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Responsive of Trade Correlates to Exchange Rate: A Comparative Analysis of Nigeria and Ghana (1996 To 2016)

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ABSTRACT

This work is set out as an inquiry into the degree to which trade openness can be enhanced by favourable exchange rate policy. It is driven along the line of evaluating how exchange rate drive export volume, import volume and cumulatively net export in two key economies in the West African Sub-region namely Nigeria and Ghana. The ex-post facto research design was adopted and annualized time series covering the period 1996 to 2016 gathered from the World Development Indicators. Three hypotheses were formulated and tested using the Ordinary Least Squares using Net Export, Export and Import respectively as dependent variables and Real Exchange rate as the independent variable with the Ratio of Trade to Gross Domestic Product as the moderating variable. It was found out that exchange rate significantly impacts on net export, Volume of export and Volume of import respectively. In line with the findings, it is recommended that export and import volume should be properly controlled to the advantage of the economy using the appropriate exchange rate policy by the government.

Keywords: Responsive, trade, correlates, comparative, analysis, Nigeria, Ghana.

INTRODUCTION

Foreign exchange rate drives the means of payment for international transaction. It puts a country's currency side by side with currencies of other countries of the world. It is quoted against convertible currencies that are generally accepted for the settlement of international financial obligations. Exchange rate system governs the interplay and the pricing of currencies in the cause of international transactions and settlements [1].

Trade correlates include such things as export volume, import volume, net export and trade openness. Trade Openness looks at the degree of accessibility to a country in terms of international trade volume. For the proponents of trade openness, the main thrust of the policy involves removal of non-tariffs obstacles to trade and a focus on the establishment of market mechanism as a medium of foreign exchange rate determination and removal fiscal disincentives and regulatory measures that prevent exports [2], [3], [4].

While trade openness, single handedly, may not generate the desired impact on long run growth, it should be noted that application of appropriate fiscal and monetary policies, intensive financial reforms and control of domestic prices and these measures are expected to raise international competitiveness and this has been the target of the present government in Nigeria [5].

Nigeria and other developed and developing economies have lately been playing around exchange rates as a key driver of trade openness. The degree to which this policy direction fruitfully produces enhanced trade across the borders represents the focus of this study [6], [7]. Significantly, this study makes comparative analyses of the two leading

economies in the West African economic bloc namely Nigeria and Ghana. The design largely is to see the degree to which exchange rate drives openness and other international trade related variables in the countries in focus [8].

Statement of the Problem

The instability and continued depreciation of the currencies of developing economies in the foreign exchange market has resulted in increased cost of production and unattractiveness of exports of these countries [9], [10]. This is in the light of ever increasing appetite for imported goods. This has also tended to undermine the international competitiveness of exports and make planning and projections difficult at both micro and macro levels of the economy. Efforts over the years have been directed at reengineering the exchange rate systems and regimes to allow for greater and unrestricted flow of trade especially minimization of importation and promotion of exportation. Essentially, government has played around fixed and flexible exchange systems to see which places the economy on a favourable threshold with emphasis on trade and international competitiveness. It is in the light of this that this work is set out as an inquiry into the degree to which trade openness can be enhanced by favourable exchange rate policy. This is driven along the line of evaluating how exchange rate drive export volume, import volume and cumulatively trade openness/net export in Nigeria and Ghana which are two leading economies in the West African Sub region [11].

Research Objective

The broad objective of this study is to measure the responsiveness of trade correlates to exchange rate in Nigeria and Ghana respectively. This broad objective is divided into the following specific objectives:

1. To measure the comparative impact of exchange rate on the volume of export in Nigeria and Ghana
2. To measure the Comparative impact of exchange rate on the volume of import in Nigeria and Ghana
3. To measure the impact of exchange rate on net export in Nigeria and Ghana

Research Questions

The following questions are to be answered in the course of this study:

1. To what extent does exchange rate comparatively affect the volume of export in Nigeria and Ghana
2. To what degree does exchange rate comparatively affect the volume of import in Nigeria and Ghana?
3. What is the degree of relative responsiveness of trade openness exchange rate in Nigeria and Ghana?

