

## The Effects of Exchange Rate on Ghana's External Trade

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### Abstract

This study examines the effects of exchange rates on Ghana's external trade. The study derived inter alia real exchange rate as a key determinant of imports and exports. The study estimated three models, viz ; imports, exports and trade balance, all incorporating real exchange rate as a determining factor using annual times series data from 1986 to 2005. The Autoregressive Distributed Lag approach to co-integration was employed to establish Long run relationship between the variables in the various models. Furthermore, vector error correction model was employed in addition to co-integration analyses which confirmed a stable Long run relationship between exports, imports and real exchange rate. The results indicated that, the short run elasticities of imports and exports with respect to real exchange rate are inelastic and thus have contractionary effects of depreciation. The overall conclusion drawn from the study is that for improved balance of trade in Ghana, coordination between the exchange rate and demand management policies should be strengthened and be based on the long run fundamentals of the economy. Domestic industries should improve their level of efficiency and quality of their products in order to compete favourably with foreign goods in both home and the world markets. Policy makers should direct much attention to the production side and let producers know the harm they cause their own business and the economy as a whole by producing shoddy goods in an inefficient manner.

**Keywords:** Trade Balance, Imports and Exports, Exchange Rate, Macro Economics

### 1. Introduction

Since the breakdown of the Bretton Wood floating Accord in 1973 and the advent of floating exchange rate, there has been renewed interest on the effect of depreciation of a country's currency on the trade balance of both developed and developing countries. The late 1970's and early 1980's proved to be extremely trying economic times for the developing countries. Throughout most of the period, a combination of exogenous shocks, such as worsening terms of trade, failing growth rates in the cost and availability of foreign financing, created serious macroeconomic management problems for policy makers in these countries.

Ghana was successful in using the exchange rate as a tool for macroeconomic stability since its independence in 1957 to 1980's. But since the mid 1980s trade and budget deficits have become large and persistent. Many exchange rate policies; multiple exchange rate system '83-'86, dual exchange rate system 1986-1987, Dutch auction system 1987-1988, foreign exchange bureaus-wholesale and interbank auction 1988-1992 and Interbank market 1992- to date. Also policies under Economic Recovery Programme (ERP) have been pursued for stabilization. Nonetheless, there is still debate whether

depreciation really improves a country's external trade. Getting the exchange rate right is an essential component of IMF conditionality under what have become known as Structural Adjustment Policies (SAP) was implemented reluctantly by developing countries. According to Musila and Newark (2003) it was the fear that the dismal performance may not cover the cost of imports resulting from currency depreciation. But the proponents of the flexible exchange rate regime argue that deregulation of the financial system serves to balance the country's international trade by making prices of internationally traded goods and services flexible.

The external trade of Ghana involves the import demand, the export demand and the balance of trade. Balance of Trade also called net exports (NX), are the sum of the money gained by a given economy by selling exports, minus the cost of buying imports. They form part of the balance of payment, which also includes other transactions such as the international investment position. Factors that can affect the balance of trade include: Prices of goods manufactured at home (influenced by the responsiveness of supply), Exchange rates movement, Trade agreement or barrier, Other tax, tariff and trade measures. A positive balance of trade is as a trade surplus and consists of exporting (in financial capital terms) than one imports. Negative balance of trade is known as a trade deficit or informally, as a trade gap and consists of importing more than one export. Neither is necessarily dangerous in modern economies, although large trade surpluses or trade deficits may sometimes be a sign of other economic problems.

Ghana began the process of reforming trade, investment and exchange rate regime around mid 1980's; this process gathered pace through the 1990s as the reform widened in terms of country coverage. These reforms constitute a reflection, in most cases, of a shift from an inward-oriented and import-substituting industrialisation strategy to an outward-oriented and export-led development strategy. The primary focus of the export sector and more specially, for achieving the goal of significantly expanding and diversifying Ghanaian exports. In this context, the emerging strategy appears to have at least two components, i.e., seeking improved external market access for a much wider range of Ghana's export products, as well as seeking ways to eliminate the export supply response constraints which have hindered the growth and diversification of the country's export basket. An integral part of this second component of the strategy consists of measures aimed at improving the incentives for exporting activities.

Ghana adopted a number of measures on her exchange rate, the objective is to encourage exports and discourage imports for the purpose of improving her current account balance. But the foreign exchange rate adjustments have proved supportive to the country's external trade since our balance on the current account is dominated by deficits.

Nonetheless, there is still debate whether depreciation and appreciation really improves a country's external trade. Despite these successive reforms, the tendency for imbalances has widened even further. Why these reforms in the exchange rate system have not been effective in improving the trade balances is an interesting issue to investigate.

The purpose of this study is to examine the effects of exchange rate on Ghana's external trade. Among other things the study will also examine the exports and imports elasticities.

The main objectives of the research are:

- To estimate the Import and Export demands function and assess the effects of exchange rate on Ghana's exports.
- To estimate the Terms of Trade (TOT) and assess the effects of exchange rate on Ghana's TOT.
- To assess the effects of flexible exchange rate on Ghana's external trade.

The hypothesis to be tested in this study includes;

Ho: Exchange rate adjustment has no significant effect on Ghana's exports.

H1: Exchange rate adjustment has significant effect on Ghana's exports.

Ho: Exchange rate adjustment has no significant effect on Ghana's imports.

H1: Exchange rate adjustment has significant effect on Ghana's imports.

Ho: The elasticity of Ghana's exports and imports is greater than one.

H1: The elasticity of Ghana's exports and imports is not greater than one.

The paper is organized in five parts, section 1 is introduction, section 2 Literature review, section 3 methodology, section 4 data analysis and section 5 conclusion and recommendation

## 2. Review of Related Literature

### Import Function

According to Caves et al. (1999) the demand for imports,  $IM$ , is a decreasing function of the imports price expressed in domestic currency which is fixed price in foreign currency times the exchange rate:

$$IM = IM_D(EP)$$

Where  $IM$  is the volume of imports,  $E$  is the exchange rate and  $P$  is the price of imports. Imports are decreasing in the exchange rate and the prices of imports.

