Causal Relationship between Stock Market Index and Exchange Rate: Evidence from Nigeria

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This paper uses Johansen's cointegration to test for the possibility of co-integration and Granger-causality to estimate the causal relationship between stock market index and monetary indicators (exchange rate and M2) before and during the global financial crisis for Nigeria, using monthly data for the period 2001–2011. Results suggest absence of long-run relationship before and during the crisis. The Granger-causality tests show a uni-directional causality running from M2 to ASI before the crisis while during the period of the crisis there is absence of causality between the variables. This suggests that ASI show responsiveness to M2. Thus, absence of the direct linkage between ASI and Exchange rate shows that the market is inefficient and perhaps not derived or guided by the fundamentals.

Keywords: Stock market index, Exchange Rate, M2, Causality, Integration, Global Economic Crisis, Nigeria

JEL Classification: N20, N27

1.0 Introduction

Since 1980s globalization, inter-linkages of the capital markets, gradual removal of capital inflow barriers and the implementation of more flexible exchange rate mechanism in developed as well as transition economies, created a systematic interdependency between and within the stock and foreign exchange markets, (Aydemir and Demirhan, 2009). Therefore, investigating the relationship between stock prices and exchange rates will give an insight on the extent of the possible contagion effect being faced on their integration as the global financial market intensified.

In a stable financial system the link between the exchange rates and stock prices could be explained in both short and long run. In the former an upward trend in the stock market may cause currency depreciation, whereas in the latter weak currency may cause decline in stock market. The relationship may not be directly, therefore this paper uses trivariate model to check for the possible interrelationship between the Exchange rate, stock prices and M2.

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On a prior, as money supply (M2) increases, interest rates may fall, and if interest rates decline, stock prices may increase. These uncertainties may result in no reliable negative causal relation from money supply to stock prices.

Movements in the stock market may also affect exchange rates. Equities, being part of wealth, may affect the behaviour of exchange rates through the demand for money according to the monetarist models of exchange rate determination (Gavin, 1989 and Soros, 2009).

The recent global financial crisis could be traced to decade ago in the increased financial sector sophistication and gradual lapse in regulatory standards which brought about the US sub-prime housing market downturn in 2006 and resonated to other sectors of its financial system. The crisis spread like a wild fire to Europe and then to the rest of the world. Globally, banks have reported about $600 billion of credit – related losses and have raised some $430 billion in new capital (Soros, 2009). As the asset and credit bubbles formed in many countries simultaneously, stock- markets have crashed and many currencies have depreciated drastically. In Nigeria the story is not different, the stock market collapsed by 70% in 2008-2009. Naira trended slightly downward during the period averaging around N125 per US$ from 2006-2008, but depreciated to an average of N152.33 per US$ in 2011.

The depreciation of the Naira partly attributed to the following: decrease in foreign exchange inflows to the economy as a result of drastic decline in the demand for oil which is the main source of foreign reserve to the economy; reduced inflow from autonomous sources; increased repatriation of investments by foreign portfolio managers in both the capital and money markets; and negative accretion to reserve.

The study of the interaction between stock prices and exchange rates especially with the emergence of crisis period for Nigeria is quite imperative for the following reasons: First, the Nigeria Stock Exchange (NSE) is one of the fastest growing markets in the continent before the crisis began. For instance, the All Share Index (ASI) and Market Capitalization (MC) trended up-ward from 9,591.80 and N567.07 billion in April 2001 to 65,653.4 and N12.50 trillion in February 2008. Second, the exchange rate regimes moved from pegged exchange rate regime to manage floating exchange rate regime.

With the crisis, the monetary authority became the only source of funding the foreign exchange market and as the demand pressure on the domestic foreign exchange market was tense the authority was left with two options - to embark on guided deregulation of the foreign exchange market or to allow the market forces to do the adjustment. Thirdly, the knowledge of the relationship between the two markets would make monetary authority to be more pro-active in taking measures to mitigate and reduce the effect on the economy in case of future occurrence of the crisis. Gavin (1989) shows that a booming stock market has a positive effect on aggregate demand.

The financial crisis is believed to have permeated into the Nigerian Economy from 2008 till 2011. However, with the banking sector reform in 2011 and the gradual stability in financial system the effect of the crisis has declined but still the crisis is not over, therefore, this paper consider 2008 – 2011 as the crisis period[2].

The rest of the paper is organized as follows: Section 2 trend and presents Stylized facts on exchange rate cum capital market in Nigeria and a review of some related literature, Section 3 discusses data and methodology, section 4 presents estimation of results. Section 5 concludes the paper.

2.0 Overview of Exchange Rate, Stock Market Index and M2 movement (before and during crisis)

Exchange rate stability and continuous growth in capital market are required for financial system stability and monetary policy effectiveness. The financial system in Nigeria from 2005 to date has improved significantly moving from fragmented to relative efficient system. However, the expected linkages among the macroeconomic variables are found to be weak.

