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The effect of currency devaluation on output: The case of ethiopian economy

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This paper assesses the short and long run effects of currency devaluation on output growth in Ethiopia. The study is conducted by using quarterly time series data over the period ranging from 1998.Q1 to 2010.Q4 and employing a vector auto regression (VAR) model. By controlling the monetary and fiscal policies, it is found that currency devaluations are contractionary in the long run and neutral in the short-run. Other results are that monetary policy has positive effect on output growth, while total government expenditure has negative effect. Moreover, this study clarifies that devaluation explains a considerable part of real gross domestic product change in Ethiopia. Since the Ethiopian export is dominated by primary agricultural products, it is insensitive for the change in exchange rate; it is not also possible for the government to allow market forces to determine the value of Ethiopian birr. Policy intervention is needed to balance the adverse impact of exchange rate movements until the economy is well transformed from agricultural sector to industrial sector and then, the economy becomes less dependent on imported raw materials. Thus, monetary policy plays a bigger role since it affects the total output positively and significantly.

Key words: Currency devaluation, output, vector auto regression (VAR).

INTRODUCTION

Up to 1970s, countries have the same consensus on the possible effect of currency devaluation on economic growth. There appears a consensus view on the fact that devaluation or depreciation could boost domestic production through stimulating the net export component. This is possible because devaluation increases international competitiveness of domestic industries which leads to the diversion of spending from foreign goods to domestic goods. Up to this period, devaluation has expansionary effect on output. It would improve trade balance, alleviate balance of payment deficits, and accordingly expand output and employment (Acar, 2000).

In the recent period, devaluation has become the basic macroeconomic policy issue in most less developed countries. The effect is contractionary or expansionary depending on the structure of the economy. During the structural adjustment program, the international monetary fund (IMF) and world bank (WB) suggested for developing countries to devalue their currency for the development of domestic firms. Devaluation increases the demand for domestic product and protects infant firms from outside competition (Genye, 2010). Krugman Taylor (1978)

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examine the negative effect of currency devaluation on output in developing countries which has used devaluation as a policy strategy. However, many researchers found different results on the effects of currency devaluation on output in less developed countries.

Some researchers examined that devaluation has mixed results. Even though ambiguous results were observed, developing countries have actively used devaluation as a policy instrument. This study investigates the long and short run impacts of currency devaluation on output growth in Ethiopia for two reasons. First, the country has short history of using exchange rate adjustments as policy tools to promote external competitiveness. Since 1992, Ethiopia devalued its currency where the 'Birr' exchange rate is adjusted continuously rather than discretely, as it was previously the case. Second, Ethiopia is heavily dependent on agricultural products and imported intermediate goods that would have contractionary effect on output. In addition, research outputs on the effects of currency devaluation in Ethiopia are very scanty. A research output done by Genye (2010), which is the recent antecedent to this study, addresses the effect of currency devaluation on output growth in Ethiopia based on time series data from the year 1980 to 2010. However, results from this study have limited policy implications as it did account for the fixed exchange rate of the Derge regime. This study has contributed to the literatures in such a way, it covers a period ranged from 1998.Q1-2010.Q4, during which Ethiopia was experiencing currency devaluation, and the study depends on a quarter data rather than annual data. The other paper, Taye (1999), found the effect of devaluation on the macroeconomic performance of Ethiopia is not sector specific and has time gap with this study.

Empirical Literatures

Empirically, many researchers give different results for the effect of currency devaluation on real output growth. In some countries, devaluation is contractionary while it is expansionary in some other countries. In some cases, devaluation has mixed results (that is, both contrationary and expansionary) in the short and long run. In some other countries, the effect is neutral.

Typically, this controversial issue is more sensitive in less developed countries. Ratha (2010) supported the traditional view of devaluation for the case of India. The result showed that devaluation has contractionary effect in the short run, but the effect is expansionary in long run.

After 1970s, the international organizations like IMF and WB suggested the less developed countries to adopt the structural adjustment program (SAP). Researchers like Narayan and Narayan (2007) support this idea in their study on Fiji. Devaluation is expansionary in the long and short run; whereas a research conducted on developing countries by Agenor (1991) states that expected devaluation is contractionary while unexpected devaluation has expansionary effect.

Many researchers tested the possible effect of devaluation in the long run as well as short run. Most results suggest that devaluation is contractionary in least developed countries (LDCs), while some others expansionary and some researchers' found neutral (zero) result as well. Edwards (1986) in his study in LDCs, devaluation has contractionary effect in the short run, but the effect changed into expansionary in the long run. Unlike Edwards, Acar (2000) has found different results on the effect of devaluation in less developed countries. Accordingly, devaluation is expansionary in the short run and neutral in the long run. Both Edwards and Acar used lagged variables as explanatory variable in their model.

