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Trade Balance Effect of Exchange Rate Devaluation in Benin Republic: The Empirical Evidence.

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Abstract: *This paper attempts to identify the relationship between the exchange rate and trade balance in Benin Republic for the period 1950 to 2008. We have employed co integration analysis and vector error correction modeling (VECM) to enable us determine the long run, as well as short-run dynamics, between the exchange rate and the trade balance for Benin. The key findings of our empirical exercise are that there is one long run steady state co integrating relationship between trade balance and exchange rate for Benin Republic. In the short run, there is no significant causal relationship existing between exchange rates and trade. The estimated coefficient of the error correction term lagged one period, EC (-1) is statistically significant at 5 percent level and with the appropriate negative sign and fractional. This provides evidence of significant long run causal relationship existing between exchange rates and the trade balance for Benin Republic. This suggests that for Benin Republic, developments in exchange rate should not be intended for adjustments in trade balance in the short run, but rather exchange rate variations may be effective in long term strategic plan for balance of trade management.*

Keywords: *Benin Republic, Devaluation, Exchange rate, J-curve hypothesis, Trade balance,*

I. Introduction

Benin Republic gained independence in 1960 and transited to a democratic government in 1990. Since then, Benin has undergone an economic recovery expressly reflected in the large injection of external investment from both private and public sources. This has alleviated the economic difficulties of the early 1990s caused by global recession and persistently low commodity prices, though the latter still drags the economy. The manufacturing sector is confined to some light industry, which is mainly involved in processing primary products and the production of consumer goods. The service sector has not been left in the growth effect of democratization having been stimulated by economic liberalization and fiscal reform. Membership of the CFA Franc Zone offers reasonable currency stability as well as access to French economic support. Benin exports its products mainly to France and, in smaller quantities, to the Netherlands, Korea, Japan, and India with France acting as the major source of its imports. Despite its rapid growth, the economy of Benin still remains underdeveloped and dependent on subsistence agriculture, cotton production, and regional trade. Growth in real output averaged about 5% since 1996, but a rapid population rise dilute much of this growth on an income per capita context, inflation has subsided over the past several years and Commercial and transport activities, which constitute greater proportion of the GDP, are vulnerable to developments in Nigeria, particularly fuel shortages. With the current estimated population of 8.9 million, the GDP of 6.712 billion USD, the ratio of total trade to GDP of 31 percent, out of which imports alone constitute 20 percent and relatively no exchange control (CIA world factbook, 2008), Benin Republic can best be described as a small open economy. Since the breakdown of Breton Wood Accord in 1973, and the advent of floating exchange rates, there has been renewed interest on the effect of devaluation on the trade balance of both developed and developing countries. Currency depreciation is said to worsen the trade balance first before resulting in an improvement, yielding a short-run pattern dubbed the J-curve phenomenon. In the international economic literature, an important question has centered on the reactions of trade balance to currency depreciations or appreciations. The empirical literature supporting the J-curve is mixed. Some economists argued that a possible way to improve trade balance would be through the devaluation of the real exchange rate. However, real exchange rate devaluations would only improve trade balance if the well-known Marshall– Lerner (ML) condition subsists in the domestic economy, then in the long run the trade balances position would witness positive adjustment. Marshall-Lerner condition hypotheses that real depreciation of the domestic currency acts to increase the trade balance in the long run if the sum up value of import and export demand elasticity exceed one. But in the short-term the TB deficit could worsen if the trade balance tows the J-curve pattern [1]. Currency depreciation has great impacts on trade balance but such an impact may vary, probably due to difference in levels of economic development.
Real depreciation improves the trade balance through two different channels. Firstly, increase quantity of export. Depreciation of the domestic currency leaves the domestic goods cheaper as compared to the foreign goods, thus making export more competitive. Secondly, quantity of imports decreases, as import is relatively more expensive. The objective of the study is to gauge the effect exchange rates depreciation on the trade balance of

Benin Republic. While investigation shows that in the short run there was no causal relationship was found to exist between exchange rate and the trade balance, it revealed the existence significant causal relationship between developments in exchange rates and broad money supply with the causality flowing from nominal exchange rate to broad money supply. The study further exposed us to the fact that in the long run, nominal exchange rates significantly cause trade balance. The remainder of this contribution is structured as follows: Section 2 brief literature review, Section 3, methodology, Section 4 results and discussion, while section 5 presents the concluding remarks.

II. Review of Related Literature.

2.1 Theoretical Review

There exist vast theoretical and empirical studies on developed economies on how the trade balance responds to adjustment in exchange rate (see [2], [3], [4] & [5]). Also studies on developing countries to this effect have proliferated considerably (see [6], [7], [8], [9], [10], [11],[12] & [13]. There are three approaches to the analysis of the effect of exchange rate depreciation on trade balance namely: the elasticity approach, the absorption approach and the monetary approach.

