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FINANCIAL OPENNESS AND OUTPUT VOLATILITY IN NIGERIA: A DEFACTO AND DE JURE APPROACH

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Abstract: *Using quarterly data from 1986-2011, this study investigates the impact of financial openness on output volatility in Nigeria. The paper adopts two measures of financial openness: de facto (total capital flow variables) and de jure (Chin-Ito Index measures)for empirical analysis. The study applies the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) Model to address its core objective. The results show that none of the two measures of financial openness contributed to output volatilityin Nigeria, within the period under review.The paper therefore recommends that the government and monetary authorities in Nigeria should lay more emphasis on developing amore robust domestic economic structural reforms that will promote competitive and viable domestic banking system, with adequate regulatory and supervisory framework. This should also be complemented by other macroeconomic stabilization policies. That means, fiscal deficits, rapidly depreciating exchange rate and high inflation should beput in check. This is one of the ways to ensure that financial openness continues to contribute togrowth while lowering output volatility.*

Key Words: *Financial Openness, Output, Volatility, De facto, De Jure, Nigeria*

JEL Classification: *B26; E32; E44; F65; G15; G20; F41; O16*

1. INTRODUCTION

A fundamental issue that has caught the attention of economic researchers is the relationship between financial openness and macro economic volatility. Some authors have argued that financial openness could be a source of greater macro economic volatility, exposing vulnerable countries to sudden reversals of capital flows (Stiglitz, 1998, Kaminsky and Reinhart, 1999). According to this school of thought which emerged after the financial crisis of the 1980's and 1990's following capital account liberalization reforms by some countries, higher macro economic volatility could be

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experienced by countries, either because they lack adequate financial institutions to cope with large and sudden reversals of capital flows or because they lack policy instruments to smooth cycles. In fact, Stiglitz (1998) suggested that the financial liberalization thesis is "based on an ideological commitment to an idealized conception of markets that is grounded neither in fact nor in economic theory". On the other hand, some authors have argued that opening the capital account can yield lower output volatility by promoting production base diversification and enhance international capital flows (Razin and Rose, 1994, Bekaet, 2006).

From a welfare perspective there are two alternative ways to view the relationship between financial openness and macroeconomic volatility. The first view is that financial openness should help countries to untie consumption streams and output streams, allowing risk-averse agents to smooth consumption and leaving output volatility inconsequential for welfare. Another way is to consider that in addition to consumption volatility, output volatility is also detrimental to welfare. In view of this, Ramey and Ramey (1995) are of the opinion that volatility has a detrimental impact on output growth even after controlling for investment.

Prior to the introduction of Structural Adjustment Programme (SAP) in Nigeria in 1986, financial liberalization had become an emerging trend in both developed and developing countries. This was the prescription of the World Bank and the IMF following the structural imbalance and severe economic woes experienced by developing countries as a result of oil price shocks, rigid exchange and interest rate controls and escalating real interest rate for external debt servicing of the 1970s and 1980s (Agu *et al.*, 2014; Okpara, 2010). Furthermore, the basic thrust of the economic reform embodied in the SAP was deregulation, particularly, financial deregulation. Some developing countries like Nigeria, Cameroun, Ghana, Botswana, Malawi, Senegal, Kenya and Zambia adopted the liberalization of interest rate as a prominent feature of their financial reforms. Also interest rates were fully deregulated in Indonesia, Philippines and Srilanka in the early 1980. While Nepal freed most key interest rates in 1986, Korea, Malaysia and Thailand relaxed control by more frequent advertisement (Fry, 1997).

The proponents of liberalization suggest that it is ideal for an economy. Honohan (2000) argues that the process of financial liberalization is expected to increase the variability of interest rates with its associated distributional consequences. The overall effect is to induce competition within the financial services industry and in the entire economy, however, the experience of several countries in the 1980s and 1990s indicate otherwise. For example Chile experienced some banking problems right after deregulating the financial sector. Caprio and Kliengebiel (1995) also argue that many banking systems experienced different problems after liberalization. Bakeart *et al.* (2005) suggest that in developing countries, financial liberalization may not yield intended benefits because of the strength of domestic institutions and other factors. Demirguc-kunt and Detragiache (1998) conclude that the benefits of financial liberalization should be weighed against the increased potential for fragility.

As beautiful as the 'message' of liberalization sounds, there is a serious debate in the literature as per whether its purported benefits are as real as projected by its proponents. For example, the economic performance of Sub- Saharan African (SSA) countries, which have opened up their capital accounts, has attracted considerable attention in recent years. The low rate of economic development experienced in these countries have from 1980's to date, been described as tragic. According to Babajide (2008), the average growth rate from 1961 to 2000 was 0.45% for SSA, while it was 1.6% for Latin America and the Caribbean (LAC), 2.3 % for South Asia (SA) and 4.9% for East Asia and the Pacific (EAP). For the Nigerian economy, the country has experienced decades of slow development due to the unimpressive growth of her per capita income and infrastructural deficits despite the liberalization of her financial system and capital account (World Bank, 2012). Nigeria's macroeconomic indicators have also been fluctuating since 1980. For example, from early 1980s to the second half of the 1990s, annual inflation has averaged around 30 percent. Subsequently, average inflation came down to one -digit rate. However, since 2001, inflation is back in the two-digit domain, with an average of about 12.50%-22.17% within some years between 1986-2011 (NBS, 2012 and Akpan, 2013).