It is simple and does not include important variables such as the gross national product (GNP), the domestic price level and the level of foreign exchange reserves. Depreciation raises the price of imports to domestic residents, reducing their demand,  $IM_D$ . Rodseth (2000), states that the demand for imports is a function of the real exchange rate and the level of economic activity.

$$IM = IM(E^*, Y) \quad IM_{E^*} < 0 \text{ and } IM_Y > 0$$

Where  $IM$  is imports demand,  $E^*$  is the real exchange rate or the relative price of foreign goods compared to home goods,  $Y$  is the level of economic activity,  $IM_{E^*}$  is the partial derivative of the imports demand function with respect to the real exchange rate and  $IM_Y$  is the partial derivative of the imports demand function with respect to the level of economic activity. Increase in the real exchange rate make imports expensive and thus reduce the demand for them. Hence the restriction that  $IM_{E^*} < 0$  is appropriate. Similarly, an increase in economic activity leads to a higher level of spending including imports. This implies that there exists a positive correlation between imports demand and the level of economic activity, making  $IM_Y > 0$  a valid restriction.

One of the most common effects of trade liberalisation, particularly in the third world countries is that it increases imports by a larger proportion than exports. Assuming that the price income elasticities of demand for imports are constant, the function can be written according to Thirlwall(200) as:

$$IM = L \left( P^f \frac{E}{P^d} \right)^{\delta_1} Y^{\delta_2}$$

Where  $IM$  is imports demand,  $L$  is a constant,  $Y$  is domestic income level,  $P^f$  is the foreign price level,  $E$  is the nominal exchange rate,  $P^d$  is the domestic price level and  $\delta_1$  and  $\delta_2$  are the price and income

elasticities, respectively. By taking the logs of the variables in the above import demand function and differentiating with respect to time we obtain the following import growth rate function:

$$im = \alpha + \delta_1 (p^f + e + p^d) + \delta_2 y$$

Where  $im$  is the growth rate in imports,  $P^f$ ,  $e$ ,  $P^d$  and  $Y$  are the growth rates in the variables already defined. It is expected that  $s < 0$  and  $s_2 > 0$ . Considering the lag in the adjustment in a disequilibrium model of import demand, it is assumed that imports adjust only partially to the difference between imports demand in period  $t$  and the actual flow of imports in the previous period ( $t - 1$ ). The dynamic import function is expressed as;

$$im = \alpha + \delta_1 p_t + \delta_2 y_t + \delta_3 im_{t-1} + \varepsilon_t$$

Where  $p_1$  is the rate of change of the real exchange rate  $e_1$  is the stochastic term and  $t$  represent the time period. Musila (2002) also used similar application but in a functional form in his paper, Exchange Rate Changes and Trade Balance Adjustments in Malawi:

$$\ln(\text{Im}) = \alpha + \alpha_1 \ln(re)_t + \alpha_2 \ln(y)_t + \alpha_3 \ln(\text{Im})_{t-1} + \nu_t$$

This model is adopted for the study with slight modification. Foreign exchange rate reserve and import price index will be introduced into the specification.

### EXPORT FUNCTION

Trade reforms have been important in reducing anti-export bias (policies to control the level of import such as tariffs, embargo and other inward looking policies like import substitution industrialization). However without appropriate real exchange rate adjustments, the incentive structure could still be significantly biased against exportable sector. Blassa(1990) finds exports in Sub-Saharan Africa to be highly responsive to exchange rate changes, especially agricultural exports. Caves et al.(1990), in their book World Trade and payments, specify the demand for exports  $EX_D$  as a decreasing function of their price expressed in foreign currency divided by the exchange rate:

$$EX = EX_D \left( \frac{P^x}{E} \right)$$

Where  $EX$  is the foreign demand for the home country's exports  $P^x$  is the price of exports in units of domestic currency and  $E$  is the exchange rate, i.e. domestic currency per unit of foreign currency. This function for the demand for exports like the imports demand function is over simplification of reality and its applicability for empirical purposes and policy recommendation is severely limited. A depreciation lowers the price of export to foreigners thereby increasing the quantity of exports demanded,  $EX_D$ . Rodseth (2000) said the foreign demand for a country's exports is a function of the real exchange rate,  $E^*$  and the level of economic activity in the rest of the world.

$$EX = EX(E^*, Y^f) \quad EX_{E^*} > 0, EX_{Y^f} > 0$$

Where:  $EX$  is the volume of foreign imports of home goods, i.e. the home country's export volume,  $Y$  is the level of economic activity in the rest of the world,  $EX_{E^*}$  is the partial derivative of the export demand function with respect to the exchange rate  $EX_Y^f$  the partial derivative of the export demand function with respect to the level of economic activity in the rest of the world.

Thriwall (2003), by assuming constant price and income elasticities of demand for exports, made the following specification for the export function:

$$EX = A \left( P^f \frac{E}{P^d} \right)^{\beta_1} Y^{\beta_2}$$

Where  $EX$  is exports,  $A$  is a constant,  $P^d$  is the domestic currency level,  $P^f$  is foreign currency,  $E$  is the nominal exchange rate measured as the domestic currency per unit of foreign currency and  $Y^f$  is the income of the rest of the world,  $\beta_1$  and  $\beta_2$  denote price and income elasticities respectively. Taking the logs of the variables and differentiating with respect to time, we obtain the export growth function as follow:

$$ex = \alpha + \beta_1 (P^f + e - P^d) \beta_2 y^f$$

Both elasticities,  $B_1$  and  $B_2$ , are expected to be positive. The model, however, assumes that exports adjust without a lag to changes in competitiveness and income, so there is no difference between short and long run elasticities. By assuming that exports adjust partially to the difference between export demand in period  $t$  and the actual flow of exports in the previous period ( $t-1$ ), the lag of exports becomes an explanatory variable, given in equation:

$$ex_t = \alpha + \beta_1 p_t + \beta_2 y^f + \beta_3 x_{t-1} + \mu_t$$

where  $P_t$  now denotes the rate of change of the relative price,  $u_1$  is the stochastic term and  $t$  represents the time period. Following Musila (2002) uses a function form:

$$\ln(EX) = \delta + \delta_1 \ln(re) + \delta_2 \ln(y)_t^* + \delta_3 \ln(EX)_{t-1} + \nu_t$$

This model will be use with little modification to the foreign income and the induction of Export price index.

