International Journal of Development and Emerging Economics

Vol.3, No.2, pp.38-52, June 2015

Published by European Centre for Research Training and Development UK (www.eajournals.org)

EXCHANGE RATE AND TRADE BALANCE IN GHANA- TESTING THE VALIDITY OF THE MARSHALL LERNER CONDITION

Anning Lucy[1], Riti Joshua Sunday[2] and Yapatake Kossele Thales Pacific[3]
School of Economics, Huazhong University of Science and Technology, Wuhan, China

ABSTRACT: *Currency depreciation has been lauded as a means of improving a country's trade balance borrowing from the Marshall Lerner Condition that the sum of the elasticity or the coefficient of the trade balance in respect of the exchange rate be greater or equal to unity. This paper examined exchange rate and trade balance in Ghana testing the validity of the Marshall Lerner Condition at aggregate level. The data spanned from 1980-2013 sourced from World Development Indicators. Co integration and vector error correction mechanism (VECM) was used to estimate the short as well as the long run parameters. The result of the findings showed that real effective exchange is negatively linked to trade balance in long run. In the short run the lag one coefficient shows a positive sign implying that trade balance deteriorate in the short run due to some contractual obligations already signed by the domestic country with the trading partners. However in the long run the coefficient shows that a depreciation of cedi all things being equal will lead to an improvement in Ghana's trade balance. Though the Marshall Lerner condition is not met in Ghana because of the REER coefficient less than unity but evidence from the result indicates that depreciation can be used to improve on the trade balance. The estimated coefficient of the error correction term is -0.3696 which implies that the speed of adjustment is approximately 37. percent per quarter. This negative and significant coefficient is an indication that co integrating relationship exists among the variables. The paper recommends that Ghana should devalue its currency to move from the deficit side of the J curve to the surplus side since evidence from the result shows that depreciation or devaluation can substantially improves the trade balance in the long run.*

KEYWORDS: Currency depreciation, Trade balance, Marshall Lerner Condition, Imports, Exports, Income

INTRODUCTION

Since the Breton Woods Accord collapsed in 1973, many countries have gravitated towards floating exchange rates with heightened interests on the effects of devaluation on the trade balance in both developed and developing economies (Marwah & Klein, 1996). The sequence of events in the traditional argument is that currency depreciation first leads to deterioration in the trade balance before improvements become obvious. This response pattern mimics the letter J hence the label J-curve phenomenon. The evidence is however not as clear-cut as the theory appears to imply. In fact, the vast empirical literature on the J-curve is inundated with conflicting

ISSN 2055-608X(Print), ISSN 2055-6098(Online)

outcomes which have been attributed to the multiplicity of samples, models and methods that were used in the analyses (Abostanci, 2002).

The Ghana cedi has over the past years particularly during the structural adjustment programme (SAP) depreciated against their major trading partners. Such depreciations have received mixed reactions. Some economists argue that the depreciation of domestic currencies is a good stimulant for export growth while others argue that the net benefits of depreciation cannot outweigh its ills on the economy as a whole. Depreciation of the cedi was not initiated by policy makers. These were due to shocks in macroeconomic environment. Since the SAP period in 1986 Ghana has been failing to maintain adequate foreign reserves for currency stabilization. This has been due to over dependency on agriculture as the main source of foreign exchange. This lack of diversification has been the main source of depreciation of the Ghana cedi. In addition, slowdown in economic activities and general deterioration in the current account balance led to the slump in the cedi (Gunnar, 2001). It is against this background that this paper would investigate the behavior of the trade balance with respect to a real depreciation in Ghana against the rest of the world.

Although investigation on the exchange rate-trade balance nexus has a long history in economics, it is the extension to capture this relationship in a time series though multi-country trading bloc context that distinguishes the present attempt. More specifically, an interesting attempt is made to unearth answers to key questions such as: Is the Marshall Lerner Condition met between Ghana and the rest of the world? Is there a J-curve effect in the economy of Ghana that trade with other economies? Can a devaluation/depreciation lead to an improvement in Ghana's trade balance? If yes, it becomes pertinent to know the response pattern since a delayed J-curve signifies a more prolonged worsening of the trade balance while the absence of this effect has a different policy implication. Thus, the novelty value of this study cannot be over emphasized.

The research focuses on the trade balance, not because of its economic importance, but rather due to the political nature of the trade balance. Often a trade deficit is taken as evidence of an unfair trading practice on the part of the other country. It is often believed that the deficit is due to the foreign partners import restrictions. The estimates of trade elasticities will help to identify the quantity and volume effects of a tariff, or the impact of a coordinated naira depreciation/devaluation. The choice of the period, 1980-2013 is due to the fact that Ghana is one of the many developing countries that adopted a comprehensive structural Adjustment Programme (SAP) during the mid- 1980s in an attempt to reduce the role of public sector in the economy. The choice of the topic is based on the fact that research related to the relationship between the trade balance and the exchange rate in Ghana is still scarce. The paper is structured into five sections: Following the introduction in section I is the relevant literature review which occupies section II. Section III takes the trend of trade and exchange rate between Ghana and the rest of the world. Methodology, analysis of data and interpretation of major findings occupies section IV while section V takes conclusion and recommendations.