Figure 1 presents the pattern of exchange rate, stock market index and M2 before the financial crisis. It is clear that exchange rate depreciates during the

[2] The global financial crisis is believed to have come to an end in 2013, with the adoption of final statement that the global economy is getting better (G-20 Economic Conference September, 2013). However, for Developing economies Nigeria inclusive, the crisis entered not mainly through the credit crunch but rather through the recession that followed it which reduced the accretions to reserves during the period due to the drop in the oil price, but since 2012 we have witnessed surge in the price which shows that the crisis is to some extent over, though there are challenges of slow recovery which is attributed to tight regulations from the regulators.

period from $/N112.95 in 2001 to $/N132.35 in 2005 and appreciated to $/N128.27 in December 2006. This indicates a relative volatility of the exchange rate before the crisis but with some level of stability especially in 2006. The ASI has risen steadily during the period indicating the expansion in the capital market for instance in 2001 to 2006 the index has increased by more than 100 percent. Although both the exchange rate and the ASI were moving in the same direction but there was no any indications of exchange rate responsive to the index and vice-versa.

Figure 1: Trend of Exchange Rate and ASI before financial crisis

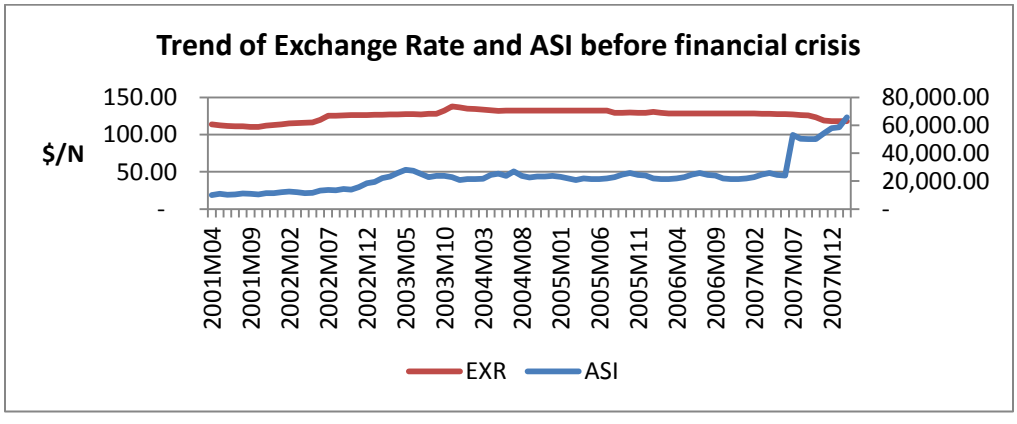
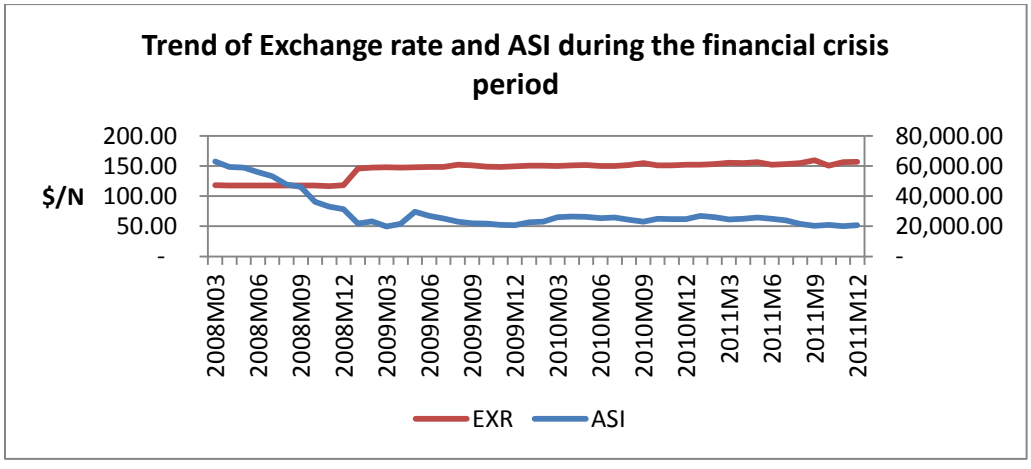