### Trade Balance

Trade balance sometimes referred to as visible balance, represents the difference between receipts for exports of goods and expenditure on imports of goods. In other words, it is the difference between the monetary value of total exports and imports. Baharumshah (2001) suggested that trade balance is determined by a a number of macro variables such as real outputs, exchange rate, money supplies etc, the existence of direct or indirect causal feedback between trade balance and such marco variables cannot be ruled out. Kruger (1983) expressed trade balance as:

$$TB = B \left( Y \frac{E}{P} \right)$$

Where,  $TB$  denotes the trade balance,  $Y$  is the real domestic income,  $E$  is the nominal exchange rate and  $P$  is the domestic price level. Economic theory determines a number of key variables that have significant effect on imports and exports and hence trade balance. Agbola (2004) defined the trade balance of an economy as the difference between export receipts  $X$ , and import expenditure  $M$ . Using a small country assumption, he expressed trade balance of Ghana as:

$$TB = X - M = P_x Q_x \left( \frac{P_x}{e} Y^* \right) - e P_m^* (e P_m^* Y)$$

Where  $TB$  is the trade balance,  $X$  is the export revenue,  $M$  is import expenditure,  $P$  is the cedi price of export,  $Q$  is the quantity of exports,  $P_m^*$  is the foreign currency price of imports,  $Q_m$  is the quantity of imports,  $e$  is the value of foreign currency in the terms of the cedi,  $Y$  is domestic national income,  $Y^*$  is foreign income. Krugman-Baldwin (1987) model is adopted for this study. An advantage of this model, in addition to its simplicity, is its ability to capture the effect of all the specified macro variables on trade balance. This two-country model stipulated that the demand for imported goods by domestic residents is positively related to real domestic income and negatively to relative price of imported goods. Hence, trade balance is given as:

$$TB = TB(Q, Y, Y^*)$$

Where  $Q = (e, P^*/P)$ . In this expression, an increase in  $e$  would denote a depreciation of the domestic real exchange rate and vice-versa. Equation can be estimated in a log-linear form by taking the logs on both sides to obtain the following estimation equation

$$\ln IM = b_0 + b_1 \ln Y_t + b_2 \ln E_t^r + b_3 \ln R_t + b_4 \ln P_t^m + b_5 \ln IM_{t-1} + e_t$$

Where lower-case letters represent logarithm of a variable and  $u$  is white-noise process. In the model, a four-variable system will be set up, denoted by the notations: log of trade balance is  $tb$ , log of real effective exchange rate (real exchange rate for Ghana) is  $q$ , compactly written as  $x = (tb, q, y, y^*)$ . In the study, trade balance is expressed as a ratio of exports to imports. Equation (16) is adopted for this study because it captures the most important variables in macroeconomic environment.

### Empirical Review

Exchange rate effects on Agriculture Trade and Trade relation paper was presented by Orden (1999). He examined the question of impact of exchange rate on Agriculture in U.S.A. He said more generally exchange rates serves on international capital flows and the macroeconomic factors determining these flows, including monetary policy. Monetary shocks have non-neutral effects which explain some of the variability in agriculture prices. Moreover, macroeconomic condition are often decisive in determination of domestic agricultural policies and hence competitiveness in world markets and tensions in trade relations. These structural policy implications of exchange rate movements, along with their direct effects on markets any given moment in time are why exchange rates are important to Agriculture.

Stucka (2004) presents a paper on the effect of exchange rate change on the Trade Balance in Croatia. The paper attempts to estimate the impact of permanent exchange rate depreciatin on the merchandise trade balance employing a reduced form model. The model was estimated using three methods – the ARDL “delta” approach developed by Pesaran, Shin and Smith (1996). On average, a permanent 1

percent depreciation of the domestic currency results in an improvement of the trade between 0.94 percent and 1.3 percent. On average, the new equilibrium is established after approximately 2.5 years. The average length of the adverse effect of permanent depreciation is moderately above one quarter. It finds adverse effect of J-curve cure effect in Croatia. An alternative modeling approach could utilize the disaggregated data according to standard international trade classification. Again, shipbuilding, as well as trade in oil derivative could be separately treated, which might lead to different outcomes.

Marquez et al (2004) did a study of Exchange rate Effects on China's Trade, they estimate export and import trade elasticities, using a sample of quarterly data from 1995 – 2003. Their choice dates avoids the period of structural Adjustment during which previous papers found the exchange rate to have little effect on trade. They report results for real exports and real imports but do not specify the way in which they deflated the nominal data. Their export equation focuses only on export to the G3 countries. It is possible they are using import prices from those partner countries,. Also, of interest is the fact that in modeling Chinese imports, they break down imports into imports for domestic use and imports for processing and re-export. In none of their equations do they get a significant coefficient on the exchange rate, but the results from the equations suggest that modeling processing and ordinary trade separately may be useful.

Thorbecke (2006) estimates income and exchange rate elasticities for China's multilateral exports and for trade with the US (export and import). The parameter estimates associated with multilateral exports are obtained using a panel data that includes trade with 30 countries from 1982 – 2003: the trade data are disaggregated across final products, intermediate products and capital goods. Thorbecke finds that the evidence for China is not conclusive enough to characterize the effect of a change in the exchange rate on China's trade.

