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How Exchange Rate Changes Affect Trade Balance in Ghana

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Abstract

In international commerce, a steady exchange rate has been touted as a positive indicator for all economies. It increases investor trust and allows global market participants to make realistic business forecasts. Despite the adoption of multiple regimes, Ghana's exchange rate has seen significant depreciation. The literature on trade have paid particular attention to the link between trade balance and exchange rate but failed to include certain relevant variables such as FDI and inflation which this study believes can influence changes in the trade balance. This research estimated the effect of exchange rate on trade balance in Ghana by including these relevant variables that extant studies have ignored. It used yearly data from the World Bank Development Indicators from 1980 to 2019 in a Vector Error Correction (VEC) model and concludes that increases in exchange rate has a short run and long run negative effect on trade balance confirming the established fact that depreciation adversely affect the trade balance of Ghana. However, inflation and FDI were shown to have a positive and significant influence on Ghana's trade balance. The study therefore calls for improved policies and actions to earnestly reduce imports, encourage exports and strengthen the value of the cedi.

Keywords: *Trade Balance; Exchange Rate; VEC Model; Ghana; FDI; Inflation.*

JEL Classification: *E17, F10, F14.*

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1. Introduction

External trade represents a considerable aspect of every economy and it is one of the major indicators' economists consider in measuring a country's performance. Trade involves the sale and purchase of goods and services among countries. Adam Smith advocated for countries to concentrate on the production and export of goods in which they had an absolute advantage and import goods in which they had an absolute disadvantage (Schumacher, 2012). David Ricardo advanced the idea by suggesting that nations can still trade even if they had a comparative advantage in the production of a particular good (Bernhofen and Bown, 2018). In all, trade increases the total volume of goods available in the world, ensure efficient utilization of resources and allow the transfer of essential goods to countries without the ability to produce them on their own (Schumacher, 2012).

Trade's contribution to Ghana's GDP cannot be overlooked. World Bank's development indicators showed that trade contributed 71.68% to Ghana's GDP in 2018. According to Sharifi-Renani and Mirfatah (2012), trade is significant for any country that desires growth and development because it expands their market size and makes available goods that are not produced in the local economy. For any country to have favorable trade balance, there is the need to devote attention to an important factor like exchange rate. Ghana's trade is mostly dominated by imports and hence volatilities in exchange rate affects its trade with other countries. Exchange rate is precisely stated as the price of one currency in terms of another. Technically, it is defined as how many units of currencies of a certain country can be exchanged for a unit of another currency (Raza et al., 2013).

Globalization and advancement in technology has made external trade more imperative than before and underscores the need for developing countries to maximize their gains through trade. World Bank (2017) data revealed that international trade as a percentage share of world GDP increased from a meager 12% in 1960 to about 30% by the end of 2015. The global quantity of goods and services exported stood at 2.34 trillion USD as at 2016. This depicts the growing importance of trade and the potential it holds for country's growth through access to larger global markets and transfer of essential knowledge and expertise for domestic firms. Consumers also enjoy variety of goods and services which enhances their welfare.

Ghana as a developing country is faced with limited production capacity and hence depend greatly on trade. According to the World Integrated Trade Solution, Ghana imported US $11,880 million worth of goods and services in 2018. This represents 31.2% increase in the country's import from US $9,058 million

recorded in 2008. This highlights the country's excessive dependence on goods and services from abroad. As a matter of fact, this inordinate taste for foreign goods and services has been cited as a major factor that contributes to a fall in the value of the cedi (Arthur, 2010).

In recent years, the cedi has depreciated against other currencies like the US dollar. Even though in 2007 Ghana undertook a redenomination exercise, not much has improved in terms of the performance of the cedi as it continues to decline in relative value. This exercise saw the Ghanaian cedi exchanging for the United States' dollar at GHS 0.9599 to 1 USD. However, as at June 2021, the exchange rate had deteriorated to GHS 5.79 to 1 USD showing depreciation of over 500% percent over the period (Bank of Ghana, 2021).

Although Ghana underwent major economic reform policies like the Structural Adjustment Program (SAP) to enhance the fundamental underpinning of the economy, the cedi still performs poorly against major currencies like the United States dollar. The increase in Ghana's rate of exchange in recent times has largely been attributed to strong performance of the United States' economy, pricing of real estate's properties and the increase in the demand for imported secondary goods (Alagidede and Ibrahim, 2017). Many governments over the years have had to grapple with the problems that depreciation of Ghana's exchange rate bring.

Cote (1994) and Mckenzie (1999) in their separate papers to a large extent established that the impact of increases in exchange rate volatilities on trade differ based on assumptions and models of the analyses. For the case of Ghana, what has become the norm is depreciation of the cedi which in turn permeate every sector of the economy. This has damning consequences on the average consumer and the economy as a whole considering the fact that the country virtually imports everything. These consequences include depletion of foreign exchange, reduction in purchasing power of consumers of foreign goods, reduces investment capacity of firms, inflation and discourage investors from investing in assets denominated in local currencies (Raza et al., 2013).

