Regime Analysis of Exchange Rate Volatility and Economic Growth in Nigeria

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Abstract

The study anchored on the traditional theory of exchange rate appraised the asymmetric effects of shocks emanating from exchange rate volatility on certain macroeconomic fundamentals in the Nigerian economy, within two structural regimes of fixed and floating exchange rate, which coincides with military and democratic governance in the country. The study used quarterly data disaggregated into 1986Q1 to 1998Q4 and 1999Q1 to 2010Q4. Using the ARCH model, the study revealed that the selected macroeconomic fundamentals (Exchange Rate, Imports, Exports, External Reserve and Gross Domestic Product) performed better within the period 1999Q1 to 2010Q4. The study also revealed that despite positive trade balances in either period, it was not enough for economic growth to move in the right direction. The study further showed that there exist strong volatility clustering for exchange rate and it is persistent, with the impact ascribed more to past volatility of exchange rate(i.e. ARCH effect) than news or information coming from the previous exchange rate volatility(i.e. GARCH effect). The study recommended that manufacturers should improve on their technological capabilities to boost real production of goods and services; as well as strategies to ease access to credit channels and the control of inflation should be recurring decimals for improvement to enable positive contribution to economic growth.

Keywords: Regime, Exchange Rate Volatility, Exchange Rate, ARCH Effect, GARCH Effect, Economic Growth

1.0 Introduction

The asymmetries effect of shocks emanating from exchange rate volatility on the economy has become a widespread debate in literature. It has been well documented in literature that exchange volatility affects decisions on gross domestic product, imports, exports, money reserve, manufacturing index, Balance of payments and a host of other macroeconomic variables. Zahoor and Muhammed (2009). On the one side of the debate are the proponents suggesting the positives of exchange rate volatility on economic growth, Zahoor and Muhammed (2009), Sengunta and Sfeir(1995)who have opinionated on the benefits of exchange rate volatility, do maintained that it provides the chance for domestic investors to invest in foreign currency to obtain higher profits especially

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when domestic currency is undervalued, leading to foreign currency gains for the trading partners. This raises the level of exports, improve balance of payments and provide large incentives to domestic economy's growth as well as increasing the investors' global varieties in the asset market. On the other side of the aisle, the arguments by Supaat (2003), Herwartz and Weber(2005) found little evidence or weak causal links operating from exchange rate volatility to economic growth. Towards this connection, Shehu and Youtang(2012) revealed that past studies on this subject have focused on advanced economies, panel of Sub-Saharan or other African Countries, while highlighting that their study was the first to focus on Nigeria. In this regard, this paper would be a first attempt in complementing existing literature, by investigating the dynamics of the effects of exchange rate fluctuations on economic growth within two structural periods of fixed and floating exchange rate regimes in Nigeria, which is structured to coincide with military and democratic governance regimes disaggregated into 1986- 1998 and 1999- 2010 time frame.

However, consensus is reached in literature on the conceptual disposition of exchange rate, which Toseef et al (2005) refers to it as the price of one currency in relation to another. It expresses the national currency's quotation in respect to other foreign currencies. As such it can be called the conversion factor or a multiplier depending on the direction of the conversion. Toseef et al (2005) therefore defines exchange rate volatility (EXRV) as the instability or uncertainty in the exchange rate ratio. This measures risk, whether in asset pricing, portfolio optimization, option pricing or risk management. This discourse as maintained by Caporale and Pittis (1995) present the right opportunity for developing countries to measure risks in their development strides as well providing the requisite input for variety of economic decisions. Shehu et al (2012) views exchange rate volatility as the persistent fluctuations of exchange rate, which often results in persistent depreciation of the home currency. Therefore exchange volatility exposes economic agent to greater exchange rate risk. In essence exchange rate volatility entails the cyclical movements of exchange rate considered as the price medium or risks associated with international or foreign trade transactions. In essence the changes in exchange rates overtime results to exchange rate volatility.

Regime shifts in exchange rate from fixed to floating regime reflects new economic reform towards market-based orientation, which depicts reduction of government intervention in exchange rate dynamics. This idea has the capacity of depleting the foreign reserve and allowing the currency to depreciate in order to improve exports and reduce imports.

