EFFECT OF EXCHANGE RATE VOLATILITY ON THE GHANA STOCK EXCHANGE

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ABSTRACT

The study looked at the relationship between Stock Markets and Foreign Exchange market, and determined whether movements in exchange rates have an effect on stock market in Ghana. The Exponential Generalised Autoregressive Conditional Heteroskedascity (EGARCH) model was used in establishing the relationship between exchange rate volatility and stock market volatility. It was found that there is negative relationship between exchange rate volatility and stock market returns – a depreciation in the local currency leads to an increase in stock market returns in the long run. Where as in the short run it reduces stock market returns. Additionally, there is volatility persistence in most of the macroeconomic variables; current period's rate has an effect on forecast variance of future rate. It was also revealed that an increase (decrease) in trade deficit and expectation in future rise in trade deficit will decrease (increase) stock market volatility. In addition, the consumer price index has a strong relationship with stock market volatility. This means that an increase in consumer price will lead to a rise in stock market volatility. Finally, there is the presence of leverage effect and volatility shocks in stock returns on the Ghana Stock Exchange.

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I. INTRODUCTION AND STATEMENT OF THE PROBLEM

An economy's financial position is susceptible to its foreign exchange volatility. Foreign exchange market developments have cost implications for the households, firms and the state. Benita and Lauterbach (2004) showed that exchange rate volatility have real economic costs that affect price stability, firm profitability and a country's stability. Exchange rate volatility has implications for the financial system of a country especially the stock market. However a survey of the available literature reveals divergent views of researchers on the issue of whether foreign exchange rate variability influences stock market volatility (Frank and Young, 1972; Solnik, 1987; Taylor and Tonks, 1989). Three events – Asian Currency Crises, the advent of floating exchange rate in the early 1970s and financial market reforms in the early 1990s have prompted financial economist into determining the link between these two markets (Mishra, 2004). Also, the internationalization of capital markets has resulted in inflow of vast sums of funds between countries and in the cross listing of equities. This has therefore made investors and firms more interested in the volatility of exchange rate and its effect on stock market volatility. Floating exchange rate appreciation reduces the competitiveness of export markets; and has a negative effect on the domestic stock market (Yucel and Kurt, 2003). But, for import dominated country, it may have positive effect on the stock market by lowering input costs.

Ghana presents an example of a small open economy which engages in international trade with several countries and hence susceptible to foreign exchange rate volatility. Ghana's stock market described as one of the emerging markets currently was established in July 1989 as a private company limited by guarantee under the Companies Code, 1963. It recorded its highest turnover of equities in volume in 1997, with 125.63 million shares, from a volume of 1.8 million shares by the end of 1991. After wards, the volume have been falling steadily from 125.63 million in 1997 to 91.45 million in 1998, 49.57 million in 1999 to 30.72 million in 2000. In 2001, the volume increased to 55.3 million, fell to 44.12 million in 2002, inched up to 96.33 million in 2003 and 104.35 million in 2004. The All-Share Index, by the close of 2003, topped performance of stock markets in the world with yield of 154.7 per cent (or 142.7 percent in dollar terms) (GSE Fact Book,2005). After such a performance, the market Share Index has continued to fluctuate with an occasional rise or dip.

However, empirical evidence on the influence of foreign exchange market volatility on stock market is largely inconsistent. These have been in the contest of developed economies. Mishra (2004) admitted no theoretical consensus on the interaction between stock prices and exchange rate. Solnik (2000) on the other hand posits that there is a negative correlation between stock market and local currency.

The openness of a country's economy is recognised as a cause of volatility of its market. Ghana presents a classic example of an open economy which engages in international trade transaction. Moreover, with advert of globalisation, developing economies are becoming more integrated into developed economies with the results of increasing flow of imports and exports. Ghana is not an exception. A cursory examination of foreign exchange rate history in Ghana shows some considerable level of volatility. Therefore, it would be interesting to explore the effect of its foreign exchange volatility on its stock market. Again, much work on the effect of the exchange rate volatility in the developing country like Ghana has not been done. Thus, therefore the study intended look at the effect of foreign exchange movements and stock market volatility in Ghana.

