< EXCHANGE RATE VOLATILITY: BEFORE AND AFTER REDENOMINATION AND ITS EFFECTS ON BULK OIL DISTRIBUTION COMPANIES IN GHANA >

<Emmanuel Oheneba-Acquah>
<Lecturer>
<Blue Crest College>
<emohacq@gmail.com / emmanuel.acquah@bluecrest.edu.gh>

<Adetola Ogundein>
<Reseacher>
<Institute of Distance Learning, KNUST>
<adetola2003@yahoo.com>

ABSTRACT-

The effects of exchange rate volatility and its effect on pricing of petroleum products has over the years been an issue for both policy makers and industry players in the implementation of a full-deregulated petroleum market in Ghana. The primary study objective was to determine to what extent exchange rate volatility is affecting Bulk Oil Distributing Companies in Ghana. Graphs suggested a direct effect of exchange rate on petroleum prices thus a negative effect towards BDC's. The Ordinary Squares Method showed that in all cases, the exchange rate variability was not statistically significant. Secondary data was used for the research with specifics on Petrol, Diesel and Kerosene. The data period spanned January 1989- August 2007 prior to currency re-denomination and September 2007- June 2013 after the currency re-denomination to assess the volatility after the re-denomination. Per the analysis, the Ghanaian currency has been very volatile in the past years with negative implications for BDC's and the economy as government implements the full deregulation policy devoid of subsidies. In some instances where there were sharp volatility in exchange rates and crude oil prices, government absorbed the shocks thus, no significant increases in prices of petroleum products. This therefore requires BDC's to hedge their payment of import bills through forwards, options and swaps to hedge the short run risks of high volatility of the cedi and the government to ensure the cedi stability.

Keywords: exchange; rate, volatility, distribution, petroleum.

I. INTRODUCTION

Countries rise and fall depending on how they manage exchange rates. A minor change in exchange rates which ripples through an economy affects the fortunes of companies and the consequence of which can be dire. Exchange rate problems can be worse in a developing economy because they keep high balance of payments deficits. A major source of these deficits is because of huge oil imports. The explanation of the sources of these exchange rate volatilities is one of the most challenging issues affecting developing economies due to their high balance of payment deficits especially for a country like Ghana. . It is undeniable that oil, christened "black gold", fuels the global economy. Oil converted into petrol and diesel fuels our various modes of transportation that allows for the movement of people, goods and services around the globe.

Statement Of The Problem

In February 2005, Ghana deregulated its petroleum marketing from which emerged oil distributors. The distributors import crude oil, refine, and distribute. They do not however set prices which remains in the hands of government. The final price paid by consumers consists of subsidy and tax effectively keeping prices below market prices. This strategy of government has come under intense scrutiny, as many believe it is not sustainable. For example in recent times international price of crude oil have been increasing daily in the world market putting a lot to pressure on government to review domestic prices. Meanwhile government's ability to subsidize continues to be hampered by declining revenues due to poor gold and cocoa prices in the international markets (ISSER, 2013; Adam, 2009). The effects of exchange rate volatility and a fully deregulated petroleum sector pricing possess challenges of their own. A fully deregulated sector could mean more volatility in trade and prices that could have further implication for poverty reduction. The primary focus of this study was to determine to what extent exchange rate volatility is affecting Bulk Oil Distributing Companies in Ghana and find out how they manage their exchange rate fluctuation risks to achieve profitability and liquidity.

Objective of the study

The overall objective of this study is to empirically analyze the short run relationship between exchange rate volatility and the price of petroleum products in Ghana

II. RESEARCH REVIEW/METHODOLOGY

Research Design

In this study, the design is quantitative in nature where an attempt was made to measure the effect of exchange rates volatility and its possible effects on BDC's. This design emphasizes the importance of looking at parameters in the natural setting.

The data collected for the research was mainly secondary data. Sources of data were from the Bank of Ghana's

statistical bulletin and National Petroleum Authority data bank. The period covered in this study is from 1989 to 2013 in order to have a good impact assessment of the volatility, given the data availability of nominal exchange rates and prices of selected petroleum products. In this study, the nominal exchange rate values used represents the monthly average exchange rate of the cedi, and the monthly average exchange rate of the US dollar that were computed using indirect quotation. The data set was converted into natural logarithms to determine the monthly percentage change. The natural logarithms of nominal exchange rate were used as the independent variables in the regression.

The spot price of crude oil is used as the base for pricing petroleum products in Ghana. The price build-up and the exchange rate were mainly used as the population for the study. This was chosen because they are the main indicators used in pricing petroleum products. The build-up of the price consumers pay for petroleum prices in Ghana is decomposed into ex-refinery price, taxes, margins to distributors, and the ex-pump price. The aggregate of these components make up the price of petroleum products. The monthly average price of petroleum products were used in this study. The natural logarithms of these variables were taken and were used as the dependent variables.