Empirically Marial et al. (2005) did a study on the effects of exchange rate changes of trade balance in North Africa. The paper examines the effects of exchange rate changes on the bilateral trade balance of Egypt, Morocco and Tunisia vis a vis the U.S and Japan. The study employs the Johansen co integration and error correction model on the annual data in the period 1970 – 2003. The findings confirms the existence of both the short run dynamics and long run casual relationships between trade balance and the set of specified independent variables. The results produce mixed evidence about the existence of the J-curve effect. A classic pattern is observed only in case of Morocco/Japan in which the trade balance deteriorates almost immediately following depreciation of the real exchange rate and recovers after two years. The finding that exchange rate depreciation improves trade balance (in cases of Egypt/Japan, Morocco/ Japan and Tunisia/U.S) corroborate the conjecture in the literature that a country's trade balance may deteriorate following currency depreciation before improving in the long run. The finding of J-curve in three cases out of six in the paper does not help much in clearing the murk surrounding the issue of the j-curve phenomenon in the literature. These findings underscore the important implication that the effect of real exchange rates changes on the trade balance of any given country depends largely on the volume of trade activities between the countries concerned.

Bahmani-Oskooee and Alse (1994) tested 41 developed and less developed countries for the existence of co integration and the j-curve effect applying the Engle-Granger two-step procedure. The results indicated that the trade balance and real effective exchange rate are co-integrated for only fourteen countries. In countries exhibiting co integration, there was some evidence of the j-curve effect.

Bhattarai and Armah (2005) study the effects of exchange rate on the trade balance in Ghana using a co integration analysis. The results from this study show that the trade balance of Ghana will not improve in the short run unless it adopts policy rules in the foreign exchange market, but it may be costly if such adjustment were to occur unaided in the long run. The result also shows that in the short - to - medium term, as well as in the long, income levels are not important determinants either of the import demand or the export demand of Ghana. It also shows that it is the exchange rate that is the significant factor in the short term. In the long run however, the study reveals that only the real exchange rate significantly affects the trade balance. However, the estimate for Ghana shows that even in the long run, the Marshall-Lerner-Robinson (MLR) condition for a successful devaluation is barely met and therefore, in Ghana's case the gains would not be enough to offset the losses in the trade balance in the short run.

In a paper on Exchange Rates and the Management of the Exchange Sector in Sub-Saharan Africa, Delphin G. Rwegasira said the evidence and arguments in this article support the pursuit of a flexible exchange-rate policy in African economies. The region is faced with a very difficult and unsustainable balance of payments situation which cannot be helped by appreciating exchange rates. The direct controls of imports, in the situation described earlier, serves a very limited purpose if the aim is to achieve acceptable economic equilibrium. By considering structural and sectoral issues, however, his article cautions against the over-optimism which characterizes some quarters on this subject. When income-distribution considerations are added, thus alluding to the concept of social and economic equilibrium, they point to the advisability of using fairly small and timely change in exchange rates, rather than the large adjustments which are sometimes advocated. This is still true even if there is obvious long-term over-valuation of the currency. To be useful, any devaluation must, of course, be accompanied by other supportive policies, especially those relating to monetary and fiscal policies. It is important in these efforts to adopt a level-headed perspective of the nature of the balance of payments problems. The effect of the terms of trade losses and domestic inflationary forces in developing countries cannot be simply reversed by exchange-rate changes. From the above, it is clear that neither theoretical nor empirical studies have established definitely whether a depreciation of a country's domestic currency would improve its trade balance. Understanding of the long run relationship between exchange rate depreciation and trade balance is important for policy formulation and implementation in developing countries, such as Ghana.

### **Ghana Exchange Rate System and External Trade**

Ghana's policies on the exchange rate have been influenced by the contrasting political regimes that have been in place since independence in 1957. From independence in March 1957 - March 1983, Ghana adopted a fixed exchange rate regime in the management of its exchange rate. During this period, the Ghanaian cedi was pegged to the main convertible currencies, notably the British pound and the American dollar. The fixed exchange rate was not maintained by active intervention in foreign exchange market economies in those days.

Jebuni et. al.(1991) explains that the monetary authorities attempted to address the balance of payments difficulties by adopting a fixed exchange rate in addition to resorting to ad-hoc restrictions on trade and payments. A series of discrete devaluation of the cedi were implemented under a fixed exchange rate system by eight different governments, made up of three civilian and five military regimes, with different political and economic ideologies. The devaluation was attempts to realign the overvalued currency (the cedi) and reduce the shortage of foreign exchange as well as the size of the parallel markets. Instead, the exchange rate was pegged more or less by decree and a series of administrative controls were instituted to

deal with any possible excess demand for foreign currency. The issuing of import licenses was one such control.

In September 1986, the government adopted an auction market approach in order to accelerate the adjustment of the exchange rate and to achieve the object of trade liberalization, leaving it partially to market forces (demand and supply) to determine the cedi-dollar rates. This new arrangement was made up of a dual exchange rate comprising two windows. Window one was operated as a fixed exchange rate and pegged the cedi-dollar exchange rates at \$90.00: \$1.00 and mainly used in relation to earnings from the export of cocoa and residual oil products. Window two, which catered for all other transactions, was determined by demand and supply in a weekly auction conducted by the Bank of Ghana. The two systems were however unified in February 1987. Dual-Retail Auction was adopted and was based on the marginal pricing mechanism. It required successful bidders to pay the marginal price. A second auction - the Dutch auction - was introduced and under it, successful bidders were supposed to pay the bid price.

Sowa and Acquaye (1998) have pointed out that the massive industrialization and modernization programme implemented by the government in the early 1960's depleted the country's reserves and Ghana began to see the signs of foreign exchange constraints. No doubt the first Exchange Control Act was passed to regulate the foreign exchange market. The scarcity of foreign exchange notwithstanding, the cedi remained fixed to the pound sterling and was thus highly overvalued. Ghana retained this policy until 1983 when it embarked on the donor support ERP. In September 1986, Ghana reformed its exchange rate policy with the support of the IMF and World Bank under the ERP/SAP. Initially this was a two-tier system which was aimed particularly at an official fixed rate to take care of imports and exports of selected goods and a weekly auction rate for the remaining two thirds of Ghana's external transactions determined at weekly auction (Oduro and Harrigan, 2000)

The foreign exchange bureau system was established in 1988 in an attempt to absorb the parallel market into the legal foreign exchange market. These "forex" bureaux were fully licensed entities operated by individuals, group or institutions. Their operation alongside the auction meant that the foreign exchange market was characterized by two spot foreign exchange rates. (It must be noted that the forex bureaux were not allowed to bid for foreign exchange in the weekly-retail auction).