2.1.1 The Elasticity Approach

This approach credited to Robinson [14] and Meltzler [15]and popularized by Kreuger [16], posits that transactions under contract completed at the time of devaluation or depreciation may dominate a short-run change in trade balance causing it to deteriorate in the short-term. But in the long-run, as price elasticity of exports and imports rise, the adjustment in the quantity of export demanded increase, while that of the imports decrease to improve trade balance after a substantial lags-the *J-curve effect*. Empirical evidence on J-curve hypothesis is mixed (ie having both bad and good qualities). In this regard, this work will not venture into investigating and testing for the existence of J-Curve relationship in Nigeria, but however, will estimate the long-run effect of exchange rate depreciation on the country's non-oil balance of trade. Another aspect of the elasticity approach to exchange rate-trade balance relationship is the Marshall-Lerner (ML) condition [17], [18]. This is one area of the elasticity approach models which postulates that a devaluation of a domestic currency would improve current account balance. The condition states that for balance of trade to benefit from a currency devaluation or depreciation, the summation of the price elasticities of imports and exports of the country devaluing its currency must be greater than unity.

The model is:

$$\eta x + \eta m > \qquad (1)$$

If it is equal to unity, the balance of payments remains stable, if it is less than unity the balance of payments worsens, but if it is in excess of unity, the trade balance improves. The theory states that when a country devalues its currency, the domestic prices of its imports are raised and the foreign prices of its exports are reduced. These will work to reduce the domestic demand for imports and increase the external demand for the domestic exports to improve the trade balance. Empirical evidence shows that Marshall-Lerner condition is satisfied in majority of advanced economies. But, it is a general consensus among economists that both demand and supply elasticity will be greater in the long-run than in the short-run.

2.1.2 The Absorption Approach

The absorption approach emphasizes changes in real domestic income as a determinant of a nation's balance of payments –exchange rate relationship. It treats prices as constants and therefore all variables are in real term. This approach disaggregates expenditures into consumption (c), investment (i), government expenditure (g) and imports (m). The sum of these four expenditure variables is defined as the domestic absorption (a), which in equation form is expressed thus:

$$a = c + i + g + m \qquad (2)$$

A nation's real income (y) is a reflection of the total expenditure on it's outputs as expressed below:

$$y = c + i + g + x \qquad (3)$$

where: x, represents the value of the domestic exports. The absorption approach, though a simple theory is of great assistance in understanding a nation's external sector performance in periods of economic contraction and expansions. For instance, if a nation experiences an economic contraction, does its current account balance necessarily improve and its currency definitely appreciate?. In the scenario of economic expansion, if the real income rises thereby increasing absorption, the direction of current account adjustment depends on the relative changes in the two variables. If real income rises faster than absorption, then the current account balance will be exposed to positive adjustment and vice-versa. On the whole, absorption approach stresses real income in balance of payments and exchange rate determination and further suggests that relative changes in real income (output) and absorption, determine a nation's BOPs and exchange rate performance.

In a seminal contribution of Johnson [19], he pointed out that the formulation of the balance of payments as the difference between aggregate payments and receipts identifies the "monetary nature" of the balance of payments. The monetarists would argue that this ought to be expected, as under the quantity theory, there is a fundamental relationship between the money supply and real income.

2.1.3 The Monetary Approach

Although Hume (1752) identified some of the key ideas, the monetary approach essentially is a product of works conducted in the late 1950s, the 60s and early 70s. The approach is concerned with the determination of balance of payments under a fixed exchange rate regime. In the world of monetary approach, devaluation is equivalent to a reduction in money supply; or put differently, devaluation reduces the real value of money stock. Reduction in the money stock directly affects the availability of credit needed to finance budgetary deficits. Such a reduction in government expenditure can in the context of developing economies lead to unemployment, reduction in investment and social services, and general deflation (www.swan.ac.uk/economics/cware/ec312...)

On the other hand, there is hardly any developed capital market in developing dependent economies. In the same vein, there is little or no access to foreign capital markets, excepting for the oil producing countries. Therefore, if the authorities desire to maintain the level of expenditure in order to sustain the prevailing levels of employment, it means financing the deficit domestically from the banking system.

This would mean monetary expansion, which therefore exerts further pressures on the balance of payments through the tortuous process. From a theoretical point of view, since money is a stock, not a flow, the principal contribution of the monetary approach is its emphasis on the effects of changes in balance of payments on the stock of financial assets in the economy.

