THE EFFECT OF DEVALUATION ON TRADE BALANCES OF ETHIOPIA: A VECTOR AUTO REGRESSIVE APPROACH

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Abstract

The relationship between devaluation and the trade balance is an important and controversial issue for economies. Though there is no clear cut answer for the effect of devaluation on trade balance among writers, the current Ethiopian government employed devaluation as instrument of exchange rate policy to improve the balance of trade. Hence the main objective of this paper is to examine the effect of currency devaluation on trade balance of Ethiopia using a Vector Auto Regressive approach for the period 1960/61 to 2008/09. The estimated long run and short run equations have showed that currency devaluation, which is proxied by real exchange rate, has a positive and significant impact on the trade balance of Ethiopia.

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1. Introduction

Since the breakdown of Bretton Wood Accord in 1973[2] 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. due to expansionary financial policies, deterioration in the terms of trade, price distortions, higher debt servicing or a combination of these factors many developing countries facing balance of payments problems and have often resorted to devaluing their currencies (Nashashibi, 1983).

The relationship between devaluation and the trade balance is an important and controversial issue for economies. Since currency devaluation is often considered to be a tool for improving the foreign sector of an economy, economists have been studying correlation between the real exchange rate and the trade balance. It is argued that a devaluation of currency improves trade balance by raising the price of imports in comparison to that of its exports. This leads to an improvement in the foreign sector of economy which in turn leads to the rise in output and employment in the overall economy. Generally, according to the traditional theory (such as the Elasticities, Absorption, and the Keynesian approach), it is expected that devaluation will result in expenditure switching, increased production of tradables, higher exports, and in an improvement of the external position of the country

Contrary to the traditional view, a considerable amount of theoretical literature suggests that currency devaluations may have a contractionary impact on the economic activity. First, the devaluation can redistribute income from groups with a lower to a higher marginal propensity to save. This may lead to a decline in aggregate demand and output (Diaz-Alejandro, 1965, Krugman and Taylor, 1978). Second, devaluation will change the relative prices of traded and non-traded goods leads to an increase in the domestic

[2] The Bretton Woods system is commonly understood to refer to the international monetary regime that prevailed from the end of World War II until the early 1970s. It had the original purpose of rebuilding after World War II through a series of currency stabilization programs and infrastructure loans to war-ravaged nations. The major features of the agreement were an obligation for each country to adopt a monetary policy that maintained the exchange rate by tying its currency to the U.S. dollar and the ability of the IMF to bridge temporary imbalances of payments. In 1971 the Smithsonian Agreement established to allow for greater fluctuation band for currencies. Just after a year, European Joint Float Established as the European community tried to move away from their dependency on the US dollar. However, in 1973 Smithsonian Agreement and European Joint Float failed signifying the official switch to a free-floating system.

general price level, generating a negative real balance (or Pigou) effect[3]. This, in turn, will result in lower aggregate demand and output. Third, if the price elasticities of exports and imports are very low, then the trade balance expressed in terms of domestic currency may deteriorate causing a recessionary effect in the economy. In addition to these demand-side effects, there are also a number of supply-side channels through which devaluation can be contractionary. Exchange rate devaluation raises the cost of imported inputs, leading to a decrease in aggregate supply. Additionally, it may raise the domestic interest rate and wage level through an increase in the price level. This might also decrease the aggregate supply in the economy.

Despite there is no consensus on the effect of devaluation on trade balance, the current Ethiopian government employed devaluation as instrument of exchange rate policy to improve the balance of trade. Hence the main objective of this paper is to examine the effect of currency devaluation on trade balance of Ethiopia using a Vector Auto Regressive approach. The paper is organized in the following form. In Section the model being tested is briefly presented. Section 2 below addresses overview on the relationship between devaluation and trade balance, while Section 3 describes the model specification. In Section 4, estimation procedures and main results are presented. Finally, in Section 5 the main points of the paper are summarized and some directions for future research are suggested.