Extensive search of literature shows that the relationship between exchange rate and trade balance has received considerable attention. In Ghana, Bhattarai and Armah (2013) investigated the effect of real rate of exchange by fixing two models for imports and exports. Their findings focused on the elasticities of export and import demand without estimating the effect of real rate of exchange on trade balance. Anning et al. (2015), Iyke and Ho (2017) and Akoto and Sakyi (2019) corrected this by regressing trade balance on real exchange rate and other relevant variables.

While these studies provided recent evidence on the effect of real rate of exchange on Ghana's balance of trade, they failed to include foreign direct investment (FDI) and inflation which can influence movements in the balance of trade of Ghana. Inflation is regarded as a major factor that influence the demand for both domestic and foreign goods (Raza et al., 2013) and ultimately has the potential to explain changes in Ghana's trade balance. Alagidede and Ibrahim (2017) noted FDI as a pointer that shows a country's level of integration with the global finance markets. Anoke et al. (2016) also found FDI to improve Nigeria's trade balance and it is therefore important to find out if Ghana's trade balance can also be improved with an improvement in the inflow of FDI. Alagidede and Ibrahim (2017) included inflation and FDI but their study used economic growth instead of trade balance as the dependent variable. It is therefore prudent to find out the effect of exchange rate on trade balance in Ghana especially with the inclusion of these important variables which past studies ignored. This will provide new and needed insights on how the Ghanaian cedi can be stabilized to improve the fortunes of the economy. The objective of this paper is twofold; first it estimates the effect of exchange rate increases on Ghana's trade balance; second it estimates the effect of other factors that determine trade balance in Ghana.

The reminder of this paper is organized as follows. Section two reviews the relevant literature on theories and empirical studies as far as trade balance and exchange rate changes is concerned. The next section outlines the methodology adopted by the study whiles section four presents empirical results and its discussions. The paper is concluded in section five by presenting summary of findings, conclusions and some policy recommendations.

2. Literature Review

2.1. Theoretical Literature

Mercantilism is perhaps the oldest economic theory that sought to explain the exchange of goods and services among countries. Under this system of trade, the purchase of goods from one country simply means the transfer of gold from the buyer to the seller while sales represent the exact opposite. Mercantilism was therefore referred to as bullionism since countries resort to policies that will maximize their exports and restrict imports in order to bring in more gold while retaining their gold reserves (List, 1916). The motive of mercantilists has evolved over time but its basic idea remained unchanged. Countries still use restrictions to

reduce imports and embark on policies to encourage domestic production and exports.

Adam Smith's theory of absolute advantage suggests a mutually beneficial path for nations to trade among themselves. This theory implies a country has an absolute advantage over its trade partner if it produces the same good at a lower cost than the other nation (Hong, 1984). This means such a country has a higher productivity in the production of that particular good relative to the other country. On the other hand, it has an absolute disadvantage if it produces that good at a higher cost relative to the other country. The theory of absolute disadvantage by Smith suggests that a country must have an absolute advantage in the production of at least one good for mutually beneficial trade to occur. This however received criticism because it means countries without an absolute advantage in the production of any good cannot gain from international trade (Hong, 1984).

David Ricardo's comparative advantage is considered more conclusive than the theory of absolute advantage by Adam Smith as it explained how countries without an absolute advantage in any traded commodity can still benefit from international trade (Hong, 1984). The theory suggests that a nation has a comparative advantage in trade if it produces a commodity at a lower opportunity cost relative to the other country although it has absolute advantage in none of the goods in trade. It means that country give up less compared with its counterparts to produce the same commodity. This allows that country to be more productive and efficient than the other country in the production of that particular commodity (Bernhofen, 2018).

The Marshall Lerner condition assumes variations in exchange rate as the only drivers of change in the exports and imports of a country. It also assumes constant prices of both domestic and foreign goods in each country for its analysis. The condition suggests a direct change in the country's export while an opposite change occur in the country's imports when there is a change in the rate of exchange of that country. As defined before, a rise in the rate of exchange means depreciation and this will lead to an increase in the country's exports whereas the country's imports declines. For an import driven economy like Ghana which have to pay a higher import bill and get paid lower for their export, the indirect effect of depreciation on balance of trade tend to be bigger than the direct effect (Davidson, 2009). Essentially, an increase in exchange rate stimulate exports while it discourages the import of goods and services. This stem from the fact that depreciation increases the real income of foreigners while it reduces that of domestic consumers of foreign goods. Exports therefore increase as they

become relatively cheaper but imports fall due to a fall in their purchasing power (Davidson, 2009). The point here is that imports will still continue for a country like Ghana because of the country's dependence on it. For an import dependent country like Ghana, depreciation will only boost the country's balance of trade if the addition of price elasticities of export and import demand exceeds unity. In this case, the Marshall-Lerner condition is satisfied (Davidson, 2009).

