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## The Impact of Exchange Rate Movement on Export: Empirical Evidence from Ghana

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### Abstract

This paper aims to investigate the impact of exchange rate movement on export growth in Ghana. The data, made up of secondary sources was extracted from International Monetary Fund (IMF), United Nations Conference of Trade and Development (UNCTAD) and Bank of Ghana websites spanning 22 years from 1990 to 2012. In addition to other controlled variables, exchange rate is used as an independent variable while export growth is the dependent variable. Using the OLS estimator, the study finds that exchange rate has no impact on the export of goods and services in Ghana. The study however finds that Gross Domestic Product, Gross National Saving, Import Growth and Total Investment have significant impact on export.

**Keywords:** Export Growth and Exchange Rate Movement

### Introduction

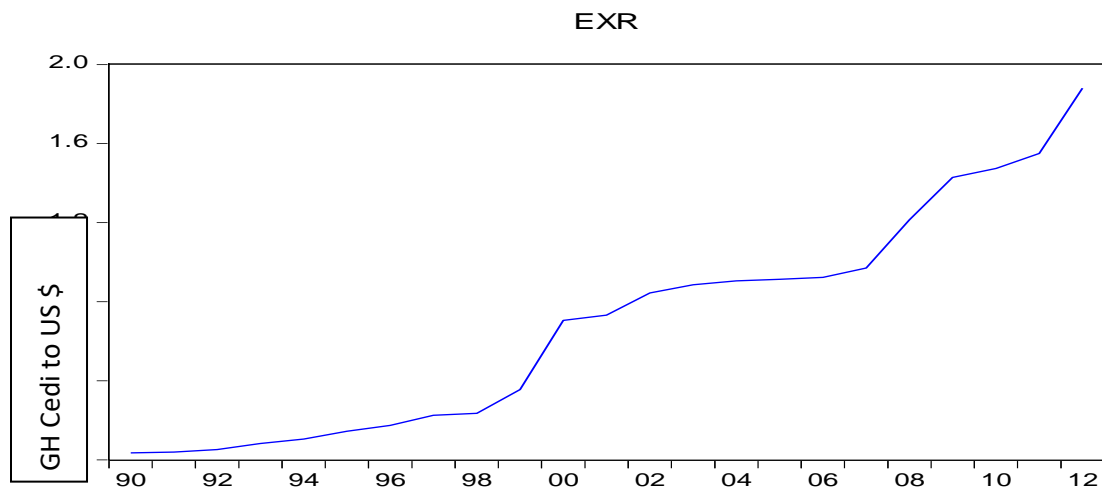
Ghana is well endowed with natural resources. These resources include gold, diamond, timber, cocoa, oil etc. Like many well-endowed African countries, Ghana exports almost all of its natural resources in their unprocessed state to its trading partners for further processing. Consequently, revenues accruing from the export of these natural resources are highly dependent on the volume of export and the export prices. Thus the importance of export to the Ghanaian economy cannot be overemphasized. Volume of export of an economy is determined by several factors of which exchange rate movement is cardinal (Smith, 2004). The exchange rate of Ghana currency (the cedi) for the US dollar has been on the ascendancy as depicted in figure 1 below. Figure 2 below also shows the export of goods and services made by Ghana from 2006 to the third quarter of 2013.

Theoretically exchange rate movement has been found to have some impact on the export of an economy. Hooper and Kohlhagen (1978) stated that increases in uncertainty of exchange rate affects trade negatively granted that people are risk-averse. In his analysis, De Grauwe (1988) noted that as trade volatility is based on people risk aversion, exchange rate volatility can hence lead to positive impact on export of goods and services. Using the goods

and money markets, Dincer and Kandil (2011) demonstrated theoretically how exchange rate affects export in the following two ways.