Hypotheses

The following are the hypotheses for this study

Ho_1: Exchange rate does not significantly affect the export volume in Nigeria and Ghana

Ho_2: Exchange rate does not significantly affect the volume on import in Nigeria and Ghana

Ho_3: Exchange rate does not significantly affect the volume on net export in Nigeria and Ghana

Significance of the Study

The study would identify the strengths and weakness of exchange rate in driving the studied trade correlates in Nigeria and Ghana respectively and would essentially provide awareness to the general public [12]. The various findings of this would enable the government and financial authorities to device, modify and adopt better exchange rate regimes for the economies in focus. The results from this study would add to existing body of literature in this topical issue and would be used by students and the academia alike.

Scope of the Study

The scope of this study covers Nigeria and Ghana's exchange rate policies over the years to date. The empirical investigation of the relationship between exchange rate and trade correlates covers the period between 1996 and 2016 [13]. All the Variables for the study are drawn from the Nigerian and Ghanaian economic

environment as published in the World Development Indicators.

METHODOLOGY

Research design

The study adopts the *ex post facto* research method. This is mostly used in a study where it is not possible or acceptable to manipulate the characteristics of the variables under study.

[14] sees *ex post facto* research as one which is based on a fact or event that has already happened.

The data set captures already completed and reported variables, therefore the use of the above research design is justified.

Nature and source of Data

The data for the work is annualized time series drawn World Bank databank. It covers the period 1996 to 2016. The data by source is secondary in nature since It is drawn from already published works and existing sources.The choice of the period 1996 to 2016 is informed by the availability of data in a form detailed enough to allow for robust analyses.

Area of study and Sample

The area of study is the Nigerian and Ghanaian economic environment from where the datasets for analyses are drawn. There is no need for sampling except for the period of study. The study takes a sample period of 1996 to 2016 in dealing with data for the estimation and empirical analyses [15]. The choice of 1996 is based on availability of data while the choice of 2016 as the upper limit is to ensure currency of the data to be used.

Model Specification

The model for this work is specified following the Classical Linear Regression Model

$$Y= bo + b_1Xi + b_2X_2 + b_3X_3 \ldots\ldots\ldots\ldots b_nX_n + \varepsilon_t$$

Where

Y = Dependent variable

X_1, X_2, X_3..... X_n = the explanatory or independent variables

b_0 = intercept

b_1, b_2, b_3....b_n = the coefficient of the parameter estimates or the slope.

$\varepsilon_{t=}$ error or disturbance term.

In relating this to the work,

Nxp = f(Exr)

Where:

NXP = Net export (proxy for trade openness)

Exr = Exchange

The model is disaggregated for the purposes of testing the stated hypothesis and is rewritten thus:

$$LNXP = b_0 + b_1LREXR + b_2LTGDP + \varepsilon_t$$ ---------- model 1(hypothesis 1)

$$LXP = b_0 + b_1LREXR + b_2LTGDP + \varepsilon_t$$ ---------- model 2(Hypothesis 2)

$$LMP = b_0 + b_1LREXR + b_2LTGDP + \varepsilon_t$$ ..... model 3(hypothesis 3)

Where:

LNXP = net export; LMP = import; LXP = export; LEXR= exchange rate

LTGDP = Ratio of trade to Gross Domestic Product

To ensure linearity and trimming down the data size without losing its real value, the variables will be used in their log transformed form hence the attachment of “L” to all of them.

Description of Variables

In this study NXP, XP and MP are the dependent variables for hypothesis one, two and three respectively while the independent variable of interest is REXR. TGDP is used in all the instances as a moderating or control variable [16].

Method of Estimation

The Classical Linear Regression Model (CLRM) which represents the foundational model for most econometric analyses form the most fundamental technique of

data analyses for this work [17]. In specific terms, regression analyses explains the variation in an outcome (dependent variable) Y, as it depends on a predictor (independent explanatory) variable, X. In this work therefore, the variation in trade openness will be explained on the basis of Real Exchange rate which is the predictor.

Test of Significance (F and T Statistic)

F and T statistic will be used to test the significance of the overall regression and the significance of the parameter estimates respectively.

The probability values of the F and T as shown in the regression results will be used to make the acceptance or rejection of hypothesis decision. If the p-value is greater than the chosen level of significance which is 5%, null is rejected otherwise the alternative is accepted [18].