A. Research Objectives

The study determined the following:

1. Whether exchange volatility has effect on stock market volatility in Ghana,
2. If other macroeconomic variables affect stock market volatility in Ghana.

B. Research Hypothesis

H_0: Exchange rate volatility has no impact on stock market volatility

H_1: Exchange rate volatility has an impact on stock market volatility

H_0: Macroeconomic variables have no effect on stock market volatility

H_1: Macroeconomic variables have an effect on stock market volatility

II. LITERATURE REVIEW

Two portfolio models explain the interaction between exchange rate and stock market volatility. First, the "Flow-Oriented" model (Dornbusch and Fischer, 1980 and Gavin, 1989) – in which exchange rate movement affects output levels of firms and also the trade balance of an economy. Share price movements on the stock market also affect aggregate demand through wealth, liquidity effects and indirectly the exchange rate. Specifically a reduction in stock prices reduces wealth of local investors and further reduces liquidity in the economy. The reduction in liquidity also reduces interest rates which in turn induce capital outflows and in turn causes currency depreciation. The second is the "Stock-Oriented" model (Branson, 1983 and Frankel, 1983). In the case of the "Stock-Oriented" model the stock market exchange rate link is explained through a country's capital accounts. In this model the exchange rate equates demand and supply for assets (bonds and stocks). Therefore expectations of relative currency movements have a significant impact on price movements of financially held assets. Thus stock price movements may influence or be influenced by exchange rate movements. That is, if the cedi for a example depreciates against a foreign currency (the British pound), it will increase returns on the foreign currency (the pound). Such events will motivate investors to move funds from domestic assets (stocks) towards pound assets, depressing stock prices. Thus a depreciating currency has a negative impact on stock market returns (Adjasi and Biekpe, 2005).

Officer (1973) showed that aggregate stock volatility, volatility of money growth and industrial production increased during the period of depression. But stock volatility was at similar levels before and after the depression. However, Black (1976) and Christie (1982) discovered that stock market volatility can partially be explained by financial leverage. This is a contrary finding to that of Officer. Also French et al. (1987) and Schwert (1989) measured market volatility as the variance of monthly returns of market index. They discovered that the market volatility changes over time. Also they were of the view that the value of corporate equity depends of the health of the economy, so a change in the level of uncertainty about future macroeconomic conditions would cause a proportional change in stock return volatility. But as French et al. fail to find a direct positive relation between expected return and volatility, Schwert also failed to explain much of the change in market volatility over time using macroeconomic variables. In a related study, Schwert (1990) analyzed the behaviour of stock return volatility around stock market crashes and discovered that stock market volatility jumps dramatically during the crash and returns to low pre-crash levels quickly.

In related studies, Officer (1973) explained the drop in stock market volatility in the 1960s with a reduced variability in industrial production. Schwert (1989) and Hamilton and Lin (1996) discovered that stock market volatility is increases in times of recession and Glosten et al. (1993) find interest rates to be an important factor in explaining stock market volatility.

In Mao and Kao (1990) exporting firms' stock values were seen to be more sensitive to changes in foreign exchange rates. Their findings also revealed another topical issue of the relationship between stock prices at the macro and micro levels. Although theories suggest causal relationship between exchange rate and stock prices, existing evidence indicates a weak link between them at a micro level. On the macro level, Ma & Kao (1990) found that a currency appreciation negatively affects the domestic stock market for an export-dominant country and positively affects the domestic stock market for an import-dominant country, which seems to be consistent with goods market theory. Meanwhile, Khoo (1994) estimated mining companies' economic exposure by using exchange rates, interest rates and price of oil and discovered that, the sensitivity of stock returns to exchange rate movement and proportion of stock returns explained by exchange rate movement are small. Domely and Sheehy (1996) also found a contemporaneous relation between the foreign exchange rate and the market value of large exporters in their study.