ISSN 2055-608X(Print), ISSN 2055-6098(Online)

LITERATURE REVIEW

According to the absorption approach, devaluation through its impact on terms of trade and domestic production, leads to a switch in spending from foreign to domestic goods, and hence an improvement in trade balance. Monetarists, in contrast, argue that devaluation reduces the real value of cash balances and/or changes the relative prices of traded and non-traded goods, and thus improves the trade balance as well as the balance of payments.

An aspect of the elasticity approach to exchange rate-trade balance relationship is the Marshall-Lerner (ML) condition (Marshall, 1923; Lerner, 1944). The theory that a devaluation of a domestic currency will improve current account balance is founded on a number of elasticity approach models, the most popular of which is the Marshall-Lerner condition. 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. 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 effects of devaluation in the exchange rate on the trade balance are related to the determinants of the demand and supply elasticities of exports and imports. In the short run, the elasticities are relatively smaller (inelastic demand and supply), than in the long run (elastic) hence the trade balance may deteriorate in the short run, Bahman-Oskooee (2004). Due to currency contracts, initially, the trade balance worsens as a result of a real depreciation since prices and trade volumes are not allowed to change. This situation assumes that exports are invoiced in domestic currency and imports in foreign currency. The degree of foreign and domestic producer's price pass-through to consumers and the scale of supply and demand elasticities of exports and imports, determine the value of the effect, Hsing (1999). The J-curve effect can be explained by both a perfect pass-through and a zero pass-through. Under a perfect pass-through domestic import price increases while domestic export price remains unchanged. The resulting effect is a deterioration in the trade balance. In zero pass-through situation, domestic export price increases and domestic import prices remain constant hence the real trade balance improves following devaluation. According to Bahman-Oskooee (2004), the Marshall-Lerner condition is the necessary and sufficient condition for an improvement in the trade balance following a devaluation. For a currency devaluation to have a positive impact on the trade balance, the sum of import and export demand elasticities should be greater than one. The Marshall-Lerner condition is a long-run condition because exporters and importers have enough time to adjust to changes in the exchange rate by coming up with alternative choices in demand and supply.

Most studies on the J-curve effect have come up with mixed results. Some results are consistent with the J-curve phenomenon while others depict non existence or new evolution of the J-curve

ISSN 2055-608X(Print), ISSN 2055-6098(Online)

effect. Gupta-Kapoor and Ramakrishnan (1999) used the error correction model and the impulse response function to determine the J-curve effect on Japan using quarterly data from 1975:1 - 1996:4. Their analysis showed the existence of the J-curve on the Japanese trade balance. Tihomir Stucka (2004) found evidence of J-curve on trade balance for Croatia. His study employed a reduced form model to estimate the impact of a permanent shock on the merchandise trade balance. It was found that 1 percent depreciation in the exchange rate improves the equilibrium trade balance by the range of 0.94 percent-1.3 percent and it took 2.5 years for equilibrium to be established. Koch and Rosensweig (1990) studied the dynamics between the dollar and components of U. S. trade. They employed time series-specification tests and Granger tests of causal priority to identify the J-curve phenomenon. Two of the four components portrayed dynamic relationships that are weaker and more delayed than the standard J-curve. In the conventional J-curve, the theory asserts a strong and rapid dependency of imports prices on the currency. Carter and Pick (1989) found empirical evidence indicating the existence of the first segment of the J-curve on the U.S. Agricultural trade balance. The results exhibited deterioration in the trade balance that lasted for about 9 months following a 10 percent depreciation in the U.S. dollar. Using the generalized impulse response function from the vector error correction model to examine the existence of J-curve for Japan, Korea and Taiwan, Hsing (2003) found that Japan's aggregate trade provided evidence of the phenomenon while Korea and Taiwan did not show any presence of the J-curve effect. He argues that this may be attributed to a small open economy effect. In small open economies like Korea and Taiwan, both imports and exports are invoiced in foreign currency as a result the short run effect of real devaluation is hedged and the trade balance remains unaffected. [Riti, 2012; Adeniyi, Oyinlola, 2011 & Agbola, 2004] tested the validity of the MLC on bilateral basis between Nigeria and some West African countries using the 2SLS econometric technique. His results showed that Cote'di Voire, Sierra-Leone and The Gambia met the MLC where as Ghana did not meet the MLC.