### **3. Model Specification**

The functional forms of the exports, imports and the trade balance models used in this study are standard in the trade literature and are used in Musila (2002) and others. In addition, Khan (1974) pointed out that this specification avoids the problem of drastic falls in elasticities. To capture the partial adjustment behaviour, a lagged term in both dependent variables should be included in the estimated equations. Hence, the inclusion of lags in exports and imports, respectively, in the model; which assumes a small open economy similar to the Ghanaian.

To avoid spurious results unit root tests using Augmented Dickey-Fuller (ADF) (Dickey and Fuller, 1979) is performed to determine the time-series properties of the variables employed in the analysis.

Two or more variables are said to be co-integrated when they exhibit long run equilibrium (relationship), if they share common trend(s). Auto-regressive distributed lag bounds approach (ARDL) is used. The choice is based on several considerations. The ARDL models yield consistent estimates of the long run

coefficients that are normal irrespective of whether the underlying regressors are  $I(0)$  or  $I(1)$ . It provides unbiased estimates of the long run model and valid t-statistics even when some of the regressors are endogenous. The functional forms of the exports, imports and the trade balance models used in this study are standard in the trade literature and are used in Musila (2002) and others. This study considers the following functions for imports, exports and the trade balance respectively. A Logarithmic functional form is adopted because it allows import and exports to react proportionately to changes in their arguments. In addition, Khan (1974) pointed out that this specification avoids the problem of drastic falls in elasticities. To capture the partial adjustment behaviour, a lagged term in both dependent variables should be included in the estimated equations. Hence, the inclusion of lags in exports and imports, respectively, in the model; which assumes a small open economy similar to the Ghanaian. Where:

$$\ln IM = b_0 + b_1 \ln Y_t + b_2 \ln E_t^r + b_3 \ln R_t + b_4 \ln P_t^m + b_5 \ln IM_{t-1} + e_t$$

$$\ln EX = \alpha_0 + \alpha_1 \ln E_t^r + \alpha_2 \ln P_t^x + \alpha_3 \ln EX_{t-1} + e_t$$

$$TB = \gamma_0 + \gamma_1 E^r + \gamma_2 Y + \gamma_3 Y^* + \psi_t$$

IM = total value of goods bought abroad including non-factor services

EX = total value of goods including non-factor services sold abroad

TB = trade balance

E = real effective exchange rate

Y = income proxied by the real GDP of Ghana

$P^m$  = import price

$P^x$  = export price

$Y^*$  = foreign income

R = foreign reserves

t = is the time subscript

e and w = disturbance terms

Equations (1), (2) and (3) are estimated and used to evaluate the effect of changes in exchange rate on imports, exports and trade balance.

s also efficient in small sample cases.

We estimate the error – correction model in which the error – correction terms (ECM), derived from long-run co-integrating vectors, and are included as independent explanatory variables in the estimation process in order to recover all the long-run information that was lost in the original estimation process.

Stability Test will be performed or check whether the estimation regression equations were stable throughout the sample the sample period. The plots of cumulative Sum (CUSUM) and Cumulative Sum of Squares (CUSUMSQ) test proposed by Brown et (1975) will be used. The importance of this test is that a movement of the CUSUM and CUSUMSQ residuals outside the critical lines is suggestive of the instability of the estimated co-efficient and parameter variance over the sample period.

## EMPIRICAL RESULTS AND ANALYSIS

### 4.1 Unit Root Test

The study then test for co integration among the series using the ARDL co integration test. Before using these formal tests in the study, a rather casual graphical representation of all the variables was done to

ascertain whether or not the variables are stationary. The graphical results indicate that, all the variables contain unit roots at their levels but achieved stationary after taking their first differences. The ADF PP unit root test results, reported in Table 4.1, also indicate that, real income, export price index as well as import price index are level stationary. That is to say that, they do not contain unit roots, and hence are integrated of order zero (i.e.  $I(0)$ ). However, all the other variables are integrated of order one  $I(1)$ , achieving stationary after taking their first differences. Having ascertained the absence of  $I(2)$  variable in the series, the ARDL approach to co integration is now applied to the models. Bound test is performed and all the variables used in the three equations have a stable long run relationship in their respective models. Their compound F-statistics exceeded the upper critical values of F-statistic at equations: import demand function, export demand function and trade balance function, since they have long run relationship.

#### 4.2 Results of the Long Run Imports Demand Function

The results indicate that income obtained the expected positive sign and statistically significant at the 1 percent level of significance. Thus, a one percent increase in the real GDP would increase imports demand by 2.4 percent in the long run. The coefficient of the real income is suggestive of a high income elasticity of imports demand. A rise in domestic income of Ghana encourages consumers to demand more foreign goods, leading to a deterioration of the trade balance in favour of our trading partners. The high income elasticity is consistent with economic theory, since most of Ghana's imports are necessary and luxury commodities and are expected to be positive and highly income elastic. The results confirm studies done by Bhattari and Armah, and Yol and Baharumshah.

The import demand elasticity of real exchange rate measures the proportionate rate of change in imports demand as a result of a given proportionate rate of change in real exchange rate, *ceteris paribus*. The long run elasticity of import demand with respect to the real exchange rate 0.6. The coefficient of real exchange rate has correct negative sign and significant at 1 percent level as the theory predicts, suggesting that increase in real exchange rate makes imports expensive to domestic consumers and consequently reduces demand for their imports. Thus, the elasticity of import demand with respect to the real exchange rate is inelastic in the long run. The long run elasticities of import demand with respect to foreign reserves 0.03 as expected in terms of the sign. The co-efficient is not statistically significantly at any of the conventional levels. An increase in total foreign reserves will not lead to a significant increase in the domestic demand for foreign goods. The long run elasticity of foreign exchange reserve is very low. Owing to the results revealed above, it can be concluded with respect to the second hypothesis set in this study that, the null hypothesis is accepted against the alternative that exchange rate adjustment has no significant effect in Ghana's imports. Additionally, the expectation of import price index was met but it was not significant at any of the conventional levels. Ghana's imports demand comprises more of goods that cannot be produced in the domestic economy. As a result, these goods are demanded even when people complain about their terms of structure and growth as her imports still remain machinery, raw materials and manufactured goods that cannot be produced in the domestic economy. The economy is still undeveloped and depends mainly on the export of primary commodities-namely cocoa beans, timber and minerals. Check table 4.2.