2. Overview on the Relationship between Devaluation and Trade Balance

2.1 Theoretical Framework

The theoretical impact of exchange rate reforms on trade is still highly controversial. The conventional view of balance of payment argued that nominal devaluation improves trade balance by raising the price of imports in comparison to that of its exports. There are different approaches under the conventional views of devaluation. The first views is the Monetarist approach which argues devaluation changes the relative price of traded and non-traded goods, thus improving both the trade balance and the balance of payments (Dornbusch, 1973; Frenkel and Rodriquez, 1975; Mills, 1979). In this case, devaluation results a reduction in a real money supply which leads to an excess demand

[3] Devaluation increases prices of traded goods and thus contributes to inflation. Accordingly, the value of real wealth falls. Consumption expenditure can therefore be reduced so that additional savings ensure that the value of real wealth is unchanged.

for money. This excess demand for money can be satisfied by inflow of money from abroad which improves the trade balance of the nation (Upadhyaya and Dhakal, 1997).

The second approach is Elasticity approach (Bickerdike, 1920; Robinson, 1947; Metzler, 1948). It states that devaluation will improve the balance of payments if the sum of the price elasticities (a measure of how much demand changes in response to a price change) of domestic and foreign demand for imports is larger than one. This condition is said to be the Marshall - Lerner condition. Upadhyaya and Dhakal (1997) argued that in the short run devaluation may lead to deterioration of trade balance. However, via the adjustment of export and import quantities, in the long-run elasticity's of exports and imports increase and quantities adjust. This leads to improvement of trade balance by reducing the foreign price of devaluing country's exports and reducing the demand for imports by raising it price.

2.2 Empirical Literature

Despite extensive research on the impact of exchange rate arrangement on the economy, empirical studies have not resolved the theoretical debate over the impact of devaluation on trade balance. For instance, Copper (1971) attempted to explain the effect of devaluation on trade balance episodes in 19 developing countries over the period 1959-66. He found that devaluation improved trade balance and balance of payments of developing countries by stimulating demand abroad for cheaper exports and/or substitution away from imports to goods produced at home resulting in overall economic growth. However, Musila and Newark (2003) criticized the findings of Copper because the methodology employed failed to distinguish between on the effects of devaluation and macroeconomic factors on trade balance. Bahmani-Oskooee and Niroomand (1998) also estimated the trade elasticities for 30 countries and concluded that devaluations could have a positive effect on the trade balance. Rawlins and Praveen (2000) also found the same result by investigating the relationship between devaluation and trade balance for selected African countries. Moreover, Andualem (1999), Kamin (1988), Salant (1977), and Lizando and Montiel (1989) also found the positive effect of devaluation for different countries.

On the other hand, a lot of researchers have found that devaluation has 'J- Curve' phenomena[4] on trade balance. Bahmani-Oskooe and Pourheydarian (1991), using a quarterly data over the 19771-19881 period, showed that while the short-run response of the Australian trade balance to devaluation followed the pattern of movement described by the delayed J-curve phenomenon, the long-run response was an improvement in that country's trade balance. Contrary to the above research works, there are a number of studies which indicates a negative impact of devaluation on trade balance. To mention some, Laffer (1977), Miles (1979), Gylfason and Risager (1984) and Branson (1986) find that devaluation does not improve trade balance.

3. Model Specification

a. Theoretical Frame Work

To examine the impact of devaluation on trade balance, the following model is specified following the works of Himarios (1980, 1989), Bahmani-Oskooee (1985, 1989) and Buluswar et al. (1996). The theoretical specification of the model starts by assuming Ethiopia as a small economy. Trade balance of an economy can be defined as export revenue minus import expenditure which is given as follows:

$$TB = X - M \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Where TB, X and M represents the trade balance, export revenue and import expenditures respectively. In line with this, it is possible to rewrite export revenues and import expenditures as follows:

$$X = P_X Q_X\left(\frac{P_X}{e}, Y^*\right) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

$$M = eP_M Q_M(eP_M, Y) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

Where P_X, Q_X, Y and e represents domestic price of export, export quantity, domestic income and nominal exchange rate of Ethiopia. Similarly P_M, Q_M, Y *with astrix in equation 2*

[4]According to the J-Curve trade balance could get worse before getting better, subsequent to devaluation.

refers to foreign price of export, quantity of export and foreign income respectively.

