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A Conditional Restricted Equilibrium Correction Model on Nigerian Stock Exchange All-Share Index and Macroeconomic Indicators with 2008 Global Financial Crisis Effects: A Univariate Framework Approach

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Abstract This paper employed the modified autoregressive distributed lag (ADRL) procedure to establish a univariate single level relationship existing between the Nigerian Stock Exchange (NSE) All-Share Index and three macroeconomic indicators such as Treasury bill rate, nominal exchange rate and inflation rate in Nigeria. A conditional restricted equilibrium correction model (ECM) was postulated with significant long-run relationship between NSE All-Share Index, exchange rate and inflation rate. The model relates exchange rate and inflation rate negatively with the All-Share Index in the long-run. Treasury bill rate have no long-run relationship with All-Share Index. The short-run dynamics indicated a negative causal relationship between All-Share Index and the three macroeconomic indicators. The results of this paper showed that All-Share index is slow to react to any disequilibrium caused by shocks on these macroeconomic indicators in the long-run. The 2008 global financial crisis had an insignificant negative effect on the NSE All-Share Index due to improved financial deepening. Monetary policy stability is crucial to price level control because inflation is a monetary phenomenon in Nigeria. Therefore, this paper propose that the efficient use of Treasury bills as apparatus of monetary policy (inflation-targeting) and major source of government financing is essential to the growth of the Nigerian stock market. In addition to efficient monetary policy through interest rate and most importantly exchange rate, a secure fiscal discipline through effective government spending will likely have a positive effect on the All-Share Index rapidly and directly.

Keywords ARDL, All-Share Index, Treasury bills, Nominal exchange rate, 2008 global financial crisis, Financial deepening, Inflation-targeting, Monetary policy

1. Introduction

The relationships between stock markets (the channel by which trading in securities makes funds available for investment purposes in any economy) and macroeconomic indicators have received significant attention in both developed and emerging economies globally. Macroeconomic indicators are responsible for the prices of stocks and securities are traded on the stock exchange [1]. The nature of these relationships has been extensively studied over the years. Hence, the crucial question is "do macroeconomic variables explain stock market in the long-, short-run or both?" This question has been attempted by different studies using different statistical techniques. The conclusions arrived at depended on the nature of the methods employed. Contradicting conclusions, some supported by and others in total deviation from established theory emerged over the years. The rich and diverse literature on various topics relating stock prices to macroeconomic variables include one of the earliest researches carried out by [2] through proxy hypothesis to establish significant strong positive relationships between stock prices, industrial production index, gross national product, money supply, inflation rate and interest rate. Similarly, using the arbitrage pricing theory, [3] studied the significance of some macroeconomic variables to the US stock market movement. [4] through vector error correction model (VECM) examined the relationships between stock returns and macroeconomic variables and found significant long- and short-run causal effects in selected developed economies such as Australia, Germany, Japan and United States. The exchange rate and short-term interest rate have insignificant relationships with the stock market of BSE Sensex in India [5]. While the Sensex is positively related with money supply and industrial production index but negatively related with inflation rate

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which is supported in the literature. By studying the granger causality between macroeconomic factors on Indian stock market volatility, [6] found none of the macroeconomic variables studied were significant in predicting the future volatility in stock prices individually. These variables include exchange rate, crude oil prices, interest rates, gold price etc. [1], by employing the restrictive cointegration technique, established both short- and long-run relationships between economic indicators such as short term interest rates, consumer price index, nominal exchange rate, unemployment rate with FTSE100 in the United Kingdom and S&P500 in the United States of America. Their findings suggested that increase in inflation rate does not necessarily result in the decline of stock prices, an argument supported by Rapach [7]. [7] by studying the relationships between real value of stocks in the heavily industrialized countries found a strong positive relationship between inflation rate and the stock market indexes.

A lot of researches involving the main index of the Nigerian stock exchange, NSE All-Share Index have emerged over the years. [8] employed principal component analysis (PCA) to study the correlations between the stock market and long-term economic development. He concluded that stock market development index have a negative but significant long-run effect on the economic growth. Several studies examining the relationships between Nigerian stock market and macroeconomic variables has sprung up since the work of [8]. Notable were the works of [9] and [10]. [11] conducted an empirical study on the relationship between All-Share index, consumer price index, broad money supply (M2), Treasury bill rate, exchange rate and real output growth using augmented error correction model (ECM) proposed by [12]. They found significant long-run and short-run causal relationship between All-Share index and M2, inflation rate and real output. Similarly, [13] using yearly data that dated 1954 to 2006, established a positive long-run contemporaneous relationship between leading macroeconomic indicators and All-Share Index. Higher interest rate encourages savings but discourages investments in the stock market due to lower rate of return. [14] developed an error correction model on All-Share Index and selected key macroeconomic variables such as industrial production index, fixed exchange rate and minimum rediscount rate MRR and found inverse relationship with industrial production index due to higher energy prices and consequently higher cost of production. The error correction model postulated indicated a surprising high speed of adjustment to equilibrium at about 82.91 per cent of any disequilibrium resulting from shocks on these macroeconomic variables was corrected within one year. However, only MRR had a significant negative long-run relationship with All-Share Index at all levels, which showed the existence of multicollinearity amongst the variable an implication of over-parameterization. [15] employed vector error correction model to study the short-run dynamic relationships between All-Share Index and industrial production index, consumer price index, narrow and broad money supply, oil prices and Treasury bills.

This current work intends to study the existing relationship between All-Share index and three major macroeconomic indicators such as Treasury bills rate, nominal exchange rate, and inflation rate using the modified autoregressive distributed lag model ARDL or bounds testing proposed by [16]. Though this robust method has been attracting a lot of researchers' attention in the last decade, its application to the Nigerian stock market is still unconvincing. Few researches/studies have employed this method in the establishing cointegration amongst the stock market index and these macroeconomic variables in Nigeria. For example [17] using an ARDL (1,1) model found significant long-run and short-run causal relationships between NSE All-Share Index and consumer price index (as proxy for inflation rate). [18] attempted a study of the effect of stock market performance has on the gross domestic product (GDP). An ARDL (2,1,0,1,1,1) model involving stock market performance indicators such as value of traded securities, financial deepening, market capitalization, average dividend yield and interest rates. These variables are either I(0), I(1) or mutually cointegrated. They concluded that there exists a long-run relationship between stock market performance and gross domestic product (GDP) but with relatively slow speed of adjustment to disequilibrium caused by shocks on the stock market. Their paper, though not directly involving All-Share Index, is important in this current research as it showed that Nigerian stock market cannot be used as a determinant of the overall health of the economy due to the low level of reaction of the GDP to changes in market capitalization and average dividend yield.