#### 4.3 Results of the Short Run Imports Demand Function

The results of import elasticity with respect to real exchange rate in absolute terms is 0.25 which implies that a percentage increase in the real exchange rate will bring about a 0.25 percentage decrease in imports demand. Thus, the elasticity of demand for imports in the short run is inelastic with respect to the real exchange rate. However, this change in the real exchange rate has no significant impact on the demand

for imports at least in the short run. Furthermore, the elasticity of imports demand with respect to real gross domestic product is 7.36. Thus, a percent increase in the real GDP brings about 7.36 percent increases in the demand for Ghana's imports. This implies that, import demand is income elastic in the short run. The high income elasticity of import demand is consistent with economic theory since most of Ghana's imports are machinery and raw materials. The import demand elasticity in the short run is -0.896 and 0.61 with respect to foreign reserve and the import price index respectively. That is, the demand for Ghana's imports is inelastic with respect to both variables. The inelasticity of import demand with respect to the import price index is due to the fact that most of Ghana's imports are machinery and raw material that cannot be produced in the domestic economy, as the economy is not well industrialized. The negative sign of the coefficient of the error correction terms ECM in the equation for import demand accord with prior expectations and indicate that the model is dynamically stable. The relative magnitude, however, suggest that an imbalance in the long-run import demand is corrected much faster. That is to say, the coefficient of the ECM of -0.98125 suggests that approximately 98.1% Of the disequilibrium generated in the short run will be corrected each year towards equilibrium in the long run in the case of a shock. This indicates that rate at which the system corrects itself in the event of a shock is very high . The coefficient of the ECM is highly significant at 1 percent significance level indicating that the model is dynamically stable. The model has an R2 of 0.696 and R value of 0.545. An R2 OF 0.696 implies that approximately 70 percent of the variations in imports demand of Ghana are explained by the variations in the explanatory variables in the model. The F-statistic of 5.52 is statistically significant level, thus indicating that all the explanatory variables jointly affect import demand significantly.

#### **4.4 Results of the Long Run Export Demand Function**

All the coefficients of the regressors achieved their a priori signs. The results indicate that, in the long run real exchange rate revealed its expected negative sign with respect to export demand. The coefficient shows that there is an inverse relationship between real exchange rate and demand for Ghana's exports, which is consistent with a priori economic theory. That is, increase in the real exchange rate (appreciation) of Ghana will make export uncompetitive and thus reduce the demand for our export. The elasticity's of the export demand for Ghana with respect to exchange rate is 3.59 at 10 percent level of significance. The relationship indicates that a 10 percent increase in the real exchange rate decreases the value of exports by 3.6 percent. This suggests that an increase in the real exchange rate would discourage exports and hence deteriorating the trade balance. It can be stated with respect to the first hypothesis set for this study that, the null hypothesis is accept against the alternative that exchange rate adjustment has significant effects in Ghana's exports. The coefficient of export price index indicates that, an increase will significantly decrease export demand. Specifically, a 5 percent increase in export price index will reduce export demand by 1.93 percent.

#### **4.5 Results of the Short Run Export Demand Function**

The signs obtained are consistent with their long run parameter estimates, albeit none of them was statistically significant. For instance, a one percent increase in real exchange rate will result in a 0.16 percent fall in Ghana's exports. This is suggestive of the inelastic nature of Ghana's export demand. The coefficient of export demand with respect to export price index also indicates that, export demand will fall by 0.77 percent, should the export price index increase by one percent. This also confirms the inelasticity obtained from our long run estimates, which is attributed to factors that characterized the inelasticity of exports with respect to the real exchange rate. The adjustment coefficient achieved the required negative sign and is significant at 10 percent error level. This coefficient shows how the actual levels of export demand for Ghana adjust to the desire level, hence the name adjustment coefficient. This coefficient is

quite low and shows how the actual level of the demand for Ghana's exports sluggishly adjusts to its desire level. This is not surprising since the bulk of the country's exports are primary commodities with long gestation period. Thus, we cannot meet international orders within a given time frame if our trading partners make such orders. Thus the low adjustment coefficient of the exports demand of Ghana is due to the very characteristics of the export sector. The model has R<sup>2</sup> of 0.29091 and R value of 0.14909, suggesting that the model has a weak explanatory power. However, the F-statistic is significant at the 10 percent level of significance.

#### **4.6 Results of the Long Run Trade Balance**

Unlike the export and import demand models, the dependent variable in the trade balance model is not in the logarithmic form since some of the observations recorded negative values in some of the years under consideration. The results indicate that all the coefficients are statistically significant at the required conventional levels. However, in the long run, the expected sign on the real exchange rate was not achieved. The coefficient of real exchange rate revealed in the results indicates that, Ghana's trade balance does not respond to changes in real exchange rate in the long run. In the case of real income, no expectation was placed on it, that is to say, the expected sign is ambiguous. It assumes a negative sign and significant at 1 percent level, suggesting a rise in domestic income of Ghana encourages consumers to demand more of foreign goods, leading to a deterioration of trade balance in favour of Ghana's trading partners, which is consistent with theory. The coefficient of foreign real income variable is significant at 5 percent significance level and obtained a positive sign, which suggests that an increase in foreign real income causes domestic trade balance to increase in the long run.

#### **4.7 Results of the Short Run Trade Balance**

The results of the short run model corroborate that of its long run counterpart, as all the coefficients of the former model achieved the signs as that of the latter. However, the real exchange rate variable is statistically not significant. The estimated coefficient of the error correction term (ECM) has the expected sign and significant at 1 percent level of significance. Thus, if in the long run the value of trade balance increase by 1 percent, over its equilibrium path, then its growth has to fall by about 0.99 percent in the short run to force trade balance back to their long run growth path. Moreover, the model has an R<sup>2</sup> of 0.63849 and adjusted R value of 0.53521, suggesting that the data fits the model quite reasonably well. The F-statistic of 6.1817 is statistically significant at 1 percent error level.