Substituting equation (2) and (3) in to equation (1), the trade balance equation becomes:

$$TB = P_X Q_X\left(\frac{P_X}{e}, Y^*\right) - eP_M Q_M(eP_M, Y) \ldots\ldots\ldots\ldots \quad \textbf{(4)}$$

According to Buluswar et al. (1996), in addition to the above factors incorporated in the model trade balance is also affected by the domestic and foreign money supply and interest rates. This is mainly due to the fact that, the change in interest rate affects the trade balance through its effect on demand for money and other monetary assets. Hence, a change in interest rate influences savings, consumption and hence imports. On the one hand, an increase in interest rate generates an excess money supply and thereby causing trade balance to deteriorate. Here, the impact of changes on interest rate on trade balance depends on the net effect income and substitution effects. If income effect dominates the substitution effect, an increase in interest rates would cause trade balance to deteriorate and vice versa.

Dornbush (1973) also noted that, an increase in domestic money supply would create supply of money, causing domestic residents to spend their cash balances. This will raise the domestic price level and lower the effective exchange rate which in turn leads to improved trade balance in the long run. A higher domestic price level will also leads to hoarding by lowering the real money balance. Assuming money market is in equilibrium, the real domestic money supply is determined by the domestic demand for money and exchange rate. Accordingly, the monetary model of exchange rates is specified as:

$$\frac{Ms}{P} = L(Y, e) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad \textbf{(5)}$$

Where Ms, *P*, *L* ,e and Y represents the nominal money supply, domestic price level, demand for money, value of foreign currency in Birr, and domestic real income respectively. Here, a higher *e* would reduce the purchasing power of the cedi and this will increase the demand for money to maintain imports. Generally, following Himarios (1980, 1989), Bahmani-Oskooee (1985, 1989) and Buluswar et al. (1996), the empirical model which is used in the analysis was specified as:

$$y_t = \sum_{i=1}^{k} A_t y_{t-i} + u_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (6)$$

$$y_t = (LTB_t, LRGDP_t, LMS_t, IR, ER_t, LRGDP*_t, LMS*_t, IR*)$$

$$u_t = (uLTB_t, uLRGDP_t, uLMS_t, uIR_t, uER_t, uLRGDP*_t, uLMS*_t, uIR_t*, uER*_t)$$

Where; y_t is a vector of endogenous variables, A^1-A^k are matrices of coefficients and u_t is a vector of error terms. Whereas LTB, LRGDP, LMS, IR and ER represent the logarithms of trade balance, real income, money supply, interest rate, and effective exchange rate of the domestic economy respectively. Similarly, LRGDP*, LMS* and IR* refers the logarithms of foreign real income, money supply and interest rates respectively. Here, RGDP and RGDP* is a proxy for domestic and foreign real income.

b. Source of Data

The study examined the Effect of Devaluation on Trade Balance of Ethiopia by using annual data covering the period from 1960/61 to 2008/09. The major data sources for the problem under investigation were publications of National Bank of Ethiopia (NBE), Ministry of Finance and Economic Development (MOFED) and Central statistics Authority (CSA) of Ethiopia. Besides, IMF CD-ROM, WB CD-ROM, and IFS-CD-Rom were used.

4. Estimation Procedure and Results

4.1. Unit Root and Structural Break Tests

Most of the macroeconomic data is usually non-stationary. A time series is said to be stationary if its mean and covariance are independent. This is to say there should be no correlation across time, that is, no serial correlation. To avoid the pitfall of wrong inferences from the non-stationary regressions, the time series data should be stationary. If one regresses a non-stationary variable on another non-stationary variable the results obtained might look very attractive, which might be characterized by high R^2 and a low DW statistic whilst in actual fact they are spurious (Lutkepohl, 1993). Given that stationarity is of paramount importance it is imperative to first carry out the unit root tests, to test for stationarity before running a regression. The results of the test for the variables at level and first difference are presented in Table 1 and 2 below respectively.