In a developmental context, it ought to be noted that many developing countries are characterized by peasant and subsistence agricultural farmers. These peasants lack the ability and facility to access the complex and sophisticated commercial banking system, and there are hardly any developed indigenous financial institutions designed to meet the demand of the poor peasants. On this note, it could be argued that a substantial portion of the outputs in these economies are perhaps uninfluenced by considerations of the monetary authorities and the money supply. This therefore imposes a limitation on the applicability of the monetary approach in managing balance of payments in developing economies.

The monetary approach as opposed to the elasticity and absorption approaches, regards capital account as central in the depreciation analysis, and relegates the current account. The basics of this approach are that money and asset markets govern the trade balance position through the forces of demand and supply of real money. In a closed economy, money stock in excess of the demand, results in excess liquidity in the private sector. This leads to increased expenditure, which if the economy is already operating at full capacity, results in excess demand in the goods market. This generates price increase and reduces the real money balance until the excess of expenditures over output is eliminated.

In the case of an open economy, the increase in the domestic expenditure spills over to the balance of payments (BOPs), with the increased demand for goods satisfied by imports. This depletes the volume of foreign reserves and causes the money stock to gradually fall until money holding are reverted to its original level. This relation if expressed in equation is of the form:

$$MS = D + R \tag{4}$$

where: MS is the aggregate money stock, D is the domestic credit, while R represents foreign reserves. Bulusivar et al [20] states that where the demand for money is in excess of the supply, residents are forced to reduce their consumption expenditures, thus improving the trade balance.

In the short-run, devaluation of domestic currency raises the prices of domestic goods as the resultant increase in import prices reflects in the prices of domestic import substitutes as a result of the increase in their demands. This higher price level drags the real money stock, bringing the demand for money in excess of the supply. Then, for the economic agents to restore their desired level of money balances and financial asset holdings, they tend to reduce their consumption expenditures to spend less and save more. This translates into improved money stock and balance of payments. But as soon as people have restored their desired financial holdings, expenditure will rise, eliminating the trade surplus.

In essence, the monetary approach argues that changes in nominal exchange rate can have only temporary effect and that there will be no long-run equilibrium relationship between the trade balance and the real exchange rate [21]. In effect, co integration analysis for trade balance-exchange rate relationship need not yield any long-run -relationship between the two variables. Our study however adopts a modeling approach where the vector captures the effects of exchange rate changes on trade balances; and where reasonable considerations are give to the above three approaches.

2.2 Empirical Review:

Recently, an upsurge of research has occurred relating to less developed countries, predominantly emerging Asian markets. Ahmed and Yang [22] investigate the effect of devaluation on China's bilateral trade with the G-7 countries. The results suggest that devaluation improves the trade balance for some countries. Narayan [12], tests for the existence of any cointegration relationship between trade balance and real effective exchange rate, foreign income and domestic income for New Zealand for the period 1970-2000 and no cointegration relationship between the above variables was verified. Rose [23] investigates the empirical relation between real effective exchange rate and trade balance of major five OECD countries in the post-Bretton Woods era. The results identified exchange rate as insignificant determinant of balance of trade.

Upadhyaya and Dhakal [7] test the effectiveness of devaluation on the trade balance for eight developing countries of Colombia, Cyprus, Greece, Guatemala, Mexico, Morocco, Singapore, and Thailand applying the methodology proposed by Wickens and Breusch in 1988 [24]. Their empirical findings appear to be contradictory to Baharumshah's findings regarding Thailand and Rincon [25] regarding Colombia. However, they provide evidence that seems to suggest that only in the Mexican case that devaluation improve the trade balance in the long-run. Bahmani-Oskooee and Alse [26] applied the Engle-Granger co integration technique on quarterly data of 19 developed and 22 less developed countries for the period 1971- 1990 test the exchange rate effect on trade balance. The results suggest that the long-run impact of devaluation on the trade balance is positive for Costa Rica, Brazil, and Turkey; negative for Ireland.

However, for Canada, Denmark, Germany, Portugal, Spain, Sri Lanka, UK and the USA, the null hypothesis of no long-run effect cannot be rejected. Buluswar et al. [20] found that devaluations have had no significant long-run effect on the trade balance for India. Upadhyaya and Dhakal [7] test the effectiveness of devaluation on the trade balance in eight developing countries. The results reveal that devaluation, in general, does not improve the trade balance in the long run and that in some instances, it even had a perverse effect. Bahmani-Oskooee and Brooks [27] investigated the effect of depreciation on US's bilateral trade with her six trading partners. They found that real depreciation of the dollar has a favorable long-run effect on US trade balance.

Bahmani-Oskooee [28] investigates the long-run response of Middle Eastern countries' trade balances to devaluation by applying the Engle-Granger and Johansen-Juselius cointegration methodology. The evidence suggests that there exist a favourable long-run effect of a real depreciation on the trade balance for all seven countries (Bahrain, Egypt, Jordan, Morocco, Syria, Tunisia, and Turkey). In the case of Morocco, this opposes the results obtained by Upadhyaya and Dhakal [7].