Figure 2: Trend of Exchange Rate and ASI during financial crisis



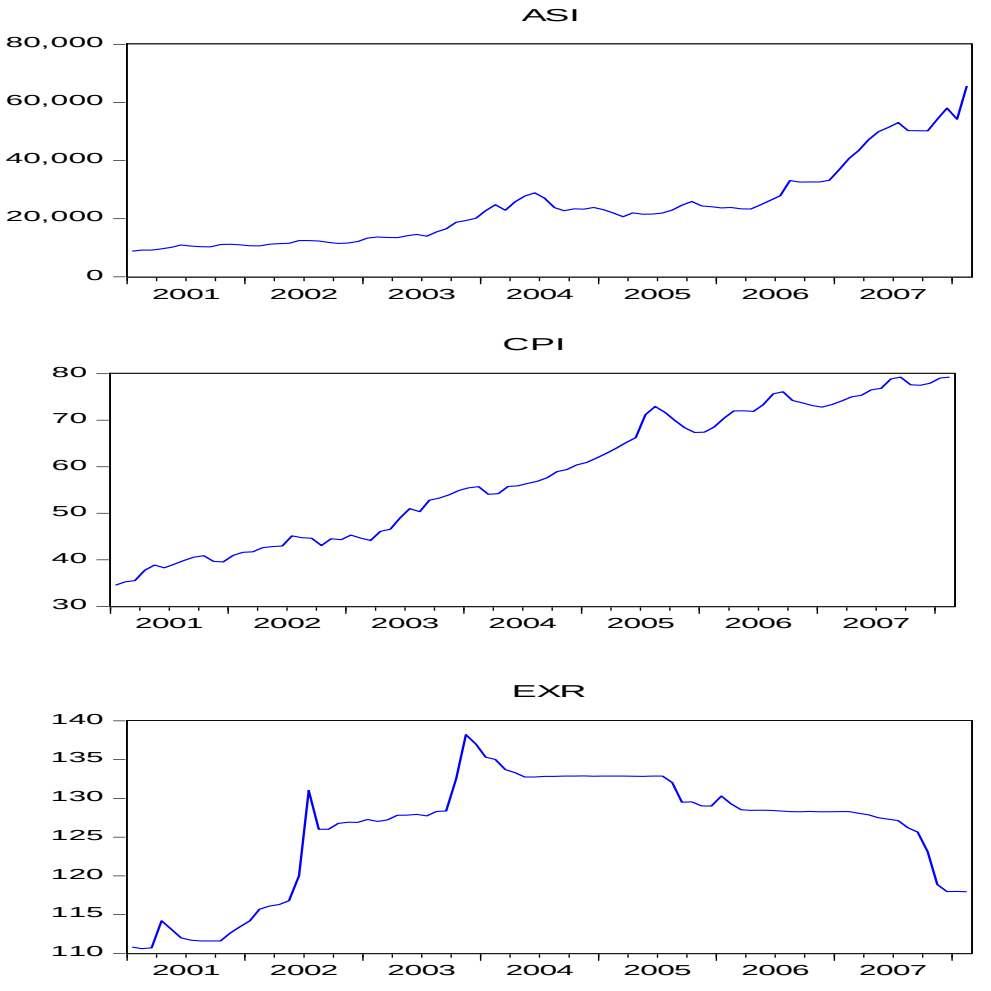


Figure 2 above depicts a movement of exchange rate, ASI and M2 during the crisis (March 2008 – December 2011). The index increased rapidly reaching its peak of 63,016.56 in March 2008 but crashed to 20,730.63 in December, 2011. The exchange rate was relatively stable from 2006 to 2008, however in 2009 the rates depreciated very fast, for instance, the rates was $/N117 in 2007 and depreciated to $/145.90 in January 2009.

Based on the trend of the variables shown in figure 2 we can deduced that exchange rate and all share index have no any link during the financial crisis. The exchange rate and capital market witnessed a significant change which affects the market, however, there was no relationship between ASI index and exchange rate during the period.

2.1.1 Exchange rate

Over the years, the monetary authority has put in place various exchange rate regimes to achieve a sound financial system. The exchange rate policy applied at any time depends on the prevailing conditions in the economy. The exchange rate of the Nigerian domestic currency remained at par with the pound sterling up to 1973 when it was changed to Naira. Subsequently, exchange rates were fixed to the US Dollar and the Pound Sterling. The import-weighted basket approach was introduced in 1978, where the currencies of seven major trading partners were designated with different trade weights.

In 1985 US Dollar was adopted as the intervention currency in which Nigerian Naira was tied with US Dollar. The introduction of structural adjustment programme in 1986 with flexible exchange rate regime and later improved to full deregulated system has marked the turning point in Nigeria's exchange rate management. The movement from fixed to flexible exchange rate was aimed at remedying the fast depreciation of the Naira at the parallel market and achieving external competitiveness. The floating exchange rate regime which was initialized with dual exchange rate system, which later metamorphosed fully to deregulated system.

The rates at Dutch Auction System (DAS), 2002 and Second-tier Foreign Exchange Market (SFEM) in 1986 where merged. Thus, the exchange rate experienced sharp depreciation which resulted in the introduction of dual exchange rate system in 1995, to check the issue and achieve efficient allocation and utilization of foreign exchange resources. The abolishing of dual exchange rate system has paved way for the introduction of Inter-Bank Foreign Exchange Market (IFEM) 1999-2002.

Exchange rate regime moved from regulated to de-regulated and then to guided de-regulation. From 2006 to 2011 the policy was quite flexible moving from Retail Dutch Auction System (RDAS) to Wholesale Dutch Auction System (WDAS). Thus, during the period of the global financial crisis the autonomous inflow of foreign exchange declined and also accretion to reserves reduced drastically, CBN became the only source of funding the foreign exchange market which was characterized by very high demand. The monetary authority were pushed to a tight corner and had the option to either

intervene in the foreign market and deplete the reserve, or allow the mysterious market forces to do the adjustment.

Since the reform in 1986, the naira exchange rate has been highly unstable. A huge real depreciation was recorded which resulted in a realistic value of the Naira. For instance, between 1986 and 2011 the naira had depreciated by 98.68 per cent (CBN Annual Report for 2004, 2005, 2007 and 2008).

2.1.2 Capital Market

The Nigerian Capital market has recorded a tremendous growth over the years. Although, the capital market consists of the issues, equity (or stock) and bonds markets, the stock market is dominated by the Nigerian Stock Exchange which is at the center stage of the Nigerian Capital Market and has achieved a tremendous success during that period, for instance, from 2000 to 2010 the bond market has deepened both in issue and size. The market indices indicated an upward movement namely, (Market Capitalizations, Price Index and Number of companies listed). The growth in the market has been influenced by government economic reforms, notably, with the establishment of the second-tier market (SSM) in 1985 and the deregulation of interest rates in 1987 which enabled many private enterprise investors to patronize equity market.

