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Exchange Rate Policy and GDP growth in Ghana

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Abstract

The study aims at examining the relationship between exchange rate policy (adjustment) and GDP growth in Ghana. The Auto Regressive Distributed Lag (ARDL) method was used to compare the effects of devaluation on GDP growth in short run and long run periods in the economy of Ghana. The findings revealed that both the long run and short run devaluations of the cedi have improved the economy, but the impact is low. The long run nominal exchange rate coefficient of -0.23624 means a 1% devaluation of the cedi will result in 0.23624% improvement in GDP. Also the research shows that both the long run and the short run depreciation of the cedi have impacted positively on the economy, but low. The long run co-efficient of -0.25231 means a 1% depreciation of the cedi will result in 0.25231 increase in GDP. In the ECM model for fixed exchange rate, the speed of adjustment of -0.62131 is quite high. The coefficient of -0.62131 implies that it will take less than 2 years for disequilibrium in the dynamic (short run) model to be restored. Also in the ECM model for flexible exchange rate the speed of adjustment is quite high. The co-efficient of -0.53211 means it will take less than 2 years for disequilibrium in the dynamic model to be restored. The findings suggest that reduction in the value of the cedi, either through devaluation or depreciation has impacted positively on GDP growth, but low. The following policy recommendations are suggested to put the economy onto a sustainable growth path; To improve upon macroeconomic performance (GDP growth), it is highly recommended that the government should embark on policies aim at boosting output in the various sectors of the economy namely agriculture, industry and tertiary. Micro credit, irrigation, storage facilities should be made available to farmers in order to increase their output. In short the government should strengthen and diversify production capacity.

Keywords: exchange rate; GDP growth; fixed exchange rate regime; flexible exchange rate regime; devaluation; depreciation; ARDL co-integration approach.

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1. Introduction

Until the introduction of economic recovery programme (ERP), the growth rates of developing countries including Ghana have been disappointing. For example the average growth rate of the country in the 70s stood at about 2%. Extensive implementation of liberalization and adjustment policies in the 1980s produces some growth in agriculture and manufacturing. For the entire period 1984-1988, GDP recorded annual growth rate of 5%. The country is also beset with high rate of inflation. Inflation became a serious problem in Ghana in the late 1970s. From the rate of 56% in 1976, inflation peaked at 117% in 1977 and the decade ended with 54%. This was a monetary phenomenon because while the GDP recorded negative growth rates of -12%, -4% in 1975 and 1976 respectively, money supply grew at the rate of 25% and 44% for 1974 and 1975 respectively. Inflation reached its peak again in 1983 of 123%. The main cause of inflation was explained by Sahelian drought and the widespread bush fires that destroyed farm produce, sharply reducing supply of food and other consumables. A number of factors could account for this poor performance. One of the main ones is thought to be policy – induce distortions in the economy. It was therefore thought that through appropriate exchange rates, fiscal, monetary, trade and payment policies, these distortions could be removed; creating a structure that would favour the productive sectors of the economy.

Ghana's exchange rate policy before the introduction of the economic recovery programme, had involved the maintenance of a fixed exchange rate with occasional devaluations (March 1957 –March 1983). Under this system the official exchange rate was over-valued. The Nkrumah government rejected pressure from the Bretton Woods Institutions (World Bank and IMF) to accept an orthodox stabilization policy, including devaluations as a means of correcting balance of payment deficit and increase GDP which had remained negative for four consecutive years since 1964(IMF World Report). The country continues to maintain an over-valued fixed exchange rate, until the overthrown of the CPP government in 1966 by the national liberation council (NLC) – a military government was established. Ghana experiences its first devaluation by (NLC) government, in November 1967. The cedi which was pegged at ¢ 0.71 to $1 in 1966 was devalued to ¢1.02 to $1. As a result there was an increase in exports by 6.04 percent between 1966 and 1967, while imports declined by 18.9 percent within the same period. The civilian government that followed the NLC, that is the progress party (pp) led by Dr. Busia devalued the currency the second time. The cedi which was pegged to the dollar at ¢1.02 in 1970 was devalued to ¢1.82 to the dollar in 1971, representing 44 percent, but later revalued to ¢1.28 = $1. One of the reasons cited by the Acheampong regime (SMC) for overthrowing the Busia regime was the massive devaluation. The cedi was revalued in 1973 and 1974 i.e. ¢1.17 = $1 and ¢1.15=$1 respectively. In June 1978, Ghana introduced a flexible exchange rate system under which the exchange rate for the cedi in terms of the US dollar was to be adjusted to reflect the underlying economic, financial and balance of payments situation. Such adjustments were discontinued in August 1978 when the rate of exchange was fixed at ¢2.75 = $1.00 by the (SMC II) government, since the rate was considered overvalued. This was the rate inherited by the Provisional National Defense Council (PNDC) in 1981.

The economic recovery period has been characterized by massive reforms in exchange rate policy. The country has shifted from the fixed exchange rate regime (that is those that peg the domestic currency to one or more currencies) of the pre-adjustment period to a regime of "managed float" in which rates are determine at weekly

auctions. The auction system is a transitional mechanism that will move the country pegged exchange rate regime to floating or flexible exchange rate regime (that is those that determine the external currency more or less by the market supply and demand for it). In October 1983, the exchange rate of the cedi to the dollar stood at ¢30 = $1, during 1985, the exchange rate of the cedi was adjusted three times, culminating in a rate of ¢60 = $1. In 1986 the exchange rate was again adjusted to ¢90 = $1, representing a depreciation of 33.3 percent.