Empirical Econometric Model

The ordinary least squares model is used to analyse the volatility in exchange rate and it influence on petroleum pricing. The researcher demonstrates the mechanics of this model below:

Ordinary Least Squares (OLS) Model:

Prices of petroleum products in Ghana depend on several factors including the real exchange rate, real incomes, volumes of trade, government subsidies, interest rates, etc. The exchange rate, which is of particular interest in this study, is however, an implicit price rather than an explicit price. According to Balassa et al. (1986), the impact of such implicit prices can be identified when an adequate measure of the effective exchange rate is used. In the present study, the nominal exchange rate is used. Lagged variables are of particular importance in measuring the influence of past changes in the dependent variables. The relevant model takes the form:

$$y_j = \beta_1 x_{1j} + \cdots + \beta_k x_{kj} + u_j, j = 1, .., n \quad (1.1)$$

Where the y_j's are the dependent variables. Thex_{ij}'s are the independent variables. These variables are independent across observations and are assumed to come from a random sample. The u_j's are the error terms, which are assumed to be normally N(0, $\square^2$) distributed, conditional on the $x_{i,j}$'s, with $\square^2$ constant (and finite).The $\square_i$'s are the model parameters to be estimated, and *n* is the sample size.

Model Specification:

The data used to estimate and interpret the model consist of annual time series $ExR, PEPx, GOPx, LPGPxandKEPx$ for Ghana. Where ExR is the nominal exchange rate, $PEPx$ is the prices of premium gasoline, $GOPx$ is price of gas oil, $LPGPx$ price of Liquefied Petroleum Gas, and $KEPx$ is the price of kerosene. Before the model is specified, the researcher takes the natural logarithms of all variables ($lnExR, lnPEPx, lnGOPx, lnLPGPxand\ lnKEPx$) and differenced the exchange rate variable:

$$\Delta lnExR = (lnExR_t - lnExR_{t-1}) \quad (1.2)$$

Since the data comes from a time series, the observation index *j* represents time (or a period), and is therefore now denoted by *t*. Thus, the model with intercept is now written as:

$$y_t = \beta_1 x_{1,t} + \ldots + \beta_{k-1} x_{k-1,t} + \beta_k + \mu_t, t = 1,2, \ldots n \quad (1.3)$$

From the above the model variables are no longer independent across the observations *t*, it is however necessary to restrict the dependence.

The models estimated include:

$$lnPEP_x = \beta_1 \Delta lnExR_{t-1} + \beta_2 lnPEP_{xt-1} + \beta_3 + \mu_1 \quad (1.4)$$

$$lnGOP_x = \beta_4 \Delta lnExR_{t-1} + \beta_5 lnGOP_{xt-1} + \beta_6 + \mu_2 \quad (1.5)$$

$$lnLPGP_x = \beta_7 \Delta lnExR_{t-1} + \beta_8 lnLPG_{xt-1} + \beta_9 + \mu_3 \quad (1.6)$$

$$lnKEP_x = \beta_{10} \Delta lnExR_{t-1} + \beta_{11} lnPEP_{xt-1} + \beta_{12} + \mu_4 \quad (1.7)$$

Where μ is the error term, satisfying $E[\mu_t|\varphi_t] = 0$

The economic *a prior* expectation is positive for the nominal exchange rate in that a rise in the nominal exchange rate will lead to a rise in prices of petroleum products *ceteris paribus*. Similarly, the lagged independent variables (y_{t-1}) is positively related to dependent variable (y) in the short run for variables described above. The lagged variables are introduced as explanatory variables based on the partial adjustment principle, which postulates that there is a desired level of stock that the economic agent thinks is right for a smooth production process, without excess capacity (Nerlove, 1967).

Hypotheses Testing

The t-value of b_i is used to test the null hypothesis that $\beta_i = 0$, against the alternative hypotheses that $\beta_i > 0$. First, I select a significance level, for example 5%. Where t_{n-k} is a t distributed random variable, with n - k degrees of freedom. The researcher conducts a Right-sided test, reports the critical values for $t_{5\%}$ for which $P[|t_{n-k}|>t_{5\%}] > 0.05$. The decision rule follows that: If $|t_i|>t_{5\%}$ then you reject the null hypothesis that $\beta_i = 0$, and if not, then the researchers fails to reject the hypothesis $\beta_i = 0$, which means that the corresponding regressor xi, j has no effect on, y_j. Similarly the p-value can be used to test the null hypothesis $\beta_i = 0$ against the alternative hypothesis that β_i is unequal to zero. Here, the researcher selects a significance level, say 5%. Then, the null hypothesis is rejected if the p-value involved is less than 0.05, and we accept it if not (Mahony,1986)