In the last three decades the Nigerian capital market represents a small proportion of the national economy. The market capitalization ratio to GDP for the period 1980 – 1999 stood at an average of less than 10 per cent except in few years. However, from 2004 the performance of the market rose significantly from 18 per cent to 64 per cent in 2007 before it declined drastically to 40 per cent in 2008. It increased slightly in 2011 to 45 per cent (Nigerian Stock Exchange, 2010).

2.1.3 Money Supply (M2)

The growth of money supply during the period under review, the M2 grew substantially from N1,092.6 billion in 2001 to N10, 730.8 billion in December 2008, and the growth was mainly due to the expansion of domestic credit particularly to the private sector. It further increased to N10, 780.6b, N11, 525.5b and N13, 300.3b in 2009, 2010 and 2011 respectively.

2.2 Review of Theoretical and Empirical Literature

2.2.1 Theoretical Literature

Economic theory suggests that there is a causal relationship between exchange rate and stock prices. However, the nature of the relationship remains contentious among scholars. The theoretical underpinning of the relationship between exchange rate and stock prices could be traced to two main theories that relate these segments of financial market.

Firstly, the traditional approach, which assumes that exchange rates leads stock prices. Under this approach the transmission channel is from exchange rate fluctuations which affect firms' values via changes in competitiveness and changes in the value of firms' assets and liabilities, dominated in foreign currency, there by affecting firms' profits and therefore the value of equity (Gavin, 1989).

Portfolio approach, postulates that changes in stock prices influence movements in exchange rates through portfolio adjustments (inflows/outflows of foreign capital). The approach believes that an inflow in foreign capital rises as upward trend in stock prices is recorded. However, a decrease in stock prices would induce a reduction in domestic investor's wealth, leading to a fall in the demand for money and lower rates, causing capital outflows and consequently currency depreciation.

It also pointed out that, a depreciation of the local currency makes exporting goods attractive, increases foreign demand and hence revenue for the firm and its value appreciates thus stock prices increases. Conversely, appreciation of local currency reduces the profit for an exporting firm and thereby affect it value of stock price negatively (Jorion, 1991).

Dornbusch and Fischer (1980) suggest that fluctuations in exchange rate can significantly have an effect on firm value, as they influence the terms of competition, the input and output prices, the value of firm's assets and liabilities denominated in foreign currencies. Therefore, the fluctuations affect the competitiveness of firms earning and cost of its funds and thereby impacting on the value of its shares. Although firms with foreign operations, from exporting to international production, are more affected as compared to "pure" domestic firms, virtually no company can be considered as fully insulated from the effects of exchange rates changes.

Consequently, all firms' prices may react sooner or later to changes in the exchange rates. Depending on the moment in time when exchange rates change, a company might face: (1) transaction exposure, that arises whenever the firm commits or is contractually bounded to make or receive a payment at a future date denominated in a foreign currency; (2) translation exposure, arising from the need to globally consolidate the financial reports of a multinational company from affiliates' reports denominated in various currencies; and (3) economic exposure, seen as the change in the firm's present value as a result of changes in the value of the firm's expected future cash flows and cost of capital, induced by unexpected exchange rate changes.

As opposed to transaction and translation exposure, a firm will be confronted with economic exposure to exchange rates when unanticipated real, not only nominal exchange rate changes have a non-zero effect on its expected future cash flows.

2.2.2 Empirical literature

Empirical literature on the causal relationship between exchange rate and stock price are mixed with some revealing the causality from exchange rate to Stock market and vice-versa.

Some researchers suggest that a change in the money supply upsets the equilibrium position of money with respect to other assets in the portfolios of individual investors. As investors attempt to rearrange their portfolios of financial and real assets to a new equilibrium, stock prices adjust to new levels. There is a considerable research that supports the view that the stock market is a leading barometer of economic activity. Pan *et al.* (2001) pointed out that sustained upward movements in stock prices are generally indicative of economic upturns, which stimulate money growth as banks respond to increasing demand for more loans. Increasing demand for money will lead to an increase in interest rates consequently; high interest rates will cause capital inflows and appreciation of the domestic currency. In other words, changes in stock prices may affect the inflows and outflows of capital, which will lead to changes in the domestic currency exchange rate.

Aggarwal (1981) shows that there is positive effect of exchange rate changes on the stock market in U.S, while Solnik (1984) found that exchange rate changes can substantially affect the values of firms, and the changes in the

values of foreign currency – denominated assets. Bodnar and Gentry (1993),in their study on Canada, Japan and the U.S Firms' stock prices and changes in the exchange rates, their findings shows that the direction of causality runs from exchange rates to stock prices.

Abdalla and Murinde (1997) examined interactions between stock prices and exchange rates for four emerging markets (India, Korea, Pakistan and Philippines) using granger causality and cointegration techniques, their study reveals a unidirectional causality running from exchange rate to stock prices.

Pan *et al.* (1999) used daily market data to study the causal relationship between stock prices and exchange rates in China and found that the exchange rates Granger-cause stock prices with less significant causal relations from stock prices to exchange rate.

Agus and Carl (2004) investigated the statistical relationship between stock prices and exchange rates using granger causality and Johansen cointegration test in four SEAN countries (Indonesia, Philippines, Singapore and Thailand). The study found that the relationship between stock prices and exchange rates is characterized by a feedback system. The cointegration test found that all the stock prices and exchange rates in the four countries are cointegrated and the causality runs from exchange rate to stock prices.