2.2. Empirical Literature

Among empirical works on the nexus of trade balance and exchange rate is Stucka (2004) which examined the link in Croatia for the period 1994 to 2002. The results revealed that lasting depreciation of exchange rate in Croatia leads to an improvement in the equilibrium balance of trade. The suggestion of the J-curve was found to hold in Croatia. Thorbecke (2011) investigated the relationship in East Asia using a Gravity model and data spanning the period 1988 to 2007. The study revealed that the current exchange rate regimes would interfere with the relationship that exist between developed and developing countries if market forces exert pressure on currencies in that region to appreciate. It was revealed that market forces influence movements in currencies across countries in East Asia especially if the regime of exchange rate permits it. Lencho (2013) also examined this nexus in Ethiopia from 1970 to 2008 and showed that depreciation of exchange rate improves Ethiopia's balance of trade. The study also found the balance of trade deficit in Ethiopia to persist due to the inelastic nature of the country's import demand. The sensitivity of the country's exports to weather conditions and changes in commodity prices tend to reduce exports and widen the balance of trade deficit.

In a related study, Anoke et al. (2016) and Akpansung and Babalola (2013) investigated the effects of real exchange rate on trade balance in Nigeria. Their results revealed that real exchange rate adjustment alone may not ensure favorable balance of trade in Nigeria. Their study noted that several other aspects of the Nigerian economy must be well-grounded coupled with a favorable macroeconomic environment are some of the conditions that will lead to an improvement in its trade balance. Schaling and Kabundi (2014) estimated the impact of exchange rate on the trade balance and the J-curve effect in South Africa from 1994 to 2011. The study found evidence of the J-curve in South Africa such that devaluation/depreciation does not influence trade balance in the short run but in the long run. Net-exports of South Africa is improved with devaluation of the country's currency. In Uganda, the findings of Tumwine (2018) showed that the rate of exchange in Uganda has a significant and positive effect in the short

run on trade balance but a negative significant effect on trade balance in the long run. Again, the results from the study indicated that the short and long run is contrary to what the J-curve suggests since changes in exchange rate in Uganda are dominated by depreciations.

In Ghana, Agbola (2008), Bhattarai and Armah (2013), Anning et al. (2015), Iyke and Ho (2017) and Akoto and Sakyi (2019) examined the relationship between exchange rate and trade balance for various time periods and arrived at different conclusions. While Agbola (2008), Bhattarai and Armah (2013) and Anning et al. (2015) found depreciation/devaluation of the cedi to contract Ghana's economy through a reduction in trade balance, Iyke and Ho (2017) found no evidence of exchange rate depreciation influencing trade balance on a basis of a linear model. Iyke and Ho (2017) however found a significant relationship between exchange rate and trade balance when a non-linear model was employed. The findings from Akoto and Sakyi (2019) showed that the Marshall-Lerner condition and the J-curve effect do not to hold in Ghana and suggested that currency depreciation may not be the right solution for the country to improve its trade balance.

The empirical review showed that the literature is replete with studies that explored the relationship between trade balance and exchange rate especially on Ghana. However, these studies particularly those on Ghana failed to include important variables like inflation and FDI which this study argued have the potential to explain changes in trade balance. Addition of these two important variables will surely provide new information and advance discussion on the trade balance-exchange rate nexus.

3. Data and Methodology

3.1. Model Specification

The study followed Sims (1980) and adopts a Vector Error Correction (VEC) model as the estimation strategy. VEC model is a restricted VAR model that becomes necessary after a long run relationship have been established among the variables. The series therefore have to be stationary at first difference and must be co-integrated.

The functional form of the model is specified as follows:

$$TB_t = f(\, RER_t, GDP_t, INF_t, FDI_t\; GDP_t^*\; MS_t) \tag{1}$$

where TB_t is defined as trade balance, RER_t is real exchange rate, GDP_t is gross domestic product, INF_t is Inflation, FDI_t is foreign direct investment, GDP_t^* is foreign income and MS_t is money supply.

Following the functional form specification, the estimable form of equation (3.1) is specified as;

$$TB_t = \alpha_0 + \beta_1 REXR_t + \beta_2 lnGDP_t + \beta_3 INF_t + \beta_4 FDI_t + \beta_5 GDP_t^* + \beta_6 MS_t + \varepsilon_t \quad (2)$$

where α_0 is the intercept and ε_t is the error term. All variables are as previously defined:

3.2. Type and Source of Data

The study used annual data from the World Development Indicators (WDI, 2019) datasets. The data spans 1980 to 2019 because it captures the various transitional regimes of Ghana's exchange rate as well as developments in Ghana's trade sector. The choice of variables and period of the study is due to data availability. Trade balance is the dependent variable for this study. It refers to the gap between the monetary value of a country's exports and imports for a given time. By convention, empirical studies measure trade balance as the value gap between exports and imports. Trade balance for Ghana is measured likewise by subtracting the value of imports from exports for the period studied.