III. RESULT ANALYSIS AND DISCUSSIONS

Exchange rate volatility

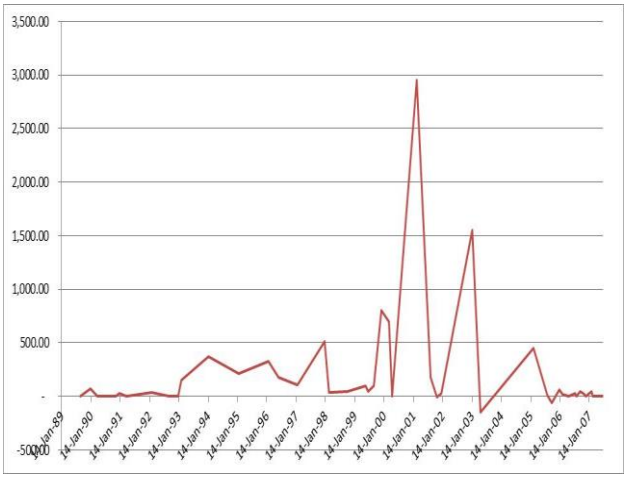

Figure 1. Changes in exchange rate (1989-2007)

For the period under review, from the graph it has been identified that from August 1989 to January 93, the exchange rate was less volatile as it had just a few changes within that period. The exchange rate seemed to be less volatile within that period. This period was also just when Ghana had moved from military rule to civilian rule.

However, after that, there were some increased changes as well from an average of 4pesewas from August 1989 to January 1993 to an average of 25pesewas for the period February 1993 to January 1999. This however included some sharp variations within the period. However, the economy experienced some increased changes in the year 2000, which caused a drastic in the exchange rate moving it to GHC 2.95 in January 2001. The nation had transitioned from a government that had ruled for 19 years; but the year 2000 was very challenging to the economy as the cedi depreciated vastly that year due to election pressures and other global economic pressures as well.

The year 2002-2006 saw some variations in the exchange rate, which fluctuated but was better than what had

happened in the year 2001. There were increasing global prices of crude oil on the world market, which affected the economy in general. Government had to subsidise petroleum products that run Tema Oil Refinery (TOR) into serious debt, as it was then the only provider of petroleum products in Ghana. Banks refused to lend to TOR due to its huge debt portfolio. The government however was able to stabilise the currency for a while from 2006 -2007 prior to redenomination of the currency.

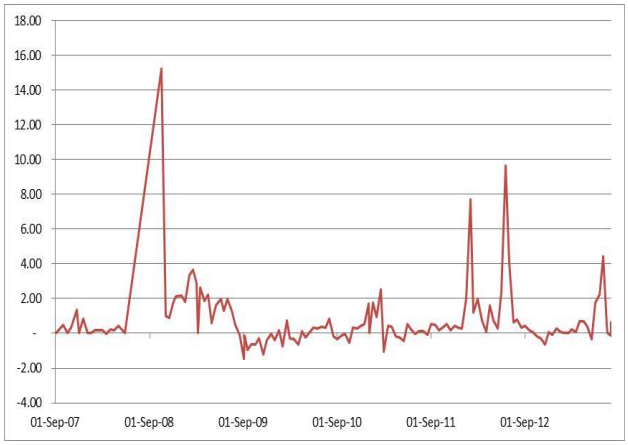

Figure 2: changes in exchange rate (2007-2013)

The Ghanaian currency was redenominated in September 2007 and the exchange rate fixed at USD1=GHS1. The economy still faced some challenges due to increased budget deficits, reduced prices of Gold; Cocoa with crude oil reaching its highest in 2008 hovering above USD140, the highest in the past 10 years. This affected the country's foreign reserves thereby pushing the exchange rate of the cedi to further depreciate against the dollar. From the graph it can be identified that exchange rates is very volatile and this is worrying as it can easily push the BDC's to incur exchange rate losses.

The changes are however negative as the currency further depreciates against the dollar for the period September 2007-August, 2013. The year 2008 was very challenging as the countries major imports saw a decline in prices whilst crude oil saw a large increase in price, thus affecting the foreign reserves, which affects the countries exchange rates. Ghana is currently a middle-income economy based on rebasing some few years ago. Ghana now has one of the most unstable currencies in the West African sub region. A major contributor to this fact is that Ghana is unable to manage its deficits consistently. From an exchange rate of almost GHC1=USD1, in 2007 when the currency was rebased, the exchange rate as at August 2013 was GHC2.15=USD1 about 100% change over the past five years. This is very worrying as it makes it difficult for the BDC's to plan effectively due to the highly volatile nature of the cedi. From Figure 2 above, there have been consistent changes throughout the five-year period under consideration. However, when the rates were moved to the open market, the exchange rate became very volatile. Government through the central bank has put in several measures to manage the heavily volatile nature of the cedi, which have yielded some short run results.