Adjasi and Biekpe (2005) investigated the relationship between stock market returns and exchange rate movements in seven African countries. Cointegration tests showed that in the long-run exchange rate depreciation leads to increases in stock market prices in some of the countries, and in the short-run, exchange rate depreciations reduce stock market returns. In Mishra (2004) it was identified that there is no Granger's causality between the exchange rate and stock return. The study of Mishra (2004) indicated that stock return, exchange rate

return, the demand for money and interest rate are related to each other though no consistent relationship exist between them. Further more, forecast error variance decomposition evidenced that exchange rate return affects the demand for money; interest rate causes exchange rate to change; exchange rate affects the stock return; demand for money affects stock return; interest rate affects the stock return, and demand for money affects the interest rate.

Engle and Rangel (2005) also examine the link between the unconditional volatility and a number of macroeconomic variables. Bercker and Clement (2005) extended the SPLINE GARCH model proposed by Engle and Rangel (2005) when they modelled stock market volatility conditional on macroeconomic conditions. They incorporate macroeconomic information directly into the estimation of such GARCH models. It was demonstrated that forecasts of macroeconomic variables can be easily incorporated into volatility forecasts for share index returns. Thus their model can lead to significantly different forecasts than traditional GARCH type volatility models.

Among the few studies on emerging markets includes; Mishra (2004), Chortareas et al (2000); and Koutmoa et al (1993). Studies like Smith (1992), Solnik (1987), Aggarwal (1981), Frank and Young (1972), Phylaktis and Ravazzolo (2000), Granger et al. (2000), Abdalla and Murinde (1997), and Apte (2001) have found a significant positive relationship between stock prices and exchange rates while others, such as Soenen and Hennigar (1998), Ajayi and Mougoue (1996), Mao and Kao (1990) have reported a significant negative relationship between the two variables. On the other hand, some studies, such as Bartov and Bodnar (1994), Frank and Young (1972), found very weak or no relationship between stock prices and exchange rates. On the issue of causation, most of the studies had mixed results (Morley and Pentecost (2000); Bahmani-Oskooee and Sohrabian (1992); Ibrahim (2000); Kanas (2000).

It is also evident that the standard Granger causality method has been the most predominant model used in most studies. Even though some studies have linked foreign exchange markets to stock markets in some emerging markets, the researcher did not come across any of such study on the Ghana Stock Exchange. Some works have been done on the issue of stock market volatility on the Ghana Stock Exchange, but it has basically be on how stock market returns vary and not linked with foreign exchange rate movement.

METHODOLOGY AND ANALYSIS

A. Data Collection

The data obtained was mainly from secondary sources including the IMF Direction of Trade Statistics Yearbook and the Ghana Statistical Service where data on volumes and values of exports and imports were obtained, the Bank of Ghana quarterly bulletins, where the data on treasury bill rates, money supply, foreign exchange rates and inflation rates and trade deficit was obtained; the

Ghana Stock Exchange quarterly publications, where the data on stock indices was obtained. Nominal figures were used for the work for the study. The data was tested for stationarity or the order of integration of the data series in order to eliminate spurious regression results. This test used was the Augmented Dickey Fuller method. Y_t, CPI, TBR, S_t were not stationary, but became stationary on the first difference.

B. Model Specification and Estimation

The Exponential Generalised Autoregressive Conditional Heteroskedascity (EGARCH) was used. This is specifically designed to model and forecast conditional variance especially in financial assets. This is most often preferred to the GARCH model in studying financial markets. As identified by Koulakiotis et al (2006) the GARCH is relatively weaker than the EGARCH in studying financial markets phenomenon. The weaknesses of the GARCH includes (i) it assumes that there is a negative correlation between current returns and future volatility; (ii) it imposes parameter restrictions that are often violated by estimated coefficients which may unduly restrict the dynamics of the conditional variance process; and (iii) it is difficulty to interpret whether shocks to conditional variance persist or not in the GARCH. This is because the usual norms measuring persistence often do not agree. The model is stated with the mean and variance equation equations, similar to Koulakiotis et al (2006) and Adjasi (2004). The mean and variance equations are stated in equations (1) and (2) respectively:

$$Y_t = \beta_0 + \beta_1 \Delta S_t + \beta_2 MS_t + \beta_3 TBR_t + \beta_4 DT_t + \beta_5 CPI_t + \beta_6 MS_{t-1} + \beta_7 TBR_{t-1} + \beta_8 DT_{t-1} + \beta_9 CPI_{t-1} + \varepsilon_t \quad \text{.....(1)}$$

$$\log(\sigma_t^2) = \varpi + \beta \log(\sigma_{t-1}^2) + \alpha \left| \frac{\varepsilon_{t-1}}{\sigma_{t-1}} \right| + \gamma \frac{\varepsilon_{t-1}}{\sigma_{t-1}} + \delta_t \quad \text{....} \ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(2)}$$

Where:

$\log(\sigma_t^2)$ = log of conditional variance of stock market returns

ε_t = the error term

β = vector of coefficient

ΔS_t - changes in exchange rate at time t

δ_t =exchange rate volatility

γ = leverage effect

Y_t = stock market returns

The macroeconomic variables included in the mean equation are value of money supply in the market measured monthly (MS), treasury bill rate (TBR), trade deficit(DT) and inflation measured by(CPI). ΔS_t was determined by using the Trade Weighted Index (TWI) model proposed by White (1997). The major (or core) Trade Weighted Index (TWI) is an index measure of the value (January 1995=100) of the cedi relative to the currencies of Ghana's top three trading currencies the euro, the pound and the dollar.
The model is specified as:

$$S_t = \Pi\left[\frac{e_{it}}{e_{i0}}\right]^{w_{it}} * sf \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(3)$$

Where:
$S_t = TWI$ **=** The trade weighted index
Π **=** The multiplication sign
e_{it} =The number of foreign currency units for trading partner **i** per the Cedi at time t
e_{i0} = The number of foreign currency units for trading partner **i** per the Cedi in the base period
w_{it} =The trade weight for the currency of trading partner **i** at time **t**;
sf **=** a scale factor which ensures that the exchange rate index does not change on a monthly re-weighting solely as the result of change in currency weights

Change in exchange rate was obtained by $\Delta S_t = \frac{S_t - S_{t-1}}{S_{t-1}}$ ....(4)

Where: S_t = Current month's trade weighted index
S_{t-1} =Previous month's trade weighted index

C. Statioarity Test

A stationary test was first carried out on the variables. In applying the Augmented Dickey – Fuller (ADF) test to the variables, DT_t, CPI_t and MS_t were found to be stationary at levels. The critical values at 1% and 5% were -3.4804 and -2.8832 respectively. However, the ADF test statistic of Y_t, S_t, and TBR_t were less than the critical value at 1% and 5% respectively, and hence not stationary. However, these variables attained stationarity after the first differencing. Therefore regression could be run without any spurious results. This is indicated in table 1.1.

Table 1.1 ADF Unit Root Test of Variables

Variables	**Levels**	**First Difference I(1)**
S_t	-0.814175*	-3.328392**
Y_t	-1.003925*	-6.531121***
MS_t	4.283642***	-
TBR_t	-1.042575*	-4.574844***
CPI_t	-4.283642***	-
DT_t	4.284977***	-

The ADF critical values at 1% and 5% are -3.4804 and -2.8832 respectively
* Not stationary
**Stationary at 5%
*** Stationary at both 1% and 5%

III. RESULTS FROM MODELLING VOLATILITY

The main model of the study was EGARCH (1,1). A variant of the in mean specification used the conditional standard deviation in place of conditional variance. In order to determine the nature of exchange rate and other macroeconomic variables' volatility, a GARCH (1,1) was employed to estimate the conditional variance of these variables. Then the volatility of the exchange rate and other macroeconomic variables were introduced in the conditional variance of the stock market returns equation using an EGARCH (1,1). The results are illustrated in the tables 1.2 and 1.3.