Some empirical studies such as Greena way, *et al.* (2002) and Servenand Schmidt-Hebbel (2002) have also established that macroeconomic volatility can have adverse effect on growth and development. Thus, the impact of financial openness on output volatility is very important for relatively poor countries like Nigeria. Analyzing the performance of the Nigerian economy, World Bank (2012) and CBN (2012) revealthat between 1986- 2012, broad macro economic aggregates in Nigeria such as growth rate (as shown in figure 1 in Appendix) , terms of trade , real interest rate and inflation were among the most volatile in the developing world.For example the rate of growth in Nigeria was 3% in 1986 when the liberalization process commenced but declined to -1% in 1987 and thereafter soared to 10% in 1988. It further declined to 7% in 1989 and rose again to 8% in 1990. From 1990 to 1994, there was a continuous decline reaching as low as 1.3% in 1994. There was a little improvement between 1995 and 1996 when the economy grew from 2% to 4%, but it began to decline again from 3% in 1997 to 1% in 1999, the very year Nigeria embraced a new democratic leadership. Owing to some policy initiatives, the economy improved to 5% in 2000 but declined again to 3% and 2% in 2001 and 2002 respectively. However, when the new government came on board in 2003, the economy grew again to 10% and 11% in 2004. The growth was short-lived as the economy nosedived again to 5% in 2005 and increased minimally to 6% between 2006 and 2008. The economy experienced another growth between 2009 and 2010 at 7% and 8% respectively but declined again to 7% in 2011. These fluctuations and volatility in growth rates of the economy have been attributed to many factors ranging from economic mismanagement to erratic policy reversals. To buttress this point further, the table below shows the relative performance of some macroeconomic variables in Nigeria when compared with other selected emerging and developed economies.

Table 1
Volatility and Average of Selected Macro economic Variables for different Economies

Countries	*GDP Growth Rate*		*Inflation*		*Exchange Rate*	
Developed Economies	*Volatility*	*Average*	*Volatility*	*Average*	*Volatility*	*Average*
Canada	2.04	2.51	1.41	2.50	0.16	1.29
South Korea	4.01	6.40	2.14	4.40	476.46	631.33
Emerging Economies						
Indonesia	4.08	4.99	10.47	10.52	3,757.88	5,780.65
South Africa	2.19	2.48	4.41	9.19	2.46	5.31
Egypt	1.74	4.46	7.03	11.02	1.76	3.69
Nigeria	6.23	4.61	18.58	22.17	57.32	62.90

Source: World Bank (2012) and Author's Computation based on 5-year Averages (Means) and Standard Deviations of the selected macroeconomic variables for the various Economies (1986 – 2011)

Table 1 above shows the averages and volatilities of selected macroeconomic variables in some selected economies. On average, the volatilities of Gross Domestic Product (GDP) growth, inflation, and exchange rates are higher in emerging market economies than in developed economies. Among emerging market economies, Nigeria exhibits the highest GDP volatility. Besides, average inflation is higher in emerging market economies relative to developed economies. Nigeria's average inflation over this period is the highest in the emerging market economies group, followed by Egypt and Indonesia. Inflation rate variability in Nigeria is also high, although with slightly smaller volatility than that of Indonesia. Furthermore, exchange rate variability in Nigeria ishigher than Canada, South Africa, and Egypt but lower than South Korea and Indonesia. On the other hand, Nigeria's GDP growth showed some buoyancy among the selected developed and emerging market economies, second only to South Korea and Indonesia, which all grew on average around 5 to 6 percent, a year,within the period under review. Although, Nigeria's GDP showed some increase within the period, yet it is the most volatile among the countries compared. This shows that Nigeria faces a macroeconomic environment that is indeed more volatile than say Canada, South Korea, Indonesia, South Africa, and Egypt, at least in terms of GDP Growth, inflation and exchange rates. This development further corroborates the finding of Batini (2004) that "emerging market economies (like Nigeria) face more volatile macroeconomic environment, and typically have weaker institutions that enjoy less credibility than their developed economies counterparts".

Over the last three decades, high macroeconomic volatility has become a key determinant as well as consequence of poor economic management. This is in line with Kama (2006), which posits that the ability of the financial sub-sector to play its role has been periodically punctuated by its vulnerability to systemic distress and macroeconomic volatility.The Nigerian economy has also been characterized by low growth trap as a result of low savings-investment equilibrium. With an average annual investment rate of about 16% of GDP, Nigeria is still far behind the minimum investment rate of about 30% of GDP required to minimize poverty and stimulate real growth (CBN, 2010, World Bank, 2010). Real Interest Rate Movement and Inflation

rate have also being volatile (as depicted by figures 2 and 3 in Appendix). In addition to this, fiscal policy in Nigeria has been characterized by highly volatile, inefficient and unsustainable public sector spending.

Another key issue here is the question of how to measure financial openness. Two broad approaches can be found in the literature: one based on measuring *de jure* openness and the other measuring *de facto* openness {(Raddatz, (2007); Fratcher and Bussierre, (2004); Lane and Millessi-Ferreti 2005; Edison *et al.* 2002b and Kray (1998)}. *De jure*openness is often proxied by the removal of restrictions to capital account transactions as published in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAR). For the *de facto* openness measures, different studies have used different capital flow variables. Each of these measurements when adopted for cross-country regressions have their pitfalls respectively. Thus, these problems call for country-specific regressions. Also despite the efforts to promote the ideals of domestic financial market cum capital account openness in Nigeria through competitive market framework, there is still the fundamental challenge of understanding its real impact on the economy. Thus, macroeconomic outcomes resulting from financial openness in Nigeria is still largely unexplored. Hence, further empirical investigation is needed to unravel the outcomes of financial openness policies with respect to output volatility in Nigeria, using the de facto and de jure approaches. That is the crux of this paper. The rest of the paper is structured as follows: section two reviews the literature, while section three discusses the methodology. The empirical results are presented in section four and section five concludes the paper.

2. LITERATURE REVIEW

2.1. Financial Openness and Output Volatility

There are plethora of literature on financial openness and its effect on macroeconomic volatility. However, understanding the effect of financial openness on output volatility is very important for relatively poor countries such as Nigeria which are exposed to exchange rate and terms of trade shocks owing to their dependence on basic commodities such as oil. The empirical relationship between financial openness and output volatility is undeniable, making volatility a fundamental development concern. A number of studies have tried to explain the nature and causes of this relationship but there is no consensus yet.

Backus, *et al.* (1992) argue that, if most shocks are country-specific and transitory, financial opening should lower consumption volatility while raising investment volatility. However, the empirical literature cannot provide statistically significant evidence on the relationship between financial openness and macroeconomic volatility (Razin and Rose, 1994). Kaminsky and Schmukler (2003) observe that, although equity markets stabilize in the long run (i.e. in five years or longer) if financial liberalization persists, the amplitudes of booms and crashes substantially increase immediately following financial liberalization.