Looking at its impact on oil prices, for example, in December 2007, when the exchange rate was Ghc 0.96 to a dollar, the premium gasoline sold at Ghc1.02 and gas oil at Ghc 1.03. However, in January 2008, when the exchange rate increased from Ghc 0.96 to Ghc 0.97 a dollar, the premium gasoline was sold at an increased price of Ghc1.07 and gas oil at Ghc 1.04. In March 2008 as well, when the exchange rate increased again from Ghc 0.97 to Ghc 0.98, the premium gasoline also sold at an increased price of Ghc1.11 and gas oil Ghc 1.16.

The research observes that prices of premium gasoline, gas oil, kerosene and liquefied petroleum gas from 2007 to 2013 shows a general positive trend with distinct peak periods. Premium gasoline shows a marked overall increase in price from 2007-2013. From September 2007 to June 2009, prices changes of petroleum products were very volatile with even some decreases in prices. However, the decreases were because of huge subsidies by government in those periods as it was also an election year and a position to woo voters to win the election. This is because exchange rates continued to experience some changes thus there was no justification for a price

reduction. Apart from the decrease in petroleum prices in December 2008, other increases are justified due to changes in the exchange rates as observed from the graph (figure 3). Exchange rates fluctuated which also affected the prices of petroleum products despite the heavy subsidies on petroleum products at the time.

However, from the graph (figure 3), it could be seen that prices were stable thereafter from December 2009 to December 2011 despite an increase in prices in January 2011. The exchange rate differences were also minimal as adjudged from the graph (figure 3) during the same periods between December 2009 to December 2011. During the earlier periods before 2013, the government used a petroleum pricing formula to directly regulate domestic prices below border prices. However as noticed from the price differentials from February, 2013 to August, 2013 there have been some increases as government has decided to scrap subsidies gradually on petroleum prices.

From the graph (figure 3), it identifies the differences in the exchange rate that affected the pricing of petroleum prices despite government subsidising the product heavily. Because petroleum products are imported from Russia, Nigeria and quoted in the USD, the exchange rate is a determinant of the pricing in Ghana as well as the world crude prices. The depreciation of the cedi against the dollar was very high about 106% within 2007-2013. From this results, it is very disturbing curbing from past events.

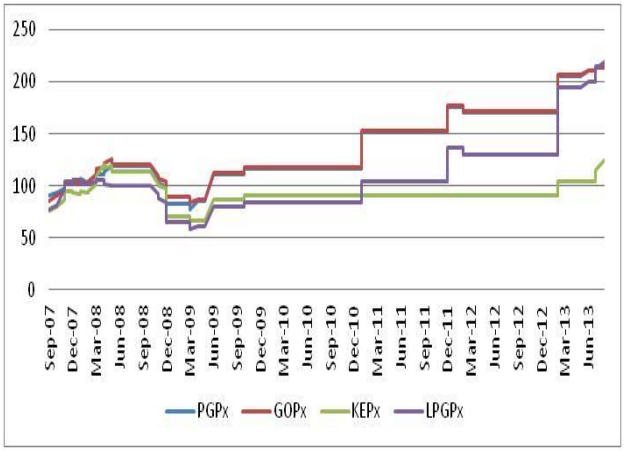

Figure 3. Petroleum Price Trends (2007-2013)

This gradual trend however exhibit high volatility year-on-year. The decision of government to keep prices below border prices resulted in substantial fiscal costs in the form of explicit budgetary subsidies and forgone revenue. These price increases were necessary to eliminate the subsidies petroleum products. Petroleum products were allowed to face the same 16 percent general sales tax as other final goods in the economy. However, the increases were substantial, ranging from 59 percent for diesel to 65 percent for fuel oil.

The period between September 2007 to August 2013 show kinks trend. There are periods when prices stabilised. For example from March 2008 to December 2008, prices rose sharply but started to decline well into early 2009. Throughout January 2009 to December 2010 prices of petroleum products were stable, only rising slightly afterwards in a single month of about 60 percent. Similar observations were made in 2011, 2012, and 2013 (ref to fig 2 above). The cited reasons for these plateaus are political manipulation of prices, especially during election periods only to rise hugely after elections. Sudden jumps in the prices have led to problems in the economy, prompting government to institute a new automatic pricing formula monitored by the National Petroleum Authority.