Exchange rate in this study is expounded as the price of one currency in terms of another currency like the US dollar. Increase in exchange rate represents depreciation which implies a fall in domestic currency whiles a fall means an appreciation implying a rise in the value of the home currency. Exchange rate is measured using the real effective rate of exchange in Ghana. The study expects increase in exchange rate to have a negative effect on trade balance. The reason is that depreciation increases the import bill especially for Ghana whose economy is largely dependent on imports. This is expected to lead to an eventual fall in Ghana's imports provided its price is elastic but import demand tends to be inelastic due to the inordinate taste for foreign goods. Imports therefore continues unabated which have adverse effect on the trade balance (Alagidede and Ibrahim, 2017).

The study controls for national income which is measured as gross domestic product at current local currency and expect it to have a negative effect on Ghana's trade balance. Majority of goods consumed by Ghanaians are imported and this follows that increases in national income will increase imports, all other things being equal. It is natural for individuals to increase consumption when they

experience increase in their income and this obviously means a rise in Ghana's imports compared with exports resulting in deficits.

The study measured inflation as the consumer price index (CPI) reported by the World Bank Development Indicators (WDI, 2018). The study expects an inverse relationship between inflation and trade balance in Ghana. This is because inflation reduces the purchasing power of consumers and decreases the profit of producers. A persistent rise in the general price level reduces the quantity of goods and services consumers can purchase with their nominal income. The cut in demand discourages local production which reduces exports and further increase trade deficit (Sloman and Wride, 2009).

Foreign direct investment (FDI) is precisely stated as the flow of productive resources in the form of capital, technical know-how and expertise from the rest of the world to a particular country with the aim of embarking on a productive venture to yield profits. FDI have been cited by Anoke et al. (2016) as a crucial variable in explaining variations in the balance of trade of a nation. The study measure FDI as the monetary value of capital resources that flow to a host country from the rest of the world and as reported by the World Bank World development indicators datasets. The study expects FDI to have a positive effect on trade balance as it adds to an economy's resources and productive capacities which encourage exports.

Foreign income represents the income of the rest of the world that trade with Ghana. Changes in the income of foreigners have significant effect on the demand for export of the domestic country. Following Akoto and Sakyi (2019), the study measures foreign income as the average of real per capita income of member countries of Organization for Economic Co-operation and Development (OECD). Given that the demand for Ghana's export is elastic, increases in the income of foreigners leads to a rise in the demand for the country's exports. This leads to an improvement in the country's trade balance. It is therefore expected that foreign income has a positive effect on the trade balance.

Money supply is the total stock of money in an economy which is mostly determined by the central bank of every country. The central bank of every country has the responsibility to regulate the stock of money in the economy by employing its instruments like required reserve ratio and the discount rate (Handa, 2009). The study measures money supply by the broad money supply (M2). Akoto and Sakyi (2019) argued that a rise in the real stock of money reduces interest rate which encourage capital flight from the domestic country. The study therefore expects a negative effect of money supply because such transfer of capital from the domestic country worsens its trade balance.

3.3. Estimation Strategy

Stationarity properties of variables were tested to ensure the specified model is not spurious using Augmented Dickey-Fuller (ADF) and the Philips-Perron tests. Optimal lag length of the model was selected using model selection criteria to ensure the right specification of the model was also done. The study then tests for a long run relationship among the variables before estimating the vector error correction (VEC) model. Finally, post-estimation tests are conducted to ensure that the coefficients estimated are reasonable and empirical results are valid. The VEC model to be estimated with the seven (7) variables is expressed as:

$$\Delta TB_t = \beta_0 + \sum_{i=1}^{k-1} \theta_i \Delta\, TB_{t-i} + \sum_{j=1}^{k-1} \alpha_j \Delta\, RXR_{t-j} + \sum_{p=1}^{k-1} \delta_p \Delta\, lnGDP_{t-p} + \sum_{m=1}^{k-1} \gamma_m \Delta\, INF_{t-m} + \sum_{g=1}^{k-1} \lambda_g \Delta\, FDI_{t-g} + \sum_{q=1}^{k-1} \pi_q \Delta\, GDP^*_{t-q} + \sum_{f=1}^{k-1} \psi_f \Delta\, MS_{t-f} + \phi_1 ECT_{t-1} + \varepsilon_{1t} \quad [3]$$

$$\Delta RXR_t = \beta_0 + \sum_{i=1}^{k-1} \theta_i \Delta\, TB_{t-i} + \sum_{j=1}^{k-1} \alpha_j \Delta\, RXR_{t-j} + \sum_{p=1}^{k-1} \delta_p \Delta\, lnGDP_{t-p} + \sum_{m=1}^{k-1} \gamma_m \Delta\, INF_{t-m} + \sum_{g=1}^{k-1} \lambda_g \Delta\, FDI_{t-g} + \sum_{q=1}^{k-1} \pi_q \Delta\, GDP^*_{t-q} + \sum_{f=1}^{k-1} \psi_f \Delta\, MS_{t-f} + \phi_2 ECT_{t-1} + \varepsilon_{2t} \quad [4]$$