Kose, *et al.* (2003) in a detailed study , provide a comprehensive examination of changes in macroeconomic volatility in a large group of industrial and developing economies over the period of 1960 " 1999. They find that on average, the volatility of consumption growth relative to that of income growth has increased for more financially integrated developing economies in the 1990s. They also report a threshold effect, where the adverse effects increasing financial openness diminish for more developed countries. In another study, Prasad, *et al.* (2003) compare the volatility experiences of a sample of 22 more financially integrated developing countries and 33 less financially integrated developing countries. They find that over the 1990s, the most financially integrated have experienced some increase in consumption volatility while the less financially integrated group of developing countries and the industrialized countries both experienced average declines in consumption volatility relative to the previous decade.

Buch, *et al.* (2005), using a panel dataset for OECD countries, find that the implications of financial openness for business cycle volatility depend on the nature of the shocks and the link between macroeconomic policy, financial openness, and business cycle volatility varies over time. They further argue that developing economies are more vulnerable to external shocks due to some structure features, e.g., limited diversification of foreign trade, sudden reversal of capital flows, the small country size. These factors hamper the unbiased empirical estimation of the relationship between financial openness and macroeconomic volatility. This is in line with Kose (2002) which shows in a dynamic small-open-economy model that terms of trade shocks can explain a sizeable fraction of volatility.

Hagen and Zhang (2006) develop a model of a small open economy and show that financial openness has non-monotonic relationship with macroeconomic volatility. After pooling the empirical data of countries with different degrees of financial openness, they conclude that domestic financial frictions may explain the lack of strong empirical evidences on the significant linear relationship between financial openness and macroeconomic volatility.In another study, Giovanni and Levchenko (2006) show that countries that are more open to trade tend to be more volatile than others. They argue that this the outcome of counteracting forces. Two mechanisms lead to a positive relationship: traded sectors are more volatile than nontraded ones, and trade leads to specialization in fewer sectors. But traded sectors are less correlated with the rest of the economy and so can act hedging activities.

Prati and Tressel (2006) find that foreign aid volatility increases trade balance volatility and depresses exports through a Dutch-diseases mechanism. They argue that these effects could be mitigated by actively managing the central bank's net domestic assets. Levchenko and Mauro (2007), concerned with the detrimental effects of sudden stops, reveal that countries with a more diversified portfolio of foreign liabilities and a higher share of foreign direct investment tend to fare better during capital-flow reversals.

Loayaz and Raddatz (2007) use a semi-structural vector autoregressions on a panel of countries to study how financial openness, trade openness, factor-market flexibility, product-market flexibility and domestic financial development influence the impact of terms of trace shocks on output. They find that financial openness and labour market flexibility appear to reduce the impact of external shocks. On the other hand, they find that trade openness increase the output consequences of terms-of-trade shocks, especially when domestic markets are not well developed. These findings are consistent with the finding of Bruner and Ventura (2006), who studied how trade integration can lead to financial instability using a model of endogenously incomplete market. In the study, they argued that trade integration can have different effects depending on domestic financial markets. If those markets are thin, trade integration destroys risk-sharing and lowers welfare. If those markets are deep, trade integration allows for better risk-sharing, thus raising welfare.

Furthermore, empirical analysis by Aguiar and Gopinath (2007) suggest that Emerging Market Economies(EMEs) are vulnerable to sudden stops in capital inflows, and that these economies are twice as volatile as that of industrial countries. Not surprisingly, if one looks at historical data, the volatility of developing countries' real GDP is at least about thirty percent higher than that of the OECD countries. This aggregate volatility, in turn, has severe implications at the micro-level, and particularly for the poor who are the least equipped to weather these aggregate shocks and are therefore likely to face the brunt of its harmful impact. Another empirical study by Calderón and Yeyati (2007) suggests that inequality increases with economic volatility—a doubling in aggregate income volatility (measured as the standard deviation of per capita GDP) leads to a 2.7 percent increase in the Gini coefficient, a 2.4 percent reduction in the income share of the poorest quintile, and a 1.1 percent increase in the income share of the richest quintile.

Also, Kose, *et al.* (2008), in another study, examined the risk-sharing implication of financial integration by focusing on the cross-country correlations of output and consumption. They find that there is no evidence that financial globalization fosters increased risk-sharing across all countries, including the developing countries.

Ahmed and Suardy (2009), examine the effects of both financial and trade liberalization on real output and consumption growth volatility in Sub-Saharan Africa. They find that trade liberalization is associated with higher output and consumption volatility while financial liberalization is observed to increase the efficacy of consumption smoothing and stabilize income and consumption growth. They conclude that there is evidence that good institutions help reduce inflation levels and volatility, which in turn promote lower growth volatility.

Udah (2010) argues that Macroeconomic uncertainty plays a key role in determining investment behaviour in developing countries. Uncertainties arise from high and unstable inflation rate, unstable fiscal deficits, overvaluation or depreciation and exchange rate misalignment. Macroeconomic uncertainty or instability could also arise from political instability or poor macroeconomic management. When the future is

highly uncertain, investors take a 'wait' and 'see' attitude. At the microeconomic level firms may decide to limit their capacity in the face of uncertainty in demand conditions, which leads to reduced investment capacity.

Mougani (2012) analyzes the impact of financial integration on economic activity and macroeconomic volatility in Africa within the financial globalization contexts. The results of the empirical analysis show that the impact of external capital flows on growth seems to depend mainly on the initial conditions and policies implemented to stabilize foreign investment, increase domestic investment, productivity and trade, develop the domestic financial system, expand trade openness and other actions aimed at stimulating growth and reducing poverty. The analysis also shows that financial instability was particularly severe as from the nineties. The instability was more pronounced in the case of portfolio investments than in foreign direct investment because of the longer-term relationship established by the latter.

Orji, *et al.* (2013) in a recent study investigatethe relative impacts of the uncertainty of macroeconomic variables on investment using Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model. Their findingsreveal the existence of long run relationship between some of the macroeconomic variables and investment. And also, that the uncertainty of most of the macroeconomic variables impact negatively on investment in Nigeria.