The first auction, which was held on September 19 1986, was based on the marginal pricing auction systems (MAPS) in the determination of exchange rate, by the government of the Provisional National Defense Council (PNDC). These rates were to be determined by "market forces" through biddings. A bidder was required to state the currency, the amount being bid for and the bid price he/she was willing to pay. The primary objective of the auction system was to bring about a further depreciation of the cedi and to ensure a reduction in the spread between the official and the parallel market exchange rates. The auction system commence with two "windows" – 1 window for official transactions and 2 windows for all other transactions. At the beginning, transactions through window 1 were allowed at the fixed exchange rate of ¢90 to the dollar. In February, 1987, however, the two windows were merged and all foreign transactions were made at the auction – determined marginal rates.

In an attempt to eradicate the parallel market, the government legislate the setting up of purely private market – oriented foreign exchange bureau. The establishment of the Forex Bureau, couple with other trade and payment policies brought in since Economic Recovery Programme, liberalized the foreign exchange market, and consequently enhanced the government trade liberalization policies. The country foreign exchange policy is flexible exchange rate system. This policy has impacted positively on the economy of Ghana. There has been gradual increase in GDP (5%), inflation has been reduced to about 17% and there has been an improvement in the balance of payment position of the country. It should be noted however that this achievements was short live. For example GDP growth in the early 1990's averaged 2%.

Several factors could account for the poor performance (low GDP growth). One of the main ones is thought to be policy-induced distortions in the economy. It is in the pursuit of this problem that the study seeks (aim) to investigate whether the low GDP growth i.e. the downward trend could be reversed with appropriate foreign exchange rate policy. It is important for researchers to research into this area, so as to find out whether the change in the exchange rate policy has had any positive effect on GDP growth in Ghana. This will help reveal the problem of improving GDP growth and finally present a study capable of making an original contribution to knowledge. The study is also very relevant, because the exchange rate policy and trade liberalization have been integral preoccupation of various governments of Ghana since the IMF Economic Recovery Programme of 1983. Also most of the research carried out by researchers on the effect of exchange rate policy and GDP growth in Ghana cover only the fixed exchange rate regime or a short period into the recovery programme. This study covers a longer period into the reforms i.e.(1965-2015)

2. Theoretical Framework

2.1 Theoretical Review on Determination of exchange rate

The exchange rate by definition; is the price of foreign currency in terms of domestic currency. It can be rigidly fixed or freely determined by the market forces. That is, the demand for and the supply of foreign exchange. With this definition a rise in the exchange rate means that foreign currency has become more expensive and therefore corresponds to a weakening or depreciation of the domestic currency. Similarly a fall in the exchange rate corresponds to an appreciation of the domestic currency. This definitions imply that the real exchange rate- the price of foreign goods in units of domestic goods denoted *e* is *EP*/P*, where E is the nominal exchange rate, P*= price of foreign goods and P = price of domestic goods. A higher real exchange rate implies that foreign goods have become more expensive relative to domestic. Both domestic residents and foreigners are therefore likely to increase their purchases of domestic goods relative to foreign ones. The reverse is the case. Real effective exchange rate, similar to real exchange rate is a weighted average. It comprises a number of countries and for that matter a basket of currencies which weighted average has been found.

According to [1] as a price, similar to the price of other commodities, the exchange rate is determined by the supply and demand for foreign exchange. References [2,3] postulate that prominent among the competing theories of exchange rate determination in a regime of floating exchange rate, which emerged as the dominant exchange rate model at the start of the recent float in the 1970s is the monetary approach. This approach rest on the view that the exchange rate between two national currencies is determined by their respective national money supplies and demands and the resulting effects on their general price levels. The main assumption necessary for monetary approach to exchange rate determination can be summarized as follows;

First assumption is that demand for money is a stable function of real income and interest rate. Under this assumption numerous studies have been carried out to establish the stability of demand for money and there is no consensus among researchers about the exact nature of the demand for money function (see [4] for excellent review of this debate).

Second, assume that there are no trade barriers. The international price equalization or the law of one price states that given the free trade, two economies in the long-run face the same general price level.

Given the above assumption, monetary approach to exchange rate determination claim that the excess supply of money in an economy creates capital outflows, and if exchange rates are flexible then leads to a depreciation of the value of domestic currency. On the other hand, factor that causes excess demand for money can create appreciation of the domestic currency. Thus, the determination of exchange rate is the same as the determinants of excess supply (or excess demand) of money in the economy.