Ajayi and Mougoue (1996) investigate the short-and long-run relationship between stock prices and exchange rates in eight advanced economies, the results on short-run effects in the U.S. and U.K. markets. Their findings show that an increase in stock prices causes the currency to depreciate for both countries. They explained their findings as follows: "A rising stock market is an indicator of an expanding economy, which goes together with higher inflation expectations. Foreign investors perceive higher inflation negatively. Their demand for the currency drops and it depreciates".

Granger *et al.* (2000) research focused on whether currency depreciation led to lower stock prices or whether declining stock prices led to depreciating currencies during the Asian Crisis of 1997. The data on some of the Asian countries support the case of bivariate causality. Stock prices are expected to react ambiguously to exchange rates. The authors explain this with the effect of currency changes on the balance sheets of multinational companies. Depreciation could either raise or lower the value of a company, depending on

whether the company mainly imports or mainly exports. When the stock market index is considered, the net effect cannot be predicted. A decline in stock prices makes foreign investors sell the financial assets they hold in the respective currency which subsequently, leads to currency depreciation.

Seven of the countries they examined showed a strong relationship between the two markets—causality was unidirectional in some cases and bi-directional in others. Whenever the relationship was unidirectional, it was found to be negative, regardless of which the lead variable was. For four of the countries the authors found evidence of joint causality. The direction (positive or negative) of the dual causality could not be determined, nor could it be specified which the trigger variable was. The reason for the disparity of results between the different countries might be the difference in country specific.

Ajayi *et al.* (1998) show that changes in stock prices lead to increases in the demand for real money and, subsequently, the value of the domestic currency. Stock prices may be employed to reflect developments in macroeconomic variables, as the market's expectations of real economic activities. Therefore, changes in stock prices can have an effect on the exchange rates.

Bodnar and Gentry (1993) highlighted three effects of exchange rate fluctuations on the firm's value or cash flows. These include the effect of exchange rates on domestic exporters' terms of competition with foreign firms, on input prices, and on the firm's assets that are denominated in foreign currencies.

Bahmani-Oskooee and Sohrabian (1992) find bi-directional causality in the case of the United States. They found that the effect of stock prices on exchange rates and interest rates is through an increase in the real money balance. Conversely, an exogenous increase in domestic stock prices will lead to an increase in domestic wealth and this, in turn, will result in an increase in the demand for money and an increase in interest rates.

On the other hand, there are some studies that could not establish any relationship between exchange rate and stock market prices. Some of these studies are as follows: Nieh and lee (2001) found no significant long-run relationship between stock prices and exchange rates in G-7 countries, using both Engel-Granger and Johansen's cointegration tests.

Rahman and Uddin (2009), in their study on dynamic relationship between stock prices and exchange rate in South Asian countries found no relationship between stock and exchange rates. Bhattacharya and Mukherjee (2003) study causal relationship between exchange rate and stock index in India and their findings reveals absence of causal relationship between stock market index and exchange rate.

Muhammad and Rasheed (2002) estimate causal relationship between exchange rate and stock market index in South Asian Countries and their results suggests no causal relationship between Exchange Rates and Stock Prices.

Other studies that found absence cointegration between stock prices and exchange rates include Okpara and Odionye (2012) and Zia and Rahman (2011).

On the other hand, there are some studies that investigate the long run relationship between stock prices and exchange rates using trivariate and multivariate model.

Keray (2009) studied the long run relationship between stock prices and monetary variables in Jamaika. Using VECM and Johansen Cointegration Test, He found a long run relationship between the Stock prices and monetary variables (Exchange rate and M2).

Nasrin and Syed (2011) estimate relationship between Macroeconomic Variables (M1, M2 and Inflation rate) and Stock Prices in Bangladash for the period 2003-2011. They used granger causality test to test for the causal relation among the variables and cointegration to detect the long run relationship. Their findings reveal that there exist long run relationship and also M2 Granger- cause stock price and three macroeconomic variables.

Desislava (2005) estimate the relationship between exchange rates and stock market prices: studied in a multivariate model he uses Granger-causality test and found that there is no existence of causality between exchange rates and stock prices for UK and US for the period 1990-2004.

This paper will add to the existing literature by investigating the causal relationship between stock market index and exchange rate in Nigeria, an

economy which operates a managed floating exchange rate regime with a fast-growing capital market. The study will explore trivariate analysis to find whether if the relationship between the variables is through Money supply.

3.0 Data and Methodology

To establish the relationship between exchange rate and stock markets, this study uses monthly data for Exchange Rate, All Share Index and M2 over the period April 2001 – December 2011, a total of 241 observations which are segregated into two periods, the pre-crisis period from April 2001 to February 2008 and the crisis period from March 2008 to December 2011.

Some analysts believe that from 2010 the global crisis was over, but this study assumes the existence of the crisis up till 2011, despite all the response of policy makers to get their economies out of the mess.

The paper uses trivariate VAR model which contains 3 variables namely natural logarithm of exchange rates (exr) which are the local currencies exchange rates relative to the US dollar, and natural logarithm of stock prices measured using the All Share Index (ASI) of the Nigeria Stock Exchange and money supply (M2).