3. METHODOLOGY

3.1. The Garch Model

3.1.1. Modeling the impact of Financial Openness on Output Volatility

Our methodological framework here draws from the seminal work of Engle (1982), in which he introduced the Autoregressive Conditional Heteroscedasticity (ARCH) to capture the issues of volatility in financial time series analysis. Bollerslev (1986) introduced the Generalised Autoregressive Conditional Heteroskedasticity (GARCH) which is an extension of Engle's original work. For the analysis of the impact of financial openness on output volatility, we employ the volatility of GDP growth rate as a measure of output volatility and also adopt the GARCH Model. Among others, we explore the relationship between the two measures to capture the response of output volatility to both de jure and de facto openness. Greater financial liberalization and larger capital inflows are expected to increase output volatility (Neumann and Ron, 2008). However, the relationship may be more complicated in that financial liberalization and capital inflows may not move in tandem or step-for-step with one another. For example, a country may have limited access to foreign capital even if is financially open. Conversely, a country that is not deemed to be financially open to capital by de jure measuresmay, in fact, have large capital flows due to the circumvention of these capital controls. Thus, we explore the impact of the de jure and de facto measures within the Nigerian context.

Before specifying the GARCH model, it is necessary to begin briefly with a review of the ARCH and GARCH models. Engle (1982) developed a new class of stochastic process; the Autoregressive Conditional Heteroskedasticity (ARCH) model which is a process where the conditional variance is a function of lagged squared residuals. As earlier stated also, Bollerslev (1986) introduced the Generalised Autoregressive Conditional Heteroskedasticity (GARCH) which is an extension of Engle's original work. It allows the conditional variance to be a function of the lagged variance; i.e. it allows for both autoregressive and moving average (ARMA) components in the heteroskedasticity variance. He showed that the GARCH model allows a better representation of the volatility process while being more parsimonious.

3.1.2. The Model

Lensik (2002) argued that the principal directions in evaluating volatility or uncertainty are: (i) standard deviations of the variables, (ii) dispersion of the unpredictable part of a stochastic process, (iii) Generalized autoregressive conditional heteroscedasticity (GARCH) model of volatility. Also, according to Ahmed (2009), and Popov (2011) output volatility can be calculated as the standard deviation of change in real output or real GDP. However we follow Fang and Miller (2012), to specify a GARCH (1, 1) model of output volatility. This is a multivariate modeling approach of GARCH where other explanatory determinants of output volatility are included in the variance equation with lags.

We therefore specify our fundamental GARCH volatility process as:

$$\sigma_t^2 = \alpha_0 + \alpha_1 \mu_{t-1}^2 + \alpha_2 \sigma_{t-1}^2 \tag{3.1}$$

which says that the conditional variance of μ at time *t* depends not only on the squared error term in the previous time period [as in ARCH(1)] but also on its conditional variance in the previous time period (Gujarati, 2004).

where σ_t^2 equals the conditional variance (squared variance), given information available at time t. α_0 is the constant, and the α_1 refers to a first order ARCH term (i.e., news about volatility from the previous period) and α_2 a first order GARCH term (i.e., persistent coefficient). The conditions that $\alpha_1 \geq 0$, $\alpha_2 \geq 0$, and $\alpha_1 + \alpha_2 < 1$ ensure the positive and stable conditional variances of μ_t. The sum $\alpha_1 + \alpha_2$, measures the persistence of shocks to the conditional variances. To estimate output variability, we take the conditional standard deviation of RGDP growth rate (Y) in GARCH (1, 1) order as specified in equation (3.1)

To estimate the determinants of output volatility, we include the lagged values of our growth rate and our de jure/ de facto measures of openness in the variance equation, while controlling for other exogenous shocks. Thus, we specify our new conditional variance equation as:

$$\sigma_t^2 Y = \alpha_0 + \alpha_1 \mu_{t-1}^2 + \alpha_2 \sigma_{t-1}^2 + \sum_{i=0}^{q} \delta_i \breve{Z}_{t-1} \tag{3.2}$$

where "Ž" is a vector of explanatory variables that could determine or influence output volatility. These explanatory variables included in the variance equation are: (1) FODJV which is the de jure financial openness volatility variable from Chinn-Ito (2012). We use this index because of its wide acceptability and it is available for a long period (up to 1970-2011) for over 182 countries of the world including Nigeria. As earlier stated, the construction of the Chinn-Ito index is based on the first principle component of four binary variables in IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREARER) and it takes higher values for more open financial regimes. These four variables are defined as follows: *K1* is the variable that indicates the presence of multiple exchange rates; *K2* is the variable that indicates restrictions on current account transactions; *K3* is the variable that indicates the restrictions on capital account transactions; and *K4* is the variable that indicates requirements of the surrender of export proceeds[2].

(2) FODFV which is the de facto financial openness volatility variable measured from gross capital flows.Here we use total capital flow as a ratio of GDP to capture our degree of de facto Financial Openness. The sum of FDI, portfolio investments and other investments make up the capital flows, (Aizenman and Noy, 2009). According to the World Bank (2012), "Gross private capital flows are the sum of the absolute values of direct, portfolio, and other investment inflows and outflows recorded in the balance of payments financial account, excluding changes in the assets and liabilities of monetary authorities and general government".

In line with the endogenous theory, we also expect a positive relationship since this variable also captures capital stock/ effects of external investment inflows (Sanchez-Robles and Bengoa-Calvo, 2002).

(3) TOTV which stands for Terms of trade volatility. This is used as a proxy for external risk premium. (4) EXRV is Exchange Rate Volatility. (5) INFV which is inflation volatility. According to Aizenman (2008) and Ahmed (2009) the values of these volatility variables can also be calculated from their standard deviations.

3.1.3. Method of Estimation

The GARCH (1, 1) is a generalization of the ARCH (*q*) model proposed by Engle (1982) as a way to explain why large residuals tend to clump together, by regressing squared residual series on its lag(s). However, empirical evidence shows that high ARCH order has to be selected in order to catch the dynamics of the conditional variance. Bollerslev (1986) proposed the Generalized ARCH (GARCH) model as a solution to the problem with the high ARCH orders. The GARCH reduces the number of estimated parameters from an infinite number to just a few. According to Brook and Burke (2003), the lag

order (1, 1) is sufficient to capture all the volatility clustering that is present in a data ceteris paribus.