The results of an EGARCH (1,1) estimation of Stock Market Volatility, Exchange Rate and other Macroeconomic variables are depicted in table 1.2 below. Even though the original model contains money supply (MS_t), it had to be eliminated due to its perfect positive correlation with the consumer price index (CPI_t). The results shown in table 1.2 indicated that there is a positive relationship between consumer price index and stock market volatility.

Table 1.2: Effect of Exchange Rate, Macroeconomic Variables on Stock Market

Dependent Variable: LY_t
Method: ML – ARCH
Date: 07/05/07 Time: 19:48
Sample(adjusted): 1995:03 2006:06
Included observations: 136 after adjusting endpoints

Convergence not achieved after 100 iterations

	Coefficient	Std. Error	z-Statistic	Prob.
C	0.001272	0.000117	10.88564	0.0000
LCPI	4.158309	0.747694	5.561513	0.0000
LTBR	-0.113066	0.013520	-8.362907	0.0000
LDT	-5.177410	0.779522	-6.641772	0.0000
$L\delta_t$	-0.188043	0.023179	-8.112585	0.0000
$LCPI_{(t-1)}$	1.224610	1.239101	0.988305	0.3230
$LTBR_{(t-1)}$	-0.003417	0.014638	-0.233457	0.8154
$LDT_{(t-1)}$	-1.348548	1.312910	-1.027145	0.3044
$L\delta_{(t-1)}$	0.114453	0.026404	4.334680	0.0000

$LY_{(t-1)}$	1.035695	0.003402	304.4638	0.0000
		Variance Equation		
C	-6.803226	1.788158	-3.804600	0.0001
|RES|/SQR[GARCH](1)	0.832085	0.253089	3.287714	0.0010
RES/SQR[GARCH](1)*	0.028974	0.134708	0.215084	0.8297
EGARCH(1)	0.720664	0.087792	8.208763	0.0000
LCPI	44.00593	7359.075	0.005980	0.9952
LTBR	245.7033	41.69450	5.892944	0.0000
LDT	46.84151	7860.877	0.005959	0.9952
$L\delta_t$	161.5657	140.9899	1.145938	0.2518
$LCPI_{(t-1)}$	-28.24004	10957.69	-0.002577	0.9979
$LTBR_{(t-1)}$	-49.03193	57.07838	-0.859028	0.3903
$LDT_{(t-1)}$	-22.88789	11717.94	-0.001953	0.9984
$L\delta_{(t-1)}$	-157.7215	177.6653	-0.887745	0.3747
$LY_{(t-1)}$	34.71869	27.35591	1.269148	0.2044
R-squared	0.986625	Mean dependent var		0.013255
Adjusted R-squared	0.984021	S.D. dependent var		0.003792
S.E. of regression	0.000479	Akaike info criterion		-13.89782
Sum squared resid	2.60E-05	Schwarz criterion		-13.40524
Log likelihood	968.0518	F-statistic		378.8832
Durbin-Watson stat	1.876963	Prob(F-statistic)		0.000000

RES/SQR [GARCH] (1) = (γ) = Leverage effect

The results of an EGARCH (1, 1) estimation of Stock Market Volatility, Exchange Rate Volatility are depicted in table 1.3

Table 1.3: Stock Market Returns and Exchange Rate Volatility

Dependent Variable: LY_t
Method: ML – ARCH
Date: 07/05/07 Time: 19:54
Sample(adjusted): 1995:03 2006:06
Included observations: 136 after adjusting endpoints
Convergence achieved after 58 iterations