2. Methods

The analyses of the time series data in this paper involve the test of non-stationarity through the usual [19] test. Though this pre-test is not necessary especially when a non-residual based cointegration method like the autoregressive distributed-lag procedure is involved in the analysis, its inclusion is to ascertain the underlying data generating process of the time series. The modified autoregressive distributed lag procedure of bounds testing proposed by [16] was employed to establish the existence of a univariate long-run relationship between the economic indicators and the All-Share Index. An ARDL (p,p_1,p_2,p_3) with no deterministic trend and one-off dummy variable was postulated. Model stability techniques such as the autoregressive characteristic root polynomial and recursive tests were conducted on the postulated model. Furthermore, Lagrange multiplier of residual serial correlations alongside information criteria (such as Akaike information and Schwarz Criteria) were also carried out in the selection of the maximum lag length p and the final equilibrium correction model for forecasting purposes. This current paper included Treasury bill rate (**tb**) as a proxy for interest rates, Naira/US Dollar was used as a proxy for nominal exchange rate(**er**) and inflation rate (**ir**) as the regressors with lags p_1, p_2, and p_3

respectively. All-Share Index (**as**) was regressed on its past values and these three variables in order to fit an autoregressive distributed lag model. Also, we introduced a dummy variable to capture the structural breaks caused by financial crisis, which led to the crash of the market especially in 2008. Generally, the presence of structural breaks in series may result in the over-acceptance of presence of one or more unit roots especially in the non-stationarity test [20]. The data employed are eleven-year monthly observations of All-Share index (**as**), Treasury bill rate (**tb**), nominal exchange rate (**er**), and Inflation rate (**ir**) between 2004 and 2014. The data on All-Share index was obtained from the database of the Nigerian Stock Exchange. The source of three macroeconomic indicators data was the Central Bank of Nigeria database. We assumed that all variables can be approximated by the natural log-linear VAR(*p*) model for reasons such as easy and improved interpretability and sustained normality assumption particularly in the disturbances.

Test of non-stationarity

To check the data generating process underlying these time series, this paper carried out test of unit roots or non-stationarity using the regular Phillips-Perron (PP) test. The PP test was preferred for two reasons;

- It is flexible in dealing with the problem of serial autocorrelation and heteroskedasticity in the error terms $\mathbf{u}_t$ in *equation 1.1*, hence the normality assumption that $\mathbf{u}_t \sim \boldsymbol{N}(0,\sigma^2)$ was relaxed making this method robust to general form of heteroskedasticity [21].
- We do not need to specify lag length for the test regression in *equation 1.1*.

The test regression is given as

$$y_t = \boldsymbol{\theta} t + \rho \mathbf{y}_{t-1} + \mathbf{u}_t \qquad (1.1)$$

[19] demonstrated that the test statistics in (*1.2*) and (*1.3*) below have similar asymptotic null distribution as Augmented Dickey-Fuller (ADF) = $(\hat{\theta} - 1)/\text{S.E}(\hat{\theta})$.

$$PP = T(\hat{\rho}-1) - 1/2T^2(\hat{\lambda}^2 - \hat{v}_0) \Big/ \left\{ \sum_{t=2}^{T} \left(y_{t-1} - \bar{y}_{-1} \right)^2 \right\} \qquad (1.2)$$

and

$$PP_t = (\hat{v}_0 / \hat{\lambda}^2)^{1/2} \{ (\hat{\rho}-1) / \hat{\sigma}_\rho \} - 1/2T \{ (\hat{\lambda}^2 - \hat{v}_0)\hat{\lambda} \} \Big/ \left\{ \sum_{t=2}^{T} \left(y_{t-1} - \bar{y}_{-1} \right)^2 \right\} \qquad (1.3)$$

where

$$\hat{\lambda}^2 = \lim_{T\to\infty} \sum E(T^{-1}(\sum \mathbf{u}_t)^2) \qquad (1.4)$$

$\hat{\sigma}_\rho$ is the standard error of ρ. That is under the null hypothesis that ρ=0, the PP and PP_t statistics have the same asymptotic distributions as the ADF *t*-statistics and normalized bias statistic [19].

The conditional equilibrium correction model

The empirical analysis of the long-run and short-run relationships between All-Share Index and these three macroeconomic indicators was expressed by fitting a conditional equilibrium correction model (ECM) with intercept and no deterministic trend and a dummy variable. In accordance with the work of [16], we defined the vector $\mathbf{w}_t = (\mathbf{as}_t, \mathbf{tb}_t, \mathbf{er}_t, \mathbf{ir}_t)' = (\mathbf{as}_t, \mathbf{x}_t')'$, where $\mathbf{x}_t$ is a (3x1) vector of Treasury bill rate, exchange rate and inflation rate at levels. A one off dummy variable which did not alter the asymptotic property of the Wald and F-statistic in bounds testing was introduced such that

$$D40_t = \begin{cases} 1, \text{ whenever All-Share Index (as)} > 40{,}000 \\ 0 \text{ elsewhere.} \end{cases}$$

The choice of 40,000 was such that it reflects the 2008 global financial crisis. We expressed the model as

$$\Delta \mathbf{y}_t = c_0 + c_1 t + c_2 D40_t + \pi_{yy}\mathbf{y}_{t-1} + \pi_{yx.x}\mathbf{x}_{t-1} + \sum_{i=1}^{p-1} \delta'_{\mathbf{i}} \Delta \mathbf{w}_{t-i} + \omega' \Delta \mathbf{x}_{\mathbf{t}} + \zeta_t, \qquad t=1,2,.... \qquad (1.5)$$

$$\Delta \mathbf{x}_{\mathbf{t}} = \alpha_{x0} + \alpha_{x1} t + \prod_{xx} \mathbf{x}_{t-1} + \sum_{i=1}^{p-1} \boldsymbol{\Gamma}_{xi} \Delta \mathbf{w}_{t-i} + \boldsymbol{\varepsilon}_{xt}, \quad t=1,2,.... \qquad (1.6)$$

Δ is the first difference operator, $\mathbf{y}_t$ is the All-Share Index (**as**) at level, c_0 and c_1 are deterministic intercept and trend coefficients respectively. The intercept and trend are defined as $c_0 = -(\pi_{yy}, \boldsymbol{\pi}_{yx.x})\boldsymbol{\mu} + [\gamma_{y.x} + (\pi_{yy}, \boldsymbol{\pi}_{yx.x})]\boldsymbol{\gamma}$, $c_1 = -(\pi_{yy}, \boldsymbol{\pi}_{\mathbf{yx.x}})\boldsymbol{\gamma}$ respectively, $\boldsymbol{\pi}_{yx.x} = \boldsymbol{\pi}_{yx} - \omega' \prod_{xx}$, $\delta'_{\boldsymbol{i}} = \boldsymbol{\gamma}_{\boldsymbol{yi}} - \omega' \Gamma_{xi}$, i = 1,2,3,.....,p-1, π_{yy} is the long run coefficient of $\boldsymbol{y}_{t-1}$, $\pi_{yx.x}$ is the vector of long-run coefficients of $\boldsymbol{x}_{t-1}$ in the (m=k+1) x (m=k+1) matrix partitioned with $\mathbf{w}_t$ where k=3 (macroeconomic indicators),