Beginning with the demand for money function, it is assumed that

$$M_d = K.P.Y^a.I^b \quad \ldots\ldots (1)$$

Where M_d = Money demand, P = General price level (CP1), Y= Real national income, I = Nominal interest rate, K= Constant term and a, b are parameters such that a = Income elasticity, b = Interest rate elasticity of demand for money

Assuming that purchasing power parity holds the exchange rate is determined as

$$E = \frac{p}{p^*} \quad \text{..... (2)}$$

Substituting the value of *P* and *P** from equation (a) in equation (b),(making P the subject of the

equation (a)) we get the following;

$$E = \frac{\frac{M_d}{K.Y^a.I^b}}{\frac{M_d^*}{K^*Y^{a*}.I^{b*}}}$$

$$\therefore E = \frac{M_d.K^*.Y^{a*}.I^{b*}}{M^*d.K.Y^a.I^b} \quad \text{.....(3)}$$

Assuming fully flexible interest rates we can take the demand for money equal to supply of money in both countries and therefore write,

$$Md = M \quad \text{..... (4)}$$

Hence equation (c) can be written as

$$E = \frac{M.K^*.Y^{a*}I^{b*}}{M^*.K.Y^a.I^b} \quad \text{..... (5)}$$

Taking the logarithms of both sides of equation (e) we get the reduced form equation of exchange rate determination as

$$LogE = logM + a^*logY + b^*logI - log\ M^* - alogY - blogI + e \quad \text{.....(6)}$$

Where *e* is the error term

The form of equation 6 can be simplified for the sake of estimating it's co-efficient by using the following alteration.

$$LogE = a + a_1logM + a_2logM^* + a_3logY + a_4logY^* + a_5logI + a_6log\ I^* + u \quad \text{..... (7)}$$

Where the expected signs of the estimated co-efficient are:

$a_1 > 0$,Since we expect that with increase in domestic money supply there is excess supply of money given the stable demand for money. This leads to depreciation of the domestic currency and appreciation of the foreign

currency.

$a_2 < 0$ since we expect that with increase in foreign money supply**,** domestic currency would appreciate.

By similar reasoning, $a_3 < 0$, $a_4 > 0$, $a_5 > 0$ and $a_6 < 0$

A simplifying modification is made by many monetarists by assuming that interest rate, money supply and i

ncome effects on exchange rate are the same for domestic as well as foreign country, so that $a_1=a_2$, $a_3=a_4$

and$a_5=a_6$. Because of the assumption of this form, we can specify the model as follows

$$LogE=bo + b_1log(M/M^*) + b_2log(Y/Y^*) + b3Log(I/I^*) + e \quad\text{...(8)}$$

Secondly, the real interest rate variable appears to work the best when, it is divided into two of its components nominal interest rate and inflation rate. Here, at the cost of inviting the problem of multicollinearity. We introduce three measures of interest rate: real interest rate, nominal interest rate and inflation rate separately for the estimated equation. Hence, logarithm of exchange rate is seen as a function of logarithms of relative growth rate in money supplies, income levels, price levels, nominal Interest rates and real Interest rates.

Therefore,

$$logE = C_o + C_1log(M/M^*) + C_2log(Y/Y^*)+ C_3log(I/I^*) + C_4log(P/P^*) + C_5log(i/i^*) + \text{e} \quad\text{..............(9)}$$

where $C_1 > 0$, because of the domestic money supply grow faster than foreign money supply, exchange rate is expected to depreciate.

$C_2 < 0$ because as domestic GNP grows faster than foreign GNP, demand for money increases and exchange rate appreciates.

$C_3 > 0$, because when domestic nominal interest rate goes up faster than the foreign interest rate, demand for money (nominal) decreases and exchange rate depreciates.

$C_4 < 0$, because when domestic price level relative to the foreign price level increases, demand for money goes up and exchange rate appreciates.

$C_5 > 0$, because as real interest rate goes up faster than foreign real interest rate, the nominal demand for money is expected to go down causing depreciation of the local currency . From above it is clear there is relationship between exchange rate and GDP and inflation.

2.2 Theoretical Review on Determinants of Economic Growth

According to [1], the term Economic Growth is defined simply as the increase in national income or output

overtime. The rate of economic growth also refers to the ratio of increment in output to the total level of output in the previous period and equilibrium growth rate is that rate required to maintain full employment throughout a specific period.

Over the last two decades the determinants of economic growth have attracted increasing attention in both theoretical and applied research. Yet, the process underlying economic performance is inadequately conceptualised and poorly understood, something, which can be partly attributed to the lack of a generalised or unifying theory, and the myopic way conventional economics approach the issue.

Despite the lack of a unifying theory, there are several partial theories that discuss the role of various factors in determining economic growth. Two main strands can be distinguished: the neoclassical, based on Solow's growth model, has emphasised the importance of investment and, the more recent, theory of endogenous growth developed by [5] has drawn attention to human capital and innovation capacity. The starting point of conventional economic growth theorisation is the neoclassical model of Solow (1956). The basic assumptions of the model are: constant returns to scale, diminishing marginal productivity of capital, exogenously determined technical progress and substitutability between capital and labour. As a result the model highlights the savings or investment ratio as important determinant of short-run economic growth. Technological progress, though important in the long-run, is regarded as exogenous to the economic system and therefore it is not adequately examined by this model. Turning to the issue of convergence/divergence, the model predicts convergence in growth rates on the basis that poor economies will grow faster compared to rich ones. Technological progress, Openness to trade, Foreign Direct Investment (FDI) are all determinant of economic growth.

The 'three gap' models, extended the 'two gap' models developed during the late sixties by adding a fiscal (financial) to the traditional 'savings' and 'external ' gaps. The inclusion of the new gap into the analysis was the consequence of the two stylized facts that characterized the developing countries development process in the eighties.