On the other hand, various researchers obtained different result of devaluation on output growth. Researchers like Gylfason and Schimid (1983), and Connolly (1983) supported the conventional effect of devaluation on output. However, Gylfason and Risager (1984) confirmed the modern view of devaluation in developing countries. Whereas, researchers like Bahmani-Oskooee (1998) found that devaluation has neutral (zero) effect in the long run.

A study done by El-Ramly and Abdel- Haleim (2008) in Egypt on the effect of devaluation on output by applying a VAR model, the effect is contractionary in the short run, whereas expansionary in the long run. This different result of currency devaluation in different countries comes from the economic structures of the countries, the model adopted and the variable used by researchers. Some empirical studies on the effect of devaluation on output is not adequately control economic variables. These economic variables are terms of trade, government expenditure, money supply and exchange rate. Kalyocu et.al (2008) by using error correction model found mixed results. In the same token et al. (2008) by using error correction model found different results in the short and long run.

A study by Galbotswe and Andrias (2011), on the effect of devaluation by using error correction model with appropriate stance for monetary and fiscal policy the effect is contractionary in the long run while it is expansionary in the short run. Miteza (2006) tests the effect of devaluation on output in a group of five transition economy. He use panel unit root and panel co-integration test. Based on the result devaluation has contractionary effect on output in the long run. Kandil and Mirzaie (2005), in their study investigate the effects of anticipated and unanticipated devaluation in less developed countries. Unanticipated devaluation has expansionary effect on output, whereas anticipated devaluation is contractionary. Due to unavailability of data, there is no significant research output on the effect of devaluation in Ethiopian economy. On the other hand, the empirical studies on this topic that focus on Ethiopia have been extremely limited. Taye (1999) as cited in El-Ramly and Abdel-

Table 1. Summary of empirical studies that suggests the contractionary effect of devaluation.

No	Author	Year	Region	Period
1	Van-Wijinbergen	1986	LDCs	
2	Edwards	1986	LDCs	
3	Nunnenkamp and schweickert	1990	LDCs	Short run
4	Agenor	1991	LDCs*	
5	Domac	1997	Turkey*	
6	Taye	1999	Ethiopia	
7	Upadhyaya et al	1999	Latin America	
8	Acar	2000	LDCs	Long and short
9	Miteza	2006	5 Emerging economies	Long run
10	Yiheyis	2006	20 African Countries	Short run
11	El-Ramly and Abdel-Haleim	2008	Egypt	Short run
12	Galebotswe and Andrias	2011	Open import dependent	Long run
13	Ratha	2010	India	Short run
14	Genye	2010	Ethiopia	Short run

Source: Researcher's own computation

Table 2. Summary of empirical studies suggests neutral effect of devaluation.

No	Author	Year	Region	Period
1	Upadhyaya and Upadhyaya	1999	6 Asian countries	
2	Upadhyaya et al	2009	Kenya Tanzania Uganda	Short run

Source: Researcher's own computation

Haliem, (2008), used a macro simulation approach to a macroeconomic model for Ethiopia found that devaluation has positive impact on the current account balance. The result reveals that devaluation reduces import and increase export, while it decreases output and employment.

According to Genye (2010) in Ethiopia, devaluation has contractionary effect in the short run. She uses variables like private investments, openness, education, war beside the exchange rate. Thus, the result suggests that devaluation has expansionary effect on output in the long run (Table 1-3).

MODEL SPECIFICATION

Edwards (1986) investigated whether devaluation is contractionary or expansionary, he considered the important effect of policy variables like monetary, fiscal and trade policy on economic activities in developing countries. In his model, variables included the ratio of government expenditure to nominal income, money supply, terms of trade, the real effective exchange rate and real output are incorporated.

Nominal devaluation translated into real devaluation when the real effective exchange rate is accompanied by policy variables. In this study the real effective exchange rate (REER) is incorporated as variable of interest. This variable is accompanied by macroeconomic variables, in particular fiscal and monetary policy. Appropriate stance for monetary and fiscal policies is included in this model because of their crucial role in sustaining the real devaluation.

This study employs the vector auto-regression (VAR) technique to test the effect of devaluation on output in the Ethiopian economy. The VAR model is a means of overcoming the limitations of traditional approach in estimating economic variables. According to Ramly and Abdel-Haleim (2008), when variables has simultaneity bias the feedback relationship between the dependant and independent variable results in biased coefficients and standard errors if estimated by ordinary least square (OLS) method. Charmeza and Deadman (1997) cited in Ramly and Abdel-Haleim (2008), the traditional multi equation modeling has been criticized on the bases of two main assumptions namely (i) the zero restriction assumption imposed on some variables as a resolution for the identification problem and (ii) initial division of variables in to exogenous and endogenous variables.