In the same vein, Wilson [29] examined the relationship between the real trade balance and the real exchange rate for bilateral merchandise trade between Singapore, Korea and Malaysia with respect to the United States and Japan. No evidence of a J-curve effect was found, with the exception of Korean trade with the United States. In the case of Turkey, Akbostanci [30] finds support for a favorable long-run relationship between the exchange rate and the trade balance. The generalized impulse response function indicates in the short-run an S-shaped trade balance response to devaluation. This view with respect to the positive long-run relationship is supported in Bahmani-Oskooee [29].

Despite the plethora of theoretical and empirical research into how exchange rate changes affect trade balance, there is still considerable disagreement concerning the relationships between these economic variables and the effectiveness of currency devaluation as a tool for increasing a country's balance of trade. Consequently, the effect of exchange rate changes on trade balance must be considered an open question from both analytical and empirical perspectives. The premise that there is no clear resolution - neither analytical nor empirical-regarding the effectiveness of currency devaluation as a tool for increasing a country's trade balance calls for a fresh look at the issue using recent advancements in the field of time series econometrics [31]. Research related to the relationship between the trade balance and the exchange rate in Benin is still scarce. Specifically, the author is yet unaware of any literature that has diagnosed Benin's economy using trade balance model that included income and money stock and closing this lacuna is the motivation for this study.

III. Methodology

3.1 Data Discussion

The four variables employed in this study are discussed below. The trade balance (TB): The trade balance is proxied by dividing the nominal value of export value by the nominal value of imports. The choice of export and import ratio as proxy for trade balance is preferred because trade built in this way in a logarithmic model gives the Marshal-Lerner condition in an exact form rather than approximation [32][21]. In most studies investigating trade elasticity, the researchers have preferred use of real values to nominal figures of variables (See [21][25][27][10]}. But in the contrary, this study, uses nominal values because deflecting variables such as domestic consumer price index, inflation rates and GDP deflator are absent for quiet a greater part of the period covered by the study. The same approach will be adopted by the author in this study.

The nominal exchange rate (NER): variable refers to the rate at which the domestic currency can be exchanged for one unit of the reference currency which in this is the United States Dollars (USD).

The national output, proxied by the Gross Domestic Products (Y) and the domestic money supply (MS) were determined after adjusting for inflationary trend. All these variables are expressed in logarithm (L) in specifying the estimation model.

3.2 Model Specification

Trade balance in most instances is stated as the value of net exports (X – M). In this study we measure trade balance as the ratio of the values of aggregate export (X) to the aggregate imports (M). The x/m ratio has been employed in many empirical analyses to determine trade balance exchange rate relationship [25][27][33]. One reason adduced for its use according to Bahmani-Oskooee [34]7 is that this ratio is not sensitive to the unit of measurement and can be interpreted as nominal or real trade balance. In the same vein, this ratio in a logarithmic model yields the exact Marshall-Lerner condition rather than approximation [30]. Following the procedure adopted by Rincon [25], we specify the bilateral trade balance as a function of exchange rate, GDP and domestic money supply. The reduced form of the equation expressed in natural logarithm is given as follows:

$$LTB = a_0 + a_1LGDP + a_2LNER + a_3LMS + \square_t \quad (5)$$

Where: L is natural logarithm, GDP is gross domestic product, NER is the nominal exchange rate, MS represents domestic money supply, $a_0 \ldots a_3$ represent the explanatory powers of the variables, TB is the trade balance and ε_t is the stochastic error term. According to Rincon [25] this vector is thought to capture the effect of exchange rate on the trade balance in a model that puts together the elasticity, absorption and monetary approaches to the balance of payments. The analysis covers time series data spanning across 1950-2008 and sourced primarily from the IMF International Financial Statistics On-line (2008) and Economic Intelligent Unit Data Base (2006).

3.3 Estimation Procedures

The modeling procedures adopted in this study are as follows: To avoid the problem of spurious regression, it is pertinent that the time series properties of the data sets employed in the estimation of the equation 5 is verified. The Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP) unit root techniques are used to test the integration level and the possible co integration among the variables [35][36]. The ADF test involves estimating the following regression and carrying out the unit root tests:

$$\Delta X_t = \alpha + \rho_{t} + \beta X_{t-1} + \Sigma\, \lambda X_{t-1} + \varepsilon_t \quad (6)$$

Where: x is the variable under consideration, Δ is the first difference indicator, t is the time trend and ε is the stochastic error term. Then, if the null hypothesis of no unit root ($\beta = 0$) is rejected, then the variable series contain unit root and therefore non-stationary ($\beta = 1$).