$$\Delta lnGDP_t = \beta_0 + \sum_{i=1}^{k-1} \theta_i \Delta TB_{t-i} + \sum_{j=1}^{k-1} \alpha_j \Delta RXR_{t-j} + \sum_{p=1}^{k-1} \delta_p \Delta lnGDP_{t-p} + \sum_{m=1}^{k-1} \gamma_m \Delta INF_{t-m} + \sum_{g=1}^{k-1} \lambda_g \Delta FDI_{t-g} + \sum_{q=1}^{k-1} \pi_q \Delta GDP^*_{t-q} + \sum_{f=1}^{k-1} \psi_f \Delta MS_{t-f} + \phi_3 ECT_{t-1} + \varepsilon_{3t} \quad [5]$$

$$\Delta INF_t = \beta_0 + \sum_{i=1}^{k-1} \theta_i \Delta TB_{t-i} + \sum_{j=1}^{k-1} \alpha_j \Delta RXR_{t-j} + \sum_{p=1}^{k-1} \delta_p \Delta lnGDP_{t-p} + \sum_{m=1}^{k-1} \gamma_m \Delta INF_{t-m} + \sum_{g=1}^{k-1} \lambda_g \Delta FDI_{t-g} + \sum_{q=1}^{k-1} \pi_q \Delta GDP^*_{t-q} + \sum_{f=1}^{k-1} \psi_f \Delta MS_{t-f} + \phi_4 ECT_{t-1} + \varepsilon_{4t} \quad [6]$$

$$\Delta FDI_t = \beta_0 + \sum_{i=1}^{k-1} \theta_i \Delta TB_{t-i} + \sum_{j=1}^{k-1} \alpha_j \Delta RXR_{t-j} + \sum_{p=1}^{k-1} \delta_p \Delta lnGDP_{t-p} + \sum_{m=1}^{k-1} \gamma_m \Delta INF_{t-m} + \sum_{g=1}^{k-1} \lambda_g \Delta FDI_{t-g} + \sum_{q=1}^{k-1} \pi_q \Delta GDP^*_{t-q} + \sum_{f=1}^{k-1} \psi_f \Delta MS_{t-f} + \phi_5 ECT_{t-1} + \varepsilon_{5t} \quad [7]$$

$$\Delta GDP_t^* = \beta_0 + \sum_{i=1}^{k-1} \theta_i \Delta TB_{t-i} + \sum_{j=1}^{k-1} \alpha_j \Delta RXR_{t-j} + \sum_{p=1}^{k-1} \delta_p \Delta lnGDP_{t-p} + \sum_{m=1}^{k-1} \gamma_m \Delta INF_{t-m} + \sum_{g=1}^{k-1} \lambda_g \Delta FDI_{t-g} + \sum_{q=1}^{k-1} \pi_q \Delta GDP_{t-q}^* + \sum_{f=1}^{k-1} \psi_f \Delta MS_{t-f} + \phi_6 ECT_{t-1} + \varepsilon_{6t} \quad [8]$$

$$\Delta MS_t = \beta_0 + \sum_{i=1}^{k-1} \theta_i \Delta TB_{t-i} + \sum_{j=1}^{k-1} \alpha_j \Delta RXR_{t-j} + \sum_{p=1}^{k-1} \delta_p \Delta lnGDP_{t-p} + \sum_{m=1}^{k-1} \gamma_m \Delta INF_{t-m} + \sum_{g=1}^{k-1} \lambda_g \Delta FDI_{t-g} + \sum_{q=1}^{k-1} \pi_q \Delta GDP_{t-q}^* + \sum_{f=1}^{k-1} \psi_f \Delta MS_{t-f} + \phi_7 ECT_{t-1} + \varepsilon_{7t} \quad [9]$$

Where β_0 is the constant term, θ, α, δ, γ, λ, π, ψ and φ are the coefficients of trade balance, exchange rate, GDP, inflation, FDI, foreign income, money supply and the error correction term respectively. ε_t is the white noise error term and all variables are as already defined.

4. Empirical Results

4.1. Descriptive statistics

Description of study variables are given in terms of their mean, standard deviation, minimum and maximum values. Table 1 presents the descriptive statistics of study variables.