2.0 Review of Related literature

The traditional theory of exchange rate as propounded by the Classical in the 50s, which this work is anchored on stipulates that exchange rate is as a result of the interplay of the demand and supply of goods and services. The lower the demand

for domestic products, the higher will be the demand for goods and services produced from abroad. This means a higher demand for foreign currencies and as a result leading to exchange rate depreciation for the domestic economy. The reverse will be the chain of effects in a situation of exchange rate appreciation. The combined frequency of exchange rate appreciation and depreciation is what leads to exchange rate volatility. Exchange rate fluctuations can be anticipated or unanticipated according to Shehu and Youtang(2012),Kandil and Mirzaie(2008). They posited that the unanticipated fluctuations have more significant effect on aggregate demand through exports, imports, and the demand for domestic currency and determines aggregate supply through the cost of imported intermediate goods. That is unanticipated fluctuations in exchange rate increases demand of exports and reduces imports level as it raises the price of importable goods and services.

Zahoor et al(2009) asserting the benefits of exchange rate volatility maintains that it provides the chance to domestic investors to invest in foreign currency to obtain higher profits especially when domestic currency is undervalued, there would exist foreign currency gains for the trading partners. Sengunta and Sfeir(1995) cited in Zahoor et al(2009)arguments are no different in asserting the benefit of exchange rate volatility to international trade to include raising the level of exports, improving balance of payments and providing large incentives to domestic economy's growth as well as increasing the investors global varieties in the asset market.

Empirical literature on exchange rate volatility on economic growth has revealed a series of mixed results. Using VAR models, works by, Akhar and Hilton (1984), Kenen and Rodrick (1986), Persson and Sevenson(1989), Equivel et al (2002), Rogoff(1998), Arize(1998), for developing countries, Ibikunle and Isaac(2011) for Nigeria found adverse and negative effects of exchange rate volatility on imports and exports in international trade. Further reviews cited by Shehu and Youtang(2012), which include Koray and Lastrapes(1984) investigated the relationship between exchange rate volatility and bilateral imports and subsequently on economic growth amongst USA, UK, Germany, France, Japan and Canada, while using VAR models, found out a negative relationship.

Using the same econometric methods, works by Zahoor et al (2009)for Pakistan, Khan and Sajid(2005) for Pakistan, Kahir-Uz-Zaman(2005) for Iran , Doganlar(2002) for 5 countries including Pakistan, Turkey, South Korea, Malaysia and Indonesia, De grauwe(1988), Ortega and Giovanni(2005), Sjaastad and Manzur(2008), Glauco and Abott(2004) Qayyum and Kemal(2006) for group of developing countries found strong evidence of the positive relationship between exchange rate volatility and economic growth. Further works by Aliyu(2010), Omisakin, Oyinlola and Adeniyi(2010) found stable and long-run relationship between exchange rate volatility and Trade flows and subsequently on economic

growth for the selected countries while employing cointegration and Error correction modeling techniques.

While Supaat (2003) for developing countries, Herwartz and Weber(2005) for fifteen(15) industrialized countries including the G-7 countries, found little evidence or weak causal links operating from exchange rate volatility to trade growth which further affects economic growth.

Virgil (2001) suggested mixed results for a group of countries to include adverse negative effects for Turkey but positive and statistically significant effects for Germany, France and USA. These mixed thoughts are no different for studies from Brada and Mendez (1988) for a group of thirty (30) developed and developing countries, Bahmani-Oskoee and Kovyryalova(2008) for 177 commodities traded between USA and UK between 1971-2003, Bahmani-Oskooee and Wang(2008) for Austria and USA as trading partners for 107 industries while using VAR models, Bound cointegration and Error correction modeling. Further review of works from Abeysinghe and Yeok (1998) for a group of several countries, found out that exchange rate depreciation stimulates exports and restrain imports, while exchange rate appreciation would reduce exports and encourage imports. However, the combined interactions leading to exchange rate volatility has negative implication for economic growth in the group of several countries investigated.