$$\Pi = \begin{bmatrix} \pi_{yy} & \pi_{yx} \\ \pi_{xy} & \Pi_{xx} \end{bmatrix}$$

of long-run coefficients, $\delta'_{\boldsymbol{i}}$ is a (p-1) x 1 vector of short-run coefficients of the regressors, $\boldsymbol{\varepsilon}_{xt}$ was derived from $\boldsymbol{\varepsilon}_{yt} = \omega_{yx}\boldsymbol{\Omega}^{-1}{}_{xx}\varepsilon_{xt} + \boldsymbol{\zeta}_t$ given that $\boldsymbol{\varepsilon}_{yt}$ is conditionally dependent on ε_{xt}. $\Delta \boldsymbol{x}_t$ which is uncorrelated with the disturbances, $\boldsymbol{\zeta}_t$, in the model of *equation 1.5* is a 3x1 vector of the first difference of Treasury bill rate, exchange rate and inflation rate at levels. The model in *equation 1.5* stems from a simple VAR(*p*) process in *equation 1.7* and is referred to as a conditional equilibrium correction model (ECM) which will be emphasized later in this paper.

$$\boldsymbol{\Phi}(L)(\boldsymbol{w_t} - \boldsymbol{\mu} - \boldsymbol{\gamma t}) = \boldsymbol{\varepsilon_t}, \qquad t = 1,2,3,..... \qquad (1.7)$$

which is written in vector equilibrium correction model form in *equation 1.8*

$$\Delta \mathbf{w}_{\mathbf{t}} = \alpha_0 + \alpha_1 t + \prod \mathbf{w}_{t-1} + \sum_{i=1}^{p-1} \boldsymbol{\Gamma}_{\mathbf{i}} \Delta \mathbf{w}_{t-i} + \boldsymbol{\varepsilon}_t, \quad t = 1,2,3,..... \qquad (1.8)$$

where the vectors $\boldsymbol{\mu}, \boldsymbol{\gamma}$ are the 4x1 vectors of intercepts and deterministic trend coefficients respectively, α_0 *and* α_1 are partitioned into $(\alpha_{y0}, \alpha'_{x0})'$ and $\alpha_1 = (\alpha_{y1}, \alpha'_{x1})'$ respectively, $\boldsymbol{\Phi}(L)$ is 4 x 4 polynomial lag operator given as $\mathrm{I}_4 - \sum_{i=1}^{p} \Phi_i L^i$. The matrix Γ is a short run matrices equivalent to $I_m - \sum_{i=1}^{p-1} \Gamma_{\boldsymbol{i}}$,

$\alpha_0 \equiv -\prod\boldsymbol{\mu} + (\Gamma+\prod)\ \boldsymbol{\gamma}$, and $\alpha_1 \equiv -\prod\ \gamma$. The conditional equilibrium correction model (ECM) in *equation 1.5* was based on a number of assumptions according to [16]. Firstly, the characteristics root of $\left|\ \mathrm{I}_4 - \sum^{p}_{i=1}\Phi_i \mathbf{w}^j\ \right| = 0$ should lie outside the unit circle $|\mathbf{w}| = 1$ or $\mathbf{w} = 1$. This implies that variables in the vector $\mathbf{w}_t = (\mathbf{y}_t, \mathbf{x}_t')' = (\mathbf{as}_t, \mathbf{tb}_t', \mathbf{er}_t', \mathbf{ir}_t')'$ can be entirely I(0), entirely I(1) or jointly cointegrated. The result of the PP unit root test showed that All-Share Index ($\mathbf{as}_t$), exchange rate ($\mathbf{er}_t$) and Treasury bills rate ($\mathbf{tb}_t$) are I(1) while inflation rate ($\mathbf{ir}_t$) is stationary I(0) with trend. Also All-Share Index and exchange are jointly cointegrated. However, none of the variables (dependent and regressors) in $\mathbf{w}_t$ has unstable or seasonal unit roots. According to [22], this assumption is crucial to the validity of the *F*-statistic in the bounds testing The second assumption borders around the vector error term $\boldsymbol{\varepsilon}_t$ which is distributed $\boldsymbol{IN}(0,\boldsymbol{\Omega})$ where $\boldsymbol{\Omega}$ is a 4 x 4 variance-covariance matrix partitioned with $\mathbf{w}_t$ given as

$$\Omega = \begin{bmatrix} \omega_{yy} & \omega_{yx} \\ \omega_{xy} & \Omega_{xx} \end{bmatrix}$$

Under a univariate framework where the All-Share Index, $\mathbf{y}_t$, given the three economic indicators in the vector $\mathbf{x}_t$, $\boldsymbol{\varepsilon}_t = (\boldsymbol{\varepsilon}_{yt}\ ,\ \boldsymbol{\varepsilon}'_{xt})$, the former and latter assumptions imply that *equation 1.5* is generated from

$$\Delta\mathbf{y}_t = c_0 + c_1 t + c_2 D40_t + \pi_{y.x}\mathbf{w}_{t-1} + \sum^{p-1}_{i=1}\ \delta'_{\mathbf{i}}\ \Delta\mathbf{w}_{t-i} + \omega'\Delta\mathbf{x}_{\mathbf{t}} + \zeta_t, \qquad t = 1,2,3,..... \qquad (1.9)$$

Where $c_0 = -\pi_{y.x}\boldsymbol{\mu} + (\ \gamma_{y.x} + \pi_{y.x}\ )\ \boldsymbol{\gamma}$ and $c_1 = -(\pi_{yy}, \boldsymbol{\pi_{yx.x}})\boldsymbol{\gamma}$ are modified deterministic relation of $\alpha_0 \equiv -\prod\boldsymbol{\mu} + (\Gamma+\prod)\ \boldsymbol{\gamma}$ and $\alpha_1 \equiv -\prod\ \gamma$ of equation 1.8, $\pi_{y.x} = \pi_y - \omega' \prod_{xx}$. A third assumption is strictly based on the vector of long-run relations $\boldsymbol{\pi}_{xy}$ in the model of *equation 1.6* being zero i.e $\boldsymbol{\pi}_{xy} = 0$. By expressing the matrix $\prod$ of long-run coefficients as $\alpha\beta'$ where $\boldsymbol{\alpha} = (\boldsymbol{\alpha}'_{yx}, \boldsymbol{\alpha}'_{xx})'$ and $\boldsymbol{\beta} = (0, \boldsymbol{\beta}')'$ which are 4xr matrices of full rank i.e rank ($\boldsymbol{\alpha}$) = rank ($\boldsymbol{\beta}$) = r, there exist 4x1 statistically independent complements $\boldsymbol{\alpha}_{y\perp}$, $\boldsymbol{\beta}_{y'\perp}$ and 4x(3-r) statistically independent complements $\boldsymbol{\alpha}_{\perp}$, $\boldsymbol{\beta}_{\perp}$ of $\boldsymbol{\alpha}$ and $\boldsymbol{\beta}$ respectively. Under the assumptions that the maximum rank ($\prod$) = r+1, minimal rank ($\prod$) = r, and $\pi_{yy} \neq 0$ [16] there is only one conditional long-run level relationship between All-Share Index, $\mathbf{y}_t$ and the vector of economic indicators, $\mathbf{x}_t$ regardless of the order of integration of $\mathbf{x}_t$ expressed as