Table 1. Descriptive statistics of variables

Variable	Mean	Std. Dev.	Min.	Max.	Obs
Trade Balance (bill. GHS)	-4.51	8.50	-44.1	30,800	40
Exchange rate (GHS/$)	326.61	664.20	64.67	3522.14	40
Income (bill. GHS)	16.9	9.78	6.25	36.1	40
FDI (% of GDP)	3.03	2.94	0.045	9.52	40
Foreign Income	31,331.87	5,749.26	21,605.37	39,973.51	40
Inflation (%)	26.65	24.89	8.73	122.87	40
Money Supply (bill. GHS)	10.7	18.5	795,055	67.0	40

Table I shows Ghana's trade balance had an average negative value of 4.5 billion GHS with standard deviation of 8.50 billion GHS which means it has seen a lot of variation for the study period. The exchange rate stood at an average rate of 326.61 units while national income averaged about 17 billion GHS for the same study period. Foreign direct investment (FDI) as a percentage of gross domestic product (GDP) had a mean of 3.03% and a standard deviation of 2.94% which shows that FDI inflow have been quite stable. The high level of inflation that characterized Ghana's economy was evidenced by a mean rate of 26.65% with the highest being about 123% recorded in 1983. Money supply was quite high as it averaged 10.7 billion GHS for the study period while the average income of OECD countries was unstable as its standard deviation exceeded its mean over the study period.

4.2. Stationarity Test Results

Results of the Augmented Dickey-fuller (ADF) and Philips-Perron (PP) tests for unit root are presented to ascertain the stationarity properties of the variables used in the study. This is presented in Table 2.

Stationarity results from the ADF and PP tests for unit root indicate that all the variables were not stable at the level as can be seen in panel A for both tests. However, results showed that all variables became stationary after the first difference. Hence, all the series in the model are integrated of order one and therefore justifies estimation of the VEC model.

Table 2. Results of Unit Root Tests

Variable	ADF test		Philip-Perron Test		Integration Order
	CONST	***CONST + T***	***CONST***	***CONST + T***	
Panel A: Levels					
TB	-2.302	-2.032	-2.044	-1.614	-
RXR	-2.814	-3.305	-2.705	-3.363	-
GDP	1.661	-1.84	1.303	-1.863	-
FGDP	-1.345	-1.077	-1.345	-1.200	-
FDI	-1.313	-2.336	-1.371	-2.538	-
INF	-4.745	-6.599	-4.790	-6.594	-
MS	-3.395	1.008	-3.459	1.817	-
Panel B: First Difference					
Δ TB	-8.515***	-8.844***	-9.448***	-11.889***	I(1)
Δ RXR	-7.866***	-7.829***	-8.639***	-8.842***	I(1)
Δ GDP	-3.243***	-3.454***	-3.179***	-3.548***	I(1)
Δ FGDP	-4.322***	-4.440***	-4.142***	-4.183***	I(1)
Δ FDI	-5.190***	-5.113***	-5.119***	-5.034***	I(1)
Δ INFL	-14.513***	-14.566***	-17.242***	-18.364***	I(1)
Δ MS	-4.740***	-5.944***	-4.780***	-5.939***	I(1)

4.3. Selection of Optimal Lag Length

The optimal lag length used for the study was determined based on the criteria such as the Final Prediction Error (FPE), Akaike Information Criteria (AIC), Hannan-Quinn Criteria (HQ) and the Schwarz Criteria (SBIC). The results are presented in Table 3.

Table 3 showed that all the criteria supported a lag length of 4. The study therefore proceeded to verify if a long run relationship exists among the variables. This is important as it enable the researcher to know whether to estimate the short run or the long run model (Wooldridge, 2006).

Table 3. Results of Selection Order Criteria

Lag	LL	LR	Df	P	FPE	AIC	HQIC	SBIC
0	-1493.74				4.1e+28	85.7565	85.8639	86.0676
1	-1446.54	94.393	49	0.000	4.9e+28	85.8596	86.7186	88.3481
2	-1375.84	141.4	49	0.000	2.0e+28	84.6195	86.2302	89.2856
3	-1292.33	167.03	49	0.000	8.7e+27	82.6473	85.0097	89.4908
4	-550.107	1484.4*	49	0.000	1.7e+14*	43.0347*	46.1487*	52.0557*

4.4. *Results of Cointegration Test*

There is the need to conduct a cointegration test to know whether or not a long run relationship exists among the variables. This is done by way of the Johansen cointegration test. The results are presented in Table 4.

Table 4. Results of the Johansen Cointegration Test

Max. Rank	Parms	LL	Eigenvalue	Trace statistic	5% critical val.
0	154	-1387.9213	.	533.4768	124.24
1	167	-1212.8263	0.99995	183.2869	94.15
2	178	-1165.9611	0.93130	89.5563	68.52
3	187	-1143.3741	0.72492	44.3825*	47.21
4	194	-1131.8709	0.48177	21.3760	29.68
5	199	-1124.6761	0.33710	6.9863	15.41
6	202	-1121.1829	0.18095	-0.0000	3.76
7	203	-1121.1829	-0.0000		

Table 4 showed there is at least three co-integrating equations. This is because the trace statistics for lags 1 to 3 exceeded their 5% critical values. This means the trace statistic supports that there is at least 3 co-integrating equation and therefore reject the null hypothesis that there is no co-integration among the series. Establishing a long run relationship among the variables implies that a VEC model can be estimated.

