 at 5 per cent level of significant, the value falls within the region of no autocorrelation.

6. Conclusion

Based on our findings, we hereby proffer the following recommendations. To accelerate growth rate of the economy, Nigeria has to increase export by promoting the production of more attractive goods and services beyond oil and raw materials. In this context of analysis, first, the Nigerian government should encourage the consumption of locally produced goods in response to increase income; this will certainly reduced imports and increase economic growth. Second, in order to put the Nigerian economy on the path of sustainable growth and development, the export-based growth policy, such as export promotion and import substitution industrialization policies should be reinvigorated. Third and lastly, this research work transcended from Balance of payments constrained growth in Nigeria deep into Thirlwall's Law. The model is an alternative to supply-oriented model.

Balance of payments position in Nigeria constitutes a structural problem that can hinder the attainment of potential growth. It has been shown clearly that, these problems can be addressed by diversifying the structure of production; reduce dependency on imports, making exports competitive in the international markets through macroeconomic stability, improvement in the state of infrastructure, human capital development, and eradication of corruption. The models used in this research inform the design of effective BP-constraint alleviating strategies, for example, the export-based growth policy suggested earlier, with foreign trade being seen as an important transmission channeled for improvement in the balance of payments, hence economic growth.

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Appendix

Table 5a. Unit Roots Test Using ADF and PP

Variable	ADF Level	First Difference	PP Level	First Difference	Decision
ΔLGDP	1.314366	-4.869875**	0.917282	-4.983588**	1(1)
ΔLNFCI	-1.472432	-11.39151**	-3.228756**	-12.14876	1(1)
ΔLEXPO	-1.453320	-7.326754**	-0.733908	-6.469415	1(1)
ΔLNEER	-1.620758	-5.756761**	-1.693215	-5.743951**	1(1)
ΔTOT	-1.810542	-6.113462**	-0.81956	-4.63489**	1(1)

Source: *Authors' Computation Note: * Significant at 1%, ** Significant at 5%, *** Significant at 10%*

The ADF result in table 5a above shows that, all the variables (ΔLGDP, ΔLNFCI, ΔLEXPO. ΔLNEER, ΔTOT) are statistically significant at first difference and at 5 per cent level of significance. Similarly, the Phillips-Perron (PP) non-parametric test shows that, ΔLGDP, ΔLNEER, and ΔTOT are stationary at first difference and at 5 per cent level of significance, but ΔLNFCI and ΔLEXPO are not stationary at first difference.

Table 5b. Johansen Co-integration Test
Sample (adjusted): 1973 – 2009
Included observations: 38 after adjustment.
Trend assumption: Linear deterministic trend
Series ΔLGDP, ΔLEXPO, NFCI, ΔLNEER, TOT
Lags interval (in first difference) 1 to 2

Unrestricted Co-integration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.362630	17.89679	15.49471	0.0213
At most 1	0.032745	1.231834	3.841466	0.2670
At most 2	0.255657	1.354782	4.236672	0,2106
At most 3*	0.432891	1.564903	4.278592	0,0432
At most 4	0.379411	1.346778	2.457384	0.2358
Trace 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				

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.362630	16.66496	14.26460	0.0205
At most 1	0.032745	1.231834	3.841466	0.2670
At most 2	0.495971	3.786541	12.95329	0.0452
At most 3*	0.467781	4.876554	6.843211	0.0108
At most 4	0.122384	10.37865	15.94328	0.0302
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				
Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):				
ΔLGDP90	ΔLREXPO			
-2.075118	2.940848			
5.474090	-2.283894			
Unrestricted Adjustment Coefficients (alpha):				
(ΔLGDP90)	0.007381	0.009615		
(ΔLREXPO)	-0.217358	0.014510		
1 Cointegrating Equation(s):		Log likelihood	47.77803	
Normalized cointegrating coefficients (standard error in parentheses)				
ΔLGDP90	ΔLREXPO			
1.000000	-1.417196			
	(0.22265)			
Adjustment coefficients (standard error in parentheses)				
(ΔLGDP90)	-0.015317			
	(0.02014)			
(ΔLREXPO)	0.451043			
	(0.11148)			

Source: Authors' Computation

Table 5c. Parsimonious Error Correction Model

Dependent Variable: ΔLGDP90 Method: Least Squares Date: 07/27/11 Time: 15:19 Sample (adjusted): 1972 2009				
Included observations: 38 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.028742	0.009675	2.970574	0.0056
ΔLNEER	0.019448	0.008115	2.396579	0.0226
ΔLNEER (-1)	0.016553	0.008649	2.913979	0.0646
ΔLEXPO (-1)	0.036643	0.024606	2.489198	0.1462
ΔNFCI (-1)	-7.30E-08	6.10E-07	-0.119738	0.9054
ΔTOT(-1)	0.014567	4.20E-04	-0.211984	0.3421

ECM1 (-1)	-0.651732	0.139865	2.799821	0.0813
R-squared	0.820175	*Mean dependent var*		0.038492
Adjusted R-squared	0.706453	*S.D. dependent var*		0.058491
S.E. of regression	0.048711	*Akaike info criterion*		-3.061885
Sum squared resid	0.075928	*Schwarz criterion*		-2.803319
Log likelihood	64.17581	*Hannan-Quinn criter.*		-2.969889
F-statistic	16.269783	*Durbin-Watson stat*		2.377120
Prob(F-statistic)	0.004357			

Source: Authors' Computation