The GARCH (1, 1) estimation process involves some steps. The first step is to examine the time series properties of the data before applying other appropriate modeling procedures. Secondly we need to estimate the model to obtain the residuals from the regression with which to test for ARCH and GARCH features. The third step involves regressing the squared residual series and conditional variance on their lags and on the other explanatory variables in the model.

3.1.4. Data Sources

The data used in the study covers annual time series data from 1986 to 2011. We used Eviews Quadratic Match-Average interpolation technique to convert them to quarterly series. The sources of the data include various issues of the Central Bank of Nigeria (CBN) statistical bulletins/ financial reports and National Bureau of Statistics (NBS) publications and World Bank Publications.

4.1. Presentation and Analysis of Results

Unit root test

The result of the ADF test of stationarity is presented on Table 4.10a below. Here, Real exchange rate was found to be stationary at level; while others, GDP growth rate (Y), terms of trade, de facto financial openness, de jure financial openness and inflation were found to be stationary at first difference at the 5% level for the ADF test.

Table 4.10a
Summary of ADF Unit root test results of the GARCH series

Variable	*Mackinnon Critical Values*	*LevelADF Test Stat*	*1st Difference ADF Test Stat*	*Order of Integration*
Y	-3.600	-3.514	4.595*	I(1)
FODFV	-3.222	-2.084	4.223*	I(1)
TOTV	-2.5868	2.097	3.827*	I(1)
FODJV	-3.451	-2.352	-3.603*	I(1)
REXRV	-2.891	-3.604*		I(0)
INFV	-3.455	-3.427	-4.286*	I(1)

Note: * indicates significant at 5%, probability levels

Source: Computed by the Author

Computed by the author

As can be seen in Table 4.10b, four variables in the series are non-normally distributed. The null hypothesis of normal distribution is rejected for TOTV, REXRV, FODJ and INFV at the 1% level, and at the 5% level for the rest of the series. The mean and median of TOTV and REXRV are positive and high above 100% respectively. This

Table 4.10b
Descriptive characteristics of the variables

Variables/ Statistics	*Y*	*FODFV*	*TOTV*	*REXRV*	*INFV*	*FODJV*
Mean	2.199808	27.17365	104.4112	108.127	22.12626	2.030385
Median	2.3	27.07500	87.935	100.21	13.53	1.7
Maximum	8.89	36.73000	221.26	439.18	76.43	3.02
Minimum	-4.21	16.35000	42.4	53.97	1.86	1.35
Std. Dev.	3.084427	4.728219	51.77508	50.61129	20.10329	0.599218
Skewness	0.098315	-0.047166	0.906833	4.036898	1.246872	0.582155
Kurtosis	2.370927	2.678203	2.467907	2.39166	3.144525	1.482444
Jarque-Bera	1.882386	0.487292	15.48087	2178.325	27.03845	15.85391
Probability	0.390162	0.783765	0.000435	0.00000	0.000001	0.000361

suggests that terms of trade and real exchange rate especially at the beginning of each fiscal quarter were significantly positive and perhaps imply that higher average values attract larger economic growth especially terms of trade.

The variables from the table also do not show evidence of fat tails, since the Kurtosis did not exceed 3, which is the normal value. But there is little evidence of negative skewness, for de facto financial openness volatility. These imply left and right fat tails, respectively. We can, therefore, employ the GARCH model since there is no much kurtosis problem.

Confirmation of data as AR (1)

Before the estimation of the GARCH model the data was confirmed to be suitable for AR (1). The correlogram test for the series is shows a slow decay in AC and a spike in the PAC on first observation and then drops to zero/under zero indicates the AR(1). The first order autocorrelation is 0.914, and they gradually decline to .0030 after 15 lags. These autocorrelations are not large, but they are very significant. Though some are positive and others negative, which is expected in most economic time series and yet is an implication of the GARCH (1, 1) model.

Then the above is followed by an estimation of Y, AR (1) using OLS in order to test the hypothesis whether there is autocorrelation (and hence no ARCH) or not.

Table 4.11

Dependent Variable: Y
Method: ML – ARCH

	Coefficient	*Std. Error*	*z-Statistic*	*Prob.*
C	-11.42835	14.27232	-0.800736	0.4233
AR(1)	0.981731	0.014924	65.78130	0.0000
		Variance Equation		
C	0.317251	0.058825	5.393102	0.0000
ARCH(1)	1.650808	0.317355	5.201769	0.0000

contd. table

	Coefficient	*Std. Error*	*z-Statistic*	*Prob.*
R-squared	0.830084		Mean dependent var	2.181845
Adjusted R-squared	0.824935		S.D. dependent var	3.094039
S.E. of regression	1.294568		Akaike info criterion	2.867000
Sum squared resid	165.9148		Schwarz criterion	2.969320
Log likelihood	-143.6505		F-statistic161.2139	
Durbin-Watson stat	1.871836		Prob(F-statistic)	0.000000
Inverted AR Roots	.98			

Arch test

In order to test the ARCH effect we performed the ARCH-LM Heteroskedasticity test. Often a "Ljung box test" with 15 lagged autocorrelations is used.

Table 4.12

F-statistics	4.74130	Probability	0.000003
Obs *R-squared	43.72930	Probability	0.000121

The test p-values shown in the last column are all zero, resoundingly rejecting the null hypothesis which says that "there is no ARCH". On top of the p-values, out of the result of the Heteroskedasticity test we see that, the ARCH-LM statistic is 4.74130 significant at the 5% level, thus we conclude that there is ARCH effects.

Table 4.13
The GARCH Model Results

Mean Equation			
	Coefficient	*Z-Statistics*	*Probability*
Constant (μ)	2.373219	3.388535	0.0007
AR(1)	0.737731	11.38609	0.0000
Variance Equation			
Constant (ώ)	5.607304	12.26144	0.0000
ARCH (1) (α)	0.225949	0.558670	0.5764
GARCH (1) (β)	0.424017	1.612945	0.1068
Y (-1) (λ)	-0.166743	-1.427170	0.1535
FODFV (-1) (δ)	-0.033537	-0.762094	0.4460
TOTV (-1) (ž)	-0.010199	-1.270723	0.2038
FODJ (-1) (ζ)	-0.0406922	-0.702016	0.4827
REXR (-1) (ν)	-0.007939	-0.758922	0.4479
INFV (-1) (ρ)	-0.022769	-1.096954	0.2727
R-squared	0.808468		
Adjusted R-squared	0.787649		
F-statistics	38.83371		
	Prob (F-statistics)		
	0.00000		
Inverted AR Roots	.74		

Computed by the author

Analysis of the GARCH Model

From the result in the table above, the ARCH and GARCH coefficients (0.2259 and 0.4240) are not statistically significant. The sum of these coefficients is 0.650 which indicates that shocks to volatility have a persistent effect on the conditional variance. These shocks will have a permanent effect if the sum of the ARCH and GARCH coefficients equals unity (that is, the conditional variance does not converge on a constant unconditional variance in the long run).