$$\mathbf{y}_t = \emptyset_0 + \emptyset_1 t + \emptyset X_t + \upsilon_t,\ t=1,2,3,..... \qquad (2.0)$$

where $\emptyset_0 \equiv \pi_{y.x}\mu/\pi_{yy}$, $\emptyset_1 \equiv (\pi_{y.x}\gamma/\ \pi_{yy}) = 0$, $\emptyset = -\ \pi_{yx.x}/\ \pi_{yy}$, $\upsilon_t = \pi_{y.\mathbf{x}}\mathbf{C}^*(\mathrm{L})\ \varepsilon_t/\ \pi_{yy}$ (which was derived from $\pi_{y.\mathbf{x}}(\boldsymbol{w_t} - \boldsymbol{\mu} - \boldsymbol{\gamma t})$) is a zero mean stationary process since the numerator is also a mean zero stationary process [16]. Depending on the specification on the deterministic intercept and trend, [16] discussed five asymptotic cases for bounds test on the model in *equation 1.5*. This paper is particularly based on the Case III where intercept ($c_0 \neq 0$) is unrestricted and trend is restricted to zero (or there is no trend, $c_1 = 0$). This imply that the trend term in *equation 1.5 & 1.9* is disregarded and the conditional equilibrium correction model (ECM) becomes

$$\Delta\mathbf{y}_t = c_0 + c_2 D40_t + \pi_{yy} y_{t-1} + \pi_{yx.x}\mathbf{x}_{t-1} + \sum^{p-1}_{i=1}\ \delta'_{\mathbf{i}}\ \Delta\mathbf{w}_{\mathbf{t}-\mathbf{i}} + \omega'\Delta\mathbf{x}_{\mathbf{t}} + \zeta_t, \qquad t=1,2,.... \qquad (2.1)$$

The restriction of the deterministic trend to zero in equation 1.5 gave rise to the conditional restricted equilibrium correction model in equation 2.1. As mentioned earlier, the introduction of the one off dummy variable, D40 does not alter the asymptotic property of the Wald and *F*-statistics because as the sample size T approaches ∞, the proportion of the non-zero values in D40 should tend to zero in the Bounds testing procedure. The Bound testing as an extension of ARDL modelling uses *F* and *t*-statistics to test the significance of the lagged levels of the variables in a univariate error correction system when it is unclear if the data generating process underlying a time series is trend or first difference stationary [16]. Several consistent bounds testing procedure, which follow asymptotic distribution have been proposed by [16].

Empirical analysis, results and interpretations

The time plots (*Figure 1*) assume random walks for the three regressors and the dependent variable. Also, there exist structural breaks in the series especially the All-Share Index, exchange rate and inflation rate between 2007 and 2008, a period, which coincided with the global financial crisis. The collapse of Lehmann Brothers and major financial institutions (mainly in the United States) with international affiliations led to the crash of stock markets across the globe. The Nigerian stock market, which had enjoyed a fair share of cross-border investments, inform of foreign direct investments (FDI) was directly hit with the All-Share Index dipping to its trough by the dawn of the crisis. Also, exchange rate and inflation rate rose significantly during this period indicating a weak monetary policy on the side of the monetary authorities.

Interest rate in form of Treasury bill rate dipped initially in response to the downturn but rose steadily after 2009 resulting in increased government domestic debt and increased expenditures (especially the administration, social, community services and transfers' expenditures). Nominal exchange rate which has inverse relationship with crude oil prices [20] rose significantly since the crisis. [20] emphasized that periods of rising crude oil prices resulted in increased foreign reserves required by the CBN to stabilize the exchange rate. The Central Bank of Nigeria (CBN) through its exchange rate policy primarily to achieve a sound macroeconomic stability, favourable external reserve position and healthy debt to GDP ratio (below IMF ceiling of 56 per cent) could not prevent inflation rate from rising marginally despite series of exchange rate policies adoptions. There is usually a significant shift in real income from crude oil exporting to importing countries whenever there is a crash in crude oil price. Therefore, lower crude oil price reduced household and corporate real income immediately after the shock on crude oil prices in 2009 and 2014. Hence, [20] concluded that nominal exchange rate (unlike some countries adopting the fixed exchange rate in the practice of

their inflation-targeting policy) is a weak shock absorber during period of higher inflation in Nigeria. Therefore, it is rarely used in the control of inflation rate by the CBN. Furthermore, government fiscal policy was weak with rising government recurrent expenditures and improper budget implementations (*Figure 2*), which was mainly financed by public debts (both foreign and local). Inflation rate through cause and effect continued to move along with nominal exchange rate in the upward direction although at a lower speed. This is expected because rising inflation devalues the local currency invariably leading to higher exchange rate. However, by 2012 when the global recession appeared to have abated, the nominal exchange rate stabilized due to more interventions by the CBN. Tapering measures involving upward review of long-term interest rate by the US Federal Reserve made investment in US government bonds more attractive which had a transmission effect on the value of the US Dollar. On the contrary, this had a huge negative impact on emerging markets including Nigeria's economy through increased foreign direct investment (FDI) outflow and declining demand for government bonds, which result in lower return. Issue such as rising domestic foreign exchange demands meant that CBN had to deplete the foreign reserve to meet up with local US dollar demands. The All-Share Index rose between 2012 and mid 2014 partly due to lower inflation, lower interest rate, improved companies' fundamentals and renewed investors' confidence. Lower interest rate implied expansionary monetary policy by the CBN, which resulted in lower cost of borrowing and in effect increased investments. Furthermore, lower interest rate meant reduced savings that has a disadvantage of stimulating inflationary pressures in the short-run as was the case in the second half of 2014. This in turn implied investors' expectation of higher rate of return in stock prices leading to higher demands and stock prices. On the contrary, higher expectation of general price level increased the risk associated with future cash flows of corporations. These risks were priced into the yield curve for the Treasury bills by demanding higher yields for maturities into the future. Monetary policy stability is crucial to price level control because inflation is a monetary phenomenon in Nigeria. But increased interest rate on Treasury bills will likely result in the decline of All-Share Index as corporate (including mutual funds) and individual investors will concentrate their portfolio on the money market and vice versa.