Statistics of Variables

In table 1, the researcher presents a summary of characteristics of the variables used in this study.

Table 1: Summary Characteristics of Variables

	$lnExR$	$lnPGPx$	$lnGOP$;	$lnKEPx$	lnLPGPx
Mean	5.74*	5.49*	5.47*	5.14*	5.25*

Maximum	9.14*	9.15*	9.05*	8.95*	8.97*
Minimum	4.53*	4.10*	4.01*	3.73*	4.07*
Std. Dev	2.08*	1.77*	1.68*	1.85*	1.90*
Kurtosis	0.93*	2.01*	2.12*	2.20*	1.78*
Skewness	1.58*	1.81*	1.83*	1.91*	1.79*
Sum	1102.263	1053.845	1049.94	986.0466	1007.66
Sum Sq. Dev	1.44*	1.33*	1.29*	1.36*	1.38*
Observations	192	192	192	192	192

*rounded up to two decimal places

The table above (table 1) shows the characteristics of the full sample data set; it can be identified that the mean of both the returns on exchange rate, premium gasoline, gas oil, LPG and Kerosene are positive, this suggests there is more of increase than decrease in the changes of all the variables. The standard deviation of the exchange rate variable is higher than that of the petroleum products that suggests that the degree of variability of that of the exchange rate is higher than that of the prices in petroleum product, which means the dispersion of the data points of the petroleum products prices is closer to its mean.

The returns of all the variables are positively skewed which suggests that the majority of the distribution is concentrated to the left that suggests that the majority of the distribution will be to the left, and the high values in this distribution are relatively few. The exchange rate returns has a lower excess kurtosis than all the other variables, which suggests that more of the exchange rate variance might be because of infrequent low deviations.

Table 2. Estimated OLS model results

Econometric Model

In this section, the researcher presents the regression results followed with brief analysis.

Estimated OLS Model

The F-tests (table 3) are significant at 1% for $lnPEPx$and $\Delta lnExR$, implying that either $lnPEPx_{(t-1)}, \Delta lnExR_{(t-1)}$ or both have an influence on $lnPEPx$. Similar interpretation is made for $lnGOPx, lnKEPx, and\ lnLPGPx$. From the reported Durbin-Watson statistic on the information, set there is no autocorrelation. The adjusted R2 value of $lnPEPx, lnGOPx, lnKEPx, and\ lnLPGPx$ are positive. It implies that the included respective independent variables explain the variations in the dependent variable. For example 93.11 percent of variations in $lnPEPx$ about its mean is explained by $lnPEPx_{(t-1)}\ or\ \Delta lnExR_{(t-1)}$, or both. Similarly, 93.52%, 93.54% and 92.85% of variations in $lnKEPx, lnLPGPx\ and\ lnGOPx$ respectively, about its mean is explained by their regressors. The intercept terms measures other fixed components related to changes in premium gasoline prices, Kerosene, LPG, diesel prices.

The only significant regressors are $\boldsymbol{lnPEPx_{(t-1)}, lnKEPx_{(t-1)}, lnLPGPx_{(t-1)}}$ and $\boldsymbol{lnGOPx_{(t-1)}}$. They are have positive signs. A unit rise in price of premium gasoline in June could lead to 0.9617 unit change in prices of premium gasoline in July *ceteris paribus.* Similarly, a unit rise in $\boldsymbol{lnKEPx_{(t-1)}, lnLPGPx_{(t-1)}}$ and $\boldsymbol{lnGOPx_{(t-1)}}$ would lead to a rise of 0.9642588, 0.9660 and 0.9599 units in $\boldsymbol{lnKEPx_{(t-1)}}$, $\boldsymbol{lnLPGPx_{(t-1)}}$ and $\boldsymbol{lnGOPx_{(t-1)}}$ respectively, *ceteris paribus.* In all cases, the exchange rate variable was not statistically significant

	Dependent Variables			
Coefficients	$lnPEPx$	$lnKEPx$	$lnLPGPx$	$lnGOPx$
Constant	0.217	0.1896635	0.1831	0.2263
	(0.108)	(0.09862)	(0.10062)	(0.10952
$\Delta lnExR_{(t-1)}$	0.0362	0.0241507	0.03239	0.0291
	(0.0741)	(0.07356)	(0.07457)	(0.07347)
$lnPEPx_{(t-1)}$	0.9617***		X	X
	(0.0191)			
$lnKEPx_{(t-1)}$	X	0.9642588***	X	X
		(0.01853)		
$lnLPGPx_{(t-1)}$	X		0.9660***	X
			(0.01853)	
$lnGOPx_{(t-1)}$	X			0.9599***
				(0.01946)
R^2	0.9319	0.9359	0.9361	0.9293
$Adj\ R^2$	0.9311	0.9352	0.9354	0.9285
Standard Error	0.3485	0.3463	0.3510	0.3456
Akaike info. Criteria	-2.092	-2.105	-2.077	-2.1090
F-stat(2, 187)	1278.88***	1364.34***	1370.07***	1228.77***
DW-stat	1.9734	1.9607	2.0046	1.9768