Table 1: Unit Root Tests of the Variables at Level

Variables	Dickey Fuller (DF)		Augmented Dickey Fuller (ADF)			
	Lag Length 0		Lag Length 1		Lag Length 2	
	T_v	T_t	T_v	T_t	T_v	T_t
LTB	1.415	0.5208	-2.92	-2.908	-2.124	-2.097
LRGDP	1.685	-1.143	2.037	-0.8952	1.933	-0.8668
LRGDP*	-0.02505	-2.617	-0.1016	-2.361	-0.1046	-2.341
LMS	0.1969	-2.777	0.5670	-2.381	0.5743	-2.502
LMS*	0.5760	-1.648	0.8106	-2.452	0.7460	-2.487
LIR	-2.159	-2.327	-2.234	-2.459	-1.644	-1.818
LIR*	-0.02505	-3.044	-0.1016	-3.334	-0.1046	-3.044
LER	-1.173	-2.148	-1.755	-2.993	-1.209	-2.438

Table 2: Unit Root Tests of the Variables at First Difference

Variables	Dickey Fuller (DF)		Augmented Dickey Fuller (ADF)			
	Lag Length 0		Lag Length 1		Lag Length 2	
	T_v	T_t	T_v	T_t	T_v	T_t
DLTB	-3.290*	-3.724*	-3.388*	-3.726*	-3.331*	-3.46
DLRGDP	-7.307**	-7.963**	-4.434**	-5.095**	-3.719**	-4.554**
DLRGDP*	-3.409*	-6.007**	-3.019*	-3.696*	-2.891	-3.445
DLMS	-5.915**	-5.794**	-3.869**	-3.750*	-2.790	-2.684
DLMS*	-5.947**	-4.603**	-2.998*	-3.608*	-1.542	-3.265*
DLIR	-5.380**	-5.380**	-4.898**	-4.898**	-3.596*	-3.596*
DLIR*	-5.394*	-5.394**	-4.635**	-4.635**	-3.581*	-3.581*
DLER	-3.582*	-3.582*	-4.042**	-4.042**	-3.472*	-3.472*
Critical Value 1%	*-4.224 and -3.623 with and without trend, respectively.*					
Critical Value 5%	*-3.535 and -2.945 with and without trend, respectively.*					

Where; ** and * *denotes rejection of the null hypothesis of unit root at 1% and 5% significance level respectively.*

T_v *is estimated value of test statistics when a drift term (constant) is included in the auxiliary regression for unit root test.*

T_t *is estimated value of test statistics when a drift term (constant) and trend are included in the auxiliary regression for unit root test.*

The ADF test statistics[5], as depicted in the above table, illustrates that all variables are non - stationary at levels. That is, it is not possible to reject the null hypothesis of unit root both with and without trend in the auxiliary regression of unit root. But, the ADF test applied to the same variables in their first difference becomes stationary at the conventional 1% and 5% level of significance. However, according to Alemayehu et al. (2009), the Dickey – Fuller type tests of unit root are sensitive to structural breaks in the data. A truly structural variable with some structural breaks may be labeled to be non - stationary. Thus, System Chows structural break test is conducted for all variables entered in both growth and private investment equations. The result confirmed that the null hypothesis of no breaks at specified breakpoints is not rejected at the conventional 1% and 5% levels of significance. Hence, the variables are integrated of order one (I ~I(1)).