3.1 **Materials and methods**

Data for the work is collected from various issues of Central Bank of Nigeria Statistical Bulletin on variables in use for this paper to include, Exchange rate (EXR), exports(X), imports (M), External Reserve (RM) and Economic growth (GDP). These variables covering a period of 1986-2010 are all deflated by the Consumer Price Index (CPI). Thereafter, these variables undergo log transformation, which aside reducing the complexity in dealing with large numbers, would also assist to solve the problems of heteroscedascity as well as enable easier interpretation of the parameter estimates in their elasticities Gujarati (2003). The Exchange Rate Volatility (EXRV) is calculated by taking the percentage change of exchange rate given the period studied.

The Auto Regressive Conditional Heteroscedascity (ARCH) model structured by Engel(1982) and later reformulated by Bellertov(1986) is adopted for this work, which would also ensure the testing of volatility clustering within the separate regimes. The Auto Regressive Distributed Lag (ADRL) approach enables the analysis of trends and pattern of EXRV and its impact on the variables selected for this work. This technique also ensures that long run equilibrium and their short run dynamics are estimated and secondly, if their exist a long- run relationship then, the determination of the causal links would be investigated through Granger Pairwise causality test. Test to ascertain the existence of long-run equilibrium relationship are done by first ascertaining through the Dickey-Fuller unit root test

whether the series are stationary or non-stationary. Again, it is important to test for Unit roots or Stationarity because as expressed by Hacker and Hatemi (2004) that in the presence of unit roots, the Standard distribution of test statistics are not correct and there is a risk of having spurious regression results. Thereafter, the cointegration test would be applied to ascertain the existence of long-run relationship amongst the variables studied. The Akaike Information Criteria (AIC) and Schwartz Information Criteria (SIC) aside showing the goodness of the model would also be used to ascertain the maximum distribution of the lag length.

Note worthy is that since the paper is tailored along two periods, there would be need to carry out the Chow test to ascertain the parameter stability and its predictive forecast.

3.2 `Model Specification

The generalized format of the ARCH model is represented as follows:

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i}\Delta LNX_1 + \sum_{i=1}^{n} \alpha_{2i}\Delta LNX_2 \ldots + \sum_{i=1}^{n} \alpha_{ni}\Delta LNX_n + \varnothing_i \sqrt{h} + \varepsilon_t \quad (1)$$

$$\varepsilon_t / \Omega_{t-1} \sim N(0, h^2_t) \quad (2)$$

$$h^2_t = \alpha_0 + \lambda_t \varepsilon^2_{t-1} + \varnothing_i h^2_{t-1} \quad (3)$$

In this case Q stands for the lag length for the ARCH model while ΔX_t and ΔY_t are the first differences of the logarithms of the dependent and independent variables respectively. α_0 are the intercepts of the regressions. α_1 to α_n are the coefficients of the variables. ε_t- equates the error term. h^2_t is the conditional variance. Ω_{t-1} represents all information available in the previous year. λ_t and $\varnothing_i$ are the ARCH and GARCH coefficients respectively, whose coefficients measures the short run dynamics of the volatility of the data.

A large value of λ_t reflects a strong volatility clustering, while a large value of $\varnothing_i$ shows that the impact of the shock to the conditional variance last for awhile before dying out or volatility is persistent. If $\lambda_t + \varnothing_i$ < or > and = 1 then GARCH(q,p) model is covariance stationary, non stationary and the volatility will explode to infinity respectively. Alexander(2007)

It is worthy to note as observed by Alshogeathri(2011), He and Terasvirta(1999) that in the GARCH model, the sign of the shock is irrelevant, which contrast the non-negative conditions of Engle(1982) and Bollerslev(1986) assumed to be too restrictive. That good news corresponds to negative shocks ($\varepsilon^2_{t-1} < 0$) since it leads to fall in conditional volatility, while bad news corresponds to positive shocks ($\varepsilon^2_{t-1} > 0$) since it brings about increase in conditional volatility.

Apriori Expectation.

The a priori decisions expected are that Exchange rate volatility (i.e. currency depreciation) has a positive relationship with imports, but with a negative relationship with exports, external reserves and economic growth. This is expected to improve trade balances of the country.