IV. CONCLUSION AND FUTURE WORKS

Indeed studies on exchange rate volatility and its impact on trade have mostly come to mixed conclusions. For example, a survey by Cote's (1994) research on the effects of both real and nominal exchange rate volatility on the volume of international trade concluded that results are ambiguous. He argued these mixed conclusions is because results are sensitive to the choices of sample period, model specification, proxies for exchange rate volatility, and whether the countries considered are developed or developing. This means that debate on the impact of exchange rate on trade is far from settled as it may depend on several factors. Though some agree to a causal relationship, others dispute any such relationship with some even suggesting a negative impact on trade and welfare.

Futher research can be conducted on how the redenomination of the cedi has affected fuel prices in the era of petroleum de-regulation

V. REFERENCES

[1] Adam, M. A. (2009), Petroleum Products Pricing In Ghana – Economics or Politics? Retrieved from www.ghanaweb.com/GhanaHomePage/features/Petroleum-Products-Pricing-In-Ghana-Economics-Or-Politics-171021

2) Aghion, P., Blundell, R., Griffith, R., Howitt, P., & Prantl, S. (2009). The effects of entry on incumbent innovation and productivity. *The Review of Economics and Statistics*, *91*(1), 20-32.

3) Akhtar, M. A., & Hilton, R. S. (1984).Exchange rate uncertainty and international trade: Some conceptual issues and new estimates for Germany and the United States.

4) Aryeetey, E., & Baah-Boateng, W. (2007). *Growth, investment and employment in Ghana*. International Labour Organization.

5) Aryeetey, E., &Kanbur, R. (2005).*Ghana's economy at half century: An overview of stability, growth and poverty*.Cornell University.Department of Applied Economics and Management.

6) Bahmani-Oskooee, M., &Niroomand, F. (1998). Long-run price elasticities and the Marshall–Lerner condition revisited.*Economics Letters*, *61*(1), 101-109.

7) Balassa, B., Voloudahis E., Fylahtos E. P. and Suhtai S. (1986), 'Export Incentives and Export Growth in Developing Countries: An Econometric Investigation.' World Bank, DRD Discussion Paper DRD159, Washington, D.C.

8) Barr, G. D., & Kantor, B. S. (1989).Money and economic activity, a response to the Reserve Bank.*South African Journal of Economics*, *57*(3), 196-202.

9) Birol, F. (2010).World energy outlook 2010.*International Energy Agency*.

10) Bordo Michael D. (1993), *The Bretton Woods International Monetary System: An Historical Overview*. In Michael D. Bordo and Barry Eichengreen (eds.) *A Retrospective on the Bretton Woods System*. Chicago; University of Chicago Press.

11) Boyd, D., Caporale, G. M., & Smith, R. (2001).Real exchange rate effects on the balance of trade: co integration and the Marshall–Lerner condition.*International Journal of Finance & Economics*, *6*(3), 187-200.

12) Broll, U. (1994), Foreign Production and Forward Markets, *Australian Economic Papers*, 33, 1-6

13) Broll, U., &Eckwert, B. (1999).Exchange rate volatility and international trade. *Southern Economic Journal*, 178-185.

14) Buiter, W. H., & Miller, M. (1981).Monetary policy and international competitiveness: the problems of adjustment.*Oxford Economic Papers*, *33*, 143-175.

15) Caporale, T., &Doroodian, K. (1994).Exchange rate variability and the flow of international trade. *Economics Letters*, *46*(1), 49-54.

16) Centre for Policy Analysis (Accra, & Ghana). (2004). *Overview: The State of the Ghanaian Economy, 2004-2005* (No. 8). Centre for Policy Analysis, CEPA.

17) Chowdhury, A. R. (1993). Does exchange rate volatility depress trade flows? Evidence from error-correction models. *The Review of Economics and Statistics*, 700-706.

18) Clark, P., N. Tamirisa, and Shang-Jin Wei (2004), "A New Look at Exchange Rate Volatility and Trade Flows," IMF Occasional Paper No. 235.

19) Cook, D., 2000. Liability Dollarization and Stability Monetary Policy and Foreign Currency Debt.