III Trend Of Trade Between Ghana And The Rest Of The World

Table 1: Real Effective Exchange Rate, Ghana's GDP, Export Import and US GDP proxy for Foreign GDP

YEAR	Ghana REER	GDP Ghana	GDP Foreign	Ghana EXPORT	Ghana IMPORT	Trade balance
1980	773.9211	4.45E+09	2.86E+12	3.76E+08	4.07E+08	-3.1E+07
1985	405.8816	4.5E+09	4.35E+12	4.8E+08	6.12E+08	-1.3E+08
1990	161.2953	5.89E+09	5.98E+12	9.94E+08	1.52E+09	-5.3E+08
1995	118.7073	6.46E+09	7.66E+12	1.58E+09	2.13E+09	-5.4E+08
2000	94.12588	4.98E+09	1.03E+13	2.43E+09	3.35E+09	-9.2E+08
2001	95.16254	5.31E+09	1.06E+13	2.4E+09	3.44E+09	-1E+09
2002	94.76921	6.17E+09	1.1E+13	2.63E+09	3.38E+09	-7.6E+08
2003	94.99504	7.63E+09	1.15E+13	3.1E+09	4.32E+09	-1.2E+09

ISSN 2055-608X(Print), ISSN 2055-6098(Online)

2004	93.69422	8.88E+09	1.23E+13	3.49E+09	5.36E+09	-1.9E+09
2005	102.3508	1.07E+10	1.31E+13	3.91E+09	6.62E+09	-2.7E+09
2006	107.7524	2.04E+10	1.39E+13	5.14E+09	8.31E+09	-3.2E+09
2007	107.0241	2.48E+10	1.45E+13	6.07E+09	1.01E+10	-4E+09
2008	101.8875	2.85E+10	1.47E+13	7.14E+09	1.27E+10	-5.6E+09
2009	93.77339	2.6E+10	1.44E+13	7.61E+09	1.1E+10	-3.4E+09
2010	100	3.22E+10	1.5E+13	9.48E+09	1.48E+10	-5.3E+09
2011	94.89754	3.96E+10	1.55E+13	1.75E+10	1.97E+10	-2.2E+09
2012	88.91843	4.17E+10	1.62E+13	2.01E+10	2.21E+10	-2.1E+09
2013	89.56842	4.81E+10	1.68E+13	2.03E+10	2.27E+10	-2.4E+09

Source: WDI CD Rom, 2015

The real effective exchange in Ghana depreciate for about 2880 percent from 1980 to 1983. It later appreciate with about 18.7 percent in1995. However the reel effective exchange continues to fluctuate till it finally appreciate from 2000 to 2013 with about 110.5 percent. On the path of the trade balance Ghana has experienced trade deficit through the years from 1980 t0 2013. This is owing to the fact that the country has witnessed appreciation of the cedi throughout the years except from 1980-1983 when the currency depreciated. T is worthy of note that even during the structural adjustment programme that saw many developing countries devaluing their currency, Ghana was an exemption as the currency kept on appreciating.

METHODOLOGY AND DISCUSSION OF FINDINGS

In this section, macroeconomic models based on trade balance model approach to macroeconomic exchange rate-income modeling are specified for Ghana in order to estimate the impact of exchange rate and income variables on trade balance. In line with the theoretical consideration, the functional form of the model to be used in this study is specified as follows:

$TBt = f(REERt, YDt, YFt)Ui$……(1)

Equation (1) is specified in a functional form , where:

TBt = Ghana's trade balance

REERt = Ghana's real effective exchange rate

YDt = Ghana's domestic income (GDP)

YFt = US income to proxy foreign income

Ui = Error or disturbance term.

In a more explicit form, the equation can be written as;

$TBt = \beta o + \beta_1 REERt + \beta_2 YDt + \beta YFt + Ui$……(2)

To linearize equation (2), we apply logarithm to the equation which gives

$LTBt = \beta o + \beta_1 LREERt + \beta_2 LYDt + \beta_3 LYFt + Ɛi$……(3)

ISSN 2055-608X(Print), ISSN 2055-6098(Online)

For the purpose of estimation and in line with the objective of the study, finding the change in the trade balance model is very useful. As a result, the trade balance model to be estimated in this study is:

$\Delta LTBt = \beta o + \beta_1 \Delta LREERt + \beta_2 \Delta LYDt + \beta_3 \Delta LYFt + \varepsilon i$……..(4)

Based on economic theory, the expected signs of the coefficients are $\beta_1 < 0$ β_2 and $\beta_3 > 0$ while β_0 can be > or < 0.

The choice of the log-linear model was because of the following reasons:

Firstly, to find the percentage change in the dependent variable resulting from percentage changes in the independent variable. Thus, the study sought to find the responsiveness of a change in poverty to changes in real effective exchange rate and both domestic and foreign incomes (that is, elasticities of the variables), hence the need to use the log-linear model.

Secondly, while the values for some of the variables such as incomes and trade variables are in million dollars, real effective exchange rate is in percentage . There was therefore, the need to use the log form to bring the values for all the variables to the same unit or level. In other words, the use of logarithm in the models is to bring the variables to the same base, since the variables are measured in different bases. Lastly, the use of log transformation is necessary because it reduces the scale of the variables from a tenfold to a twofold, thus reducing the possibility of heteroscedasticity in the model (Gujarati and Sangeetha, 2007). The estimation technique is the co integration and Vector Error Correction Mechanism.

Time Series Preliminary Tests

One major problem often associated with empirical analysis is non-stationarity of time series data. When variables being used for analysis are non-stationary, it usually leads to spurious regression results. In this case, the t-statistic, DW statistic as well as the R^2 values are not accurate.