2.3 Empirical Studies on Exchange Rate and GDP Growth

Exchange rate policy has been an important component of orthodox stabilization policy aim at improving GDP growth. Devaluation has been the consistent policy used in Ghana since 1967. It is supposed to lead to expenditure switching, increase production of tradable, higher export and consequently an improved external payment for the country. Such measures in other developing countries have been mixed results. In some instances, real devaluation has been contractionary. Such contractionary effects could happen through a negative real balance effects. Recently, a number of authors have criticized the role of devaluation in the traditional stabilization programs. It has been argued that, contrary to the traditional view, devaluation is contractionary and generates a declined in aggregate output. In spite of the renewed theoretical interest in the possible contractionary effects of devaluation, the empirical evidence on the subject has been quite sketch.

Reference [6] in his research paper entitle, Real overvaluation, terms of trade and cost to agric in sub-Saharan Africa , the case of the Sudan, he addresses the extent to which policy induced distortion influence the structure

for incentive for Agriculture.

Reference [7] model is extended to empirically address the issue of contractionary devaluations. The extended model considers the growth of money, fiscal factors, terms of trade changes and devaluation (exchange rate) on the level of real output. The results obtained, using, a variance components procedure on data for twelve developing countries, provide some support to the short run contractionary devaluation hypothesis. It is also found that after one year, devaluation will have an expansionary effect on output (the J-effect). The reduce form of their model is $Y_t = f(M_t, G_t, REER_t, TOT_t)$ *where Yt=real GDP growth, Mt=growth of money Gt=government expenditure, REERt=real effective exchange rate and TOTt=terms of trade*

Reference [8] examining the supply response of non-traditional export to policies under Economic Recovery Programme (ERP), identified exchange rate depreciation during the reforms as the major factor that boosted NTEs during the period.

2.4 Studies in Ghana

Reference [9] in his research paper, Ghana adjustment and growth(1983-1991) revealed that monetary policies since 1983 have been broadly successful in restraining the growth in domestic credit, while accommodating a strong expansion in real output and supporting the exchange rate policy.

3. Methodology and Conceptual Framework

In this research study, data was collected mainly from secondary sources. Annual data from 1965 -2015 was obtained. The period covered was subdivided into two to cater for fixed exchange regime and flexible exchange regime. The period 1965-1982 coincided with fixed exchange rate regime, while 1983-2015 was used for flexible exchange rate regime. This is to enable the study compare the relative performance of the two regimes. All the variables used are in logs form. Data on GDP growth was obtained from statistical service department (Accra) various issues. Terms of trade, money supply (M2) were obtained from Bank of Ghana annual report (Various issues). Other sources for obtaining data are International financial statistics (Various issues), Center for Policy Analysis (Various issues), the state of the Ghanaian economy (Various issues).

The study adopted economic a prior, statistical and econometric methods in analyzing the effect of exchange rate policy and GDP growth in Ghana. Attempt was made to model the impact of real exchange rate adjustment on economic growth. In this study, Reference [7] reduced form equation for real output to estimate the relation between GDP and the exchange rate was used. Thus the reduced form equation for our GDP growth is

$Y_t = f(Mt, Gt, REERt, TOTt,)$

Where *Y*= growth in *GDP growth*, *G* = the rate of Government Expenditure to GDP, *TOT* = Terms of Trade, *RER* = Real Exchange Rate M=Money Supply, t=Time

The relevant equation for the estimation in log form is given as

$lnY_t = \alpha_0 + \alpha_1 lnMt + \alpha_2 lnG_t + \alpha_3 lnREER_t + \alpha_4 lnTOT_t + e_t$

The expected signs of GDP growth model in both short run and long run are the following;

(1) $\delta Y_t/\delta M_t > 0$, if the rational expectation argument is correct, increase in money supply can be expected to have a positive effect on GDP growth in both short run and long run.
(2) $\delta Y_t/\delta G_t > 0$; the coefficient of the Government expenditure variable is expected to have a positive sign in both short run and long run.
(3) $\delta Y_t/\delta REER_t < 0$, A reduction in the cedi value will encourage exports and make imports dearer and improve the GDP in both short run and long run.
(4) $\delta Y_t/\delta TOT_t > 0$; An improvement in terms of trade would impact positively on GDP in both short run and long run.

It should be noted at this juncture that the same model is used for both fixed exchange rate regime (devaluation) and flexible exchange rate regime (depreciation).The data used however, have been divided into two to coincide with the two regimes. That is (1960-1982) fixed exchange regime and (1983-2015) flexible exchange rate regime.

3.1 Unit Root Test, Co-integration and the ARDL Approach

A two variable cointegration test requires that the variables be integrated of order one. In other words the series data should be stationary only in their first differences, and not in levels. A number of alternative tests are available for testing whether a series is stationary or not, the Augmented Dickey-Fuller (*ADF*), Dickey and Fuller (1979), as well as the Phillips Perron (PP) test developed by Phillips (1987) and Phillips and Perron (1988). The *PP* tests are based on the following *ADF* regression, and the critical values are the same as those used for the *ADF* tests:

$$\Delta X_t = \lambda_0 + \lambda_1 X_{t-1} + \lambda_2 T + \sum_{i=1}^{n} \psi_i \Delta X_{t-1} + \varepsilon$$

Where Δ is the difference operator, X is the natural logarithm of the series, T is a trend variable, λ and ψ are the parameters to be estimated and ε is the error term.