We start by testing stationarity for the three series using Augmented Dickey Fuller (ADF) and Phillips Perron (PP) tests to assess the order of integration of the three series. We then proceed and test for cointegration between series integrated of the same order I(1). Using Johansen cointegration we test to ascertain whether the linear combination of the series possesses a long-run relationship. Johansen procedure, following a vector autoregressive (VAR) model, it involves the identification of rank of the n x n matrix Π in the specification given by:

$$\Delta Y_t = \beta + \sum_{i=1}^{k-1} \Gamma i \Delta Y_{t-1} + \Pi Y_{t-k} + \varepsilon_t \qquad (1)$$

Where Y_t vector of the n variables, Δ is the difference operator, Γ and Π are the coefficient matrices, k denotes the lag length and β is a constant. In the absence of cointegrating vector, Π is a singular matrix, which means that the cointegrating vector rank is equal to zero The Johansen Maximum likelihood test provides a test for the rank of Π, namely the trace test (λ_{trace}) and the

maximum eigen value test (λmax). Firstly, the λ_{trace} statistics test whether the number of cointegrating vector is zero or one. Then, the λmax statistic tests whether a single cointegration equation is sufficient. Both test statistics are given as follows:

$$\lambda_{trace\ (r)} = -T\sum_{i=r+1}[\ln(1-\lambda)$$

$$\Lambda_{max\ (r,\ r+1)} = -T\ln(1-\lambda_{r+1})$$

Where r is the number of separate series to be analyzed, T is the number of usable Observations and λ is the estimated eigen values.

Absence of cointegration relationship between variables implies that we proceed to test for causality between the variables under study. Causality between Three stationary series ER_t, ASI_t and MS_t can be based on the following Trivariate auto-regression; we set our model as follows.

$$ER_t = \alpha_0 + \sum_{k=1}^{P}\alpha_k\, ASI_{t-k} + \sum_{k=1}^{p}\beta_k\, ER_{t-k} + u_t \qquad (2)$$

$$ASI_t = \varphi_0 + \sum_{K=1}^{P}\varphi_k\, ER_{t-k} + \sum_{k=1}^{p}\Phi_k\, ASI_{t-k} + V_t \qquad (3)$$

$$\mathrm{MSt} = \mu_0 + \sum_{k=1}^{P}\mu_k\, ASI_{t-k} + \sum_{k=1}^{p}\mu_k\, MS_{t-k} + u_t \qquad (4)$$

Where r is positive integer; α'_k s, and $'_k$ s, k=0, 1, … ,p are consonants; and U_t and V_t are usual disturbance terms with zero means and finite variances. The null hypothesis that ASI does not Granger-cause ER and M is rejected if βk's, k>0 in equation (2) and (4) are jointly significantly from zero using a standard joint test. Similarly, ER/M Granger-causes ASI if the $\varphi_{k'}$s, k>0 coefficients in equation (3) are jointly different from zero. Also, A bi- directional causality relation exists if both $\beta_{k'}$s and $\varphi_{k'}$s, k>0 are jointly different from zero.

4.0 Estimation of Result

We tested the presence of unit roots and order of cointegration in the exchange rates and All Share Index, we started with levels and later take the

first difference using both ADF and PP tests, the results of the unit root test is presented in Table 1 .

After ensuring that the variables are all stationary, the paper checked the cointegration relationship between the variables using Johansen (1988) methodology. This method is superior because as it provides number of cointegration relationships unlike other methodologies that do not specify the number of the cointegration relationships. This is followed by causality test to ascertain the direction of the causal relationship.

4.1 Unit root test result

Table 1 reports the result of the Augmented Dickey Fuller (ADF) and Phillips Perron (PP) unit root tests for the period before crisis 2001-2008 shows that ASI, exchange rate, and M2 are not stationary at level. However, at first difference, the variables are stationary suggesting that they are all I (1).

Table 1: Augmented Dickey-Fuller and Phillips Perron Unit Root Tests (before the crisis, 2001-2008)

Variable	Level		First Difference		Comment
	ADF prob-values	PP prob-values	ADF prob-values	PP prob-values	
ASI	0.8461	0.7374	0.0000	0.0000	I(1)
EXR	0.3729	0.3638	0.0000	0.0000	I(1)
M2	0.9999	0.3468	0.0000	0.0000	I(1)

Table 2: Augmented Dickey-Fuller and Phillips Perron Unit Root Tests (During crisis, 2008-20011)

Variable	Level		First Difference		Comment
	ADF prob-values	PP prob-values	ADF prob-values	PP prob-values	
ASI	0.3071	0.3234	0.0000	0.0000	I(1)
EXR	0.4352	0.4352	0.0004	0.0004	I(1)
M2	0.9337	0.9879	0.0000	0.0000	I(1)

Table 2 reports the result of the Augmented Dickey Fuller (ADF) and Phillips Perron (PP) unit root tests for the crisis period 2008-2011, It shows that ASI, exchange rate, and M2 are not stationary at level. However, at after

differencing, all the variables are became stationary suggesting that they are all I (1).

Table 3 reports the result of the Augmented Dickey Fuller (ADF) and Phillips Perron (PP) unit root tests for the period 2001-2011 shows that ASI, exchange rate and M2 have unit root. We also take first difference and the variables are stationary suggesting that they are all I (1).

Table 3: Augmented Dickey-Fuller and Phillips Perron Unit Root Tests (2001-2011)

	Level		First Difference		
	ADF prob-values	PP prob-values	ADF prob-values	PP prob-values	
ASI	0.2221	0.4781	0.0022	0.0000	I(1)
EXR	0.6913	0.7624	0.0000	0.0000	I(1)
M2	0.9999	0.3468	0.0000	0.0000	I(1)

In the next step, we utilized Johansen (1988) and Johansen and Juselius (1990) Maximum likelihood procedure to test for co-integration.