4.2 Estimation of the Reduced form VAR and Test for Cointegration

The first step in estimating a VAR model is to determine the optimal lag length of the VAR (Alemayehu et al, 2009). Hence, the optimal lag length for this study has been determined using the AIC and HQ as these methods have been proven in most empirical papers to be superior to other tests. According to these criterions, the VAR estimate with the lowest AIC and HQ in absolute value is the most efficient one. In addition, the optimal lag length that is obtained from the AIC and HQ are also confirmed by the model reduction test. Accordingly, the VAR estimates were conducted successively from lag length four to one. Based on AIC and HQ criterion, the first lag was found to be optimal for trade balance equation. Hence, this study is going to employ the optimal lag length of one.

The unit root test, as reported in Table 1 and 2, showed that all the variables contained in the growth equation are I(1). This permits to conduct the test for cointegration among the variables. The λ_{trace} statistics adjusted for degrees of freedom confirms that the null hypothesis of at most one cointegrating vector is not rejected at 5% significance level. This points the presence of one cointegrating vector. The test is reported in the following table.

[5] If the estimated Augmented Dickey-Fuller statistic is greater than the critical value we reject the null hypothesis that the series is non-stationary in favour of stationarity.

Table 3: Johansen's Cointegration Test for Growth Equation

$H_0: r \leq$	Trace Statistics	Eigen Value	P - value
0	0.85513	170.68	[0.010] **
1	0.80643	120.45	[0.098]
2	0.61483	77.751	[0.445]
3	0.54529	52.945	[0.510]
4	0.42614	32.455	[0.591]
5	0.35309	18.016	[0.575]
6	0.2208	6.6915	[0.619]
7	0.0078168	0.20404	[0.651]

The result, depicted in the above table, reports that there is one cointegrating vector in the system. The null of no-cointegration vector ($r \leq 0$) is rejected by λ_{trace} statistics at 1 % significance level. On the other hand, the null that there exists at most one cointegrating vector ($r \leq 1$) is accepted. The existence of one cointegrating vector suggests that the first row of β and first column of α matrices are important for further analysis. The following table, Table 4, reports the β and α matrices of growth equation.

Table 4: Standardized Beta (β) Coefficient

LTB	LRGDP	LRGDP*	LMS	LMS*	LIR	LIR*	LER
1.0000	-0.065415	0.024905	0.19887	-0.35293	-0.89430	1.7893	-1.3956
1.3006	1.0000	-0.31178	-2.8163	-1.6515	-1.8448	-3.382	2.4304
12.548	-2.4118	1.0000	-0.27778	-12.380	7.3246	5.113	5.0301
-39.349	-0.63464	-0.23664	1.0000	3.9643	3.9699	9.9170	-16.362
-27.556	1.4183	0.057466	2.8743	1.0000	-8.7992	13.893	-2.3496
7.2221	-0.22409	-0.029837	-1.7140	0.62609	1.0000	-2.7289	-0.036646
-2.1801	-0.19477	-0.094996	-0.76629	-0.068726	-0.28255	1.0000	-0.40840
-4.8629	0.20028	-0.25758	-2.8633	-0.33425	4.1308	-4.5468	1.0000

Table 5: Standardized α Coefficients

LTB	-0.0039248	-0.19868	-0.48771	-0.46621	-0.018490	-0.0043215	-0.0038133
LRGDP	-0.0016154	-0.055198	-0.025217	-0.0005875	-0.043803	-0.0069909	-0.00021079
LRGDP*	-0.00066740	-0.014958	0.0027751	0.00062740	0.0077022	-0.00034109	-0.00058890
LMS	-0.0028382	-0.037190	-0.038300	0.016861	-0.031782	-0.0017873	-0.0016602
LMS*	-0.0033227	-0.082234	0.28272	-0.0067282	-0.0044778	-0.00047757	-0.00032897
LIR	-0.053618	1.3569	-0.13002	0.019224	-0.077324	-0.012312	0.0052955
LIR*	-0.054240	0.69851	1.4411	0.43476	0.34016	-0.0058870	-0.013736
LER	-0.0066190	-0.59421	0.062878	0.097599	-0.018866	0.0016309	0.00029024

Note: number of lags used in the analysis is one.