In both the *PP* and *ADF* unit root tests the null hypothesis is that the series is non-stationary and this is either accepted or rejected by examination of the t-ratio of the lagged term X_{t-1} compared with the tabulated values. If the t-ratio is less than the critical value the null hypothesis of a unit root (i.e. the series is non-stationary) is accepted. If so the first difference of the series is evaluated and if the null hypothesis is rejected the series is considered stationary and the assumption is that the series is integrated of order one $I(1)$. Critical values for this t-statistic are given in Mackinnon (1991). Depending on the result of the test above, the regression is specified either as error correction model subject to the test of co-integration or the use of Ordinary Least Squares (OLS) after the data has been differenced. If all variables are Integrated of the same order, I(d) and the residuals are

found to be integrated of order I(0), then Y(GDP growth) and their dependant variables are co-integrated. This research used Autoregressive Distributed Lag (ARDL) 'bound test' approach, because the sample size became small after dividing the total data sample into two for fixed and flexible exchange rate regimes. Also the ARDL could be used whether the variables are integrated in order I(0) or I(1).

3.2 The ARDL Co-integration Approach

A large number of past studies have used the Johansen co-integration technique to determine the long-term relationships between variables of interest. In fact, this remains the technique of choice for many researchers who argue that this is the most accurate method to apply for I(1) variables. Recently, however, a series of studies by [10] have introduced an alternative co-integration technique known as the 'Autoregressive Distributed Lag (ARDL)' bound test. This technique has a number of advantages over Johansen co-integration techniques. According to [10], the ARDL approach requires the following two steps. In the first step, the existence of any long-term relationship among the variables of interest is determined using an F-test. The second step of the analysis is to estimate the coefficients of the long-run relationship and determine their values, followed by the estimation of the short-run elasticity of the variables with the error correction representation of the ARDL model. By applying the ECM version of ARDL, the speed of adjustment to equilibrium will be determined.

1. The growth model

$$Y_t = f\left(M_t, G_t, REER_t, REER_{t-1}, TOT_t\right)$$

Log version, $\ln Y_t = \alpha_0 + \alpha_1 \ln M_t + \alpha_2 \ln G_t + \alpha_3 \ln REER_t + \alpha_4 \ln REER_{t-1} + \alpha_5 \ln TOT_t + \varepsilon_t$

Following [10] the error correction representation of the ARDL (ECM-ARDL) model is

$$\Delta \ln Y_t = \alpha_0 + \delta_1 \ln Y_{t-1} + \delta_2 \ln M_{t-1} + \delta_3 \ln G_{t-1} + \delta_4 \ln REER_{t-1} + \delta_5 \ln TOT_{t-1} + \sum_{i=1}^{n} \beta_i \Delta \ln Y_{t-i} + \sum_{i=1}^{n} \gamma_i \Delta \ln M_{t-i} + \sum_{i=1}^{n} \pi_i \Delta \ln G_{t-i}$$

$$+ \sum_{i=1}^{n} \eta_i \Delta \ln REER_{t-i} + \sum_{i=1}^{n} \theta_i \Delta \ln TOT_{t-i} + \lambda ECM + \varepsilon_t$$

4. Empirical Results and Analysis

This chapter presents the econometric result of the estimated GDP growth function (fixed and flexible) both in the long run and short run. It Commence with unit root test. The standard Augmented Dickey Fuller (ADF) and Phillips and Peron (PP) unit root test were used to check the order of integration of these variables. The determination of co-integration among the variables was conducted by F-Statistics. It is followed by long run and short run co-integration result on GDP growth both flexible and fixed exchange rate regime.

4.1 Unit Root and Co-integration Test Result

Two tests as indicated in chapter three were conducted to establish whether there exist a unit root in the variables using PP and ADF. In other words, they were used to check the order of integration of these variables. The result reported in table 4.1.for fixed exchange regime (1965-1982, the variables were tested at levels with trend and without trend. The variables are non-stationary at both trend and without trend with ADF and PP (see The results reported in table 4.2 Panel A). They all became stationery after first differencing (see Panel B)for flexible exchange rate system (1983-2005), the variables were tested with trend and without trend. The variables are non-stationary at both trend and without trend (see panel A). They all became stationary after first differencing (see panel B). The determination of co-integration among the variables was conducted by F-statistics, indicated in the Table 4.3 and 4.4

Table 4.1: Results of the Unit Root Test

Panel A : At Levels				
Variable	**ADF**		**PP**	
	Constant No Trend	Constant Trend	Constant No Trend	Constant Trend
Data Period: 1965-1982				
InY	-1.467323	-1.106135	-1.476112	-1.114140
LnM	-1.433401	1.305426	-2.433401	1.030326
Ln*G*	0.662164	-2.142242	-0.133551	-1.132242
Ln*REER*	0.677815	-1.335176	-1.116444	1.312512
LnTOT	1.355244	0.612432	0.3115510	1.163210
Panel B: First Difference				
Variable	**ADF**		**PP**	
	Constant No Trend	Constant Trend	Constant No Trend	Constant Trend
Data Period: 1965-1982				
$\Delta \ln Y$	-2.239379**	-2.134502	-2.114452**	-3.351561***
$\Delta \ln M$	2.140501***	-2.334530***	3.432234***	-2.434241***
$\Delta \ln G$	-4.053420***	-2.555433***	-5.010546***	-12.42322***
$\Delta \ln REER$	-2.162105***	-2.514565*	-3.141105***	-11.45430***
$\Delta \ln TOT$	3.211441***	2.154310**	-1.102245	-4.215024***