20) Côté, A. (1994). Exchange rate volatility and trade. Bank of Canada. Retrieved from https://www.bankofcanada.ca/wp-content/uploads/2010/04/wp94-5.pdf

21) Dagut, M. B. (1978). The Economic Effect of the Oil Crisis on South Africa1.*South African Journal of Economics*, *46*(1), 15-21.

22) De Grauwe, P. (1988). Exchange rate variability and the slowdown in growth of international trade. *Staff Papers-International Monetary Fund*, 63-84.

23) Dellas, H., &Zilberfarb, B. Z. (1993).Real exchange rate volatility and international trade: a re-examination of the theory. *Southern Economic Journal*, 641-647.

24) Dooley, M. P., Isard, P., & Taylor, M. P. (1995). Exchange rates, country-specific shocks, and gold. *Applied financial economics*, *5*(3), 121-129.

25) Dordunoo, C. K. (1994). The foreign exchange market and the Dutch auction system in Ghana.

26) Dornbusch, R. (1979). Monetary policy under exchange rate flexibility.

27) Ethier, W. (1994).Some of the theorems of international trade with many goods and factors. *The Stolper-Samuelson Theorem: A Golden Jubilee*, *4*(344), 148.

28) Frenkel, J. A. (1976). A monetary approach to the exchange rate: doctrinal aspects and empirical evidence. *thescandinavian Journal of economics*, 200-224.

29) Ghosh, Atish, Anne-Marie Gulde, and Holger C. Wolf, (2003), "Exchange Rate Regimes: Choices and Consequences" .Cambridge, Massachusetts: MIT Press

30) Ghosh, A. R., Gulde-Wolf, A. M., & Wolf, H. C. (2002). *Exchange rate regimes: choices and consequences* (Vol. 1). MIT Press

31) Ghosh, S., Wolf, H., (2001).Spatial Effects and Capital Flows. IMF, Mimeo.

32) Hausmann, R., Panizza, U., Stein, E., 2001. Why do countries float the way they float? Journal of Development Economics.

33) Gotur, P. (1985). Effects of Exchange Rate Volatility on Trade: Some Further Evidence *Staff Papers-International Monetary Fund*, 475-512.

34) Gyampo, R. (2010). Saving Ghana from its oil: A critical assessment of preparations so far made. *African Research Review*, *4*(3).

35) Hall, B.H., J. Mairesse and P. Mohnen (2010), Measuring the Returns to R&D, in: B.H.

36) Hall, and N. Rosenberg (eds.), Handbook of the Economics of Innovation, Vol. 2, Elsevier, 1033-1082.

37) Hill, R. C., Griffiths, W. E. & Lim, G. C., 2008. *Principles of Econometrics.* 3rd ed. U.S.: John Wiley & Sons. Inc.

38) Hooper, P., &Kohlhagen, S. W. (1978).The effect of exchange rate uncertainty on the prices and volume of international trade. *Journal of International Economics*, *8*(4), 483-511.

39) International Energy Agency (2011). World Energy Outlook 2011

40) International Energy Agency (IEA). 2005. Energy Balances of OECD Countries and Energy Balances of Non-OECD Countries (2003 Edition). Paris: IEA.

41) International Energy Agency (IEA). 2006. "Oil Market Report." September 2006. Retrieved from http://omrpublic.iea.org/

42) Institute of Statistical Social & Economic Research (ISSER) (2013), Policies & Options for Ghana Economic Development, 3rd Edition. Retrieved from www.isser.edu.gh/images/Publication_files/Policies_and_Options_for_Ghanas_Economic_Development.pdf

43) International Energy Agency (2010), *World Energy Outlook 2010. Retrieved from* https://www.oecd.org/berlin/46389140.pdf.

44) International Monetary Fund (2011), *World Economic Outlook: Tension from the TwoSpeed Recovery, April 2011.*

45) International Monetary Fund (2006), International Financial Statistics.Washington, D.C.: IMF. Retrieved from

https://www.imf.org/en/Publications/International-Financial-Statistics/Issues/2016/12/31/International-Financial-Statistics-Yearbook-2006-19414

46) Kanagawa, M., & Nakata, T. (2008).Assessment of access to electricity and the socio-economic impacts in rural areas of developing countries. *Energy Policy*, *36*(6), 2016-2029.

47) Kapur, I. (Ed.). (1991). *Ghana: Adjustment and growth, 1983-1991* (Vol. 86). International Monetary Fund.

48) Koray, F., &Lastrapes, W. D. (1989).Real exchange rate volatility and US bilateral trade: a VAR approach. *The Review of Economics and Statistics*, 708-712.

49) Mahony, M. O. (1986). *Sensory evaluation of food: statistical methods and procedures* (Vol. 16).CRC Press.