Interpretation of the output volatility determinants

The coefficients of lag of GDP growth rate, de facto and de jure financial openness volatility, terms of trade, real exchange rate, inflation in the GARCH (1, 1) measure the predictive power of previous values of the variables on economic growth in Nigerian economy. As can be seen from Table 4.13 the coefficients are all negative implying that a change in either of the variables in the previous period in Nigeria reduces conditional output volatility this quarter. However, the findings infer that financial openness and other macroeconomic variables in the model have not made any significant impact on output volatility in Nigeria.

This finding is in line with Ramey and Ramey (1995) who in a detailed study documented an empirical relationship that show that growth and volatility are negatively correlated. This is an important result since it suggests that policies and exogenous shocks that affect growth may not necessarily influence volatility.

Furthermore, the findings from the above GARCH result agree with existing studies such as; Razin and Rose (1994) ; Easterly, Islam, and Stiglitz (2001); Buch, Dopke, and Pierdzioch (2002), O'Donnell (2001) and Kose *et al.* (2008), that were unable to document a clear positive empirical link between openness and macroeconomic volatility. For example, Razin and Rose (1994) study the impact of trade and financial openness on the volatility of output, consumption, and investment for a sample of 138 countries over the period 1950–88. They find no significant empirical link between openness and macroeconomic volatility. Easterly, Islam, and Stiglitz (2001) explore the sources of macroeconomic volatility using data for a sample of 74 countries over the period 1960–97. They find that a higher level of development of the domestic financial sector is associated with lower volatility.

On the other hand, an increase in the degree of trade openness leads to an increase in the volatility of output, especially in developing countries. Their results indicate that neither financial openness nor the volatility of capital flows has a significant impact on macroeconomic volatility.

Buch, Dopke, and Pierdzioch (2002) use data for 25 OECD countries to examine the link between financial openness and business cycle volatility. They report that there is no consistent empirical relationship between financial openness and the volatility of output.

O'Donnell (2001) examines the effect of financial integration on the volatility of output growth over the period 1971–94 using data for 93 countries. He finds that a higher degree of financial integration is associated with lower (higher) output volatility in OECD (non-OECD) countries. His results also suggest that countries with more developed financial sectors are able to reduce output volatility through financial integration.

Arch test

In order to test the ARCH effect of the GARCH estimation result above, we performed the ARCH-LM Heteroskedasticity test. Often a "Ljung box test" with 15 lagged autocorrelations is used.

Table 4.14

F-statistics	2.22306	Probability	0.012845
Obs *R-squared	27.85531	Probability	0.022492

However, the GARCH model did not assume a symmetric response of volatility to past shocks. The test p-values shown in the table above are close to zero, rejecting the null hypothesis which says that "there is no ARCH" at 5 % level. Also, the Q statistics on all the lags in the specification do reject the null thus they support the hypothesis that the standardized residuals not serially correlated. Mores o, we have tested further even longer lag (36 default lag) for the square residual and we have observed that the Q-stat from lag 1 to lag 7 did not reject the null. But it rejected the null hypothesis from lags 8 to 16 and failed again to reject at lag 17 Choosing shorter lag might result to one failing to capture the lag order however, the longer lag one chooses the lower the power will be.

Note: If there is no serial correlation, the autocorrelations and partial autocorrelations at all lags should be nearly zero, and all *Q*-statistics should be insignificant with large *p*-values.Finally, we find that past volatilities in financial openness and other macroeconomic variables in our model did not lead to output volatility in Nigeria. This result supports the work of Kose et al (2008).

5.1. Conclusion and Policy Recommendations.

This paper focuses on the impact of financial openness on output volatility in Nigeria. It uses two measures of financial openness: de jure (Chin-Ito Index) based on Chinn and Ito (2012) and de facto capital flows variables which are the sum of FDI, portfolio flows and other investments following Aizenman (2004, 2008) and Aizenman and Noy (2009), for empirical analysis. The study applies the the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) Model to address the core objective. The findings show that none of the two measures of financial openness contributed to output volatility in Nigeria, within the period under review. Other

control variables in the GARCH Model also reveal a negative relationship with output volatility in Nigeria.

The Emphasis should be placed on more robust domestic economic structural reforms such as promoting a competitive and viable domestic banking system, with adequate regulatory and supervisory framework. This should be complemented by other macroeconomic stability policies. That is, fiscal deficits, rapidly depreciating exchange rate and high inflation should be put in check. This is one of the ways to ensure that financial openness continues to contribute to growth while lowering output volatility.

Note

1. For more detailed discussion on the construction of the Chinn-Ito Index see Chinn and Ito (2012). We justify the use of this index owing to its wide acceptability and availability.

References

Agu, C.C, Orji, A. And Eigbiremolen G. (2014), "Financial Liberalization, Interest Rate Structure and Savings Mobilization: The Nigerian Experience"*International Journal of Current Research6 (1), January, 2014*.

Ahmed, M. and Suardi, S (2009), "Do Financial and Trade Liberalization Cause Macroeconomic Volatility in Sub-Saharan Africa?" *Centre for Strategic Economic Studies, Working Paper No. 44, Victoria University, Melbourne*.

Aizenman, J. and Noy, I. (2009), "Endogenous Financial and Trade Openness". *Review of Development Economics, 13: 175-189*.

Aizenman, J. and Noy, I. (2004), "Endogenous Financial Openness: Efficiency and Political Economy Considerations", *NBER Working Paper No. W10144.*

Aizenman, J., (2008), "On the hidden links between financial and trade opening," *Journal of International Money and Finance, Elsevier, 27(3): 372-386*.