Phillips and Perron [36] developed a number of unit root tests that have become popular in the analysis of financial time series. The Phillips-Perron (PP) unit root tests differ from the ADF tests mainly in how they deal with serial correlation and heteroskedasticity in the errors. In particular, where the ADF tests use a parametric auto regression to approximate the ARMA structure of the errors in the test regression, the PP tests ignore any serial correlation in the test regression. The test regression for the PP tests is:

$$\Delta y_t = \beta^l D_t + \pi y_t - 1 + u_t \quad (7)$$

where u_t is I(0) and may be heteroskedastic. The PP tests correct for any serial correlation and heteroskedasticity in the errors u_t of the test regression by directly modifying the test statistics.

The justification for insisting on knowing whether a variable is non-stationary (has a unit root) stem from the fact that under the alternative hypothesis of no unit root (stationary), variables exhibit mean reversion characteristic and infinite variance, shocks are transitory and autocorrelations die out as the number of lags grows [25]. To establish the property of the series, several tests are computed. First, the standard version of the augmented Dickey-Fuller [37][38]; then, the Philip-Perron test procedure [36] which is robust for error autocorrelation and heteroscedasticity adjustments. If the time series variables of LTB, LY, LNER, and LMS have unit roots, ie integrated of the order 1(1), then we take the first difference of the variables (as expressed in (7) in order to obtain the stationary series, using Johansen [39][40] and Johansen and Juselius [41] test procedures:

$$\Delta LTB = a_0 + a_1\, \Delta LGDP + a_2\, \Delta LER + a_3\, \Delta LRMS + \varepsilon_t \qquad (8)$$

(3) Ignores any reference to the long-run aspect of decision making, ie this procedure of differencing result, is a loss of valuable "long-run information" in the data [42]. This issue will be addressed by the theory of co integration by introducing an error correction term. The effect of this is that an error correction term lagged one period EC (-1) integrates short-run dynamics in the long-run trade balance model to generate the general error correction model (GECM) as specified below:

$$\Delta LTB = a_0 + \sum_{i=1}^{n} a_{1i}\, \Delta LGDP + \sum_{i=0}^{n} a_{2i}\, \Delta LNER + \sum_{i=0}^{n} a_{3i}\, \Delta LMS + a_4 EC_{t-1} + \varepsilon_t \qquad (9)$$

Where: EC_{t-1} is the error-correction term lagged one period. We employ the vector error correction model (VECM) in the estimation of the trade balance model because of its robustness in estimation of co integrating vectors. VECM has co integrating relations built into the specification, so that it restricts the long-run behavior of the endogenous variables to converge to their co integrating relationships, while allowing for short-term adjustment. This serves as the motivation for the choice of ECM technique (8) for the estimation of the trade balance.

IV. Empirical Results

4.1 Unit Root Tests

It is a well known fact that one of the problems with unit root tests is that they have poor size properties or low power in finite samples. The problem stems from the fact that it is difficult to differentiate between unit root and near unit root processes and/or between a trend stationary and drifting processes [43]. In the same vein, "the tests for unit root are conditional on the presence of the deterministic regressors and test for presence of the deterministic regressors are conditional on the presence of a unit root" [44]. In effect therefore, the test critical values depend on whether one includes a constant and/or a trend term in the estimation equation. To test for the stationary properties of the employed variables, we use the standard version of the Augmented Dickey-Fuller [37][38] and the Phillip-Peron test procedures [37][45] which is robust for error autocorrelation and heteroscedastricity. The results of the ADF and PP tests are reported in TABLE 1 in the appendix. The results indicate integration of the order 1(1) for all the employed variables at least in their first difference. The overall results of the unit root tests suggest that all the employed variables have non stationary property and therefore quite suitable for the purpose intended.

4.2 Johansen Co Integration Test

With the unit root test conducted indicating integration of the order 1(1) for all the variables employed, we proceed further to test for co integration among the variable using Johansen [39][40] and [41] test procedures. In TABLE 2, in the appendix, the results of both tests (i.e. trace and maximal eigenvalue) are reported. Beginning with the null hypothesis of no co integration (r=0) among the four variables of trade balance (TB), national output (Y), nominal exchange rate (NER) and money stock (MS), the both tests suggest r=1. These lead us to conclude that there is only one (1) co integration relation among the variables and the rejection of the null hypothesis (r=0) in favor of 1 co integrating vector at 5 percent level of significance. This confirms the presence of an underlying long-run stationary steady state relationship between dependent and the explanatory variables.