In conducting the Dickey Fuller test, it is assumed that the error term εt is uncorrelated. But in case the εt is correlated, Dickey and Fuller have developed a test known as Augmented Dickey-Fuller (ADF) test. This test is conducted by :augmenting" the equation by adding the lagged values of the dependent variable $\Delta TB_{t,i}$. Suppose, the equation for TBt in our model, the ADF here consists of estimating the following:

$$\Delta TB_t = \beta 0 + \beta 1 + \partial \Delta TBt - 1 + \sum_{i=1}^{m} \lambda_1 \Delta TB_{t-i} + \varepsilon t \quad \text{.....(5)}$$

Where εt is a white noise error term and $\Delta TB_{t-1} = (\Delta TB_{t-1} - \Delta TB_{t-2})$ etc. The number of lagged difference terms to include is often determined empirically, the idea being to include enough terms so that the error term in (5) is serially uncorrelated. In ADF we test whether $\partial = 0$ and the ADF follows the asymptotic distributions and some critical values can be used.

ISSN 2055-608X(Print), ISSN 2055-6098(Online)

For this reason, the Augmented Dickey-Fuller (ADF) test was used to test the stationary status of the variables used in the growth equation. The presence of unit root in the series indicates that the variable is non-stationary, hence the degree or order of integration is one or higher. The absence of unit root however, implies that the variables are stationary and the order of integration is zero.

To investigate the presence of random walk in the time-series data, a unit-root test is carried out. This is to ascertain the stationary nature of the data to avoid a spurious regression model. The tables below show results of the tests on the time series data using the Augmented Dickey- Fuller (ADF) and the Phillips-Peron's (PP) techniques.

Table 1: ADF Unit Root Test Result

	ADF AT	LEVEL		ADF AT	1st DIFF	OI
Variable	**t-statistic**	**Probability**	**IO Lag**	**t-statistic**	**Probability**	**IO Lag**
LogYFt	-0.648840	0.9686	(0) [1]	-5.124511	0.0012*	I(1)
LogYDt	-0.877930	0.9468	(0) [0]	-4.798194	0.0028*	I(1)
LogREERt	-1.745674	0.7077	(0) [0]	-6.059214	0.0001*	I(1)
LogTBt	-2.442418	0.3526	(0) [0]	-6.590175	0.0000*	I(1)

Source: Author's Computation using Eviews 7.0

Note: IO indicates order of integration. ***, ** and * indicate significance at 1%, 5% and 10% level respectively.

Table 2: PP Unit Root Test Result

	PP AT	LEVEL		PP AT	1st DIFF	OI
Variable	**t-statistic**	**Probability**	**IO Lag**	**t-statistic**	**Probability**	**IO Lag**
LogYFt	-1.379470	0.8484	(0) [6]	-7.771941	0.0000*	(1) [22]
LogYDt	-0.877930	0.9468	(0) [0]	-4.758089	0.0031*	(1) [4]
LogREERt	-1.747444	0.7069	(0) [4]	-6.714409	0.0000*	(1) [5]
LogTBt	-3.080954	0.1273	(0) [2]	-8.451436	0.0000*	(1) [2]

Source: Author's Computation using Eviews 7.0

Note: IO indicates order of integration. ***, ** and * indicate significance at 1%, 5% and 10% level respectively.

The ADF and PP unit root test results in table 1 and 2 show that all the variables have unit root. That they are not stationary at levels. However, the variables became stationary at first difference. This is shown by the of their t-statistics and probability values high and less than 0.05 level respectively after the first difference.

Granger Causality Test

Although regression analysis deals with the dependence of one variable on the other variables, it does not necessarily imply causation. In other words, the existence of a relationship between variables does not prove causality or this direction of influence. But in regression involving time series data, the situation may be somewhat different because, one author puts it,

ISSN 2055-608X(Print), ISSN 2055-6098(Online)

"… time does not run backward. That is, if event A happens before event B, then it is possible that A is causing B. however, it is not possible that B is causing A. in other words, events in the past can cause events happen today…". Further events cannot (Gujarati and Sangeetha, 2007). This is roughly the idea behind the so-called granger causality test.

To explain the granger causality test, consider the TBt equation a function of REERt. This question is often asked in macroeconomics. Is it REERt that "causes" the TBt (REERt→ TBt) or is it TBt that causes REERt (TBt→ REERt), where the arrow points to the direction of causality. The granger causality test assumes that the information relevant to the prediction of the respective variables, TBt and REERt, is contained solely in the time series data in these variables. The test involves estimating the following pair of regressors:

$$TB_t = \sum_{i=1}^{n} \alpha_1 REER_{t-i} + \sum_{i=1}^{n} \beta_1 TB_{t-j} + \mu_{1t} \quad \text{.....(6)}$$

$$REER_t = \sum_{i=1}^{n} \lambda_1 REER_{t-i} + \sum_{i=1}^{n} \delta_1 TB_{t-j} + \mu_{2t} \quad \text{.....(7)}$$

Where it s assumed that the disturbances μ_{1t} and μ_{2t} are uncorrelated. In passing, note that since we have two variables, we are dealing with bilateral causality. However, since we are dealing with bilateral causality, we can apply the technique of vector auto regression (VAR).