The null hypothesis is that the series is non-stationary, or contains a unit root.*, ** and *** indicate the rejection of the null hypothesis of non-stationary at 10% , 5% and 1% significance level, respectively

Table 4.2: Results of the Unit Root Test

Panel A : At Levels				
Variable	**ADF**		**PP**	
	Constant No Trend	Constant Trend	Constant No Trend	Constant Trend
Data Period: 1983-2015				
InY	-1.336202	-1.241315	-1.566336*	-1.463214*
LnM	-2.003244*	-1.513441	-1.546440*	-2.515552
Ln*G*	1.421210	0.223443	1.641210	0.346765
Ln*RER*	-1.100101	-2.245132	-1.215544	-2.414401
Ln*TOT*	-1.204313	-1.142103	-1.411011	-2.360523

Panel B: First Difference				
Variable	**ADF**		**PP**	
	Constant No Trend	Constant Trend	Constant No Trend	Constant Trend
Data Period: 1983-2005				
$\Delta \ln Y$	-5.403104***	-6.120111***	-5.216411***	-2.12635***
$\Delta \ln M$	-5.211342***	-5.244513***	-4.425105***	-4.654452***
$\Delta \ln G$	-2.122464**	-2.052431**	-2.162406**	-2.464034*
$\Delta \ln REER$	-3.050342***	-2.103243**	-2.035614***	-3.101524**
$\Delta \ln TOT$	-2.333407**	-2.132401*	-1.625152***	-3.445563***

The null hypothesis is that the series is non-stationary, or contains a unit root.*, ** and *** indicate the rejection of the null hypothesis of non-stationary at 10% , 5% and 1% significance level, respectively

Table 4.3: Bound Testing the existence of a Long Run Relationship (1965 - 1982)

Models	**Computed F-Statistics**	**Critical Values of the F-Test**	
		F-Statistic	Significance Level
$Y_t = f(M_t, G_t, REER_t, TOT_t)$	4.1461	2.223 – 3.340	10%

Table 4.4: Bound Testing the Existence of a Long Run Relationship (1983 - 2015)

Models	**Computed F-Statistics**	**Critical Values of the F-Test**	
		F-Statistic	Significance Level
$Y_t = f(M_t, G_t, REER_t, TOT_t)$	4.2201	2,121– 3.450	10%

The null hypothesis of no co-integration was tested against the alternative hypothesis of existence of co-integration, with the bound test. In all the computed F-statistics indicated in the table (4.3) and (4.4) are greater than the upper bounds values meaning the null hypothesis of no co- integration were rejected in favour of the alternative hypothesis of existence of co--integration at 10% significant level for both fixed and flexible regimes respectively.

4.2 Empirical Results of the GDP Growth Model

4.2.1 Estimates of Long Run Co-integration Vectors for GDP Growth Equation under Flexible Exchange Rate Regime

The empirical estimated long run co-integration of GDP growth and its dependent variables (regressors) depicts that not all the variables are statistically significant as shown in the Table 4.5**.** From the table, money supply show the right theoretical sign (positive) meaning that increase in money supply, impacted positively on the economy under the flexible exchange rate regime. The co-efficient of 0.31134 means that 100% increase in money supply will result 31% growth in GDP(Y) and it is statistically significant at 10%. Government expenditure (G) has the right theoretical sign (positive) and is statistically significant at 5%. The co-efficient of government spending (0.24473) means that 100% growth in government spending will cause about 24% growth in GDP. Stated differently 1% growth in government spending will result about 0.24% growth in GDP.

The estimated Real Effective Exchange Rate (REER) indicates that the parameter is not only significant at1%, but also shows the right sign. The elasticity obtained is -0.25231. This implies 100% depreciation in the Ghanaian cedi against the dollar will result 25.25% growth in GDP. Theoretically, if the Ghanaian cedi depreciates then this will raise the competitiveness of the domestic commodity and hence encourage export thereby increasing GDP growth.

The Terms of Trade has the correct sign as expected. That is improvement in the terms of trade will impact positively on the GDP growth. The co-efficient of 0.43421 implies a 100% improvement in the terms of trade will result .43% growth in GDP. It should be noted however that it is not significant even at 10%.

Having established what happens between the GDP growth and its explanatory variables in the Long run, the

effect of the short run relationship is discussed in the next step below as any co-integrated series can be estimated as error correction model.

Table 4.5: The Results of the Long-Run Co integrating Growth Equation under Flexible Exchange Rate

Dependent variable: In Y_t ARDL(0,1,0,0,0) selected based on Schwarz Bayesian Criterion

Regressor	**Coefficient**	**Standard Error**	**T-Ratio**
Constant	-4.1551	4.0677	-1.0244
$\ln M_t$	0.31134	0.21003	2.0021*
$\ln G_t$	0.24473	0.16167	2.2191**
$\ln REER_t$	-0.25231	0.06131	-3.0511 ***
$\ln TOT_t$	0.43421	0.34120	1.1432

4.2.2 The Result of the Short Run Vector Correction (GDP growth) Equation, Under Flexible Exchange rate

We can discern from the table 4.6 below that the empirical estimates of ECM of GDP growth and its explanatory variables depicts that the explanatory variables determined about 81% variation in GDP growth as indicated by the strong $R^{2.}$ Also the F-statistics depicts that the parameters (explanatory variables) jointly explain changes in GDP growth and is significant at 1% level (see table 4.6)