4.2 Cointegration Result for the pre-crisis period

Table 4: Johansen Cointegration Tests Pre-crisis period (2001 – 2008)

Maximum Eigenvalues (λ_{max})		
No. of CE (s)	None	At most 1
Eigen Value	0.215	0.083
(λ_{max}) Statistic	20.124	7.235
Critical Value	21.132	14.264
Trace (λ_{Trace})		
No. of CE (s)	None	At most 1
Eigen Value	0.215	0.083
(λ_{max}) Statistic	29.004	8.879
Critical Value	29.797	15.494

Table 4 presents the result of the Johansen cointegration test for the period before the financial crisis reveals that both the maximum Eigen-value statistics and trace statistics suggest absence of cointegration among the

variables. Table 5 results indicate absence of cointegration among the variables by both maximum Eigen-values and trace statistics.

Table 5: Johansen Cointegration Tests Crisis period (2008-2011)

Maximum Eigen-values (λ_{max})		
No. of CE (s)	None	At most 1
Eigen Value	0.325	0.254
(λ_{max}) Statistic	17.707	13.246
Critical Value	21.131	14.264
Trace (λ_{Trace})		
No. of CE (s)	None	At most 1
Eigen Value	0.325	0.254
(λ_{max}) Statistic	31.131	13.423
Critical Value	29.797	15.494

Table 6 presents the result of the Johansen cointegration test for the period 2001 - 2011; it reveals that both the maximum Eigen-value statistics and trace statistics suggest absence of cointegration among the variables.

Table 6: Johansen Cointegration Tests 2001-2011

Maximum Eigen-values (λ_{max})		
No. of CE (s)	None	At most 1
Eigen Value	0.133	0.066
(λ_{max}) Statistic	18.19	8.692
Critical Value	21.131	14.264
Trace (λ_{Trace})		
No. of CE (s)	None	At most 1
Eigen Value	0.133	0.066
(λ_{max}) Statistic	26.896	8.706
Critical Value	29.797	15.494

After testing for the long run cointegration relationship between the variables in the period before and during the crisis, and found out the absence of long run relationship, the study proceeds with the VAR and test for Granger causality. Though, from literature we know that most I(1) series are cointegrated but it did not rule out the possibility of non-cointegration. Therefore, this result could be plausible, that the series are driven by other

exogenous variables in the case of Nigeria just like many other countries as shown in empirical literature.

4.3 Causality Test result

Table 7: Causality test for the period pre-crisis period (2001 -2008)

Pairwise Granger Causality Tests
Sample: 2001M01 2008M02
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
DEXR does not Granger Cause DASI	84	0.99746	0.3209
DASI does not Granger Cause DEXR		0.06655	0.7971
DM2 does not Granger Cause DASI	84	5.23366	0.0248
DASI does not Granger Cause DM2		1.30573	0.2565
DM2 does not Granger Cause DEXR	84	0.04340	0.8355
DEXR does not Granger Cause DM2		1.69347	0.1968

Table 7 above present Granger-causality test results which shows that, the null hypothesis which will not be rejected in all cases, except the hypothesis that M2 granger-causes ASI but not vice versa. That means there is a unidirectional causality running from M2 to ASI. This is in line with our apriori expectation. But for the relationship between ASI and Exchange the result suggests absence of causality between the variables.

This signifies the absence of the causal relationship between the variables during the period of the crisis. The rates and the index were not influenced by the fundamentals but rather by maneuvers and insider abuse in the case of capital market index. The foreign exchange the market was driven by speculative rather that effective demand. Also the Money supply is a tool that is meanly used by the Central Bank to regulate the economy but with the emphasis on Inflation curtailing rather preventing volatility in stock market prices.

Table 8 presents the result of granger causality; we fail to reject all the null hypotheses. Thus there is indicates absence of causality between ASI, and exchange rate and M2 during the period of global financial crisis.

Table 8: Causality test for the period crisis period (2008 -2011)

Pairwise Granger Causality Tests
Sample: 2008M03 2011M12
Lags : 1

Null Hypothesis:	Obs	F-Statistic	Prob.
DEXR does not Granger Cause DASI	44	1.45999	0.2339
DASI does not Granger Cause DEXR		0.02591	0.8729
DM2 does not Granger Cause DASI	44	1.81801	0.185
DASI does not Granger Cause DM2		0.06571	0.799
DM2 does not Granger Cause DEXR	44	0.04857	0.8267
DEXR does not Granger Cause DM2		0.21535	0.6451

The paper uses impulse response function to establish the relationship between the variables as shown in the appendix.

Figure 1 in the appendix presents the generalized impulse response function which analyzes the response of index on exchange rates and money supply for the pre-crisis. Panel (b) of figure 1 indicates that the response of DASI to a shock from DEXR is significant and negative from second month up to third month. However, from fourth month the shock effect becomes relatively insignificant and dies out pattern over time horizon. Panel (C) shows the response of DASI to M2 is significant and positive up till month three and thereafter it dies. During the crisis in panel (b) and (c) of figure 2 indicates that the response of DASI to a shock from DEXR and M2 is inconsistent moving from negative to positive and move to negative before it dies out after seven months. This is plausible, considering the unpredictable nature of the macroeconomic variables during the crisis period which makes them quite volatile.