We begin the empirical analysis by conducting a test of non-stationarity on the macroeconomic indicators and NSE All-Share Index, based on the method proposed by [19]. The test is strongly in favour of non-stationarity hypothesis i.e I(1) in the case of All-Share Index, nominal exchange rate and Treasury bill rate. Inflation rate is trend- stationary I(0) at 5 per cent level of significance. These PP test results suggest a test of level relationship such as bounds testing procedure is pertinent in determining whether these time series are cointegrated. A bounds testing approach developed by [16] was preferred to conventional cointegration methods such as [12] and [23] due to its robustness to mixture of entirely I(0), entirely I(1) or jointly cointegrated time series. Also, this methodology involves a single equation framework making it easy to execute and interpret. Lastly it offers itself to varied lag lengths for variables as they enter the VAR model.

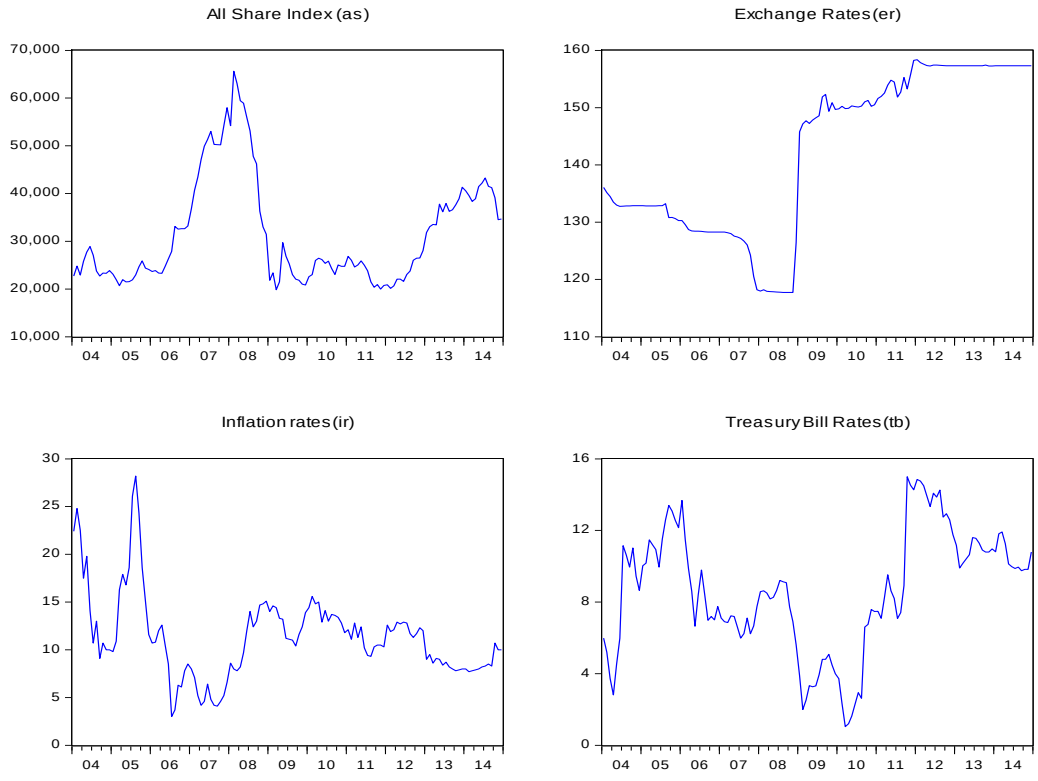

Figure 1. Time Plots on NSE All-Share Index, Nominal Exchange rate, Inflation rate and Treasury Bill rate (2004-2014)

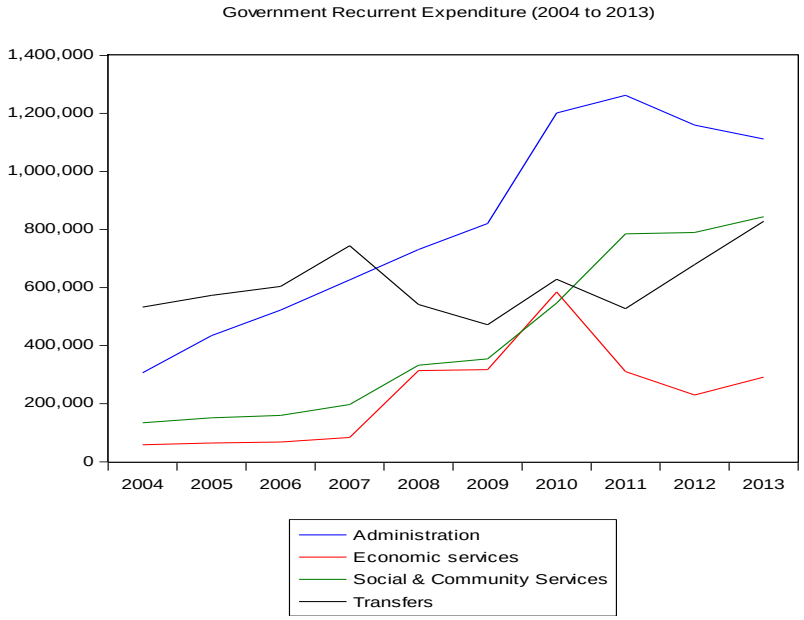

Figure 2. Government Expenditure (₦'millions)

Table 1. Unit root tests- Phillips-Perron (PP) test

Variable	Level		1st difference	
	with trend	***without trend***	***with trend***	***without trend***
All-Share Index (**as**)	-1.7687	-1.7830	-10.1592*	-10.1182*
Exchange rate (**er**)	-0.9217	-2.1468	-7.1655*	-7.1462*
Treasury bills rate (**tb**)	-2.3318	-2.1182	-8.7202*	-8.6815*
Inflation rate (**ir**)	-2.9962**	-2.9197	-10.2398*	-10.2481*

Test significant at * 1 per cent, ** 5 per cent, *** 10 per cent

Table 2. Test of Non-causality

AS				**TB**				**ER**				**IR**			
	χ^2 *-value*	df	*p-value*		χ^2*- value*	df	*p-value*		χ^2 *-value*	df	*p-value*		χ^2 *-value*	df	*p-value*
TB	4.85	3	0.18	**AS**	1.87	3	0.60	**AS**	8.47	3	0.0372**	**AS**	7.03	3	***0.07
ER	21.94	3	0.0001*	**ER**	12.99	3	0.0046*	**TB**	2.21	3	0.53	**TB**	1.78	3	0.62
IR	2.24	3	0.52	**IR**	0.34	3	0.95	**IR**	1.01	3	0.80	**ER**	1.82	3	0.61
All	29.80	9	0.0005*	**All**	18.97	9	0.0254**	**All**	12.33	9	0.20	**All**	8.54	9	0.48

* ,** ,***indicate statistical significance at 1, 5 and 10 per cent levels of significance respectively