Table 4.6: The Results of the Short-Run Vector Error Correction Equation: Flexible Exchange Rate

Dependent variable: $In\Delta Yt$ ARDL(0,1,0,0,0) selected based on Schwarz Bayesian Criterion

Regressor	**Coefficient**	**Standard Error**	**T-Ratio**
Constant	-3.1772	4.0899	-1.0268
$\Delta \ln M_{t-1}$	0.13221	0.05915	2.7104**
$\Delta \ln G_{t-1}$	0.23542	0.26167	1.3710
$\Delta \ln REER_{t-1}$	-0.25141	0.12143	-2.3282**
$\Delta \ln TOT_{t-1}$	0.34242	0.67352	1.2986
ECM_{t-1}	-0.53211	0.07431	-5.43011***

$R^2 = 0.81$ $\bar{R}^2 = 0.75$ Log likelihood = -15.5095 F-statistic = 13.0053***

Schwarz criterion = -24.6431 Akaike information criterion= -21.5095

In order to check for the estimated ARDL models, the significance of the variables and other diagnostic tests such as serial correlation, functional form, normality test, and heteroscedasticity in the model pass all diagnostic tests in the first stage. The diagnostic test shows that there is no evidence of autocorrelation and the model pass the normality and the test proved that the error is normally distributed.

As discuss, the error correction term indicates the speed of adjustment to restore equilibrium in the dynamic model. The ECM co-efficient shows how quickly variables converge to equilibrium and it should be statistically significant co-efficient with a negative sign. Table 4.6 shows the expected negative sign of ECM and is significant at 1% level. This confirms the existence of the co- integration relationship among the variables in the model.

The co-efficient of the ECM for GDP growth model (flexible exchange rate) is -0.53211 and implies that the deviation from the long term growth rate in GDP is corrected by 53.11% in the GDP growth model by the coming year. This shows that the speed of adjustment is high.

The co-efficient -0.25141 of the real effective exchange rate (REER) implies that a 100% depreciation of the cedi will result 25% improvement in GDP growth.

Also the terms of trade co-efficient of 0.34242 for the long run means a 1% improvement in Terms of Trade will result a 0.3% increase in GDP growth. The coefficient of money supply 0.13221 implies a 100% increase in money supply will result 13 % rise in GDP growth.

4.2.3 Estimates of Long Run Co-integration Vectors for GDP Growth Equation, Under Fixed Exchange Regime

Under the fixed exchange rate in the GDP growth model increase in money supply has the correct theoretical sign. That is if rational expectation argument prevails, then increase in money supply will improve GDP growth. That is, there is a direct relationship between increase in money supply and GDP growth. The co-efficient of 0.24632 means that a100% increase in money supply, will result 25% growth in GDP.

Government expenditure has the correct theoretical sign expected. The coefficient of 0.35574 implies a 1% increase in Government expenditure will result about 0.4% increase in GDP growth.

The co-efficient of the exchange rate devaluation has the appropriate theoretical sign, though the impact is low. The negative sign of the co-efficient implies that, devaluation which is the reduction of the parity rate of the cedi against the dollar will impact positively on the economy. The co-efficient of -0.23624 implies that a 100% devaluation of the cedi will result about 24% growth in GDP. The coefficient is also statistically significant at 5%.

The explanatory variable term of trade has the correct theoretical sign. That is an improvement in the term of trade will impact positively on the GDP growth. The coefficient of 0.24066 implies that a100% improvement in the TOT will result 24% improvement in GDP growth and is statistically significant at 5%.

Table 4.7: The Results of the Long-Run Co integrating Growth Equation under Fixed Exchange Rate

Dependent variable: $\ln Y_t$ **ARDL(1,1,1,0,1) selected based on Schwarz Bayesian Criterion**			
Regressor	Coefficient	Standard Error	T-Ratio
Constant	4.0355	2.1425	2.35210**
$\ln M_t$	0.24632	0.34231	1.2422**
$\ln G_t$	0.35574	1.02461	1.43575**
D_t	-0.23624	0.10256	-1.25534**
$\ln TOT_t$	0.24066	0.11225	2.16221**

Dependent variable In Y_t **ARD(1,1,1,0,1) selected based on Schwarz Bayesian Criterion**

Government expenditure has the correct theoretical sign expected. The coefficient of 0.35574 implies a 1% increase in Government expenditure will result about 0.4% increase in GDP growth.

The co-efficient of the exchange rate devaluation has the appropriate theoretical sign, though the impact is low. The negative sign of the co-efficient implies that, devaluation which is the reduction of the parity rate of the cedi against the dollar will impact positively on the economy. The co-efficient of -0.23624 implies that a 100% devaluation of the cedi will result about 24% growth in GDP. The coefficient is also statistically significant at 5%.

The explanatory variable term of trade has the correct theoretical sign. That is an improvement in the term of trade will impact positively on the GDP growth. The coefficient of 0.24066 implies that a100% improvement in the TOT will result 24% improvement in GDP growth and is statistically significant at 5%.