	Coefficient	Std. Error	z-Statistic	Prob.
SQR(GARCH)	-1.043849	0.167307	-6.239134	0.0000
C	0.000747	4.27E-05	17.47705	0.0000
$L\delta_t$	-0.105751	0.054258	-1.949034	0.0513
$L\delta_{(t-1)}$	0.051070	0.061475	0.830741	0.4061
$LY_{(t-1)}$	1.005999	0.004253	236.5350	0.0000
	Variance Equation			
C	-11.11815	0.364042	-30.54088	0.0000
|RES|/SQR[GARCH](1)	1.415530	0.226496	6.249698	0.0000
RES/SQR[GARCH](1)*	1.453967	0.208849	6.961827	0.0000
EGARCH(1)	0.286132	0.012553	22.79435	0.0000
$L\delta_t$	0.431048	71.77992	0.006005	0.9952
$L\delta_{(t-1)}$	0.028142	135.2342	0.000208	0.9998
$LY_{(t-1)}$	-2.418404	27.78157	-0.087051	0.9306

R-squared	0.829828	Mean dependent var	0.013255
Adjusted R-squared	0.814732	S.D. dependent var	0.003792
S.E. of regression	0.001632	Akaike info criterion	-11.43701
Sum squared resid	0.000330	Schwarz criterion	-11.18001
Log likelihood	789.7169	F-statistic	54.97039
Durbin-Watson stat	1.640142	Prob(F-statistic)	0.000000

RES/SQR [GARCH] (1) = (γ) = leverage effect

IV. INTERPRETATION OF RESULTS

Using the EGARCH (1,1), the results shown in table 1.2 indicated that there is a positive relationship between consumer price index and stock market volatility. The value of consumer price index CPI_t is positive; meaning that an increase in consumer price index will lead to a rise in stock market volatility. When prices in the domestic economy are uncertain, the volatility of nominal asset returns should reflect consumer price index volatility (Schwert, 1989). Similarly, Skousen (2006) submitted that in principle, the stock market should do well under conditions of strong economic growth with relatively stable price levels. Under conditions of unstable prices, analysts do not think strong job creation and economic growth are sustainable, and this may create uncertainties in the stock market leading to variability in price. This means that stock markets are not likely to perform well in periods of unstable prices.

The finding in this study is consistent with Erb et al (1995; 1997). They found out that market volatility is high when inflation (changes in prices) risk is high, which is typically the case in many emerging countries. The positive coefficients of $LCPI_t$ and its lag suggest volatility clustering; that is if stock market volatility was high in the previous period due to high price levels, it is likely to be high in the current period if level of price levels remains high. More over, the values were statistically significant, indicating a strong relationship between stock market volatility and consumer price index.

The coefficient of the lag of LY_t is positive and statistically significant. This indicates that the past period volatility of stock market returns affect the current period. This is consistent with the ARCH model Engle (1982) postulates that volatility in the current period is related to its value in the previous period.

The coefficient of $LTBR_t$ is negative and statistically significant indicating that higher volatility in Treasury bill rate dampens stock market activities. This means an increase in treasury bill rate volatility will lead to a fall in stock market volatility. Under conditions of attractive Treasury bill rates, analysts believe that investors may shift their funds from stocks into treasury bills that may affect stock market activities and vice versa.

The coefficient of LDT is negative and statistically significant indicating that that higher volatility in trade deficit dampens stock market activities. This means an increase in trade deficit volatility will lead to a fall in stock market volatility. Conditions of high trade deficit create uncertainty about the general health of an economy and its stock markets activities. For instance, high trade

deficit is a sign of a decline in demand for locally produced products, which may lead to a fall in the profitability of local firms and hence their stock prices. This will discourage investors from investing in equities. Such phenomena could dampen the stock market activities, especially for a stock exchange dominated by local firms.

In addition there is an indication of volatility clustering since the value of the coefficient of LY_t is positive. This implies that since volatility was high in the previous period, it will continue to be high in the current period.

The value of the coefficient of (γ) indicated a leverage effect. Since the value is greater than zero, it implies that a negative shock in the macroeconomic activities (e.g. shock in exchange rate, a sudden change in Treasury bill rate or an increase in trade deficit due to sudden oil price increases) is associated with low stock market volatility.