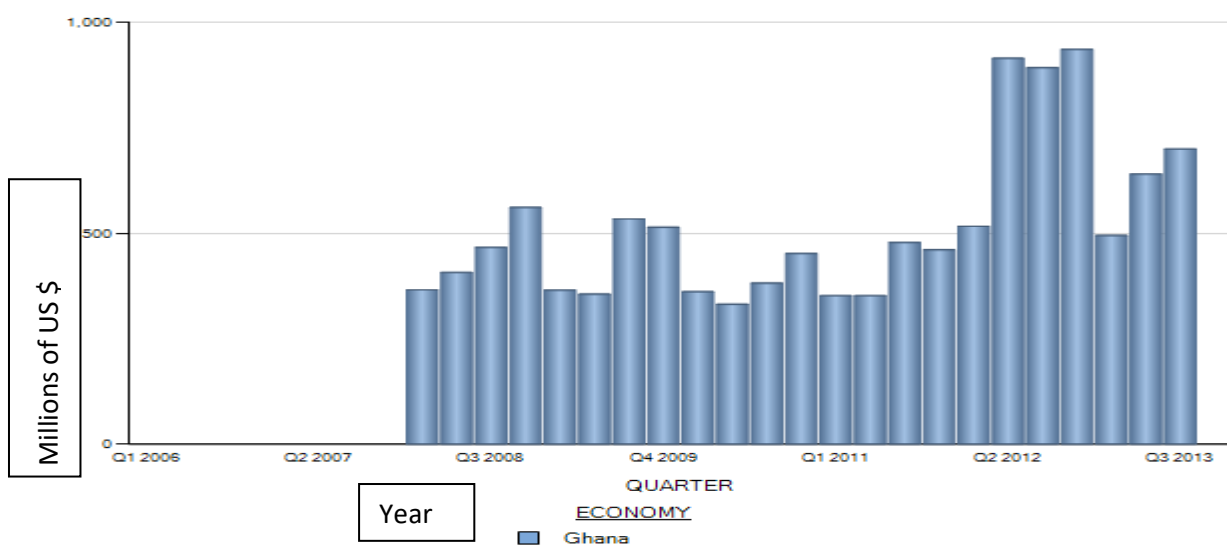
1. Unanticipated appreciation in the local currency against its trading partners will lead to exports being expensive while import becomes cheaper in terms of the good market. This situation does not auger well for countries that depend on the foreign markets for its extracted resources or manufactured goods and services as it has the ability to lower productivity of local firms.

2. A positive shock to the local currency through sudden appreciation or overvaluation of it leads to lower interest rates as agents will prefer to hold less domestic currency. Thus through the money market, a positive shock to the local currency can reduce the local production output.



Source: Authors' construct

Figure 1. Exchange Rate Movement in Ghana



Source: UNCTAD, 2014

Figure 2. Export of Goods and Services in Ghana

Empirically, apart from Klaassen (2011) who established that exchange rate has insignificant effect on exports, several studies have found significant impact of exchange rate on export (see, Oskooee and Bourdon, 2005, Erdal *et al.*, 2012, Dincer and Kandil, 2011; Granskog and Wisdom, 2003). These impact findings are however very mixed with some establishing positive while others getting negative impacts (see Hsu and Chiang, 2011). Notwithstanding the plethora of literature on the subject matter, very little exists on the subject matter as far as Ghana is concerned. This paper will therefore not only contribute to literature by filling this gap but it will help guide government in policy making as far as boosting our export industry is concerned. The rest of the paper is structured as follows. Section 2 will review some relevant empirical literature of the subject. Section 3 is devoted to data and model estimation while 4 and 5 discuss and conclude the paper respectively.

### **Review of Relevant Empirical Literature**

Oskooee & Bourdon (2005) assessed the impact of the RMB-dollar exchange rate and volatility on U.S. agricultural exports to and imports from China using a moving standard deviation of the real RMB-dollar rate and the GARCH-based measure which yields more significant results. The results concluded that the exchange rate volatility has a significantly positive long-run effect only on export earnings of the non-agricultural sector while depreciation of the dollar has an expected long-run effect on the import value of the non-agricultural sector and on export earnings of the agricultural sector. This is in line with the study conducted by (Erdal *et al.*, 2012).

Dincer & Kandil (2011) explored the asymmetric effects of random exchange rate fluctuations on exchange rate movements on export sectors in Turkey using data from spanning 1996 to 2002 and 2003 to 2008 from 21 exporting sectors. The results support the significance of exchange rate policy to export growth in Turkey in the period 1996–2002. Caglayan *et al* (2013) investigated the effects of real exchange rate uncertainty on manufacturers' exports from 28 emerging economies. Adopting a two-step system GMM dynamic panel data estimator for the study, they established findings which supported the claims that exchange rate uncertainties affects trade flows emanating from emerging economies negatively. They also found out more importantly that trade effects of exchange rate uncertainties may very well depend on the direction of trade.

Greenaway *et al* (2010) adopted a two-stage sample selection model to investigate the effect of exchange rates on Firm Exports. The results showed that firms that export are more likely to be bigger, older, more productive and foreign owned. Chit & Judge (2011) examined the role of financial sector development in influencing the impact of exchange rate volatility on the exports of five emerging East Asian countries – China, Indonesia, Malaysia, the Philippines and Thailand using a GMM-IV estimation method. The results indicated that the effect of exchange rate volatility on exports is conditional on the level of financial sector development. The less financially developed an economy, the more its exports are adversely affected by exchange rate volatility. In addition, a stable exchange rate seems to be a necessary condition to achieve export promotion via currency depreciation in these economies.