Other Tests

There will be further tests for the following:

- Goodness of Fit using the R2 and adjusted R2 (the higher the R2 the better the goodness of fit)
- First Order Autocorrelation using the DW statistic(by rule of thumb, the DW stat should be approximately equal to 2, to remove any suspicion of autocorrelation.

RESULTS

Table 1 Exchange Rate and Trade Correlates in Nigeria 1996 – 2016

Year	RNXP	REXR	TGDP	XP	MP
1996	27.26342	5.343550	3.695302	23.18797	27.28026
1997	27.62335	5.472403	3.940824	23.47067	27.63895
1998	27.63664	5.617840	3.670680	23.01655	27.64645
1999	27.28403	4.245323	3.539736	23.26225	27.30179
2000	27.26640	4.259281	3.891730	23.94285	27.30179
2001	27.27229	4.367505	3.905613	23.76370	27.30179
2002	27.27050	4.370756	3.689758	23.82189	27.30179
2003	27.26200	4.308093	3.898633	24.05780	27.30179
2004	27.26264	4.330426	3.462477	24.04193	27.30179
2005	27.24892	4.466274	3.498308	24.33548	27.30179
2006	27.19991	4.524886	3.751069	24.96730	27.30179
2007	27.21693	4.514767	3.672164	24.79285	27.30179
2008	27.17367	4.609927	3.708605	25.18361	27.30179
2009	27.22320	4.528850	3.585148	24.71923	27.30179
2010	27.16299	4.605170	3.768632	25.25845	27.30179
2011	27.10295	4.610448	3.975523	25.58876	27.30179
2012	27.07687	4.705181	3.796216	25.69943	27.30179
2013	27.16346	4.765663	3.435562	25.25534	27.30179
2014	27.14436	4.824221	3.430277	25.37535	27.30179
2015	27.22571	4.779451	3.065581	24.68800	27.30179
2016	27.24855	4.702003	3.031221	24.34229	27.30179

Source: World Bank Databank

Table 2 Exchange Rate and Trade Correlates in Ghana 1996 – 2016

Year	NXP	MP	REXR	TGDP	XP
1996	21.29559	19.93493	4.866148	4.279509	21.52391
1997	21.11909	20.43277	4.927533	4.447368	21.52683
1998	21.26890	20.51033	4.993206	4.389493	21.65303
1999	21.09822	20.74435	4.977561	4.403116	21.63001
2000	20.22227	21.32534	4.557209	4.754008	21.61191
2001	17.96460	21.62646	4.568500	4.700897	21.60044
2002	17.79230	21.70953	4.564436	4.579742	21.68944
2003	20.27740	22.04370	4.568570	4.577667	21.85621
2004	21.00989	22.29658	4.555453	4.601868	21.97336
2005	21.46118	22.51555	4.645894	4.586716	22.08721
2006	21.63031	22.75386	4.699701	4.188464	22.36064
2007	21.94163	22.96968	4.692418	4.179824	22.52697
2008	22.56139	23.32038	4.642432	4.241531	22.68900
2009	22.78663	23.46293	4.552278	4.271022	22.75265
2010	23.17855	23.77414	4.605170	4.322513	22.97288
2011	23.42531	24.10849	4.556203	4.457777	23.40528
2012	23.85207	24.40646	4.459788	4.534405	23.55215
2013	24.05526	24.51511	4.457249	4.122077	23.51713
2014	24.43807	24.75749	4.195366	4.177008	23.46077
2015	24.86618	25.08896	4.169228	4.325276	23.47807
2016	24.86746	25.11282	4.307063	4.239277	23.58761

Source: World Bank Databank

In table 1, the dependent and the independent variables of interest are presented in their log linear form.

Test of Hypothesis One

This is a test of the impact of Real Exchange rate on trade openness. The proxy for Net ExportIS (XP – MP). The model is in the form stated above and is restated thus

$$LNXP = b_0 + b_1 LREXR + b_2 LTGDP + \varepsilon_t$$

Table 3 LINEAR REGRESSION RESULT FOR MODEL 1
NIGERIA
Dependent Variable: LNXP
Sample: 1996 2016
Included observations: 21

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	21.33175	3.680206	5.796348	0.0000
LREXR	1.090722	0.298155	3.658243	0.0021
LTGDP	-0.700991	0.712567	-0.983755	0.3399