Akpan, H. E (2013), "Growth without Development in Nigeria:Confronting the Paradox", *Paper presented at the 43rd Annual ICAN Conference held at the International Conference Centre, Abuja, 8 – 10, October, 2013*.

Babajide, F. (2008), "Financial Liberalization Policies and Economic Growth: Panel Data Evidence from Sub-Saharan Africa" *African Development Review (20) 3: 549-574*.

Backus, D.K., Kehoe, P., Kydland, F., (1992), "International Real Business Cycles", *Journal of Political Economy 100 (4): 745-775.*

Batini N. (2004), "Achieving and MaintainingPrice Stability in Nigeria" IMF Working Paper WP/04/97.

Bekaert G., Harvey, C.R. and Lundblad, C. (2006), "Growth Volatility and financial liberalization," *Journal of International Money and Finance, 25: 370-403.*

Bekaert G., Harvey, C.R. and Lundblad, C. (2005), "Does Financial Liberalization spur Growth", *Journal of Financial Economics 77(1): 3-55.*

Bollerslev, T. (1986), "Generalized Autoregressive Conditional Heteroskedasticity", *Journal of Econometrics*, 31, 307-327.

Buch C.M., Jorg, D and Christian P. (2005), "Financial Openness and Business Cycle Volatility": *Kiel Institute for World Economics. Working paper, Germany*.

Buch C.M., and Yener, S. (2005), "Consumption volatility and financial openness" *Kiel working Paper 1260*.

Caprio, G. and Klingebiel, F (1995), "Bank Insolvencies: Cross Country Experience", *World Bank Working Papers No. 1620*.

Central Bank of Nigeria (2012), Statistical Bulletin.

Central Bank of Nigeria (2010), Statistical Bulletin.

Central Bank of Nigeria (2005), Statistical Bulletin.

Central Bank of Nigeria (2004), Statistical Bulletin.

Chinn, M.D. and Ito, H. (2012), "Notes on the Chinn-Ito Financial Openness Index 2010 Update" *NBER Working Papers*.

Chinn, M.D and Ito, H. (2006), "What Matters for Financial Development? Capital Controls, Institutions, and Interactions," *Journal of Development Economics 81 (1); 163-192.*

Chinn, M.D and H. (2002), Capital account liberalization, institutions and financial development: Cross country evidence." *NBER Working Paper No. 8967*.

Easterly, W., Islam, R., and Stiglitz, J., (2001), Volatility and Macroeconomic Paradigms for Rich and Poor Countries. In: Dreze, J. (Ed.), Advances in Macroeconomic Theory. Palgrave, New York.

Engle, R. F. (1982), "Autoregressive Conditional Heteroscedasticity withEstimates of the Variance of United Kingdom Inflation", *Econometrica*, 50, 987-1007.

Fry, M.J. (1997), "In Favour of Financial Liberalization", *Economic Journal, 107: 442-754*.

Greenaway, D, Morgan, W and Wright, P. (2002), "Trade Liberalization and Growth in Developing Countries" *Journal of Development Economics, 67; 229-244*.

Honohan, P. (2000), "How Interest Rates Changed Under Financial Liberalization- a Cross Country Review," *Policy Research Working Series 2313*.

Kama, U (2006), "Recent Reforms in the Nigerian Banking Industry: Issues and Challenges" *CBN Bullion, 30:3*.

Kaminsky, G.L and Schmukler, S.L (2003), "Short-Run Pain, Long-Run Gain: The Effects of Financial Liberalization" *IMF Working Paper WP/03/34*.

Kaminsky, G.L and Reinhart, C.M (1999), "The Twin Crises: The Causes of Banking and Balance of Payments Problems," *American Economic Review 89 (3): 473-500*.

Kose, A., Ayhan, M., Prasad, E, Rogoff, K. Shang-Jin, W., (2008), "Financial Globalization:A Reappraisal", *IMF Staff Papers*.

Kose, A. Prasad, E., Terrones, M.E (2003), "Financial Integration and Macroeconomic Volatility" *IMF Staff Papers 50: 119-142*.

Kose, A (2002), "Explaining Business Cycles in Small Open Economies: How much do World Prices Matter"? *Journal of International Economies 56:299-327*.

Lane, P.R., and Milesi- Ferretti, G.M (2007), "The External Wealth of Nations Mark II: Revised and Extended Estimates of Foreign Assets and Liabilities, 1970-2004" *Journal of International Economics 73 (2): 223-250*.

Lane, P. R and Milesi-Ferretti, G.M (2005), "A Global Perspective on External Positions," *NBER Working 11589.*

Neumann, R. and Ron P. (2008), "Volatile capital flows: Interactions between de jure and de facto financial liberalization." *Economics Bulletin, 6 (2): 1-10*.

Nigeria Bureau of Statistics Report 2012.

Okpara, G.C (2010), "The Effect of Financial Liberalization on Selected Macroeconomic variables: Lessons from Nigeria". *The International Journal of Applied Economics and Finance 4 (2): 53-61*.

Orji, A., Onyia A.M and Ani, E.G (2013), "Calming the Tide: Private Investment and Macroeconomic Uncertainty in Nigeria" *Asian Journal of Empirical Research, 2013, 3(5):633-653*.

Prasad, E., Rajan, R. and Subramanian, A. (2007), "Foreign Capital and Economic Growth" *Brooking Papers on Economic Activity, 2007 (1): 153-209*.

Prasad, E., Rogoff, K., Wei, S.J and Kose, M.A. (2003), "The Effects of Financial Globalization on Developing Countries: Some Empirical Evidence. *IMF Occasional Paper No.220. Washington, D.C*.

Raddatz, C., (2007), "Liquidity needs and vulnerability to Financial Underdevelopment", *Journalof Financial Economics* 80 (3): 677-722.

Serven, L. and Schmidt-Hebbel, K. (2002), "Financial Liberalization, Saving and Growth" Paper Presented at the Banco de Mexico Conference on Macroeconomic Stability, Financial and Economic Development", *Mexico, DF, Nov. 12-13*.

Stiglitz, J.E (2002), Globalization's Discontents. New York: W.W Norton and Company.