Since the existence of only a unique cointegrating vector is statistically supported in the Johansen's cointegration test, only the first row of β and the first column of α in Table 4 and 5 are happen to be the relevant entries. The values of α obtained from the cointegration show the speed of adjustment of the long run parameters towards the equilibrium relationship. For instance, the speed of adjustment of domestic and foreign interest rates towards long run equilibrium is 5.3 and 5.4 percent respectively.

To identify the variables that are endogenously determined and conditional on other variables in the VAR, the test for weak exogeniety is conducted. This requires imposing zero restriction on the first column of α coefficients. The results, using the likelihood ratio test as shown in the Table 6 below, confirmed that the null hypothesis of weak exogeniety is rejected for Trade Balance (LTB) at 5% level of significance. However, for the rest variables, the null hypothesis is not rejected at different level of significance. Therefore, the long run relationship can be formulated by taking LTB as endogenous variable, while, LRGDP, LRGDP*, LMS, LMS*, LIR, LIR* and LER as exogenous variables.

Table 6: Test of Weak Exogeniety (Test for Zero Restriction on α Coefficients)

α-Coefficients	LR test of restrictions: Chi^2(1)	Probability Value
LTB	90.202	[0.0000]**
LRGDP	0.68548	[0.4077]
LRGDP*	1.4500	[0.2285]
LMS	3.5136	[0.0609]
LMS*	0.14712	[0.7013]
LIR	3.6648	[0.0556]
LIR*	1.4669	[0.2258]
LER	1.1568	[0.2821]

**denotes rejection of the null hypothesis of weak exogeniety at 5% significance level.*

Once the long run relationship is defined, the next task is to formulate test of significance on the long run parameters. This test can be obtained by imposing restriction on β coefficients, which is termed as exclusion test. It helps to determine which are relevant or statistically significant in the cointegrating vector. The result of the test along with their respective probability values are reported on Table 7 below.

Table 7: Test of Zero restriction on the Long – run β Parameters (Significance of long run Coefficients)

β-Coefficients	LR test of restrictions: Chi^2(1)	Probability Value
LTB	87.803	[0.0000]**
LRGDP	87.796	[0.0000]**
LRGDP*	87.868	[0.0000]**
LMS	91.008	[0.0000]**
LMS*	99.228	[0.0000]**
LIR	100.07	[0.0000]**
LIR*	96.652	[0.0000]**
LER	88.078	[0.0000]**

Where, ** and * denotes rejection of the null hypothesis at 1% and 5% significance level respectively.

As it is explained from the table, the long – run results depict that all explanatory variables were found to be significantly different from zero. That is, the result rejects the null hypothesis that the β coefficients are not jointly significantly different from at 1% level of significance. Moreover, the variables are with the hypothesized sign. Hence, the long run equation with the corresponding signs and significance is presented as follows:

$$LTB = -0.065415LRGDP + 0.024905LRGDP^{*} - 0.19887LMS + 0.35293LMS^{*}$$

*[0.0000]** [0.0000] ** [0.0000] ** [0.0000] ***

$$+0.8943LIR - 1.7893LIR* + 1.3956LER. \quad (7)$$

*[0.0000]** [0.0000]* [0.0000] ***

*Where **denotes rejection at 1% level of significance*

Multivariate Diagnostic Test

Vector AR 1-2 test: F(72,136)= 1.1568 [0.2324]

*Vector Normality test: Chi^2(12)= 49.923 [0.0000]***

Vector hetero test: F(252,115)= 0.66646 [0.9956]

Vector hetero-X test: Chi^2(567)= 605.31 [0.1287]

The result of the diagnostic test confirms the adequacy of the model. That is, the null of no serial correlation and homoscedasticity are not rejected at any conventional significant level. The null hypothesis of normality, however, is rejected at 1% level of significance. Nevertheless, the Johansen result still holds.