4.3 Estimated Co Integrating Vector For Benin Republics

In TABLE 5, the beta coefficients on the long-run model for Benin show that exchange rate and money stock signs are consistent with theory, while the domestic output contrary to expectation is positively signed. The trade balance is positively related to the nominal exchange rate with an elasticity of 0.00128. This relationship suggests that devaluation will improve trade balance by meager 0.1 percent in the long run. This result further suggests that the "hypothesis" that exchange rate is not an effective parameter for trade balance adjustments cannot be rejected for Benin Republic.

4.4 Estimation Of Vector Error-Correction Model (VECM)

The results of the co integration confirm the existence of an underlying long-run stationary steady-state relationship between the explained and the explanatory variables in logarithm. In this instance, VECM is considered the best option for estimation of equation 5 to determine the dynamic behavior of trade balance, because of VECM's ability to restrict the long-run behavior of the endogenous variables to converge to their co integrating relationships while allowing for short-run adjustment dynamic. For this purpose, Engle-Granger [48] methodology is followed and error correction model employed. TABLE 3, in the appendix, reports the VECM results of estimating the long-run effect of exchange variation on trade balance of Benin Republic.

The model is estimated using Eview version 6.0 econometric package. The variants of the model were estimated and the final model was chosen at the instance of the signs, significance and the behavior of the parameter estimates. The most satisfactory empirical results of the estimated model are hereby discussed. When (5) is estimated, it tends to provide reasonable fit for the data set as gauged by the conventional measures such as R^2 adjusted. The Breusch-Pagan LM test for autocorrelation is 10.359 (0.85) and suggests the absence of first order autocorrelation at a 5 percent significance level. The coefficient of domestic output variables, (Y) in line with expectation is negative and statistically difference from zero at 1 percent level of significance.

Literally, the result suggests that an increase in domestic income drops the trade balance in Benin through increased demand for imports. The coefficient of domestic money stock (MS) variable is negatively signed and statistically significant at 1 percent level. This suggests that an increase in domestic money supply deteriorates trade balance on the long-run for Benin. This scenario can be explained by the fact that an increase in domestic money stock results in the depreciation of the exchange rate [49]

This in turn results in higher demand for imports to worsen the trade balance. The negative signing of domestic money stock variable in the trade balance model is in tandem with the views of Smal and de Jagor [51] that an increase in domestic money stock gravitates to increase in the level of real money balances, which, if individuals adjudge this as an increase in their wealth, increases their consumption (and import) expenditure relative to income and thus worsen the trade balance [19]. Similarly, a preliminary test of monetary approach can be conducted by testing whether the coefficient of real money balance is negative and significantly different from zero [50]. In essence therefore, given the fact that the coefficient of real money stock variable is negatively signed and statistically significant, indicates that on the long-run, monetary approach is a major channel by which monetary transmission adjustment can take place in Republic of Benin.

Small and de Jagar [51] used macroeconomic model for South Africa to demonstrate the monetary transmission mechanism for a three-year simulation time frame. The results indicate that contractionary monetary policy via increase in the domestic interest rate reduces domestic demand and output. With the endogeneity of the domestic currency in the model, it adjusts the interest rate parity differential between domestic and foreign interest rate. This improves foreign investment causing the exchange rate of the domestic currency to appreciate and relative prices of imports to fall causing increase in import demands to deteriorate South Africa’s trade balance in the short-run. These results contradict our findings in this study, which show that expansionary monetary policy worsen trade balance, while contractionary monetary policy improves trade balance for Benin. This not withstanding, Smal and de Jagar results represent the short-run effects of monetary policy while in this study we sort to explain the long-run effects of monetary policy on trade balance of Benin.

The equation reveals that the estimated long-run exchange rate elasticity is positively signed. In effect, devaluation/depreciation of the exchange rate of the CFA will lead to a positive adjustment in the trade balance. The coefficient of the exchange rate variable is positive and significantly different from zero at 5 percent significance level. This result further suggests that Marshall-Lerner (ML) condition holds for Benin Republic drawing from Rokas and Petras [52] that in the aggregate trade balance model, positive value of the coefficient of the exchange rate variable indicates high import/export elasticity, meaning that the trade balance would improve as a result of depreciation of domestic currency, whereas negative sign suggests low elasticity not exceeding one. The estimated coefficient of the error correction term lagged one period, EC (-1) is statistically significant at 5 percent level and with the appropriate negative sign and fractional. This provides evidence of significant long run causal relationship existing between exchange rates and the trade balance for Benin Republic.

4.5 Pairwise Granger Causality Tests

The main object of this study is to investigate the causal relationship between exchange rate depreciation and the trade balance of Benin. The null hypothesis, f-statistics and the p-values for each of the variables are as presented in TABLE 4 in appendix. The results identified no significant causal relationship between exchange rate, and the trade balance for Benin Republic in the short run. The results further reveal that significant cause and effect relationships are verified between exchange rate, domestic output and money supply with causality flowing from exchange rate to domestic income and money supply respectively. In effect, these results suggest that for Republic Benin, exchange rate adjustments would be more relevant and effective means of managing domestic output and quantum of money stock than trade balance.