3.3 **Sensitivity Test.**

i. **Unit Root Test for Stationarity.**

A stationary series should have the tendency to return to its mean value when there is disequilibrium. The Dickey-Fuller (DF) (1979) class of unit roots test for stationarity is based on the regression equation;

$\Delta Y_t = \alpha + \emptyset Y_{t-1} + U_t$……. (4)

Where ΔY_t is the first difference of the dependent variable,

$\emptyset = (\grave{u} - 1)$

U_t is the error term $N(0, \sigma^2)$ are the notations for the basic assumptions concerning the error term (U_t), denoting assumptions of randomness, normally distributed zero mean, and constant variance of the disturbance term (U_t).

For the acceptance of stationarity it now holds that when this result is compared against Dickey-Fuller critical value they must be sufficiently negative.

ii. **Cointegration Test.**

The test for cointegration can be estimated with one period lag in the system as follows:

$\Delta Z_t = \Gamma \Delta Z_{t-1} + abZ_{t-1} + e_t$ (5)

In this system the dependent column vector is the first difference of output and all the inputs of the production function (ΔZ_{t-1}). On the right hand side is the column vector of these variables lagged (here we consider only one lag, (ΔZ_{t-1}) and the associated coefficients (Γ). Also there is a column vector of the lagged levels of the production function variables (Z_{t-1}). Matrices of adjustment coefficients (a) and of cointegrating coefficients (b) pre-multiply this vector and where e_t is a vector of error terms.

The standard errors of the coefficients in the cointegrating equations of the Johansen method have conventional distributions and so may be used for the usual significance tests. As highlighted earlier that to test for a cointegration or a long-run relationship between the dependent and independent variables. Engle and Granger (1986) first regress the levels of the variables under consideration using OLS, and then test for stationarity of the residuals using a unit root test such as the ADF test. If the residuals are stationary, the variables are cointegrated, thereby

implying a long-run stationary relationship between the dependent and independent variables.

Causality Test

Causality tests are preceded by unit root tests and co-integration testing, which has implications for causality testing. Causality is assumed to mean that the cause cannot come after the effect (Sturm, 1998). Granger causality test whether lagged values of one variable predict changes in another, or whether one variable in the system explains the time path of the other variables. Hence, a variable x is said to Granger cause another y($x \rightarrow y$) if past values of x can predict present values of y. If causality is in one direction e.g. from x to y, we have uni-directional causality while if x Granger causes y and y Granger causes x, we have bi-directional or feedback causality (y □□x). There are two commonly used causality tests: one due to Granger (1969) and the other due to Sims et al (1990). The former is however more widely used in applied econometrics, partly because of its simplicity and also because it is less costly in terms of degrees of freedom (Charemza and Deadman, 1999).

iii. **Structural or Parameter Stability Test**

The testing of the parameter stability through the use of the Chow test assumes that the error terms in the separate periods are independently distributed that is, the error terms in the sub-period regression are normally distributed with the same variance (homoscedastic).

This is given as U_{1t}□□N $(0,□^2)$ and U_{2t}□□N $(0,□^2)$.

Decision Rule: if $F_{calculated} < F_{critical@(k,n1\ +n2-2k)d.f}$ (accept no structural change i.e. parameter stability exist or if otherwise reject that parameter stability exist)

Where k = number of variables in the series

n_1 = number of observations in the first period

n_2 = number of observations in the second period

iv. **Volatility Test**

Volatility test on financial series that tend to exhibit wide swings and relative calm over certain periods was developed by Engel (1982) in his so called autoregressive conditional heteroscedasticity (ARCH) model. He suggested that to measure volatility clustering from a specified K-variable linear regression model given as

$Y = ù_1 + ù_2X_{2t} + \ldots\ldots\ldots\ldots\ldots\ldots + ù_kX_{kt} + u_t$ ……..(6)