4.5. Effects of Exchange Rate Changes on Trade Balance in Ghana

The inclusion of new and important variables demands an estimation to ascertain how changes in Ghana's exchange rate affect its trade balance. The result of this estimation is presented in Table 5.

Table 5. Impact of Exchange Rate on Trade Balance

Trade Balance	**Short Run**	**Long Run**
Speed of Adjustment	-0.5011*** (0.1781)	-
Real exchange rate	0.0030** (0.0016)	0.0078*** (0.0019)
Domestic Income	2.84e-09 (2.20e-09)	-2.04e-09** (9.01e-10)
Foreign Income	-0.0004 (0.0018)	-0.0280 (0.0018)
Foreign Direct Investment	-0.9650* (0.5824)	-1.2730** (0.6416)
Money supply (ln)	-1.9210 (2.289-)	-0.0012 (2.840-)
Inflation (ln)	-2.8260** (1.4220)	-11.9080*** (1.8660)
Constant	-1.1240 (1.0200)	1.0030

Note: Standard error in parenthesis. The ***, ** and * represent 1%, 5% and 10% significance levels respectively.

It is revealed that changes in the exchange rate negatively affect the trade balance in Ghana from 1980 to 2019. Specifically, a unit increase in exchange rate reduces trade balance by 0.003 GHS and 0.008 GHS in the short and long run respectively. The negative effect of exchange rate on Ghana's trade balance increases over time with a higher level of significance as the country's dependency on imports continues unabated. This result is expected and confirms the findings of Anning et al. (2015) as well as Akoto and Sakyi (2019) of the detrimental effect of exchange rate depreciation on the trade balance of Ghana. It also confirms the findings of Anoke et al. (2016) of the negative effect of increases in exchange rate on the trade balance of Nigeria. The speed of adjustment was

negative, significant and less than one which attest to the long run relationship among the variables and hence justifies the use of the VEC model.

The effect of other factors such as domestic and foreign income, foreign direct investment, money supply and inflation on Ghana's trade balance have also been examined and the results are reported in Table 5. There is a significant and positive effect of domestic income on trade balance in the long run but the effect is insignificant in the short run. A unit increase in domestic national income increases trade balance by a close-to-zero margin. As expected, the positive effect confirms the assertion of Arthur (2010) that developing countries like Ghana increases their aggregate demand as their income increases which improves the trade balance. However, foreign income measured by the average income of OECD members as well as the supply of money were found not to have an insignificant effect on Ghana's balance of trade from 1980 to 2019.

Foreign direct investment (FDI) has a positive effect on trade balance in both the short run and in the long run. This meets the a priori expectation that FDI represents an inflow of foreign resources that adds to the resources of the host country and hence improve its productive capacities to expand production and increase exports. A unit increase in FDI improves trade balance by 0.97 GHS and 1.27 GHS in the short and long run respectively. It is evident that the overall impact of FDI on the host country improves overtime as the magnitude and significance of the long-term effect gets bigger and better. This finding is similar to the finding of Anoke et al. (2016) who found FDI to have a positive influence on the trade balance of Nigeria.

Surprisingly, inflation has a positive effect on trade balance in both short run and long run. This effect is unexpected as continuous rise in the price level discourage consumption and reduces aggregate demand in the long run. However, a unit increase in inflation improves trade balance by 2.83 GHS and 11.91 GHS in the short and long run respectively. This effect probably highlights the positive side of inflation as a necessary concomitant for economic growth as increases in the general price level spark a massive improvement in domestic production which translates into higher amounts of exports and improves trade balance as reported by Handa (2009).

4.6. Post-Estimation Tests

The results of the Jarque-Bera test of normality and the Lagrange-multiplier test for autocorrelation are presented to validate the findings of the study. This

helps to establish validity of study results and repose confidence in the its conclusions and policy recommendations.

Table 6. Results of Post-Estimation Tests

Diagnostic test	Test statistic	Probability value
Autocorrelation test	38.883	0.849
Normality test	386.437	0.000

5. Conclusion

A stable exchange rate has been cited as a good signal for every economy in international trade. It boosts investor confidence and allows participants in the global market to make accurate forecast about their businesses. However, Ghana have experienced considerable depreciations in its exchange rate despite the adoption of several regimes. The literature on trade have paid particular attention to the exchange rate-trade balance nexus but failed to include certain relevant variables such as FDI and inflation which this study believes can influence Ghana's trade balance. The prime aim of this research was to estimate the effect of exchange rate on trade balance in Ghana by including relevant variables which extant studies have ignored. It made use of yearly data from the World Bank's World Development Indicators from 1980 to 2019 in a Vector Error Correction (VEC) model. It also investigated the trends in exchange rate and trade balance for the study period as well as how other factors such as FDI and inflation impact on Ghana's trade balance.