Erdal *et al* (2012) conducted an empirical study of the effect of Real Effective Exchange Rate Volatility (REERV) on Agricultural Export (AGX) and Agricultural Import (AGM) in Turkey. The study period covered 1995 to 2007. The GARCH model was used. Long-term relationship between series was also determined using Johansen co-integration test. The direction of this relationship, on the other hand, was determined using pairwise Granger causality. The

empirical results indicated that there was a positive long-term relationship between REERV and AGX series, while there was a negative long-term relationship between REERV and AGM. This is a position supported by (Oskooee & Bourdon, 2005).

Wong & Tong (2011) examined the effects of exchange rate variability on export demand for semiconductors, which is the largest sub-sector of electronics industry in Malaysia as reported by Malaysian Industrial Development Authority (MIDA, 2004). The empirical results, estimated based on the Johansen's multivariate co-integration tests and error correction model, suggested there is a unique long-run relationship among quantities of export, relative price, real foreign income and real exchange rate variability. The major finding was that the variability of real exchange rate has some effect on semiconductor exports in both the long run and the short run.

Onafoworaa & Owoye (2008) examined the impact of exchange rate volatility on Nigeria's exports to its most important trading-partner—the United States over the quarterly period January 1980 to April 2001. Using co-integration and vector error correction (VECM) framework, empirical tests indicated the presence of a unique co-integrating vector linking real exports, real foreign income, relative export prices and real exchange rate volatility in the long-run. The results further showed increases in the volatility of the real exchange rate raised uncertainty about profits to be made which exerted significant negative effects on exports both in the short- and long-run. The findings also showed improvements in the terms of trade (represented by declines in the real exchange rate) and real foreign income exert positive effects on export activity. Most importantly, it was found that the trade liberalization and economic reform policies implemented in the post-1986 structural adjustment period contributed to Nigeria's export performance. The overall findings suggested Nigeria's exporting activities could be further boosted by policies aimed at achieving and maintaining a stable competitive real exchange rate.

Yusoff & Baharumshah (1999) examined the effects of the Malaysian dollar (ringgit) real exchange rate on the export demand for Malaysian primary commodities under alternative specification and estimation procedures. The results showed that the price and exchange rates were found to be inelastic meaning an increase in demand for exports due to depreciation in the ringgit may not be big enough to improve the balance of trade.

## **Data and Methodology**

### **Data**

Data for this work was sought from United Nations Conference for Trade and Development (UNCTAD), International Monetary Fund (IMF) and Bank of Ghana websites. It is made up of an annual data from 1990 to 2012 for Ghana.

### **Model Specification and Estimation**

We used the Ordinary Least Squares (OLS) estimators to study the relationship between the exchange rate movement in Ghana and that of export growth. The model is specified below;

$$EPTG_t = \alpha + \beta_1GDP_t + \beta_2GNS_t + \beta_3EXR_t + \beta_4INF_t + \beta_5IPTG_t + \beta_6POP_t + \varepsilon_t \quad (1)$$

Our dependent variable is EPTG = Export Growth measured as export of goods and services

Independent Variables;

GDP = Gross Domestic Product

GNS = Gross National Savings  
EXR = Exchange Rate of Cedi for the US Dollar  
INF = Inflation  
IPTG= Import of Goods and Services Growth  
POP = Size of Population  
 $\beta$  = Coefficients of the Explanatory Variables  
 $\varepsilon$  = Error Term  
t =Time Period

### Hypotheses

*Hypothesis 1:* Exchange rate of the US Dollar to the local currency (Cedi) will affect the growth of export of goods and services in the local economy. The expectation is based on the premise that as the local currency depreciates against the US Dollar, values of goods and services exported will increase and hence serves as a motivation for people who are into trade to export more.

*Hypothesis 2:* It is expected that GDP will have a positive relationship with export.

*Hypothesis 3:* GNS which serves as builder of future wealth for the nation is expected to correlate positively with export.

*Hypothesis 4:* Inflation is known to erode and destroy wealth of nations. It is therefore expected that as inflation goes up export will decline. It is thus envisaged to display a negative relationship with export.

### Diagnostic Testing

To be sure that our data meet the basic assumptions of OLS, we designed hypotheses below to test for serial autocorrelation, heteroscedasticity and normality problems. If these assumptions are not met estimations using the OLS will produce spurious results.