R-squared	0.593988	Mean dependent var	23.57618
Adjusted R-squared	0.543237	S.D. dependent var	1.121322
S.E. of regression	0.757837	Akaike info criterion	2.427243
Sum squared resid	9.189078	Schwarz criterion	2.576365
Log likelihood	-20.05881	Hannan-Quinn criter.	2.452480
F-statistic	11.70387	Durbin-Watson stat	1.966942
Prob(F-statistic)	0.000738		

Source: Author's Computation

GHANA

Dependent Variable: LOG(NXP)
Method: Least Squares
Sample: 1996 2016
Included observations: 21

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	68.20103	8.684924	7.852807	0.0000
LOG(REXR)	-3.896100	1.317058	-2.958185	0.0084
LOG(TGDP)	-6.439697	1.569454	-4.103145	0.0007

R-squared	0.613134	Mean dependent var	21.95773
Adjusted R-squared	0.570149	S.D. dependent var	1.981164
S.E. of regression	1.298911	Akaike info criterion	3.492494
Sum squared resid	30.36907	Schwarz criterion	3.641711
Log likelihood	-33.67118	Hannan-Quinn criter.	3.524878
F-statistic	14.26387	Durbin-Watson stat	1.539404
Prob(F-statistic)	0.000194		

Source: Author's Computation

From the result shown above, the R^2 is 59% for Nigeria and 61% for Ghana indicating that the independent variables account for 59% and 61% of the variation in NXP for Nigeria and Ghana respectively while 41% and 39% of the variation is explained by factors outside the model. The F statistic also shows that the overall regression is statistically significant and can be used for meaningful analyses. The

Durbin Watson Stat which is 1.9 for Nigeria and 1.53 for Ghana; all approximately 2 showing that there is no evidence of auto correlation [19]. Essentially, the regression is good enough for the test of the set hypothesis.

The hypothesis is restated thus:

H_o: Exchange rate does not significantly affect net export for Nigeria and Ghana

H_a: Exchange rate significantly affect net export for Nigeria and Ghana

From the regression result in table 4.2, LEXR shares a significant relationship with LNXP in both Ghana and Nigeria as the p-values are less than 5%. Based on this, we reject the null hypothesis and accept the alternative and conclude that Exchange rate significantly affect net export in both Ghana and Nigeria.

Test of Hypothesis Two

This is a test of the impact of Real Exchange rate on export volume. The proxy for export volume is XP. The model is in the form stated above and is restated thus

$LXP = b_0 + b_1 LEXR + b_2 LTGDP + \varepsilon_t$ ---------- model 2

Table 4 LINEAR REGRESSION RESULT FOR MODEL 2 NIGERIA

Dependent Variable: LXP
Method: Least Squares

Sample: 1996 2016
Included observations: 21

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	25.49662	2.706975	9.418861	0.0000
LREXR	0.651314	0.219308	2.969867	0.0090
LTGDP	-1.035754	0.524128	-1.976146	0.0656

R-squared	0.601750	Mean dependent var	24.40354
Adjusted R-squared	0.551969	S.D. dependent var	0.832787
S.E. of regression	0.557427	Akaike info criterion	1.812969
Sum squared resid	4.971598	Schwarz criterion	1.962091
Log likelihood	-14.22321	Hannan-Quinn criter.	1.838206
F-statistic	12.08788	Durbin-Watson stat	1.586109
Prob(F-statistic)	0.000633		

Source: Author's Computation

GHANA

Dependent Variable: LOG(XP)
Method: Least Squares
Sample: 1996 2016
Included observations: 21

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	42.40015	2.871110	14.76786	0.0000
LOG(REXR)	-2.461117	0.435400	-5.652539	0.0000
LOG(TGDP)	-1.962542	0.518839	-3.782565	0.0014

R-squared	0.740834	Mean dependent var	22.45026
Adjusted R-squared	0.712038	S.D. dependent var	0.800195
S.E. of regression	0.429401	Akaike info criterion	1.278714
Sum squared resid	3.318939	Schwarz criterion	1.427932
Log likelihood	-10.42650	Hannan-Quinn criter.	1.311098
F-statistic	25.72683	Durbin-Watson stat	1.759290
Prob(F-statistic)	0.000005		

Source: Author's Computation

From the result shown above, the R^2 are 60% and 43% for Nigeria and Ghana respectively indicating that the independent variables account for 60%

and 43% of the variation in XP while 40% and 57% of the variation are respectively explained by factors outside the model. The F statistic also shows that the overall regression is statistically significant and can be used for meaningful analyses [20]. The Durbin Watson Stat which are approximately 2, shows that there is no evidence of autocorrelation. Essentially, the regression is good enough for the test of the set hypothesis.