Based on the VECM results, the study concludes that exchange rate has a short and long run negative effect on trade balance. This confirms the established fact that depreciation/devaluation adversely affect the trade balance. The study further concludes that domestic income improves trade balance in Ghana. It also concludes that FDI improves trade balance in Ghana mainly because the inflow of foreign resources adds to domestic productive capacities which increase exports via an improvement in domestic production. Lastly, the study concludes that inflation improves trade balance in Ghana mainly because an appreciable inflation level encourages massive improvement in domestic production which translates into higher amounts of exports and improves trade balance. Policies aimed at import substitution and exchange rate stability is recommended to improve trade balance in Ghana.

References

Agbola, F.W. (2008). Ghana's exchange-rate reform and its impact on the balance of Trade. In E.A. Isser and R. Kanbur (Eds.), *The Economy of Ghana: Analytical Perspectives on Stability, Growth & Poverty* (pp. 111-131). Oxford: James Currey Publishers.

Akoto, L., & Sakyi, D. (2019). Empirical Analysis of the Determinants of Trade Balance in Post-liberalization Ghana. *Foreign Trade Review*, 54(3), 177–205. https://doi.org/10.1177/0015732519851632

Akpansung, A.O., & Babalola, S.J. (2013). Effects of Real Exchange Rate on Trade Balance: Empirical Evidence from Nigeria. *Asian Journal of Empirical Research*, 3(5), 605-617.

Alagidede, P., & Ibrahim, M. (2017). On the Causes and Effects of Exchange Rate Volatility on Economic Growth: Evidence from Ghana. *Journal of African Business*, 18(2), 169-193.

Anning, L., Riti, J. S., & K, T, P, Yapatake (2015). Exchange rate and trade balance in Ghana-testing the validity of the Marshall Lerner condition. *International Journal of Development and Emerging Economies*, 3(2), pages 38-52.

Anoke, C. I., Odo, S. I., & Ogbonna, B. C. (2016). Effect of Exchange Rate Depreciation on Trade Balance in Nigeria*. IOSR Journal of Humanities and Social Science* (IOSR-JHSS), 21(3), 72-81. DOI: 10.1080/15228916.2017.1247330

Arthur, W. (2010). Depreciation of the cedi. University of Education Winneba, https://www.academia.edu/6853657.

Bernhofen, D.M., & Brown, J.C. (2018). Retrospectives: On the Genius Behind David Ricardo's 1817 Formulation of Comparative Advantage. *Journal of Economic Perspectives*, 32(4), 227-40. DOI: 10.1257/jep.32.4.227

Bhattarai, K.R., & Armah, M. (2013). The effects of exchange rate on the trade balance in Ghana: Evidence from co-integration analysis. *African Journal of Business Management*, 7(14), 1126-1143.

Cote, A (1994). Exchange rate volatility and trade: A survey. Working Paper 94-5, Bank of Canada.

Davidson, P. (2009). *The Keynes Solution: The Path to Global Economic Prosperity*. New York: Palgrave Macmillan

Dramani, J.B., Francis, T., & Tewari, D.D. (2012). Structural breaks, electricity

consumption and economic growth: Evidence from Ghana. *African Journal of Business Management*, 6(22), 6709-6720. DOI: 10.5897/AJBM11.2800

Hong, W. (1984). *A Note on Adam Smith and International Trade*.

Iyke, B.N., & Ho, S.Y. (2017). The real exchange rate, the Ghanaian trade balance, and the J-curve. *Journal of African Business*, 18(3), 380-392. DOI: 10.1080/15228916.2017.1315706

Lencho D. (2013). The effect of exchange rate movement on trade balance in Ethiopia. Master's Thesis. Tokyo University.

List, F. (1916). *The National System of Political Economy*. New York: A.M. Kelley

McKenzie, M.D. (1999). The impact of exchange rate volatility on international trade flows. *Journal of Economic Surveys*. 13 (1), 71–106.

Raza, A., Larik, A., & Tariq, M. (2013). Effects of currency depreciation on trade balances of developing economies: A comprehensive study on south Asian countries. *IOSR Journal of Humanities and Social Science*, 14(6), 101-106.

Schaling, E., & Kabundi, A. (2014). The exchange rate, the trade balance and the J-curve effect in South Africa. *South African Journal of Economic and Management Sciences*, 17(5), 601-608.

Schumacher, R. (2012). Adam Smith's theory of absolute advantage and the use of doxography in the history of economics. *Erasmus Journal for Philosophy and Economics*, 5(2), 54-80.

Sharifi-Renani, H., & Mirfatah, M. (2012). The Impact of Exchange Rate Volatility on Foreign Direct Investment in Iran. *Procedia Economics and Finance*, 1, 365–373.

Sims, C.A. (1980). Macroeconomic and reality. *Econometrica*, 48(1), 1-48.

Stucka, T. (2004). The effects of exchange rate change on the trade balance in Croatia (No. 4-65). International Monetary Fund (IMF) working paper.

Tumwine, T.J. (2018). Effect of Exchange Rate Volatility on Uganda's Trade Balance. Makere University.