The results of an EGARCH (1, 1) estimation of Stock Market and Exchange Rate volatility are depicted in table 1.3 below. The coefficient of $L\delta_t$ is negative and statistically significant, indicating that higher volatility in the exchange dampens stock market activity. This means that an increase in exchange rate volatility will lead to a fall in stock market volatility. The findings also indicated that volatility of stock returns is not only caused by volatility in exchange rate but an effect of other macroeconomic variables such as inflation, interest rates and money supply. Both the stock market and the currency value are affected by the state of the economy. This is indicated by the negative coefficients of $L\delta_t$ in table 1.3 . But the lag $L\delta_{t-1}$ is however positive as was identified in table 1.2.

The value of the coefficient of (γ) indicated a leverage effect. Since the value is greater than zero, it implies that a negative news in the exchange rate results in low volatility in stock market than the case of positive news about exchange rate.

V. SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATION

This study was undertaken to determine the effect of exchange rate volatility on stock market in Ghana, as well as the effect of other macroeconomic variables on stock market volatility. It also attempted to find the nature of volatility in both the stock market and the exchange rate from 1995:1 to 2005:6. The results show that there is an inverse relationship between exchange rate volatility and stock market returns.

The study also indicated that there is the presence of volatility shocks of the exchange rate on stock returns on the Ghana Stock Exchange. This gives an indication that changes in the trade off between risk and return is predictable thus serving as a useful guide for risk management.

Also the results show that the relationship between stock market and macroeconomic variables were statistically significant. Further more, there is volatility persistence in most of the macroeconomic variables; current period's rate has effect on forecast variance of future rate. It was also revealed that an increase (decrease) in trade deficit and expectation in future rise in trade deficit will

decrease (increase) stock market volatility. In addition, consumer price index has strong relationship with stock market volatility. This means that an increase in consumer price will lead to a rise in stock market volatility. Treasury bill rate has a negative relationship with stock market volatility. This means an increase in Treasury bill rate volatility will lead to a fall in stock market volatility.

Exchange rate volatility has attracted much attention in financial economics in developed and developing economies due to its implications in the financial markets, especially the stock market. Different implications were observed between exchange rate volatility and stock market returns – depreciation in the local currency leads to increases in stock market prices in the long run. Where as in the short run it reduces stock market returns. This is in conformity with some empirical studies which propose that exchange rate depreciation is good for stock markets especially where the stock market is located in a highly export driven economy.

This implies that investors may use macroeconomic data to forecast stock market volatility. Also for researchers who ex post analyze macroeconomic and financial data, may employ revised macroeconomic data to study the equilibrium relations between macroeconomic variables and stock market volatility. This is because macroeconomic variables may serve as a guide in forecasting stock market volatility.

It was therefore recommended that for a better stock market performance, policy makers should put in place measures that will ensure stable macro economic environment, since any disturbances in the macroeconomic environment may affect the stock market's activities. So to attract investors (especially foreign direct investment) means that we should have a stable exchange rate system. A volatile exchange rate could raise strategic and managerial issues because it could lead to losses or gains. This may create uncertainty in investors as to invest or not to invest in the market. Hence, to boost investor confidence, there would be the need for policy maker's intervention in times of abnormal volatility.

The volatile nature of the exchange rate market in the country also means that firms that import raw materials or market their product internationally need to make use of forward contracts in other to hedge their payables and receipts. This will enable them to lock in so as to go round the problem of exchange rate volatility.

It is also recommended that investors could take into consideration the nature of volatility in the exchange and other macroeconomic variables in the economy to make an informed decision as to where to direct their investments. So that when ever the local currency depreciates, it is a signal that the stock market returns is likely to appreciate; especially for an import dominated economy. But this argument is based on an improvement in the international competitiveness of the local firms.

Finally, it is suggested base on this study that other researchers can use data for other countries and periods of time to study further the macroeconomic determinants of stock market volatility in real time.