Hence, this current work favours its application, particularly with the result of causality test using [24] procedure [1] (Table 2) indicating both unidirectional and bidirectional causality amongst our variables. Specifically, there exists a bidirectional relationship between All-Share Index (**as**) and exchange rate (**er**), a unidirectional causality from exchange rate (**er**) to Treasury bills rate (**tb**), and All-Share Index (**as**) to inflation rate (**ir**). Furthermore, All-Share Index granger causes Treasury bill rate only through exchange rate. Similarly, exchange rate granger causes inflation rate only through All-Share Index. No causality exists between inflation rate and Treasury bills rate, which is unexpected. This is particularly so because the Central Bank of Nigeria uses Treasury bill in addition to overnight interbank interest rates as its main tool in the control of inflation rate in Nigeria. These results suggest that there may exist long-run relationship between All-Share Index and these macroeconomic indicators. We established the presence of a conditional long-run level relationship between All-Share Index and these macroeconomic variables using the bounds testing procedure as discussed in [16]. The procedure as applied in this paper was based on the estimation of a restricted equilibrium correction model (ECM) in *equation 2.1* with no trend as shown in Table 5. Prior to the estimation of this ECM, the selection of

[1] $Y_t = \gamma_0 + \gamma_1 Y_{t-1} + ... + \gamma_p Y_{t-p} + \varphi_1 X_{t-1} + ... + \varphi_p X_{tp} + \omega_t$

$X_t = \upsilon_0 + \upsilon_1 X_{t-1} + ... + \upsilon_p X_{t-p} + \varphi_1 Y_{t-1} + ... + \psi_p Y_{t-p} + \nu_t$

Then, testing H_0: $\varphi_1 = \varphi_2 = ... = \varphi_p = 0$, against H_A: 'Not H_0', is a test that *X does not* Granger-cause *Y*. Similarly, testing H_0: $\varphi_1 = \varphi_2 = ... = \varphi_p = 0$, against H_A: 'Not H_0', is a test that *Y does not* Granger-cause *X*. In each case, a rejection of the null hypothesis implies there is Granger causality [1].

appropriate lag length for each variable in $\mathbf{w}_t$ is essential. This is particularly important since the disturbance ζ_t in *equation 2.1* are assumed to be uncorrelated. Also based on the result of the granger causality test, we assume that the lagged All-Share Index, $\mathbf{as}_{t-1}$ enters the sub-VAR model for $\mathbf{x}_t$ excluding the Treasury bill rate equation. Then, *equation 2.1* can conveniently be estimated using the ordinary least squares (OLS) method. The proper choice of the lag order *p* was such that it was neither too small nor too large [20]. If small, the variables excluded from the model will enter the disturbances ζ_t, thereby leading to residual serial correlation problem. Contrarily, if the *p* is large, this will result in over-parameterisation of the model in equation 2.1. Hence, this research work uses the Bayes Criterion also referred to as Schwarz Criterion (SC) because of its consistency as model selector, details of which is not discussed in this paper. The conditional restricted equilibrium correction model (ECM) in *equation 2.1* was estimated by adopting the ARDL modeling approach proposed by [25]. We choose a maximum lag length of 6 for the model and examined the 6^4 = 1,296 possible models. Lag lengths $p=4$, $p_1=3$, $p_2=2$ and $p_3=2$ were generated for All-Share Index (**as**), Treasury bill rate (**tb**), exchange rate (**er**) and inflation rate (**ir**) respectively. At each stage of model selection when first differenced levels and lagged variables of each element in 4x1 vector $\mathbf{w_t}$ enters the model, we checked for model stability and the residual serial correlation using the VAR stability condition test and Lagrange Multiplier (LM) statistics. The SC information criteria selected an ARDL (4,3,2,2) model as depicted in Table 5 along with long-run coefficients in Table 3. The order of entry for the regressors is Treasury bill rate (**tb**), exchange rate (**er)** and interest rate (**ir)** at first differenced levels and respective lags.

Table 3. ARDL (4,3,2,2) model Long-run coefficients

Long-run regressor	Coefficient		S.E	*t-statistic*	*p-value*
$\mathbf{as}_{(t-1)}$	$\pi_{yy,}$	-0.1242	0.0323	-3.8411	*0.0002
$\mathbf{tb}_{(t-1)}$	$\pi_{yx..x}$	0.0009	0.0115	0.0783	0.8574
$\mathbf{er}_{(t-1)}$		-0.1288	0.0610	-2.1096	*0.0045
$\mathbf{ir}_{(t-1)}$		-0.0559	0.0202	-2.7604	*0.0048

* statistically significant at 1 per cent level of significance

We then conducted a Bounds Testing to establish the existence of a conditional long-run level relationship between the All-Share Index (**as**) and the macroeconomic indicators. The conditional level relationship between All-Share Index, $\mathbf{y}_t$ and macroeconomic indicators in the vector $\mathbf{x}_t$ gives rise to the conditional restricted equilibrium correction model (ECM) in *equation 2.1*. This was done in two ways. Firstly, we restricted the $\boldsymbol{\pi}_{yy}$ and $\pi_{yx.x}$ in the matrix of long-run $\prod$ to zero by conducting a joint test of hypothesis [2] on these long run coefficients. The null hypothesis is rejected if the calculated *F*-statistic is greater than the asymptotic critical value bounds for case where $c_0 \neq 0$ and $c_1=0$ as postulated in our conditional restricted equilibrium model of *equation 2.1*. Table 4 shows the results of the bounds testing.

Table 4. Bounds testing results on Long-run Coefficients

Bounds Testing			
Test Statistic	***Value***	***p-value***	***Critical bounds value***
CI(iii), 2.5% [I(0), I(1)], k=3			
F-statistic	4.96	0.001	[3.69, 4.89]*
CII(iii), 5% [I(0), I(1)], k=3			
t-statistic	-3.84	NA	[-2.78, -3.78]**
CI(iv), 5% [I(0), I(1)], k=3			
F-statistic	4.96	0.001	[3.80, 4.68]*

*,** test is significant 2.5 and 5 per cent level of significance respectively

When *k*=3, Table 4 shows that the *F-value* of *4.96* lies outside the upper bounds of the critical bounds value of *4.89* for I(1) on table CI(iii) case III on page 300 of [16] when the intercept is unrestricted and no trend, indicating that the null hypothesis of no level All-Share Index equation is rejected at 2.5 per cent which is very high irrespective of whether the regressors are purely I(0), purely I(1) or jointly cointegrated. The same conclusion was derived when compared with the critical bounds values of [3.80, 4.68] for CI(iv) on page 301 of [16] where deterministic trend is restricted and intercept is unrestricted. Secondly, a *t*-test on the long-run coefficient of $\mathbf{as}_{t-1}$ is *-3.84* which compared with critical value in Table CII(iii)[3] on pg. 303 of [16] for *t*-statistic indicates that at 5 per cent level of significance with critical values [-2.86, -3.78], the null hypothesis of no level All-Share Index relationship is rejected regardless of the order of integration of the regressors. The result of the bounds testing resulted in the estimation of the conditional long-run level relationship model in *equation 2.2*.

$$\mathbf{as}_t = 16.4778 + 0.00725\mathbf{tb}_t - 1.0370\mathbf{er}_t - 0.4501\mathbf{ir}_t + \hat{\upsilon}_t \quad (2.2)$$