#### **4.8 Stability Test**

In addition, to check whether the estimation regression equations were stable throughout the sample period, the plots of Cumulative Sum (CUSUM) and Cumulative Sum of Square (CUSUMSQ) tests proposed by Brown et al (1975) were performed to ensure the stability of the parameter estimates in the various models. In the study, the test could not reject the null hypothesis that the regression equations are correctly specified at 5 percent level of significance in both the import and trade balance models, implying that there has not been systematic changes in the regression coefficients in these models. However, the plot of CUSUM for the export demand function falls within the 5 percent critical lines, but the plot of CUSUMSQ test exceeds the critical 5 percent. The period in which it went above the critical line was 1997 - 2000. This is the period in which Ghana experienced high levels of inflation, falling price of our major exports and soaring oil price. These could possibly be the reasons for the shifts in the parameters over the sample period.

### **5.1 Summary of Major Findings**

In the study, it was found that, the import demand elasticity with respect to the real effective exchange rate (used as a proxy for the real exchange rate) is elastic in both the short and long run periods. It was also found that, the income elasticity of import demands for Ghana is elastic in both the short run and long run periods. However, finding on the elasticity of import demands with respect to foreign reserve revealed an inelastic situation in both time periods. The demand for Ghana's imports is also price inelastic in both the short run and long run periods. Moreover, it was found that, actual imports adjust sharply to its desired level.

On the export side, the elasticity of export demand for Ghana is inelastic with respect to the real effective exchange rate in both the short and long run periods. The price elasticity of export demand is also inelastic in both periods. The actual levels of Ghana's imports demands adjust very fast, much faster than that of her exports to its desired level.

In the long run, the results show that a stable linear relationship exists among the imports, exports and trade balance, domestic income, foreign income, price indexes.

### **5.2 Policy Implications and Recommendations**

The fact that import and export elasticities are low with respect to the real effective exchange rate and their respective price indexes has important implications for the effectiveness of the open economy macroeconomic policies such as exchange rate and price policies. All other things being equal, currency depreciation, which increases the price of imports and reduces the price of exports in terms of units of domestic currency, will increase the expenditure on imports, whilst export revenues fall as both imports and exports are inelastic. This follows from the relationship between price elasticity and total expenditure (revenue) - an increase in the price of a good which is inelastic with respect to price, increase the expenditure on that good. The hope that flexible exchange rate system will automatically remove trade deficit and hence its adoption as part of the economic reform measures during the latter part of 1980s to the present is not felt. They rather aggravated the already fragile and volatile trade current account balance of the Ghanaian economy. The adoption of a flexible exchange rate from the late 1980s to date has not provided any hope and justification for its adoption. The cedi ever since, has depreciated against all the major trading currencies but the current balance has not seen any recovery. The simple conclusion here is that, reliance on exchange rate and or price policies alone are not sufficient to remove the trade and current account deficits.

With regards to the above discussion it is recommended that trade and the current account balance should be tackled through inward looking approach. The export sector needs to be diversified and an attempt should be made to process the export commodities before they are exported. Domestic industries should improve their level of efficiency and quality of their products in order to compete favorably with foreign goods in both home and the world markets. Though liberalization has not helped retaliation effects. Improving domestic production in terms of quality and efficiency will be quite helpful. The campaign for patronization of made-in-Ghana goods by leaders of the economy, though not bad, needs some reconsideration and direction. The campaigners must recognize the fact that, the objective of the consumer is utility maximization and does not take into consideration how the growth of domestic firms will affect the overall performance of the macro economy. Policy makers should therefore direct much attention to the production side and let producers know the harm they cause their own businesses and the economy as a whole by producing shoddy good in an inefficient manner.

### 5.3 Conclusion

This study examines the effects of exchange rate on Ghana's external trade from a macro econometric perspective. The findings confirm the existence of both short-run dynamics and long-run casual relationships between the demand for imports, demand for exports and the trade balance on one hand and the real effective exchange rate, the real domestic product, foreign reserves, import price index, export price index and foreign income on the other hand. The import and export demand functions as well as trade balance model were estimated using Autoregressive Distributed Lag (ARDL) approach to co integration and error-correction representation on the annual data between the periods 1986 and 2005. The objective of the study was to examine the effects of exchange rate on Ghana's imports and exports demands, and also, the effects of exchange rate on Ghana's external trade. The results of the study indicated that flexible exchange rate does not have much impact on Ghana's external trade. Given that flexible exchange rate is not the solution to the external trade and balance of payments problems, the government and policy makers in the Ghanaian economy are urged to encourage technical innovation, remove structural bottlenecks and rigidities, encourage efficient resource allocation and investment in labour saving technology.

To sum up, the information provided in this study is a useful guide to policy makers, especially those in the Trade Ministry and the Central Bank who want to anticipate future changes in the external trade in response to currency depreciation and appreciation of the cedi. The results indicates that despite the economic reforms measures towards liberation, the Ghanaian economy is still fragile to respond to market signals so as to use the exchange rate policy to manage its external balance.