Where

Y= Regressand at time t

X= Regressors at time t

ù= parameter estimates

U = Disturbance term

Since one can not directly observe the σ^2 or variance, Engle (1982) did show that running the following regression can easily test the volatility effect

$$\breve{U}^2_t = \tilde{\alpha}_0 + \tilde{\alpha}_1 \breve{U}^2_{t-1} + \tilde{\alpha}_2 \breve{U}^2_{t-2} + \ldots\ldots\ldots\ldots \tilde{\alpha}_p \breve{U}^2_{t-p} \ldots\ldots\ldots\ldots\ldots\ldots (7)$$

Where $\breve{U}_t$ denotes the OLS variance obtained from the original regression model in eqn. (6)

One can test the null hypothesis ($H_o = \tilde{\alpha}_1 = \tilde{\alpha}_2 = \ldots\ldots = \tilde{\alpha}_p = 0$) as $\breve{U}^2 = \tilde{\alpha}_0$ from eqn (7) by the usual F-test, in which case we do not have the ARCH effect

4.1 **Data Presentation and Analysis**

The transformation of the data used for the work is presented in table 1.

	EXRV	EXR	GDP	M	RM	X
Mean	0.2049	3.5660	10.862	10.791	8.5432	11.289
Median	0.0775	3.0933	10.329	10.188	8.5040	10.67
Maximum	1.4434	5.0126	14.713	13.319	10.232	13.81
Minimum	-	0.7033	7.8320	8.6441	5.3333	9.043
Std. Dev.	0.3440	1.3374	2.5614	1.4115	1.0293	1.525
Skewness	2.1798	-	0.4363	0.6824	-	0.705
Kurtosis	7.5494	1.9472	1.6522	2.0061	4.8061	1.942
Jarque-Bera	165.43	8.4774	10.741	11.876	24.097	12.94
Probability	0.0000	0.0144	0.0046	0.0026	0.0000	0.001
Sum	20.499	356.60	1086.2	1079.1	854.32	1128.9
Sum Sq. Dev.	11.720	177.07	649.53	197.24	104.89	230.3
Observations	100	100	100	100	100	100

Source: Author's computation

The 100 quarterly observations of the variables expressed in table 1 are in their growth rates. This means that the quarterly average growth rate of EXRV, EXR, GDP, M, RM and X between 1986 to 2010 is 0.2%, 3.5%, 10.9%, 10.8%, 8.5% and 11.2% respectively. Information on the quarterly maximum and minimum percentages of the variables used for this work is also reflected in table 1, as well as the estimation of the quarterly standard deviation and median of all the variables. The JB test for normality, which uses the Skewness(S) and Kurtosis(K) statistics assumes that for normality to happen then the joint hypothesis should be that S=0 and K=3. Though the joint combination of S and K has revealed normality of each of the variable as accounted for the low probability values at 5% level of significance, there still exist some iota of bias in the normality of the variables as measured in S(which measures the asymmetry of the probability

distribution about its mean) and K(which measures the peaky nature of the

variable's slope). A negative value shows skewness to the left, while a positive value shows skewness to the right. If S < 0 then it describes a slim or short- tailed normality distributed variable with the reverse been the case when S > 0. Conversely, if K < 3 then it is platykurtic or normality distribution been flat at the top, but if K > 3 then it is leptokurtic or peaky at the top and if K = 0 then it is mesokurtic or normal distribution. Towards this connection, EXRV, GDP, M, and X are positively skewed and long–tailed distributed while EXR, RM are negatively skewed (to the left) and short-tailed distributed. On the other hand, EXR, GDP,M, X are platykurtic while EXRV and RM are leptokurtic.

4.2 Unit Root Test

The unit root test performed on the variables between the periods 1986 to 1998 shows a mixed order of integration, since all the variables are sufficiently negative of order one or I (1) at 5% level of significance, except for GDP, which is sufficiently negative or exhibits stationarity at order Two or I (2). But for the periods 1999 to 2010, all the variables adopted for the work are sufficiently negative or they are stationary at order one or I (1) given 5% level of significance. This shows that all the variables exhibit stationarity at the various orders of integration as aforementioned.