In the VAR model there is no particular relationships imposed on the variables. Before estimation, the VAR model the optimal lag length should be determined and all variables deals with endogenous in the system. This avoids the simultaneity problem in the system. The relationships between macroeconomic variables are affected by reverse causation like real exchange rate and output. "Considering the reveres causation between real exchange rate and output, the real devaluation often found to accompany macroeconomic contractions while real revaluation often accompany macroeconomic expansions" Ramly and Abdel-Haleim (2008).

In assessing the impact of devaluation on output, most of the earlier researchers have included in their model a stance of fiscal policy as well as a stance of monetary policy in addition to the interest variable (that is, real exchange rate). Therefore, this study follows researchers like Edwards (1986), Bahmani-Oskooee (1998),

Table 3. Summary of empirical studies that suggests the expansionary effect of devaluation

No	Author	Year	Region	Period
1	Nunnenkamp and schweickert	1990	LDCs	Long run
2	Agenor	1991	LDCs	
3	Bahmani-Oskooee	1998	Fiji	
4	Acar	2000	LDCs	Medium
5	Upadhyaya et al	2004	Greece & Cyrus	Short run
6	Yiheyis	2006	20 African Countries	Long run
7	El-Ramly and Abdel-Haleim	2008	Egypt	Long run
8	Kalyoncu et al	2008	OECD	
9	Upadhyaya et al	2009	Kenya Tanzania Uganda	Long run
10	Galebotswe and Andrias	2011	Small open import dependent countries	Short run
11	Ratha	2010	India	Long run
12	Genye	2010	Ethiopia	Long run

Source: Researcher's own computation

Bahmani-Oskooee and Kutan (2008) and Galeboswe and Andrias (2011) to adopt the following model specification:

$$LRGDP_t = \beta_0 + \beta_1 LREER_t + \beta_2 LM2_t + \beta_3 LG_t + \varepsilon_t$$

$RGDP$- Real Gross domestic product is a function of money supply, government expenditure and real effective exchange rate.

$REER$ - Real effective exchange rate has no predetermined sign on output growth.

$M2$ - Broad money supply as a stance of monetary policy has expected positive sign.

G - The amount of total government expenditure as a stance of fiscal policy has expected positive sign.

ε_t Error term

The above equation is a long run model in which real gross domestic product (RGDP) is a measure of real output; M2 is broad money supply as a stance of monetary policy; G is real government expenditure as a measure of fiscal policy; and the real effective exchange rate (REER) is the policy variable, and ε is an error term. Following macroeconomic theories, monetary and fiscal policies have expansionary effect on output in the long run, if we would expect estimates of β_2 and β_3 is positive.

When the REER is decline, it reflects real depreciation of domestic currency against trading partners. Therefore, real depreciation is expansionary, if an estimate of β_1 is negative. Unless, real depreciation is contractionary, if an estimate of β_1 is positive.

RESULTS

Testing variables for stationary is the first step in time series data analysis. Variables should be stationary in the same order, unless it leads to spurious regression results. The co-integration analysis and the associated error correction modeling are among the next steps, and are recent solution to the problem of estimating relationship to the variables that have unit roots. (Table 4).

The first step in estimating a VAR model and undertaking co-integration test is determining the optimal lag length. Length selection criteria which are the sequential modified Likelihood ratio test statistic (LR), final prediction error (FPE), akaike information criteria (AIC) and the hannan-quinn information criterion (HQ), are used in this study. All this information criteria confirms four optimal lag lengths at 5% level of significance (Table 5).

All variables in this model are integrated of the same order I (1). This permits to conduct test for co-integration among variables. The trace statistics adjusted for degrees of freedom confirms that the null hypothesis of one co-integrating vector is not rejected at 5% significance level. This indicates the presence of one co-integrating vector in the system. The test is reported in the following table (Table 6).

The result depicted in the above table reports the existence of one co-integrating vector in the system. The null of no co-integration vector is rejected at 5 % significance level. On the other hand, the null that there exists at most one co-integrating vector is accepted.

$$LRGDPt = \underset{(4.4689)}{0.29061}\, LREERt + \underset{(5.4540)}{0.7451154}\, LM2t - \underset{(-2.8402)}{0.27587}\, LGt$$

In line with the definition of real effective exchange rate, the regression result shows that currency devaluation has contractionary effect in the long run, and broad money supply (M2) as stance of monetary policy produced a significant and positive effect on output. But, total government expenditure as a stance of fiscal policy has a negative effect on output growth.