The policy implication of the findings in this paper for policy formulation relating to the behavior of Stock prices in relation to exchange rate and M2 is that the monetary authority could do little to prevent the Stock prices at the time of crisis, since the relationship between the Stock prices, exchange rate and M2 is quite weak in Nigeria. Therefore, it is imperative to strengthen the regulation and tackle the problem of insider abuse in the market and also adequate monitoring of the market is highly suggested to ensure that the market is moved by fundamentals rather than sentiments.

The results of the study contradicts various studies as shown on the literature review but the study is in line with the findings of Abdalla and Murinde (1997), Tahir and Wong (2004), Doong et al (2005) and Aydemir and Demirhan (2009) .

5.0 Conclusion

The paper examined the causal relationship between stock index and exchange rates in Nigeria, before the global – financial crisis. The Study tests for the presence of co-integration and granger causality between the stock indices and exchange rates / M2, the result of this suggests that: (1) non integration between exchange rate and stock market index before and during the global financial crisis (2) The result of the granger causality indicates absence of causality in both periods for the ASI and exchange rate.

The result suggests the non-existence of link between the exchange rate and stock market index for both the period in Nigeria during the period under study.

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Appendices

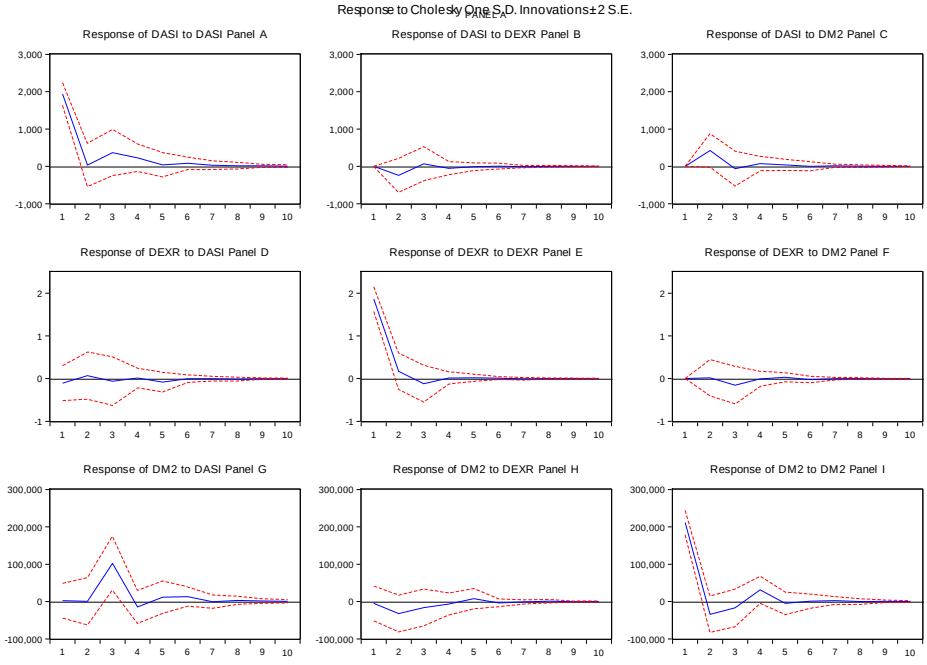

Figure 1. Generalized Impulse Response Analysis before the crisis.

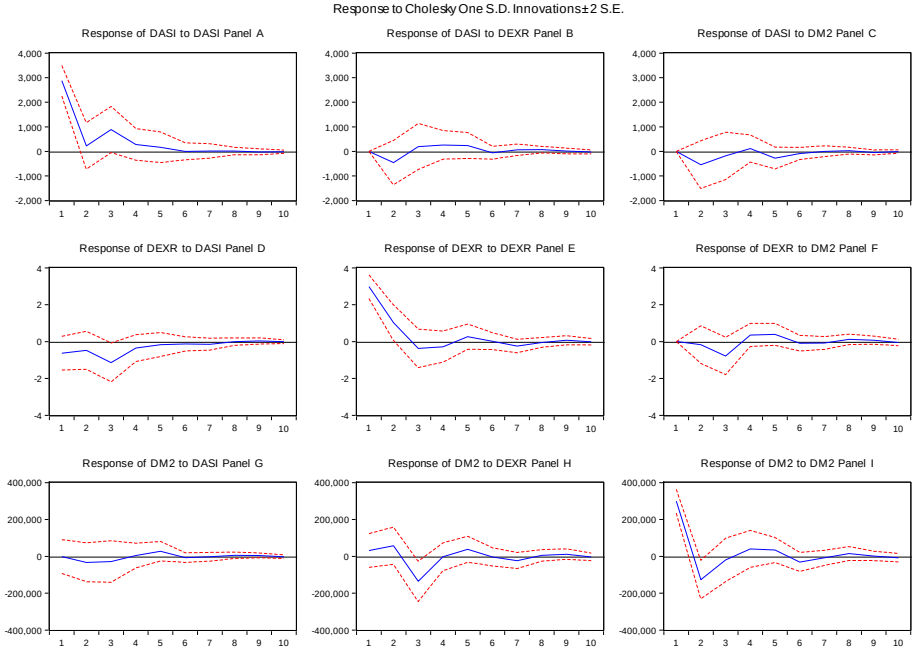

Figure 2: Generalized Impulse Response Analysis during the crisis