#### *Hypothesis 5*

H0: there is no serial correlation in the residuals

H1: there is serial correlation in the residuals

#### *Hypothesis 6*

H0: Residuals are homoscedastic

H1: Residuals are heteroscedastic

#### *Hypothesis 7*

Ho: Residuals are distributed normally

H1: Residuals are not distributed normally

### Data analysis and Interpretation

The major issue here is to ascertain whether or not exchange rate has an impact on export. In doing this, other control variables were included in the model so as to avoid omitted variables problems. These control variables are GDP, GNS, INF, POP and IMPG. We have added these variables because we expect them to have impact on export. This discussion is devoted to the discussion of the regression results.

**Descriptive Statistics**

In the descriptive statistics captured in table 1 below, the number of observations is 23. Commenting on the main variables, EPTG has mean value of 24.9477. It has a maximum value of 115.1460 with a minimum figure of -6.8580 and a Standard Deviation of 24.5399. On the other hand, EXR has 0.6901, 0.7322, 1.8800, 0.0345 and 0.5623 as values for mean, median, maximum, minimum and standard deviation respectively.

Table 1  
*Descriptive Statistics*

	EPTG	EXR	GDP	GNS	INF	IPTG	POP	TIV
Mean	24.94765	0.690087	16.47961	14.05848	21.31817	13.13135	19.14887	19.64287
Median	22.05200	0.732200	11.25700	14.21100	18.03100	11.32400	18.88300	20.38000
Maximum	115.1460	1.880000	40.43600	26.18600	59.46200	47.64300	24.92600	34.02400
Minimum	-6.858000	0.034500	7.362000	-2.804000	8.727000	-16.41400	14.30600	4.675000
Std. Dev.	24.53993	0.562275	10.25553	6.264533	12.59985	13.62333	3.268529	5.818241
Skewness	2.134530	0.429355	1.153582	-0.405224	1.462775	0.322063	0.199440	-0.075250
Kurtosis	9.045599	2.075024	3.047514	3.992499	4.899284	3.688598	1.838552	4.177728
Jarque-Bera	52.49189	1.526591	5.103378	1.573469	11.65919	0.852020	1.445231	1.350955
Probability	0.000000	0.466128	0.077950	0.455329	0.002939	0.653110	0.485481	0.508913
Sum	573.7960	15.87200	379.0310	323.3450	490.3180	302.0210	440.4240	451.7860
Sum Sq.								
StdDev.	13248.58	6.955379	2313.871	863.3761	3492.638	4083.091	235.0322	744.7424
Observations	23	23	23	23	23	23	23	23

**Regression Statistics**

In OLS estimations, the R<sup>2</sup> is a measure of the overall fitness of the model. R<sup>2</sup> has a limit of 1 and the closer it is to 1 the better the model. It describes the portion of the dependent variable which is attributable to the independent variables. R<sup>2</sup> in our model is 0.87 which means that 87% of the dependent variable is explained by the independent variables in the model. It is only 13% of the dependent variable that is being explained by the variables outside our model. From the regression, all our variables are jointly significant at 1% because we have a joint p-value of 0.000012. Thus all the variables jointly explain or affect the dependent variable.

For any variable to be significant, its p-value must be less than the 5%. From the results exchange rate being our major variable is not significant. It has a p-value of 24% which is greater than 5%. It does not therefore help in explaining changes in the dependent variable, Export (EPTg) contrary to majority of the studies (see, Oskooee and Bourdon 2005, Erdal and Esengu 2012, Dincer and Kandil, 2011 and Granskog and Wisdom 2003). The size of the population and the level of inflation do not also affect the change of export in Ghana. Though these two have positive correlation, they are not significant in explaining the change in export.

The variables that are significant in explaining the changes in the dependent variables are GDP, GNS, IPTG and TIV. These all have their p-values less than 0.05.

Table 2

*Regression Results*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXR	-43.13446	35.39541	-1.218646	0.2418
GDP	2.334780	0.521446	4.477512	0.0004
GNS	3.579215	0.824715	4.339945	0.0006
INF	0.239070	0.232876	1.026594	0.3209
IPTG	0.854484	0.251399	3.398917	0.0040
POP	3.075039	5.389051	0.570608	0.5767
TIV	-3.831843	0.928297	-4.127819	0.0009
C	-34.01258	85.40337	-0.398258	0.6961
R-squared	0.871029	Mean dependent var		24.94765
Adjusted R-squared	0.810843	S.D. dependent var		24.53993
S.E. of regression	10.67295	Akaike info criterion		7.841510
Sum squared resid	1708.677	Schwarz criterion		8.236464
Log likelihood	-82.17736	Hannan-Quinn criter.		7.940840
F-statistic	14.47223	Durbin-Watson stat		3.031597
Prob(F-statistic)	0.000012			