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APPENDIX

Figure 1.2: Stock market Volatility

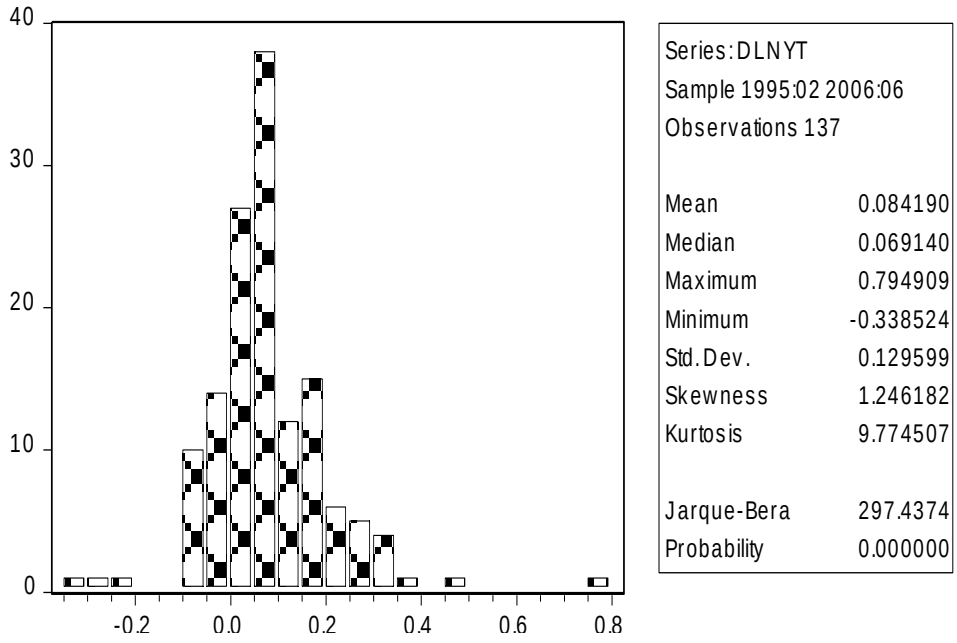
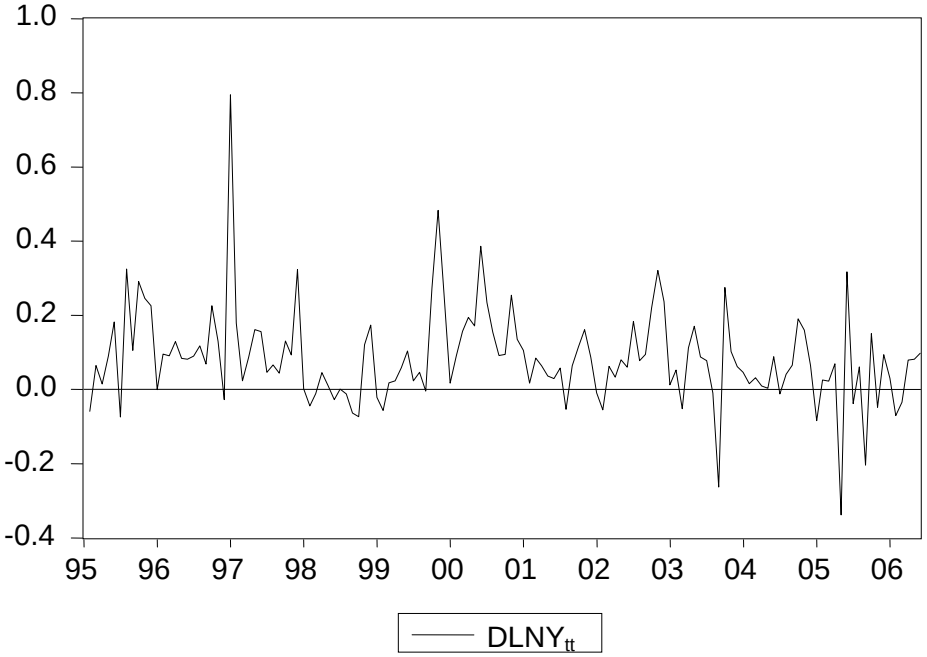


Figure 1.3: GSE Returns (Descriptive Statistics)



Figures 1.4 Growth in Exchange Rate