4.6 Variance Decompositions

The dynamic relationships of the variables with respect to the trade balance are provided in terms of variance decomposition from the generalized approach [53]. One important properties of variance decomposition analysis is that it provides some information about the relative importance of random innovations [12]. With variance decomposition you get some information on the percentage of variation in the forecast error of a variable as explained by its own innovation and proportion explained by innovations in other variables in the system. Results of the variance decomposition of the trade balance as attributable to its own innovations and to shocks in the other variables for a forecast horizon of 1 through 10 are as presented in TABLE 6 in the appendix. The results suggest that for Benin Republic, the momentous source of variation in the trade balance forecast error is its own innovations and progressive overtime with an average of 81.2 percent for the forecast horizon. The nominal exchange rate explains about an average of 3.5 percent of the variation in the trade balance. The domestic income and the level of money stock explain an average of 9.4 percent and 5.3 percent respectively. In the final analysis, the results suggest that the effect of nominal exchange rate and domestic money supply on the trade balance of Benin appears to be inconsequential.

4.7 The Impulse Response Function For Benin.

Fig. 1, is the plot of the impulse response of the trade balance to one standard deviation shock in the nominal exchange rate for Benin Republic. We clearly see that after the shock on the NER the trade balance deteriorates by a maximum of about 3 percent. However, the impact of the price effect doesn't stay long as evidenced in the figure. About nine periods after the initial shock, the trade ratio reaches its balance. On average, 1 percent real depreciation of the Benin CFA has a long-run positive impact of about 3 percent on the trade balance. However, at the given confidence level, the J-curve is insignificant. We therefore reject the null hypothesis that the J-curve phenomenon exist on the trade balance for Benin Republic. This result suggests that the assumption of a short-run inelastic response of import volumes to import prices, common in conventional studies may itself be open to question. Descriptive analyses of devaluation episodes, particularly in the developing countries, have noted the phenomenon of "import compression" immediately following devaluation. This implies that, regardless of the numerical values of the estimated import demand elasticity, devaluation quickly forces a reduction in the volume of imports, presumably because of a binding foreign exchange constraint. If so, there would seem to be no reason to expect the negative short run component of the J-curve since the "perverse valuation" effect rests on the assumption that import volumes continue unchanged in the short run [22]. Finally, the pass-through of exchange rate changes to import prices may be sluggish or even non-existent and foreign producers may lower their supply prices to absorb the effect of a rise in the exchange rate.

V. Conclusion

This paper employs the co integration analysis and vector error correction model to investigate the trade balance effect of exchange rate devaluation in Benin Republic. The overall conclusion is that exchange rate depreciation has a long-run positive impact on the trade balance in Benin and we find no evidence of J-curve hypothesis. The results of the VECM estimate show that the coefficient of the exchange rate variable is positive and significantly different from zero at 5 percent significance level. This result suggests that Marshall-Lerner (ML) condition holds for Benin drawing from Rokas and Petras [52] that in the aggregate trade balance model, positive value of the coefficient of the exchange rate variable indicates high import/export elasticity, meaning that the trade balance would improve as a result of depreciation of domestic currency, whereas negative sign suggests low elasticity not exceeding one. Furthermore, the estimated coefficient of the error correction term lagged one period, EC (-1) is statistically significant at 5 percent level and with the appropriate negative sign and fractional. This provides evidence of significant long run causal relationship existing between exchange rates and the trade balance for Benin Republic.

The results of variance decomposition analysis, suggest that for Benin Republic, the momentous source of variation in the trade balance forecast error is its own innovations and progressive overtime with an average of 81.2 percent for the forecast horizon and that exchange rate explains just a meager 3.5 percent of the variation in the trade balance. Much as we find evidence of Marshall-Lerner condition and the J-curve hypothesis rejected for Benin, these do not provide enough information to recommend a devoluationary policy for Benin's economy. One needs to bear in mind that devaluation has its own contractionary effects on the economy. Devaluation raises the cost of imported intermediate inputs and this affects supply side of the economy. In situations where devaluation is accompanied by inflation in the domestic market, it erodes purchasing power of money (real balance effect) resulting in a decline in aggregate demand [53]. It is not impossible to observe that devaluation/depreciation of the domestic currency may improve the trade balance and at the same time register a decline in gross national product as is the case with this contribution. In this instance, the net effect may be zero because the improvement in the trade balance is offset by the decline in the gross national product. As a guard against this shortcoming, we prescribe a holistic approach to studying the devaluation effect on the trade balance for Benin. This may comprise understanding the trends of macro and micro economic variables of interest rate, inflation rate and gross domestic amongst others.