**Regression Equation**

The regression equation of the analysis is:

$$EPTG_t = -34.0126 - 43.1345EXR + 2.2335GDP + 3.5792GNS + 0.2391INF + 0.8545IPTG + 3.0750POP - 3.8318TIV + \varepsilon_t \quad (2)$$

The intercept of -34.0126 means the average value of the dependent value given that there is no change in any of the independent variable. From the regression, TIV is significant but, it has a negative correlation with the dependent variable and this means that a 1 unit increase in TIV will lead to 3.8 decreases in export of goods and services. All the other variables that are significant have positive relationship. For instance, if GNS increases by 1 unit, it will lead to a 3.6 unit rise in the export while a 1 unit rise in IPTG will lead to an increase in export of about 0.85.

Table 3

*Breusch – Godfrey Serial Correlation LM Test*

F-statistic	3.243825	Prob. F(2,13)	0.0720
Obs*R-squared	7.656950	Prob. Chi-Square(2)	0.0217

For the diagnostic test for serial correlation test above, the null hypothesis that there is no serial correlation can be rejected since the p-value of 0.072 is greater than 0.05.



Table 4

*Breusch – Pagan – Godfrey Heteroscedasticity Test*

F-statistic	0.692524	Prob. F(7,15)	0.6778
Obs*R-squared	5.617604	Prob. Chi-Square(7)	0.5850
Scaled explained SS	1.219882	Prob. Chi-Square(7)	0.9905

Again, hypothesis 6, of homoscedasticity of the residuals cannot be rejected. This means that the residuals are not heteroscedastic.

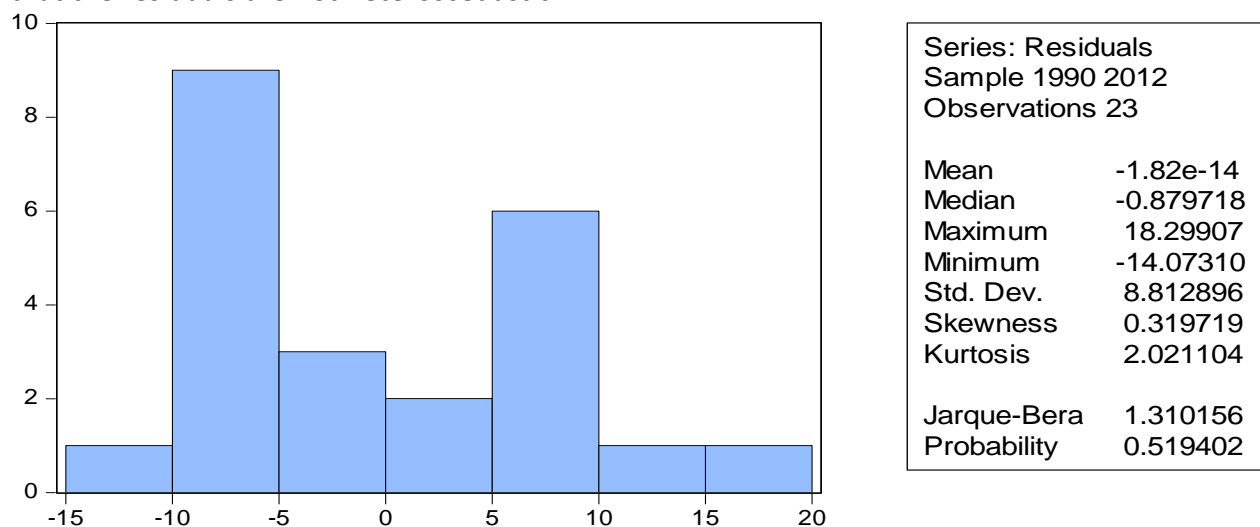


Figure 3. Residual Normality Test

From the regression diagnostics, the Jarque–Bera is 1.31 and the p-value is 0.53 which is greater than 0.05 hence we fail to reject the null hypothesis that the residuals are normally distributed.

### Conclusion

Having set out to investigate the impact of exchange rate movement on export growth, the study has established contrary to many findings, that exchange rate movement has no significant impact on export of goods and services in the country. The study however established that GDP, GNS, IPTG and TIV have significant impact on export growth. While among these variables only TIV has a negative correlation with the dependent variable, the rest all have a positive relationship on the export growth in Ghana.

In trying to address the challenges of export so as to boost export in Ghana, policy makers should be mindful not to be overly concentrated on exchange rate pegging or inflation targeting since these do not have any impact on export of Ghana. More attention should rather be directed at how to increase the GNS and GDP in order to enhance our export industry since the country is blessed beyond bounds with natural resources.

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