In line with the standard economic theory, the regression result shows that, LRGDP*, LMS*, LIR and LER have a positive and significant effect on the trade balance of Ethiopia. Whereas LRGDP, LMS and LIR* have a negative and significant impact. In line with the economic theory, a one percent increase in domestic money supply produces a 0.19887 percent deterioration in trade balance of Ethiopia. This is mainly due to the fact that an increase in domestic money supply would lead to an increase in real money balance. Following this, individuals would perceive a rise in real balance as a rise in their wealth which in turn leads to higher levels of expenditure particularly in imported commodities. This would lead to deterioration in trade balance of Ethiopia. To the contrary, the foreign money supply has a positive and significant effect on the trade balance of Ethiopia. Particularly, a one percent increase in foreign money supply, LMS*, increases the trade balance of Ethiopia by 0.35293 percent. Similarly, the long run elasticities of trade balance with respect to domestic and foreign real GDP are given as -0.065415 and 0.024905 percent respectively. This implies that, a one percent increment in domestic GDP would lead to deterioration in trade balance of Ethiopia by 0.065415 percent. In contrast with this, a one percent increment in foreign GDP leads to an increase in trade balance by 0.024905 percent.

The result also implies that the coefficient of domestic interest rate (LIR) is positive and statistically significant at 1% level of significance. In Ethiopia, a one percent increase in domestic interest rate leads to a higher substitution effect as compared to income effect. That is it leads to an increase in saving rather than increasing consumption which in turn improves the trade balance of Ethiopia by 0.8943 percent. But, a one percent increase in foreign interest rate will lead to a decrease in trade balance of Ethiopia by 1.7893 percent. In line with Andualem (1999), Kamin (1988), Salant (1977), Gylfason and Risager (1984); and Lizando and Montiel (1989) devaluation has a positive and significant effect on the trade balance of Ethiopia. Particularly, a one percent increase in real exchange rate will lead to a 1.3956 percent increment in trade balance of Ethiopia.

4.3. The Short Run Dynamic Modeling (Vector Error - Correction Model)

Having obtained the long run model and estimated coefficients, the next step is to estimate Vector Error Correction Model (VECM), which captures both the long run and short run relationship. The change in the variables represent variation in the short run, while the coefficients obtained for the error correction term represents the speed of adjustment towards the long run relationship. A VECM was estimated starting with the general over parameterized model. Then, the VECM is subjected to a systematic reduction and testing process until a robust parsimonious model is obtained. In each round, all statistically insignificant regressors were dropped until further model reduction was rejected by the likelihood ratio test.

In modeling short-run dynamics, all weakly exogenous variables which are considered in the long run are entered in to the right hand side of the model by differencing once. The main reason for the use of a first difference form is due to the fact that there are several problems with the use of variables in level form. Among these the first concerns the likely high level of correlation between current and lagged values of a variable, which will therefore result in problems of multi-colleniarity[6]. Besides, using the Hendery type general to specific approach, which would involve eliminating insignificant variables from the estimated model, might therefore result in misspecification. Also, some (if not all) of the variables in a dynamic model of this kind are likely to be non- stationary, since they enter in level form. As explained earlier, this leads to the potential problem of common trends and thus spurious regression, while t and F – statistics do not have standard distribution and the usual statistical inference is invalid. A solution might be to re specify the dynamic model in first differences (Harris, 1995).

The existence of stationarity and cointegration permits to develop the following error correction model for trade balance.

$$\Delta LTB = \sum_{i=0}^{k} \Delta LRGDP + \sum_{i=0}^{k} \Delta LRGDP^{*} + \sum_{i=0}^{k} \Delta LMS + \sum_{i=0}^{k} \Delta LMS^{*} + \sum_{i=0}^{k} \Delta LIR + \sum_{i=0}^{k} \Delta LIR^{*} + \sum_{i=0}^{k} \Delta LER - ECT_{-1}. \qquad \text{……….. (8)}$$

Where k represents the lag length and ECTt-1 denotes the error correcting term.

Following the above specification, a dynamic equation is reported in Table 8 below.