From the forgoing discussions, the variable real effective exchange rate has positive sign and statistically significant in affecting output growth. Thus, increase in real effective exchange rate by one percent increases

Table 4. Unit root test.

Variables	Specifications	ADF statistics	PP statistics	Order of integration
LRGDP	With C	0.378815	2.5478	
	With C and T	-1.445699	-1.2746	
DLRGDP	With C	-4.2648**	-3.3464*	I(1)
	With C and T	-5.1310**	-3.428847*	
LREER	With C	-1.147379	-1.258273	
	With C and T	-1.623180	-1.734994	
DLREER	With C	-6.1602**	-6.1453**	I(1)
	With C and T	-6.1530**	-6.1339**	
LM2	With C	3.059563	3.50759	
	With C and T	-1.20101	-1.07552	
DLM2	With C	-6.8621**	-6.86377**	I(1)
	With C and T	-7.3285**	-8.79454**	
LG	With C	-1.0496	-1.343112	
	With C and T	3.0793	-1.28045	
DLG	With C	-9.7101**	-9.7829**	I(1)
	With C and T	-9.6100**	-9.6805**	

Table 5. VAR Lag Order Selection Criteria.

Lag	Log L	LR	FPE	AIC	SC	HQ
0	81.72578	NA	4.30e-07	-3.307480	-3.150021	-3.248227
1	317.9179	422.1305	3.68e-11	-12.67736	-11.89006	-12.38109
2	354.8314	59.68991	1.54e-11	-13.56729	-12.15016	-13.03401
3	385.2341	43.98694	8.66e-12	-14.18017	-12.13320	-13.40988
4	424.8030	50.51355*	3.43e-12*	-15.18311*	-12.50630*	-14.17581*
5	438.9455	15.64698	4.25e-12	-15.10406	-11.79742	-13.85975

output growth by 0.29061%. The inverse is true devaluation (decrease in real effective exchange rate) by one percent promoted economic growth by 0.29061% in the long run. This result is consistent with researchers like, Wijinbergen (1986) in LDCs, Taye (1999) in Ethiopia, Upadhyaya et al (1999) Latin America, Acar (2000) in LDCs, Miteza (2006) in 5 emerging countries and Galebotswe and Andrias (2011) in small import dependant countries. But, it is inconsistent with researchers like Nunnenkemp and Scheickert (1990) in LDCs, Yiheyis (2006) in 20 African Countries, El-Ramly and Abdel–Haleim (2008) in Egypt, Rathta, (2010) in India and Genye (2010) in Ethiopia.

From the above long run model, money supply has a positive contribution for the economic growth of Ethiopia. In fact, the coefficient 0.7451154 indicates that a 1% increases in the broad money accounted for 0.7451154 % increase in the real gross domestic product in Ethiopia.

Total government expenditure has a negative effect on economic growth implying that, large size of government expenditure goes to current expenditure. Thus, current expenditure may have impeded growth by reducing the resources available for capital expenditure. Data used for this study is after 1997.3Q, during this period, government current expenditure were higher than capital expenditure. Defense expenditure, poverty targeted expenditure (which includes education, health and agriculture) and expenditure on interest payment constitute the most important components of current expenditure. As a result,

Table 6. Co-integration Rank Test.

Null	Alternative	Trace Statistics	Eigen Value	5% critical Value	P - value	Hypothesized No. of CE(s)
Trace[1]						
r = 0	r ≥ 0	57.45124	0.445957	47.85613	0.0049	None *
r ≤ 1	r ≥ 1	29.69709	0.335736	29.79707	0.0513	At most 1
r ≤ 2	r ≥ 2	10.47057	0.145294	15.49471	0.2463	At most 2
r ≤ 3	r ≥ 3	3.091654	0.063663	3.841466	0.0787	At most 3
Maximum Eigen value[2]						
r = 0	r = 1	27.75415	0.445957	27.58434	0.0476	None *
r = 1	r = 2	19.22652	0.335736	21.13162	0.0905	At most 1
r = 2	r = 3	7.378914	0.145294	14.26460	0.4453	At most 2
r = 3	r = 4	3.091654	0.063663	3.841466	0.0787	At most 3

[1]Trace statistics accepted at least one co-integrating vector
[2]Maximum Eigen value accepted there is exactly one co-integrated vector in the system

Table 7. Result for the vector error correction term (VECT).