Equation (6) postulates that current TBt is related to past values of itself as well as that of REERt, and (7) postulates similar behavior for REERt. We now distinguish four cases:

(1) Unidirectional causality from REERt to TBt is indicated if the estimated coefficients on the lagged TBt in (6) are statistically different from zero as a group (i.e., $\sum \alpha i \neq 0$) and the set of estimated coefficients on the lagged REERt in (7) is not statistically different from zero (i.e., $\sum \partial j = 0$).

(2) Conversely, unidirectional causality from TBt to REERt exists if the set of lagged REERt coefficients in (6) is not statistically different from zero (i.e., $\sum \alpha i = 0$) and the set of the lagged TBt coefficients in (7) is statistically different from zero (i.e., $\sum \partial I \neq 0$).

(3) Feedback, or bilateral causality, is suggested when the sets of REERt and TBt coefficients are statistically significantly different zero in both regressions.

(4) Finally, independence is suggested when the sets of REERt and TBt coefficients are not statistically significant in both the regression. Table 3 below presents the granger causality test results:

Table 3: Granger Causality Test Results

Null Hypothesis	Fstatistic	Probability	Decision	Direction
REERt does not granger cause TBt	5.01455	0.0077	Reject	REERt↔TBt
TBt does not granger cause REERt	8.61090	0.0005	Rejectt	
YDt does not granger cause TBt	2.88279	0.0567	Reject	YDt→TBt
TBt does not granger cause YDt	0.21809	0.8829	Accept	
YFt does not granger cause TBt	1.34174	0.2843	Accept	Independence
TBt does not granger cause YFt	0.75763	0.5289	Accept	

Source: Author's Computation using Eviews 7.0

ISSN 2055-608X(Print), ISSN 2055-6098(Online)

Table 3 above shows that REEFt and TBt bi-directionally granger cause each other. This is shown by the significance of their respective F-statistic values and probability values. This falls under the third category of granger causality test outcomes. Whereas YDt uni-directionally granger cause TBt. This falls under the first category of granger causality test outcomes. YFt and TBt suggest independence, i.e. neither uni-directional nor bi-directonal causation is established. Though there is no causality between YFt and TBt, an individual covariance between the two shows the existence of relationship. This falls under the fourth category of granger causality test outcomes.

Diagnostic Test in Respect of Normality, Specification, Serial Correlation And Heteroscedasticity

In regression analysis four possible problems are likely to occur, thus: normality, functional form or specification problem, serial correlation and lack of homoscedasticity in the residuals. Before trusting the result from a regression equation, one should check the regression passes all the four tests. If the regression fails any test, then there may be a risk of spurious results (Gujarati and Sangeetha, 2007). Tables 4 below summarize the four tests of diagnosis:

Table 4: Ordinary Least square Estimation

Variable	Coefficient	Standard Error	t-satatistic	Probability
REERt	-0.444102	0.061372	-7.236233	0.0000
YDt	0.691167	0.076677	9.013980	0.0000
YFt	0.892927	0.164681	5.422168	0.0000
C	-17.81068	3.941062	-4.519260	0.0001
R^2 = 0.983417	Adj R^2 = 0.981813	F-stat = 594.8355	DW = 1.502152	

Source: Author's Computation using Eviews Econometric Software

1I. Model criteria / Goodness of Fit:

R-square = 0.983; Adjusted R-square = 0982;

11I. Diagnostic Checking:

JB = 0.3428 [08425]; LM-1 = 0.7204 [0.4954]; ARCH (1) = 1.0258 [0.3202]; White Heteroscedasticity = 1.9955 [0.0854]; Ramsey RESET (t-Stat) = 0.5169 [0.6092]

*, ** and *** indicate significance of the parameters at 0.10, 0.05 and 0.01 level respectively. Probability values are quoted in square brackets. LM denote LM-type Breusch-Godfrey to test for the presence of serial correlation and ARCH effect; white Heteroscedasticity is for heteroscedasticity. JB and RESET stand for Jarque-Bera Normality Test and Ramsey Regression Specification Error Test, respectively. From the result, none of the test fail the diagnostic test of normality, serial correlation, heteroscedasticity and functional form. The values of their probabilities are all greater than the 5% significance level. The tests are necessary to fulfil the assumptions in respect of the error term and specification bias in ordinary least squares estimation. This implies that the models are correctly specified and suffer no econometric

ISSN 2055-608X(Print), ISSN 2055-6098(Online)

problem of parameters estimation.The OLS result above shows that REERt, YDt, YFt and the constant are significantly influencing the behaviour of TBt. This shown by their respective standard error, t-statistic and probability values. Their significance is indicated by the asterisk on the probability values. All the variables have the appropriate signs judging from the apriori expectations. However, we applied the cointegration and vector error correction mechanism to know the short as well as the long run estimates of the parameters to validate or invalidate the Marshall Lerner Condition.

Estimation Techniques

The research made use of Vector Error Correction Model to estimate both the short and long run parameters. However, the Johansen co integration test of long run relationship is conducted to check the steady equilibrium nature of the variables.