(*1.0031*) (*0.03918*) (*0.2043*) (*0.05297*)

Where $\hat{\upsilon}_t$ is the error correction term with standard error expressed in brackets[4]. The long-run level relationship of the inflation rate is negative as supported in the literature. Only Treasury bills (**tb)** rate remained highly insignificant in the conditional long-run level model. The conditional restricted equilibrium correction model that follows was estimated by adopting the ARDL modeling approach proposed by [24] as shown in Table 5. As long as $\alpha_0 \neq 0$ and the deterministic trend $\boldsymbol{\gamma}=0$ in *equations 1.6 & 1.8* then the deterministic behavior of the level process $\mathbf{w}_t$ is invariant to

[2] $H_0 = H^{\pi yy}{}_0 \cap H^{\pi yx.x}{}_0$ vs $H_1 = H^{\pi yy}{}_1 \cup H^{\pi yx.x}$ where, $H^{\pi yy}{}_0 : \pi_{yy} = 0$ vs $H^{\pi yy}{}_1 : \pi_{yy} \neq 0$ and $H^{\pi yx.x}{}_0 : \pi_{yx.x} = 0$ vs $H^{\pi yx.x}{}_1 : \pi_{yx.x} \neq 0$.

[3] CII(iii) is the Case III for unrestricted intercept and no trend critical values which computed through probabilistic simulations for testing the null hypothesis $\phi = 0$ using t-statistic in $\Delta\mathbf{y}_t = \phi y_{t-1} + \delta' x_{t-1} + \alpha' w_t + \beta_t$ t=1,2,3,....,T [16].

[4] The standard errors of the coefficients are much smaller than the coefficients signifying the significance of the variables at level except for Treasury bills rate with the long-run coefficient lower than its standard error.

the cointegrating rank of the long-run $\prod$ matrix [16], therefore the *F*-statistic and Wald statistic results are similar for the bounds test procedure as shown in Table 4. In the long-run, Treasury bill rate (**tb**) has coefficient statistically equal to zero implying that the positive causal long-run relationship with All-Share index is highly likely far-fetched. The reasons for this insignificant positive causal relationship between All-Share Index and the Treasury bill rate in the conditional long-run model of *equation 2.2* are in two folds. Firstly, increased short-term interest rate by the CBN is an indication of tightening or contractionary monetary policy to slow down economic growth[5] and subdue inflationary pressure. Very rare cases of situations where higher short-term interest rate such as risk-free Treasury bills rate leading to increase in stock prices exist in the literature. Short-term Treasury yield decline with increase in demand for the government backed security. Therefore, lower yields in the bills market result in the decline in the demand for stocks. Lower required rate of return (RRR) on stocks, rising inflation and tight liquidity lower stock prices in the long-run. Secondly, increase in Treasury bills rate also gives rise to increase in other interest rate, which imply higher cost of borrowings for both individuals and companies. For a company, the expected future discounted cash flow will decline if the company's debt expense increases, thereby eroding investors' confidence in the company resulting in lower stock prices. The postulated model relates exchange rate (**er**) and inflation rate (**ir**) negatively with All-Share Index, which was expected according to the literature. Depreciation of the local currency coincided with periods of high liquidity[6] in the banking sector (associated with lower interbank interest rate) during the period under review. We reiterate here, [20] emphasized in their paper that exchange rate is a weak shock absorber during periods of high inflationary pressures in Nigeria. During these periods, depreciation of the Naira in addition to excess liquidity in the banking system, prompted the monetary authority, CBN to adopt the contractionary (tightening) monetary policy by increasing short-term interest rate, which represented the cost of borrowing by individuals and corporations.

Whilst the short-term increase in interest rate such as the Treasury bills produced an insignificant marginal increase in share prices, the higher cost of operations/production and declining expected future cash flow of corporations lead to reduced share price as mentioned earlier during the period under review. Furthermore, investors generally react to the increase in interest rate by balancing their portfolio in money market instruments such as the Treasury bills, which are risk-free and possess higher return. The short-run dynamic revealed that only the first difference of All-Share Index at lag 4, Treasury bill rate at levels and lag 3, levels of exchange rate and inflation rate were significant (Table 5). The results of short-run dynamics further necessitated the existence of level relationships between All Share Index and the macroeconomic indicators. Although, the dummy variable D40 representing the impact of the 2008 global financial crisis on the Nigerian All-Share Index was negative as expected, it was statistically insignificant at all levels of significance. This implies that the Nigerian stock market remained resilient to the external shock from the collapse of the financial institutions in United States and United Kingdom and economic crisis across Euro Area partly due to improved financial deepening particularly during the crisis period[7]. "Financial deepening enhances resilience and capacity to cope with external shocks, improve macroeconomic policy effectiveness and support solid and durable inclusive growth" [26].

Table 5. ARDL (4,3,2,2) Conditional Restricted Equilibrium Correction Model

Regressor	Coefficient	S.E	*t-Statistic*	*p-value*
$\Delta(as_{(t-1)})$	0.0754	0.0768	0.9809	0.3287
$\Delta(as_{(t-3)})$	0.1041	0.0765	1.3603	0.1764
$\Delta(as_{(t-4)})$	-0.1680	0.0782	-2.1474	**0.0339
Intercept	0.0266	0.0140	1.9005	***0.0599
$D40_t$	-0.0267	0.0166	-1.6101	0.1101
$\Delta(tb_t)$	-0.0844	0.0321	-2.6327	*0.0096
$\Delta(tb_{(t-1)})$	0.0403	0.0324	1.2433	0.2163
$\Delta(tb_{(t-3)})$	-0.0738	0.0291	-2.5342	**0.0126
$\Delta(er_t)$	-2.1049	0.3870	-5.4387	*0.0000
$\Delta(er_{(t-2)})$	-0.6266	0.4030	-1.5548	0.1228
$\Delta(ir_t)$	-0.0655	0.0338	-1.9407	***0.0548
$\Delta(ir_{(t-2)})$	0.0496	0.0346	1.4334	0.1545
$\boldsymbol{\upsilon}_{(t-1)}$	-0.0992	0.0295	-3.3685	*0.0010
R^2	0.6999		AIC	-2.6087
Adj.R^2	0.6367		SC	-2.3176
F-Statistic	*6.3293(0.0)		Skewness	0.078
Breusch-Godfrey LM F-statistic	1.4465(0.2235)		Kurtosis	3.8014
Jarque-Berra[1]	3.5272(0.1714)			

*,**,*** statistically significant at 1 per cent, 5 per cent, and 10 per cent level of significant

[1]H_0: the forecast errors are normally distributed, (p-values in parenthesis)

[5] The Nigeria Gross Domestic Product (GDP) grew by nearly 500 per cent between 2004 and 2013 due to rebasing of the economy. The new base year for the calculation of gross domestic product was set at 2010 to accommodate other major significant sectors of the economy. The GDP annualized growth rate was 5.83 per cent between 2005 and 2014. The country's GDP growth rate in 2014 was 6.22 per cent, which was much higher than the World Bank forecasted value for African countries growth rate of 5.2 per cent.