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**RESULTS OF THE UNIT ROOT TESTS**

**Panel A: Level**

Variable	ADF		PP	
	Constant No Trend	Constant Trend	Constant No Trend	Constant Trend
Data Period: 1986-2005				
$\ln Y$	-2.072067	2.182105***	-2.905945*	2.182105***
$\ln IM$	-1.484283	-1.186797	-1.477066	-1.320346
$\ln P^m$	4.196465***	-2.282898	-10.73702***	-6.741532***
$\ln P^x$	-3.905445***	-3.255458*	-10.73702***	-6.741532***
$\ln R$	-1.409658	-3.814972**	-1.701666	-3.188512
$\ln \ln E^r$	-2.076371	-3.035228	-2.076371	-2.807043
$\ln EX$	-1.729538	-1.760917	-1.954393	-0.714085
$\ln Y^*$	2.291575	-1.429600	3.823096***	-1.199156
$TB$	-1.932505	-2.170584	-1.891833	-2.277016

**Panel B: First Difference**

Variable	ADF		PP	
	Constant No Trend	Constant Trend	Constant No Trend	Constant Trend
Data Period: 1986-2005				
$\Delta \ln Y$	-0.120978	-2.268244	-0.796872	-2.225005
$\Delta \ln IM$	-3.833889***	-3.863342**	-3.838970***	-3.863342**
$\Delta \ln P^m$	-3.787441***	-4.211547**	-4.307161***	-5.650905***
$\Delta \ln P^x$	-2.627823	-3.602053**	-2.505323	-3.167228
$\Delta \ln R$	-3.222555**	-3.039349	-6.157514***	-5.872178***
$\Delta \ln E^r$	-4.156152***	-3.997228**	-4.172207***	-4.001183**
$\Delta \ln EX$	-0.905824	-5.418390***	-4.726418***	-5.418390***
$\Delta \ln Y^*$	-4.317912***	-4.456973***	-4.362402***	-9.272471***
$\Delta TB$	-5.124621***	-5.125751***	-5.107996***	-5.125751***

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

**Bounds Test for the Existence of a Long-run Relationship in the Models**

Models	Computed F-Statistics	Testing for the Existence of a long-run relationship: Critical values of the F-Statistic	
		F-Statistic: Case II	Significance level
$IM_t = f(Y_t, E_t^r, R_t, P_t^m)$	3.725	2.525 – 3.560	90%
$X_t = f(E_t^r, P_t^x)$	4.140	2.915 – 3.695	90%
$TB_t = f(E_t^r, Y_t, Y^*)$	3.650	2.676 – 3.586	90%

**Estimated Long-Run Coefficients for the Imports Demand Function**

ARDL (0,1,0,1,0) selected based on SBC		Dependent variable: $\ln IM_t$	
Regressor	Coefficient	Standard Error	T-Ratio
Constant	-17.8120	3.3500	-5.3170***
$\ln Y_t$	2.4098	0.18112	13.3053***
$\ln E_t^r$	0.61119	0.16896	3.6173***
$\ln R_t$	0.026075	0.080642	0.32334
$\ln P_t^m$	0.24699	0.69282	0.35650

*Note:* \*\*\* denotes significance at 1% level

**Estimates of the Short-Run Error Correction Representation for the Import Demand Function**

ARDL (0,1,0,1,0) selected based on SBC		Dependent variable: $\Delta \ln IM_t$	
Regressor	Coefficient	Standard Error	T-Ratio
Constant	-17.8120	3.3500	-5.3170***
$\Delta \ln Y_t$	7.3618	2.7519	2.6752**
$\Delta \ln E_t^r$	0.24699	.69282	.35650
$\Delta \ln R_t$	-0.089668	.057282	-1.5654
$\Delta \ln P_t^m$	0.61119	.16896	3.6173***
$ECM_{t-1}$	-0.98125	0.00012	8177.0833***

$R^2 = 0.69698$     $\bar{R}^2 = 0.54548$    F-statistic = 5.5204\*\*\*   DW-statistic = 2.4508

\*\*, \*\*\* indicates significance levels respectively.

NB. The ARDL yields consist estimates whether or not the series are I(0) and I (1) series is still appropriate.

**Estimated Long-Run Coefficients for the Export Demand Function**

ARDL (0,1,0,1,0) selected based on SBC		Dependent variable: $\ln EX_t$	
Regressor	Coefficient	Standard Error	T-Ratio
Constant	-85.7592	152.4583	-0.56251
$\ln E_t^r$	-3.5870	1.7833	-2.01143*
$\ln P_t^x$	-1.9282	0.9363	2.6188**

**Estimates of the Short-Run Error Correction Representation for the Export Demand Function**

ARDL (1,0,0) selected based on SBC		Dependent variable: $\Delta \ln EX_t$	
Regressor	Coefficient	Standard Error	T-Ratio
Constant	-3.8908	2.6186	-1.4859
$\Delta \ln E_t^r$	0.16274	0.13295	1.2240
$\Delta \ln P_t^x$	0.76801	0.50542	1.5196
$ECM_{t-1}$	-0.045369	0.068686	-0.42797*

$R^2 = 0.29091$     $\bar{R}^2 = 0.14909$    F-statistic = 2.0513   DW-statistic = 3.0789

NB. The ARDL yields consist of estimates whether or not the series are I(0) or I(1). Hence, the short run regression of I(0) and I(1) series is still appropriate.

**Estimated Long-Run Coefficients for the Trade Balance**

ARDL (0,1,0,1,0) selected based on SBC		Dependent variable: $TB_t$	
Regressor	Coefficient	Standard Error	T-Ratio
Constant	23873.3	0.45896	5.2016***
$\ln E_t^r$	-1198.9	0.3275	-3.6602***
$\ln Y_t$	-3.5004	0.6281	-5.5727***
$\ln Y^*$	1.3696	0.5820	2.3533**

*Note: \*\*\*, \*\* denote significance at 1% and 5% levels respectively*

**Estimates of the Short-Run Error Correction Representation for the Trade Balance**

ARDL (1,0,0) selected based on SBC      Dependent variable:  $\Delta TB_t$

Regressor	Coefficient	Standard Error	T-Ratio
Constant	23873.3	4589.6	5.2016***
$\Delta \ln E_t^r$	-469.1167	326.7339	-1.4358
$\Delta \ln Y_t$	-3500.4	628.1412	-5.5727***
$\Delta \ln Y_t^*$	1369.6	581.9934	2.3533**
$ECM_{t-1}$	-0.99125	0.00015	6608.3733***

$R^2 = 0.63849$      $\bar{R}^2 = 0.53521$     F-statistic = 6.1817\*\*\*    DW-statistic = 2.5674

NB. The ARDL yields consistent estimates whether or not the series are I(0) or I(1). Hence, the short run regression of I(0) and I(1) series is still appropriate.