Johansen Co integration Test and Long Run Dynamics

According to Johansen (1991), co integration can be used to establish whether there exists a linear long-term economic relationship among variables. In this regard, Johansen (1991) asserts that co integration allows us to specify a process of dynamic adjustment among the co integrated variables and in disequilibrated markets. Given that the series are I(1), the co integration of the series is a necessary condition for the existence of a long run relationship. The co integration results of both the trace and Maximum-Eigen value statistic of the Johansen co integration test are presented and displayed in table 5 and 6.

Table 5: Johansen Co integration (Trace) Test Result

Hypothesized No. of CE(s)	Eigen Value	Trace Statistic	5% Critical Value	Probability Value
None*	0.633164	57.04577	47.85613	0.0054
At most 1	0.444589	24.95484	29.79707	0.1631
At most 2	0.115207	6.137314	15.49471	0.6793
At most 3	0.067037	2.220467	3.841466	0.1362

Source: Author's Computation using E-views Econometric Software

Trace test indicates 1 co integrating equation at 5 percent level of significance.

Note : * denotes rejection of hypothesis at 5 percent significant level

Table 6: Johansen Co integration (Maximum Eigen Values) Test Result

Hypothesized No. of CE(s)	Eigen Value	Max-Eigen Value Statistic	5% Critical Value	Probability Value
None*	0.633164	32.09093	27.58434	0.0123
At most 1	0.444589	18.81753	21.13162	0.1023
At most 2	0.115207	3.916848	14.26460	0.8680
At most 3	0.067037	2.220467	3.841466	0.1362

Source: Author's Computation using E-views Econometric Software

ISSN 2055-608X(Print), ISSN 2055-6098(Online)

Maximum Eigen Value test indicates 1 co integrating equation at 5 percent level of significance.
Note : * denotes rejection of hypothesis at 5 percent significant level It can be seen from both table 5 and 6 that the trace statistic and the maximum Eigen value statistic indicate the presence of one co integration among the variables. This confirms the existence of a stable long-run relationship among trade balance as the dependent variable, real effective exchange rate of Ghana, Ghana's income and foreign income as the independent variables. Base on the indication of one co integrating vector among the variables, the estimated long-run equilibrium relationship for trade balance was derived from the normalised vectors as presented below.

The first vector appears to be the one which we can normalise trade balance vector from the un-normalised co integrating coefficients below. The choice of this vector is based on the sign expectations about the long-run relationships as indicated in equation below.
The long-run relationship was derived by normalising TBt and dividing each of the co integrating coefficients by the coefficient of TBt. The long run relationship is specified as:

TBt = 42.7874 - 0.3109**REERt-1** – 0.5333**YDt-1 – 1.7353YFt-1**.....(8)

The model above represents the long-run effects on trade balance. Firstly, the constant exerts a positive effect on poverty. This implies that holding all the independent variables at zero, trade balance level of Ghana increases by 42.79

Ghana's real effective exchange rate(REERt) exerts negative effect on trade which implies that as REER decreases, trade balance level also increases. The finding is in line with the a priori expectations and the theoretical underpinning of the famous MLC (elasticity approach) which shows that a devaluation or depreciation of a country's currency will lead to an improvement in the trade balance (Riti, 2012). The coefficient of 0.3109 implies that a unit depreciation or devaluation of the Ghana cedi will lead to a 0.3109 improvement in Ghana's trade balance.

Ghana's income (YDt) on the other hand is statistically significant in the long-run and it has a negative effect on trade balance in Ghana. The result is inconsistent with the absorption approach which states that devaluation through its impact on terms of trade and domestic production, leads to a switch in spending from foreign to domestic goods, and hence an improvement in trade balance. The coefficient of 0.5333 implies that in the long-run, a unit increase in Ghana's income all things being equal will lead to approximately 0.5333 worsening of the trade balance. This finding agrees with the expected sign and is in tandem with the reality of Ghana's trade balance where imports exceeded exports throughout the years. The economic justification is that as the currency appreciate, foreign goods become less expensive than domestic goods hence imports increase (Mankiw, 2007).

ISSN 2055-608X(Print), ISSN 2055-6098(Online)

Short Run Dynamics and the Error Correction Mechanism

Engle and granger (1991) argued when variables are co integrated, their dynamic relationship can be specified by an error correction representation in which an error correction term (ECT) computed from the long-run equation must be incorporated in order to capture both the short run and long run relationships. The ECT is expected to be statistically significant with a negative sign. The negative sign implies that any shock that occurs in the short run will be corrected in the long run. If the ECT is greater in absolute value, the rate of convergence to equilibrium will be faster. The short run model for the study is given as:

$$\Delta \ln TB_t = \gamma + \sum_{i=1}^{p} \beta_{1i} \Delta \ln TB_{t-i} + \sum_{j=1}^{q} \beta_{2j} \Delta \ln REER_{t-j} + \sum_{k=1}^{r} \beta_{3k} \Delta \ln YD_{t-k} + \sum_{k=1}^{s} \beta_{3k} \Delta \ln YF_{t-k} + \rho ECM_{t-1} + \mu_t \quad \text{.....(9)}$$

The result is presented in table 7 below:

Table 7: Short Run Estimates and Error Correction Model (VECM)