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Appendix.

Table 1: ADF and PP Unit Root Tests for Stationary.

Variable	**ADF**		**PP**		Decision
	Intercept	Trend/Intercept	Intercept	Trend/Intercept	
LTB	$1.664^{1(0)}$	$-1.617^{1(0)}$	$4.324^{1(0)}$	$-1.203^{1(0)}$	1(0)
ΔLTB	$-1.194^{1(0)}$	$-3.446^{1(1)***}$	$-1.891^{1(0)}$	$-3.414^{1(1)***}$	1(1)
LY	$3.747^{1(0)}$	$3.902^{1(0)}$	$7.961^{1(0)}$	$3.075^{1(0)}$	1(0)
ΔLY	$-1.325^{1(0)}$	$-4.498^{1(1)*}$	$-2.070^{1(0)}$	$-4.395^{1(1)*}$	1(1)
LNER	$-1.376^{1(0)}$	$-2.258^{1(0)}$	$-1.454^{1(0)}$	$-2.500^{1(0)}$	1(0)
ΔLNER	$-6.669^{1(1)*}$	$-6.608^{1(1)*}$	$-6.671^{1(1)*}$	$-6.610^{1(1)*}$	1(1)
LMS	$2.627^{1(0)}$	$2.259^{1(0)}$	$6.825^{1(0)}$	$4.570^{1(0)}$	1(0)
ΔLMS	$4.817^{1(0)}$	$2.323^{1(0)}$	$-2.874^{1(1)***}$	$-4.259^{1(1)*}$	1(1)

*Notes: (i) *, **, ***, represent 1%, 5% and 10% significance levels respectively.*
(ii) Unit root tests were performed using Eview Econometric package version 6.0

Table 2: Results of Co integration Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
Trace				
r = 0*	0.579	73.401	47856	0.000
r ≤ 1	0.299	25.669	29.797	0.138
r ≤ 2	0.231	8.661	15.495	0.397
r ≤ 3	0.081	0.182	3.841	0.669
Max-Eigen				
r = 0*	0.579	47.732	27.584	1.000
r ≤ 1	0.299	17.008	21.132	0.171
r ≤ 2	0.231	8.479	14.265	0.332
r ≤ 3	0.081	0.182	3.841	0.669

Notes: 1. The test was performed using E view econometric package version 6
*2. * denotes the rejection of the hypothesis (r = 0) at the 0.05 level.*

Table 3: Results of Estimated Vector Error Correction Model.

Variables	Coefficient	t-statistics	Std Error
Constant	0.141	2.620	0.054
LTB	-0.518	-4.229	0.123
LY	-0.003	-4.216	0.001
LNER	0.002	3.614	0.001
LMS	-0.004	-3.360	0.001
ECM(-1)	-0.056	-3.032	0.018
Breusch-Godfrey LM test =10.359 (0.85)			

Notes: The tests are performed using Eview Version 6.0 Econometric package.

Table 4: Estimates of Long-run Co integrating Vectors (Linearrised)

LTB	LNER	LY	LMS
1.0000	0.00128 (0.03018)	0.00411 (0.00297)	-0.0416 (0.01189)

Note. 1. The long-run equilibrium relation is: LTB = 0.00128LNER + 0.00411LY – 0.0416LMS.
Figures in parentheses indicate standard errors

Table 5: Granger Causality Test Results.

Null Hypothesis	F-Statistic	**P-Value**
LNER does not granger cause LTB	0.398	0.673
LTB does not granger cause LNER	0.223	0.800
LY does not granger cause LTB	0.652	0.525
LTB does not granger cause LY	0.390	0.678
LMS does not granger cause LTB	1.071	0.350
LTB does not granger cause LMS	0.298	0.743
LY does not granger cause LNER	0.766	0.469
LNER does not granger cause LY	6.542	0.002
LMS does not granger cause LNER	1.619	0.207
LNER does not granger cause LMS	6.217	0.003
LMS does not granger cause LY	1.286	0.284
LY does not granger cause LMS	0.059	0.942

Note: The test is performed using E-view version 6.0 econometric package.

Table 6: Results of Variance Decomposition of LTB for Benin.

Period	LTB	LNER	LY	LMS
1	100.000	1.000	0.000	0.000
2	76.889	0.395	15.050	7.665
3	77.489	3.547	12.515	6.447
4	77.948	3.147	11.609	7.294
5	79.505	3.558	10.408	6.527
6	79.671	3.853	9.881	6.593
7	79.803	4.593	9.411	6.190
8	80.133	4.893	9.097	5.876
9	80.134	5.391	8.999	5.474
10	80.039	5.890	9.024	5.065

Figure 1: Response of LTB to LNER