4.2.4 Estimates of the Short Run Vector Error Correction (GDP) Growth Equation Under Fixed Exchange Rate Regime

The equation is satisfactory in terms of the explanatory power and fit. We can deduce from table 4.8 below that the high R^2 of 0.99 implies about 99% of changes in GDP is explained by the explanatory variables. The F-statistics is also significant at 1% showing that the explanatory variables, jointly explain changes in the dependant variable, GDP growth.

The short run elasticity depicted on table 4.8 indicate that money supply maintain a positive sign as in the long run. The meaning is that increase in money supply will impact positively on GDP growth. The co-efficient of 0.16156 implies a 100% increase in money supply will cause 16% growth in GDP. It is not statistically significant even at 10%.

Government expenditure result of the short run vector correction equation has the appropriate theoretical sign. The meaning is that, there is a direct relationship between government expenditure and GDP growth. The co-efficient of 0.35435 implies that a 100% growth in government expenditure will result 35% growth in GDP and it is statistically significant at 5%. The short run co-efficient of real effective exchange rate (Dt) has the correct theoretical sign as in the long run. The negative sign means devaluation will improve the country GDP. The co-efficient of 0.31242 means 100% devaluation of the cedi will increase GDP growth by 31% and it is statistically significant at 5%. Terms of Trade (TOT) continue to have positive sign, meaning that improvement in TOT will impact positively on GDP growth. The co-efficient of 0.32142 implies that a100% improvement in TOT will improve GDP growth by 32% (see table 4.). It is not statistically significant even at 10%. The co-efficient of *ECM* for the result of the short run vector EC equation under fixed exchange rate show the theoretical correct sign and is statistically significant at 1%. The error correction term for the short run growth model under the fixed exchange rate, which measures the speed of adjustment to restore equilibrium in the dynamic model in the case of a shock to the system, appear with the expected negative sign and is statistically significant at the 1% level ensuring the attainment of the long run equilibrium (i.e. co-integration). The co-efficient of -0.62131 implies that long run disequilibrium will be corrected in the dynamic model less than two years.

Table4.8: The Results of the Short-Run Vector Error Correction Equation: Fixed Exchange Rate

Dependent variable: $In\Delta Yt$ **ARDL(1,1,1,0,1) selected based on Schwarz Bayesian Criterion**			
Regressor	**Coefficient**	**Standard Error**	**T-Ratio**
Constant	5.4203	2.2311	2.5431**
$\Delta \ln M_{t-1}$	0.16156	0.30241	0.45265
$\Delta \ln G_{t-1}$	0.35435	0.21012	2.89839**
In Dt_{-1}	-0.31242	0.10551	-2.92052**
$\Delta \ln TOT_{t-1}$	0.32142	1.2661	1.1553
ECM_{t-1}	-0.62131	0.10201	-7.2506***
R2=99 $\bar{R}^2 = 0.98$		Log likelihood = -6.4401	
F-statistic F(5, 11) = 147.9346***		Schwarz criterion = -19.1896	
Akaike information criterion = -15.4401			

5. Suggestion and Policy Recommendation

It is obvious from the study that exchange rate adjustment has had little influence of improving macroeconomic performance (GDP growth). The following policy recommendations are suggested to put the economy onto a sustainable growth path;

1. It is recommended that, the government should pursue sound economic policy and developed the banking sector, since the success of exchange rate policy hinges on these two factors.

2. To improve upon macroeconomic performance (GDP growth), it is highly recommended that the government should embark on policies aim at boosting output in the various sectors of the economy namely agriculture, industry and tertiary. Micro credit, irrigation, storage facilities should be made available to farmers in order to increase their output. In short the government should strengthen and diversify production capacity. Land reforms for better access and entitlement to land for productive use; enhancement of the role of women as agents of change and the modernization of the food production sector. Government should provide credit facilities to small scale manufacturers in order to boost their output. In the light of the recent report by WTO that volume of agriculture export soar but value remains low, prices of our exports which is mainly agriculture need to be increased in the world market. Also guaranteed minimum price for food crops managed through strategic food reserves.

3. The government is also advised to tighten her spending especially on unproductive ventures to avoid waste in the economy. It also suggested that Ghanaians should patronize made in Ghana products.

4. Policy suggestion for enhanced growth in Ghana will also be to reform the labour sector in Ghana to ensure increased productivity. Therefore the GPRS policy and budget 2005 focus on human resources development is in the right direction.

5. The government must also pursue policy aim at improving the level of income and pattern of its distribution. The government must endeavour to enlarge the tax base, improving efficiency and probity of the collection machinery. This will go a long way to increase government revenue and help boost the economy. Government should remove subventions for parastatals other than those in the social sector and nationally strategic basic industries. This will help release resources for investment in productive sectors.

6. To improve macroeconomic performance (GDP growth), it is also recommended that specific export incentives for processed exports and carefully selected primary commodities. This will increase diversification of the economy, reduced vulnerability to fluctuation in commodity prices, export growth and increase export earnings.

5.1 Limitations of the Study

It will be inappropriate to say that, the study, though successful is without any limitation. The first limitation is that, the model is not all-inclusive. Other variables that are macroeconomic in nature that have not been modeled include financial sector reforms and foreign aid. Also the equations does not cover other details as extremes of weather (drought and flood), usually captured by dummy variables. In as much as they affect agriculture output, transport and distribution differently, they may as well be assumed to be reflected in the output (GDP) variables. The author therefore believes, if measures are taken to ratify these limitations, the study would be improved.

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