Variable	Coefficient	Std Error	t-statistic	Probability
D(LogTBt(-1))	-0.0563	0.1344	-0.4189	0.6750
D(LogTBt(-2))	-0.1465	0.2089	-0.7010	0.4830
D(LogREERt(-1))	-0.1016	0.1060	-0.9588	0.3380
D(LogREERt(-2))	-0.2562	0.0749	-3.4203	0.0010
D(LogYDt(-1))	0.1804	0.1452	1.2427	0.2140
D(LogYDt(-2))	0.0948	0.1749	0.5420	0.5880
D(LogYFt(-1))	0.5416	1.2311	0.4400	0.6600
D(LogYFt(-2))	-2.1883	1.1969	-1.8284	0.0670
C	0.2361	0.0673	3.3848	0.0010
ECM(-1)	-0.3696	0.0673	-5.4929	0.0000

Source: Author's Computation using Eviews Econometric Software

$R^2 = 0.7546$ Adj. $R^2 = 0.6494$ F-stat = 7.1745 DW = 2.1091

Note: ***, ** and * indicate significance of the parameter at 1, 5 and 10 percent respectively.

From table 7, the estimated coefficient of the error correction term is -0.3696 which implies that the speed of adjustment is approximately 37. percent per quarter. This negative and significant coefficient is an indication that co integrating relationship exists among the variables. The size of the coefficient on the error correction term (ECM) denotes that 37 percent of the disequilibrium caused by previous year's shock converges back to the long run equilibrium in the current year. According to Kremer, Ericsson and Dolado (1992), a relatively more efficient way of establishing co integration is through the error correction term.

Trade balance at lag one and two are not significant in the short run where it exerts a negative effect on current trade balance of 0.0563 and 0.1464 respectively. The insignificant effect of trade balance inertia on current trade balance implies that previous trade balance cannot be used to improve on the current period, hence the insignificant effect of trade balance lag one and two.

ISSN 2055-608X(Print), ISSN 2055-6098(Online)

Real effective exchange rate also shows significant effect on trade balance at lag two though lag one is insignificant and posses the right sign. The negative value shows that depreciation or devaluation of the currency leads to improvement in the trade balance. A unit depreciation or devaluation of Ghana cedi all things being equal will lead to 0.2562 improvement in its trade balance at lag two.

Also Ghana's income is statistically insignificant and posses positive (appropriate) signs at both lag one and two. The result shows that an increase in Ghana's income will lead to an improvement in the trade balance agreeing with the absorption approach.Foreign income does not show any significant influence on trade balance in the short run. The first lag has the appropriate sign (positive) while the second lag posses the wrong sign. However both are insignificant.Finally the constant value which measures the value of the model at it mathematical origin is positive and statistically significant. This implies that in the absence of the independent variables trade balance has a value of 0.3696.

Figure 1: Stability Test of Residuals of LogTBt Equation

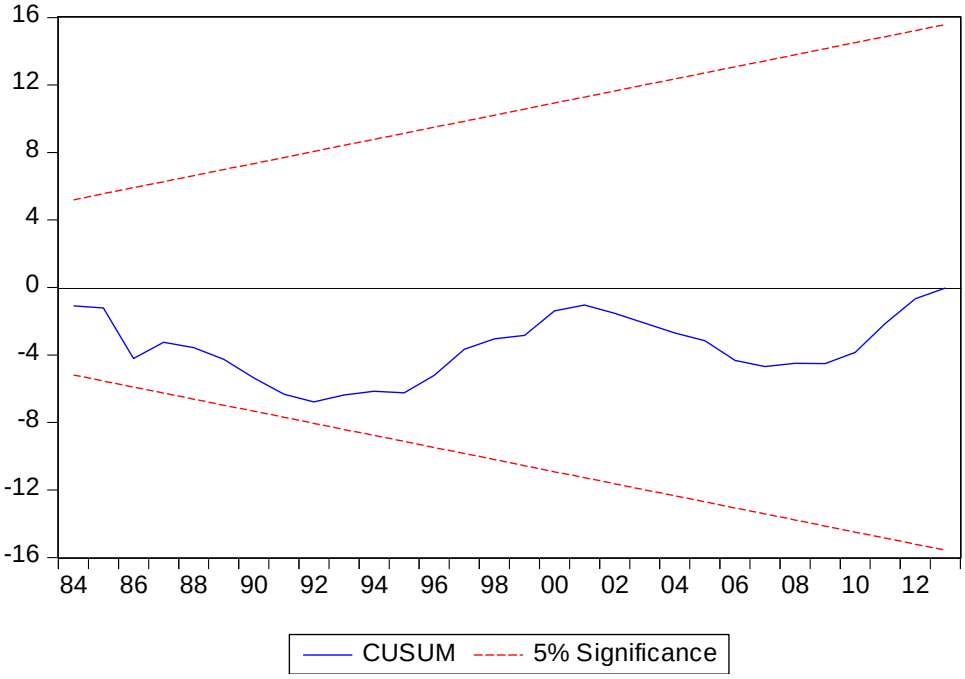

Figure 1 above shows the stability of the model, TBt. The figures indicate that the model has been stable since no root lie outside the range of the conditions. The CUSUM test satisfies the stability test at 5% significance level.