4.3 Cointegration Test

Since the unit root test for the period 1986 to 1998 has revealed a mixed order of integration, the study adopts the Engle-Granger (1986) two- step procedure test of cointegration, which test for the stationarity of the residuals series at levels. The Engle- Granger cointegration test reveals that the residual series does not exhibit stationarity at levels, showing that no long run relationship exist amongst the variables studied within this time frame.

On the other hand, since the variables studied are sufficiently negative or I(1) for the period 1999 to 2010, then we adopt the Johansen cointegration test(1990). The results revealed that for the 5 hypothesized number of cointegrated equations, both the Trace statistics and the Max Eigenvalue have revealed statistics below their critical values, which indicate absence of cointegration or long run relationship amongst the variables studied at 5% level of significance.

4.4 Optimum Lag Order Selection Criteria

For the periods 1986Q1 to 1998Q4 and 1999Q1 to 2010Q4, the test to determine the optimum lag order did indicated an optimum lag length of one at 5% level of significance for all the tests namely the Final Prediction error (FPE), Akaike Information Criterion(AIC), Schwarz Information Criterion(SIC), and Hanna-Quinn Information Criterion (HQ).

4.5 Granger Causality Test

The Pairwise Granger causality test for the period 1986Q1 to 1998Q4 at 5% level of significance has shown no causations exist amongst all the variables studied. On the other hand, for the period 1999Q1 to 2010Q4, there are unidirectional causations with movement from GDP to M, GDP to X, RM to M, and RM to X at 5% level of significance.

4.6 Stability Test

The application of the chow forecast test has indicated that the F-statistics calculated as 3.31 is statistically significant at 5% level of significance, since the probability value is 0.0001. This means that there is a substantial difference in the behaivour of the variables studied in pre and post 1998.

The Chow Breakpoint test with a calculated F-statistic of 4.04 and a probability of 0.0013 do revealed statistical significance at 5% level of significance. This signifies a substantial difference in the parameter coefficients of the variables studied pre and post 1998, which represent the fixed and floating exchange rate regimes adopted for this study.

4.7 Heteroscedasticity Test

The F-statistic of 121.02 and the lagged squared disturbance term are statistically significant at 5% level of significance given their estimated p value of 0.0000. This shows that the error variances are correlated, that is there is an ARCH effect necessitating the need for the estimation of the model via Autoregressive Conditional Heteroscedasticity framework.

Table 2: Model Specification Results

DEPENDENT VARIABLE: EXRV						
ARCH-M Equation Variable	1986Q1 1998Q4 Coefficient	t Pro	ARCH-M Equation Variable	1999Q 2010Q Coefficient	t Pro	Different
EXR	-0.11	0.0	EXR	-2.27	0.0	2.16
GDP	0.15	0.0	GDP	0.54	0.0	0.39
M	0.13	0.0	M	0.85	0.0	0.72
RM	-0.003	0.7	RM	0.29	0.0	0.293
X	-0.10	0.0	X	-1.68	0.0	1.58
C	-1.19	0.0	C	12.8	0.0	
Variance Equation			Variance Equation			
ARCH(-	1.19181	0.0	ARCH(-)	1.2646	0.0	0.0728
GARCH(	0.00038	0.6	GARCH(-	0.0003	0.7	0.00007
C	4.76E-0	0.9	C	-4.54E	0.9	
R^2	0.6		R^2	0.55		

Source: Author's Computation

Results in table 2 revealed that all the variables within the disaggregated periods of the mean equation influence exchange rate volatility except external reserve for the period 1986Q1 to 1998Q4. The coefficients of determination for the both periods indicate that the explanatory variables included in the model do explain approximately 60% of variations in exchange rate volatility.

On the mean return coefficients of the variables studied, the period 1999 to 2010 have witnessed improved performance against the period 1986 to 1998 by differentials of 2.16%, 0.39%, 0.72%, 0.3% and 1.58% for exchange rate, gross domestic product, imports, foreign reserve, and exports respectively given a 1% shock in exchange rate volatility. This could be probably explained by the improved deliberate policy of government in liberalizing the economy, which has seen the economy witnessed a boost in her macroeconomic fundamentals, as well as her institutionalization of democratic values been a pointer for her enhanced economic acceptability in the comity of nations.