The hypothesis is restated thus:

H_o: Exchange rate does not significantly affect export volume in Nigeria and Ghana.

H_a: Exchange rate significantly affect export volume in Nigeria and Ghana.

From the regression result in table 4.3, LEXR shares a significant relationship with LXP in both Ghana and Nigeria as the p-values are less than 5%. Based on this, we reject the null hypothesis and accept the alternative and conclude that Exchange rate significantly affect aggregate export in both Ghana and Nigeria

Test of Hypothesis Three

This is a test of the impact of Real Exchange rate on import volume. The proxy for import volume is MP. The model is in the form stated above and is restated thus

$LMP = b_0 + b_1 LEXR + b_2 LTGDP + \varepsilon_t$ model 3

Method: Least Squares				
Sample: 1996 2016				
Included observations: 21				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	26.15637	2.860753	9.143179	0.0000
LREXR	0.503409	0.231766	2.172055	0.0452
LTGDP	-1.199126	0.553903	-2.164867	0.0459
R-squared	0.533972	Mean dependent var		23.74003
Adjusted R-squared	0.475719	S.D. dependent var		0.813583
S.E. of regression	0.589093	Akaike info criterion		1.923475
Sum squared resid	5.552496	Schwarz criterion		2.072597
Log likelihood	-15.27301	Hannan-Quinn criter.		1.948713
F-statistic	9.166366	Durbin-Watson stat		1.693047
Prob(F-statistic)	0.002225			

Source: Author's Computation

GHANA

Dependent Variable: LOG(MP)				
Method: Least Squares				
Date: 05/15/19 Time: 21:30				
Sample: 1996 2016				
Included observations: 21				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	62.51995	4.852182	12.88491	0.0000
LOG(REXR)	-5.855172	0.735827	-7.957265	0.0000
LOG(TGDP)	-2.924081	0.876839	-3.334800	0.0037
R-squared	0.818338	Mean dependent var		22.73380
Adjusted R-squared	0.798154	S.D. dependent var		1.615252
S.E. of regression	0.725689	Akaike info criterion		2.328173
Sum squared resid	9.479243	Schwarz criterion		2.477391
Log likelihood	-21.44582	Hannan-Quinn criter.		2.360557
F-statistic	40.54265	Durbin-Watson stat		1.847990
Prob(F-statistic)	0.000000			

Source: Author's Computation

From the result shown above, the R^2 are 53% and 81% for Nigeria and Ghana respectively indicating that the independent variables account for 53% and 81% of the variation in XP while 47% and 19% of the variation are respectively explained by factors outside the model. The F statistic also shows that the overall regression is statistically significant and can be used for meaningful analyses. The Durbin Watson Stat which are approximately 2 shows that there is no evidence of autocorrelation. Essentially, the regression is good enough for the test of the set hypothesis.

The hypothesis is restated thus:

H_o: Exchange rate does not significantly affect import volume in Nigeria and Ghana.

H_a: Exchange rate significantly affect import volume in Nigeria and Ghana.

From the regression result in table 4.4, LEXR shares a significant relationship with LMP in both Ghana and Nigeria as the p-values are less than 5%. Based on this, we reject the null hypothesis and accept the alternative and conclude that Exchange rate significantly affect aggregate import in both Ghana and Nigeria.

CONCLUSION

This study viewed the relationship between exchange rate and trade correlates. The motivation stemmed from the need to determine the degree and magnitude of influence that exchange rate exerts on volume of trade. The results emanating from the study proved that exchange rate drives net export, import volume and export volume.

RECOMMENDATIONS

In line with the specific objectives of this study and the findings, we recommend as follows:

1. That the government should duly control and manage exchange rate to enable it properly drive correlates of foreign trade.
2. That export and import volume should be properly controlled to the advantage of the economy

using the appropriate exchange rate policy.

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