[6] A situation where there is high R2 but imprecise parameter estimates and low t-valves, even though the model may be correctly specified

Table 8: Result for the Dynamic Equation (Dependent Variable DLTB)

Variables	Coefficient	Std.Error	t-value	t-prob	Part.R^2
Constant	1.16493	1.706	0.683	0.506	0.0322
DLTB_1	0.933	0.073	12.8	0.000	0.921
DLRGDP	-0.250	0.54	-4.61	0.000	0.432
DLRGDP*_1	0.287	0.119	2.42	0.022	0.173
DLMS_1	0.517	0.106	4.90	0.000	0.461
DLMS*	-0.384	0.150	-1.90	0.068	0.114
DLIR*	-1.20491	1.094	-1.10	0.289	0.0797
DLER	0.339	0.141	2.41	0.023	0.172
ECM_1	-0.0226	0.160	-0.141	0.889	0.001

R^2 = 0.981807 DW = 2.24 F(9,34) = 83.95 [0.000]**

Single Equation Diagnostic Tests

AR 1-2 test: F(2,32) = 0.48115 [0.6295]
ARCH 1-1 test: F(1,32) = 0.017772 [0.8962]
Normality test: Chi^2(2) = 2.3519 [0.3085]
RESET test: F(1,33) = 1.4703 [0.2469]

The result reveals that the estimated coefficients are significant with the theoretical expected sign. All variables have the same sign as expected. Particularly, in the short run, devaluation has a positive and significant impact on the trade balance of Ethiopia. An important feature of the error correction model is in the statistical significance of the respective error correction terms. In this case the error correction term (ECM-1) has a negative sign and its magnitude is not greater than unity. So, while estimated coefficients of the error correction terms show the speed of adjustment to equilibrium, their being negative and statistically significant also confirm the existence of a co integration relationship between trade balance and its determinates.

The estimated coefficient of the error correction term is -0.0226342 for trade balance. The implication of this is that each year the trade balance of Ethiopia adjusts itself to the equilibrium by 2.2%. The small estimated coefficient of the error term implies a slow speed of adjustment towards equilibrium. In addition, the reported F-statistics rejects the null hypothesis that the coefficients of all explanatory variables except the constant term are jointly zero. There is no an indication of serial autocorrelation as shown by the Breusch Godfrey LM test for serial correlation up to the fifth lag. The white test for heterocedasticity also does not reject the null hypothesis of homocedasticity errors. Moreover, the test for autoregressive conditional hetroscedasticity (ARCH) test (Engle, 1982) points that no ARCH structure in the error term is detected. Failure to reject the null of no ARCH indicates the existence of constant variance. Similarly, the general test for misspecification as provided by Ramsey's (1969) RESET test does not reject the null hypothesis of no functional misspecification in the estimated equations. Finally, the Jarque Bera test for normality indicates that the null hypothesis of normality distributed error terms is not rejected. The goodness of fit of the above models (R^2) shows that (98.18%) of the total variation in the dependent variable (LTB) is explained by the independent variables in the model. Thus, overall, the estimated model is statistically satisfactory.

4. Conclusion and Policy Implications

The current Ethiopian government employed devaluation as instrument of exchange rate policy to improve the balance of trade. The estimated long run and short run equations have showed that currency devaluation, which is proxied by real exchange rate, has a positive and significant impact on the trade balance of Ethiopia. Similarly, an increment in domestic interest rate, foreign money supply and real income will lead to an improvement in trade balance. However, domestic real income, domestic money supply and foreign interest rates have negative and significant impacts on trade balance of Ethiopia both in the short and long run.

The policy implication is that, difficulties in the trade balance should be corrected through an appropriate policy mix of income (growth), exchange rate, as well as money supply. Hence, devaluation of domestic currency can be used as a weapon to improve the trade balance of the economy. Moreover, fostering the domestic output and controlling the domestic money supply which has an inflationary pressure may also have a significant role for the improvement of trade balance.

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