Variables	Coefficient	Std. Error	t- Value	Prob.
ECM_1	-0.051403	0.02377	-2.16265*	0.0390
D(LRGDP(-1))	1.813536	0.16280	11.1399	0.0000
D(LRGDP(-2))	-1.664093	0.31940	-5.21009	0.0000
D(LRGDP(-3))	0.944422	0.30747	3.07162	0.0046
D(LRGDP(-4))	-0.235922	0.16917	-1.39459	0.1737
D(LREER(-1))	-0.003606	0.01579	-0.22845	0.8209
D(LREER(-2))	-0.007052	0.01461	-0.48281	0.6329
D(LREER(-3))	-0.022531	0.01512	-1.48996	0.1470
D(LREER(-4))	0.016301	0.01575	1.03513	0.3092
D(LM2(-1))	0.037495	0.03685	1.01757	0.3173
D(LM2(-2))	0.018880	0.03269	0.57748	0.5681
D(LM2(-3))	0.049870	0.03221	1.54822	0.1324
D(LM2(-4))	0.033360	0.03211	1.03881	0.3075
D(LG(-1))	0.009482	0.00739	1.28347	0.2095
D(LG(-2))	0.005317	0.00535	0.99362	0.3286
D(LG(-3))	0.007487	0.00460	1.62874	0.1142
D(LG(-4))	0.006558	0.00572	1.14678	0.2608
CONSTANT	-0.003171	0.00340	-0.93387	0.3581

long run responsiveness of real gro9ss domestic product (GDP) to the change in total government expenditure is -0.27587. It means that a 1% increase in total government expenditure decreases real GDP by 0.27587 %.

The Dynamic Model

Having obtained the long run model and estimated coefficients, the next step is to determine 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 (Table 7).

In modeling short-run dynamics, all weakly exogenous variables which are considered in the long run are entered into the right hand side of the model by differencing. The main reason for differencing this variable is due to the fact that there would be high level of correlation between current and lagged values of the variables, which would

therefore result in problems of multi co-linearity.

The coefficients of vector error correction terms interpreted as speed of adjustment to the long run model. This result suggested that, the coefficient is less than one, negative and statistically significant. The result confirms the model converges to its long run and the speed of adjustment is too slow. Only each quarter over 5% of the disequilibrium is adjusted.

In general, this study gives mixed results on the relationship between devaluation and output growth in the short-run and long-run. Results from short run econometric analysis confirms that devaluation has no significant effect on Ethiopian output in the short run, while it is contractionary in the long run.

CONCLUSION

The long and short run results of this study are confirmed by the help of co-integration and vector error correction models. In the long run, devaluation has negative effect on output, while the effect is insignificant in the short run. Thus, in the long run devaluation has contractionary effect in Ethiopian output.

Different authors give different argument for the negative effect of devaluation in the long run. According to Cooper (1971), Krugman and Taylor (1978) and Edwards (1986), devaluation may create contractionary effects through imported cost, real balance, income distribution, external debt, speculative demand, trade liberalization, tax, wage indication and cost of working capital channels. Developing countries like Ethiopia depends on exports of agricultural products and the export elasticity of their product is insensitive. Devaluation increases the cost of imported items and raw materials. Since the major imported item in Ethiopia is petroleum, it significantly affects the value of import. By doing so, devaluation harms real gross domestic product in the long run.

Monetary policy has a positive and significant role in affecting the overall performance of Ethiopian economy. Based on the result, total government expenditure (including current and capital expenditure) has a negative effect on output growth. From the forgoing discussion, current expenditure accounts large proportion of total government expenditure, implying that large proportion of government expenditure goes to consumption expenditure like salaries, pension payment and defense expenditure.

Even though, devaluation helps the growth of some sectors in the economy, the foreign exchange earnings may not be sufficient enough to cover imported costs. This is true when the supply side channel is greater than the demand side channel of devaluation. Thus, the final result is reducing the economic growth unless the government reduces imported materials and reverts to other options. So, government should use other options such as import restriction like import quota, and tariff on selected imported items to improve the external sector rather than rather than intensive devaluation.

The study clarify that real exchange rate variation explain a considerable part of real gross domestic product change in Ethiopia. Since the Ethiopian economy is dominated by primary agricultural products, it is insensitive for the change in exchange rate. Thus, it is not possible for the government to allow market forces to determine the value of Ethiopian birr. Policy intervention is needed to balance the adverse impact of exchange rate movements until the economy become well transformed from agricultural sector to industrial sector and then, the economy becomes less dependent on imported raw materials. To this end, monetary policy plays bigger role since it affects the total output positively and significantly.

Conflict of Interests

The author have not declared any conflict of interests

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APPENDIX

Model stability test

Impulse response function