On the other hand, the mean return relationships have shown the right signs for the relationship between exchange rate volatility and exchange rate. Meaning that as exchange rate volatility increases there is depreciation of the naira, leading to decreasing imports and increasing exports. While that for external reserve showed a mixed relationship, given that a negative relationship is attained for the period 1986 to 1998 and a positive relationship is attained for the period 1999 to 2010. The a priori relationship of increasing gross domestic product or output is not met within the period of study.

Copelman and Werner (1996) have asserted that a shock to a nation's currency leading to devaluation or depreciation of its exchange rate reduces its credit availability and as such impact negatively on output. In their opinion these shocks do not affect the real exchange rate, which according to Ehinomen and Oladipo (2012) do have a positive relationship with inflation. In essence the positive effect of a devaluation policy on output is eroded by inflation. The extent of technological advancement is another factor as revealed by Ayinde (2014) who said that investors within this period could not successfully utilize or maximize the potentiality of technology in increasing output despite slight positive margins recorded in exports. These reasons are also associated with the mixed dynamics witnessed in foreign reserves (RM) behaivour within the period of study.

In the variance equation, while the ARCH coefficients are statistically significant for the two periods, the GARCH coefficients are statistically insignificant. This means that there exist strong volatility clustering for exchange rate, with the impact ascribed more to past volatility of exchange rate(i.e. ARCH effect) than news or information coming from the previous exchange rate volatility(i.e. GARCH effect). This is substantiated by the greater than one or high values of ARCH and low values of GARCH across the two periods. That is, 1.19181 to 1.26461 for ARCH effect and 0.00038 to 0.000314 for GARCH effect. The ARCH effect has higher or stronger past volatility clustering witnessed in the period 1999Q1 to 2010Q4 by a differential of 0.073units, and then the GARCH effect has weak and insignificant values noticed from previous volatility in the period 1986Q1 to 1998Q4 by a margin of 0.0007units.

In summary, the statistical significance of the ARCH effect shows that information on the past volatility do impact or influence significantly the current volatility of exchange rate more than news coming from previous year's volatility depicted by the low and insignificant values of the GARCH coefficients. The low values of the GARCH effect also depict that a shock to the conditional variance will fizzle out fast and with its persistence almost non existent.

The GARCH (q, p) model is covariance non stationary for the two periods since $\lambda_t + \varnothing_i > 1$. but with the non stationarity been more within the period 1999Q1 to 2010Q4. This shows that the time varying volatility of exchange rate is persistent over the two periods studied with the persistence been higher in the 1999Q1 to 2010Q4.

5.1 Summary and Conclusion

This work appraised the dynamics resulting from the asymmetries of certain macro-economic fundamentals on exchange rate volatility within two structural regimes using quarterly data for the period 1986 to 1998 and 1999 to 2010. The covariance analysis (i.e. conditional and unconditional) reveals non stationarity as well as high volatility clustering with high persistence due mainly from unconditional variance. This suggests that exchange rate volatility is influenced

and have a positive relationship with Gross Domestic Product (GDP) and Imports (M). However, improved statistics of these variables are recorded in the period 1999 to 2010 with variation statistics of 0.39units and 0.72 units for GDP and M respectively. On the other hand, the mean returns of current exchange rates and exports do impact significantly and with a negative relationship on exchange rate volatility. The period 1999 to 2010 have recorded improved performance for Exchange Rate (EXR) and exports(X) with margins of 2.16units and 1.58units respectively. The external reserve which has shown mixed results depicts an insignificant influence and negative relationship in the period 1986 to 1999 as against its significant and positive influence in the period 1999 to 2010. Factors attributed to the behaivour of these statistics are likely to be the under utilization of available technology by manufacturers; inflation eroding the benefits accruable to depreciation or devaluation policy; and the constraints associated with credit availability to bolster economic growth. It is recommended that manufacturers should improve on their technological capabilities to boost production of goods and services. Strategies to ease access to credit channels as well as control inflation should be improved upon to contribute positively on economic growth. In exchange rate fluctuation management central authorities should also be mindful of the dynamics in gross domestic product, external reserve, imports and exports.

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