ISSN 2055-608X(Print), ISSN 2055-6098(Online)

CONCLUSION

Currency depreciation has been lauded as a means of improving a country's trade balance borrowing from the Marshall Lerner Condition that the sum of the elasticity or the coefficient of the trade balance in respect of the exchange rate be greater or equal to unity. This paper examined exchange rate and trade balance in Ghana testing the validity of the Marshall Lerner Condition at aggregate level. Based on the above results, we can conclude that real effective exchange is negatively linked to trade balance in long run. In the short run the lag one coefficient shows a positive sign implying that trade balance deteriorate in the short run due to some contractual obligations already signed by the domestic country with the trading partners. However in the long run the coefficient shows that a depreciation of cedi all things being equal will lead to an improvement in Ghana's trade balance. Though the Marshall Lerner condition is not met in Ghana because of the REER coefficient less than unity but evidence from the result indicates that depreciation can be used to improve on the trade balance. The result is plausible given the fact that Ghana's currency has been appreciated over the years with the trade balance being at the deficit side. The coefficient of the domestic income and foreign income do not support the frame work of the absorption approach that devaluation through its impact on terms of trade and domestic production, leads to a switch in spending from foreign to domestic goods, and hence an improvement in trade balance. The paper recommends that Ghana should devalue its currency to move from the deficit side of the J curve to the surplus side since evidence from the result shows that depreciation or devaluation can substantially improves the trade balance in the long run. Increase in income however should be used to switch from consumption of foreign goods to the consumption of domestic goods.

SUGGESTION FOR FUTURE RESEARCH

Given that paper examines exchange rate-trade balance in nexus in Ghana with the view of testing the Marshall Lerner Condition using aggregated data, it is obvious that the results may suffer from aggregation bias. Therefore future research on this or related topic (exchange rate-trade balance nexus) should be done at disaggregated level, so as to be able to estimate the real size of the depreciation or devaluation needed to cause an improvement in the trade balance.

REFERENCES

Adeniyi, O., Omisakin, O & Oyinlola, A. (2011). Exchange Rate and Trade Balance in West African Monetary Zone: Is There a J-Curve?. *The International Journal of Applied Economics and Finance, 5: 167-176.*

Agbola, F. (2004). "Does devaluation improve trade balance of Ghana?" *Paper to be presented at the International Conference on Ghana's economy at the half Century,* M- Plaza Hotel, Accra, Ghana, July 18-20, 2004.

ISSN 2055-608X(Print), ISSN 2055-6098(Online)

Akbostanci, E. (2002). "Dynamics of the trade balance: The Turkish J-Curve". *Education Resource Centre Working Papers, 02/05.*

Bahmani-Oskoee, M. (1985). "Devaluation and the J-Curve: Some evidence from LDCs". *The review of economics and statistics*, 67(3): 500-504.

Carter, Colin and Daniel Pick (1989). The J-curve Effect and the U.S. Agricultural Trade Balance. American Journal of Agricultural Economics, 71 (3), 712-720.

Lerner, A. (1944), *The economics of control,NewYork:* Macmillan.

Marshall, A. (1923), *Money,Credit and Commerce,* London: Macmillan and Co.

Marwah, K. & Klein, L.R. (1996). "Estimation of J-Curves: United States and Canada". *Canadian journal of economics*, 29 (3): 523-539.

Gujarati, D. N. & Sangeetha (2007). *Basic Econometrics, fourth edition*. New Delhi: Tata McGraw-Hill Publishing Company Limited.

Gunnar, J. (2001) Inflation, Money Demand, and Purchasing Power Parity in South Africa. IMF Staff Papers, 48 (2).

Gupta-Kapoor, A. and Ramakrishna, U. (1999). Is There a J-curve? A New Estimation for Japan. International Economic Journal,13 (4), 71-19.

Hsing, Han-Min (2005). Re-examination of J-Curve Effect for Japan, Korea and Taiwan. Japan and the World economy, 2 (17), 43-58.

Johansen, S. (1991). Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Auto Regressive Models. Econometrica: Journal of Econometric Society, 51(16), 1551-1580.

Koch, Paul and Jeffrey Rosensweig (1990). The Dynamic Relationship Between the Dollar and the Components of U.S. Trade. Journal of Business and Economic Statistics, 8(3). 355-364.

Kremers, J.J.; Ericsson, N.R. and Dolado, J.J. (1992). The Power of Cointegration Test , Oxford Bulletin of Economics and Statistics, (54): 325-347.

Mankiw, G.N. (2007). Macroeconomics, Eight Edition, Harvard University, Worth Publishers.

Riti, J.S. (2012). Estimation of Trade Elasticities in Nigeria: A Test of the Marshall Lerner Condition (1981-2010). Jos Journal of Economics, Vol. 5 No. 1, 2012, 87-111.

Tihomir, S. (2004). The Effects of Exchange Rate Change on the Trade Balance in Croatia. IMF Working Papers,04 (65).

WDI (2014). World Development Indicators. World Bank Data. http://databank.worldbank.org/data/views/variableselection/selectvariables.aspx?source=world-development-indicators#c_n

ISSN 2055-608X(Print), ISSN 2055-6098(Online)