Stiglitz, J. E. (1998), "Towards a New International Economic Architecture: Principles and Policies." *Presented at the European Investment Bank,* FiesoleItaly, October, 15.

World Bank Development Indicators 2012.

Zhang, K.H.L., (2001), "Does Foreign Direct Investment Promote Economic Growth? Evidence from East Asia and Latin America". *Contemporary Economic Policy 19: 175-185.*

APPENDIX

1. Selected Macroeconomic Variables

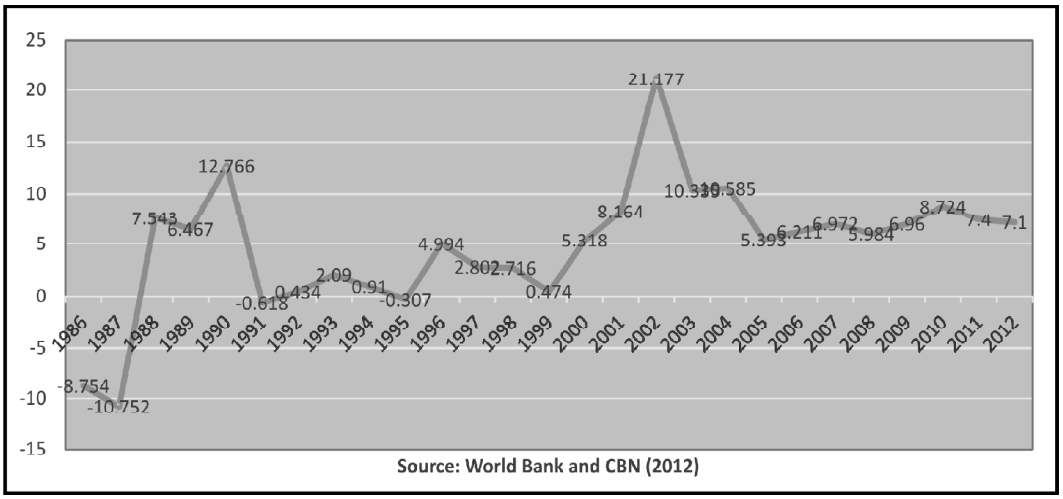

Figure 1: Nigeria GDP Growth Rate

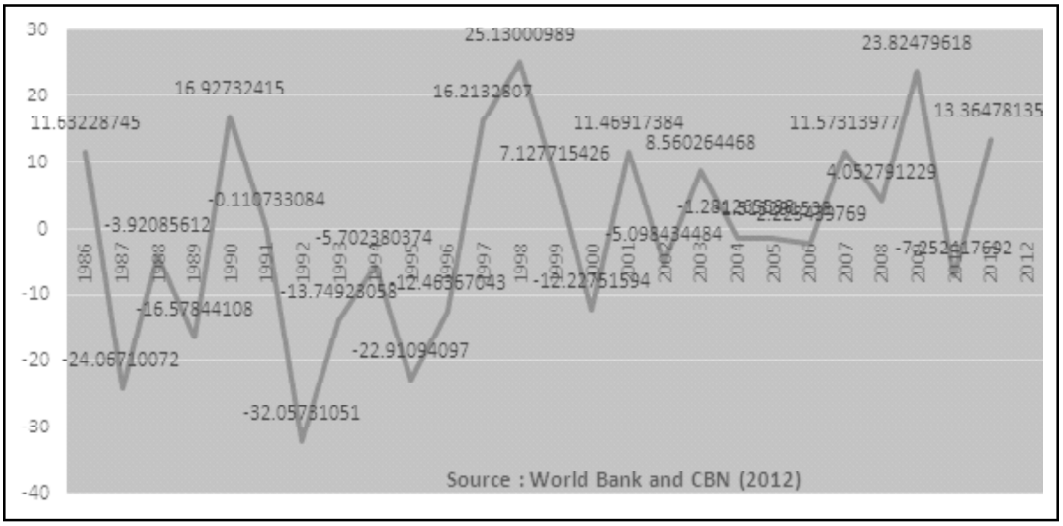

Figure 2: Nigeria: Real Interest Rate

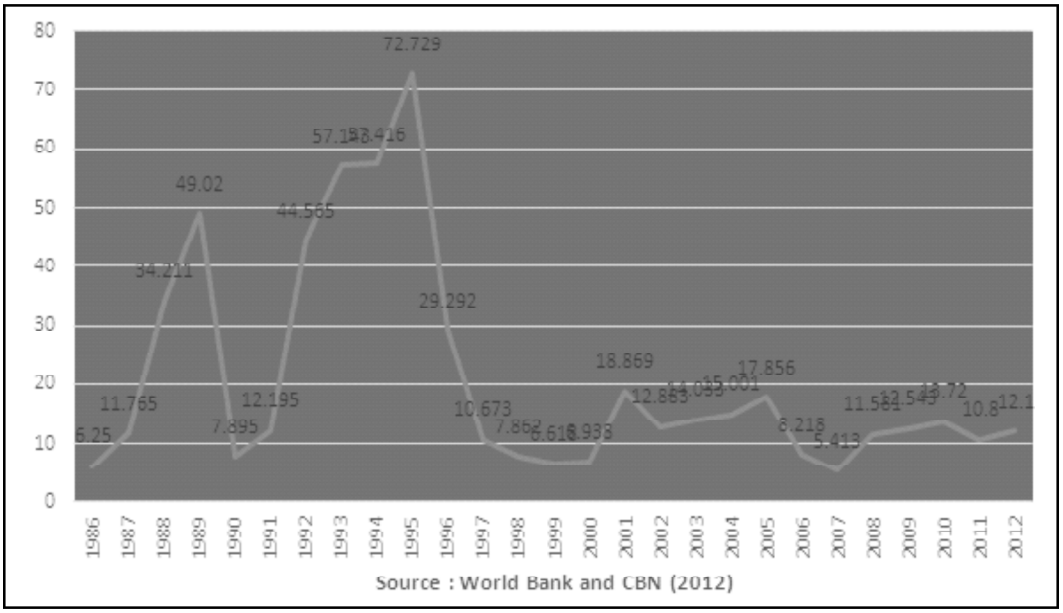

Figure 3: Nigeria: Inflation Rate