50) Masson, P., &Ruge-Murcia, F. J. (2005). Explaining the Transition between Exchange Rate Regimes*. *The Scandinavian Journal of Economics*, *107*(2), 261-278.

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

52) Meltzer, Allan (1991) "U.S. Policy in the Bretton Woods Era." Federal Reserve Bank of St. Louis Review 73 (May/June) pp. 54-83

53) Moss, T. and Lauren, Y. (2010) *Saving Ghana from its Oil: The Case for Direct Cash Distribution*, CGD Working Paper 186. Washington DC. Centre for Global Development

54) Munthali, T., Simwaka, K., &Mwale, M. (2010).The real exchange rate and growth in Malawi: Exploring the transmission route. *Journal of Development and Agricultural Economics*, *2*(9), 303-315.

55) Mussa, M. (1986).Nominal exchange rate regimes and the behavior of real exchange rates: Evidence and implications.In *Carnegie-Rochester Conference Series on Public Policy* (Vol. 25, pp. 117-214).North-Holland.

56) Nerlove, M. (1971).A note on error components models. *Econometrica: Journal of the Econometric Society*, 383-396.

57) Nkomo, J.C. (2006). "The Impact of Higher Oil Prices on Southern African Countries." Journal of Energy Research in Southern Africa, 17(1), 10-17

58) Obstfeld, M., &Rogoff, K. (1998). *Risk and exchange rates* (No. w6694).National Bureau of Economic Research.

59) OECD (Online service). (2006). *World energy outlook*.OECD/IEA.

60) Okyere, F. (2013). *Modelling and forecasting monthly petroleum prices of Ghana using subset ARIMA models*. GRIN Verlag.

61) Onafowora, O. (2003). Exchange rate and trade balance in East Asia: is there a J-curve. *Economics Bulletin*, *5*(18), 1-13.

62) Ozturk, I. (2006). Exchange rate volatility and trade: a literature survey.*International Journal of Applied Econometrics and Quantitative Studies*, *3*(1).

63) Quirk, Peter J. Et al., 1987, Floating exchange rates in developing countries. Occasional paper 53, International Monetary Fund.

64) Radelet, S., & Sachs, J. D. (2000).The onset of the East Asian financial crisis.In *Currency crises* (pp. 105-162).University of Chicago Press.

65) Ransford, V., Gyampo, E., Kuditcher, N. L., &Asare, B. E. (2011).First One Hundred Days of Oil Production in Ghana. *African Research Review*, *5*(2).

66) Rasmussen, T., &Roitman, A. (2011). Oil Shocks in a Global Perspective: Are they Really that Bad. *IMF Working Papers*, 1-29.

67) Olowe, R. A. (2009). Modelling Naira/Dollar Exchange Rate Volatility: Application of GARCH and Assymetric Models. International Review of Business Research Papers, Vol. 5, No. 3. Pg.377-398.

68) Reinhart, Carmen M., and Kenneth Rogoff, 2004, "The Modern History of Exchange Rate Arrangements: A Reinterpretation," Quarterly Journal of Economics. Retrieved from http://www.puaf.umd.edu/faculty/papers/reinhart/papers.htm

69) Rose, A. K. (1991). The role of exchange rates in a popular model of international trade: Does the 'Marshall–Lerner'condition hold. *Journal of International Economics*, *30*(3), 301-316.

70) Salvatore, Dominick (2004). *International Economics.* John Wiley & Sons. ISBN 978-81-265-1413-7

71) Sanusi, A. R. (2010). Exchange rate pass-through to consumer prices in Ghana: Evidence from structural vector auto-regression.

72) Syczewska, E. M., 2010. Empirical power of the Kwiatkowski-Phillips-Schmidt-Shin test. *Warsaw School of Economics, Institute of Econometrics,* Working Paper(3-10).

73) Tavlas, G. S., &Ozeki, Y. (1992). *The internationalization of currencies: an appraisal of the Japanese yen* (Vol. 90).International Monetary Fund.

74) Velde, F. R., &Veracierto, M. (2000). Dollarization in Argentina. Economic Perspective-Federal Reserve Bank of Chicago, *24*(1), 24-37.

75) World Bank, (1994). Adjustment in Africa: Reforms, Results, and the Road Ahead.World Bank Policy Research Report. Oxford University Press

AUTHORS PROFILE

Emmanuel Oheneba-Acquah has more than a decade experience in academia. He has published some research papers and do review some papers for some international journals. His research interests fall broadly within the fields of management and finance. His earlier appoints were a Principals College, CoDE-UCC and IDL-KNUST as a Lecturer/Adjunct Lecturer.

Adetola Ogundein has several years of experience in the petroleum industry. He has presented some research works in conferences. His research interests fall broadly within the fields of finance and oil/gas.