[6] Excess liquidity (or money supply) may arise when the amount of broad money (M2) is higher than the level required to keep inflation under control in the economy. Excess liquidity implied that the liquidity ratio is in excess of the monetary authority level which varies over time depending on the Monetary Policy Committee (MPC) stance. A 47.02 per cent annualized average was recorded for the liquidity ratio during the period under review. Public sector Cash Reserve Requirement (CRR) is usually set higher than the Private Sector Cash Reserve Requirement. Banks deploy this excess liquidity mainly into Standing Deposit facility (SDF) and in a manner that put pressure on the exchange rate rather than encourage credits especially to the private sector. Interbank interest rate was kept low through the excessive repo operations of the CBN.

[7] In spite of the external shocks on the financial sector, the financial deepening in terms of the credit to private sector (CPS) relative to the GDP averaged more than 26 per cent between 2007 and 2009. Similarly, M2/GDP recorded annualized average of 31.44 per cent during the same period.

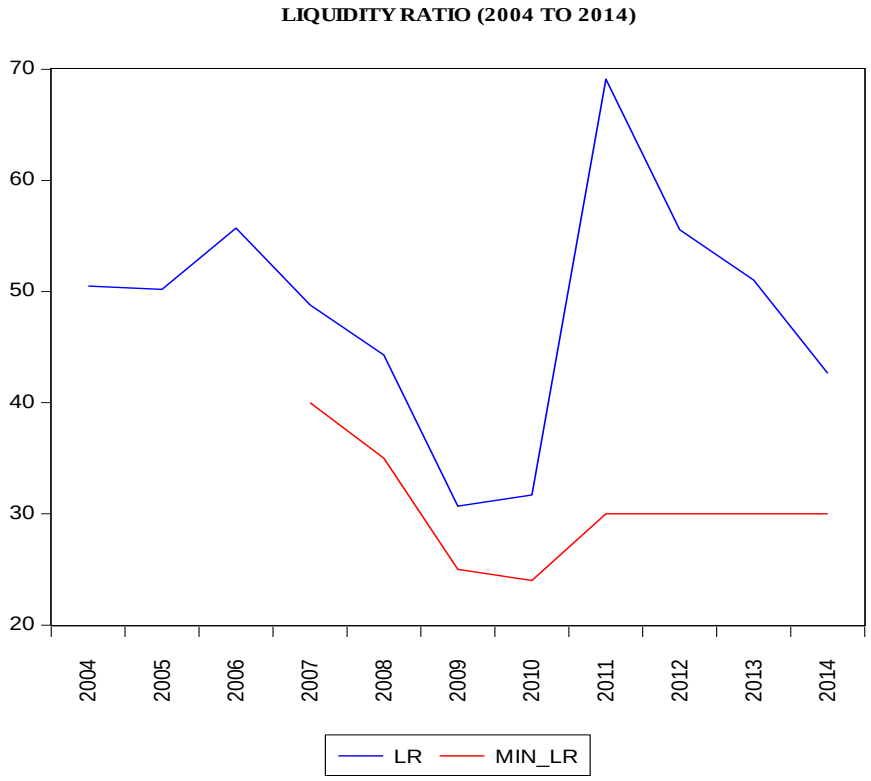

Figure 3. Banking Industry Liquidity Ratio (2004-2014)

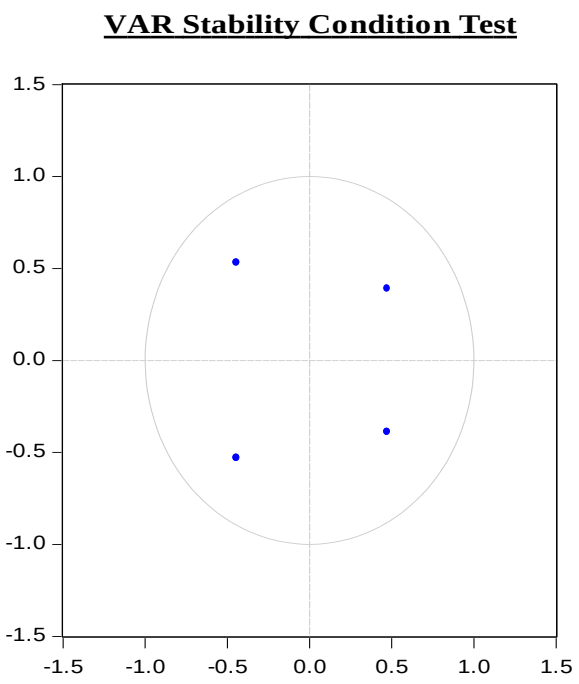

Figure 4. VAR Stability Condition Plot

This model was checked for residual serial correlation using the Bruesch-Godfrey Lagrange Multiplier Serial correlation test for *p=4, T=107*. The test which was based on computed *F*-statistic = *1.4465* (*p-value=0.2235*) and χ^2 = *6.3461* (*p-value=0.1747*) could not reject the null hypothesis of no residual serial correlations at all levels of significance. Also, a VAR Stability condition checks on the roots of the polynomial $\left|I_4 - \sum^4_{i=1}\Phi_i w^i\right|=0$, showed that there exist four complex roots and no root lies outside the unit circle. The result of the stability condition explains the complex nature of the relationships between All-Share Index and the three economic indicators particularly the Treasury bills rate in the long-run.

The $\upsilon_{(t-1)}$ is referred to as the speed of adjustment to long-run equilibrium (α_{yx}) in the long-run full ranked matrix $\prod$. A highly significant coefficient of *-0.0992* with standard error of *0.0295* implies that about *0.10* per cent of any disequilibrium caused by shocks on economic indicators is corrected within a month, which is relatively small. This also implies that All-Share Index is extremely slow to react to shocks on these macroeconomic variables in the long-run. A VAR residual normality test based on a Jarque-Bera value of *3.5272(0.1714)* indicates the residuals are multivariate normally distributed at all levels of significance which satisfies the necessary condition for CUSUM and CUSUM of squares recursive tests proposed by [27][8]. A graphical examination using each recursive test is shown in *Figure 5a & 5b* respectively.

CUSUM and CUSUM of Squares tests plots on NSE All-Share Index Model Stability Diagnostics

[8] CUSM employ test statistic $V_t = \sum^t_{p=k+1} v_p/\sigma_v$ to ascertain parameter instability arising from cumulative sum falling outside areas between [k, ± -0.948(T-k)$^{1/2}$] and [T, ± 3*0.948(T-k)$^{1/2}$] of 5 per cent critical areas. CUSUM of Squares is based on the test statistic $S_p = (\sum^t_{p=k+1} v^2_p)/ (\sum^T_{p=k+1} v^2_p)$ with an expected value $E(S_p)$ = (t-k)/ (T-k) which takes value zero if *t = k* and 1 if *t = T* under parameter constancy [6]

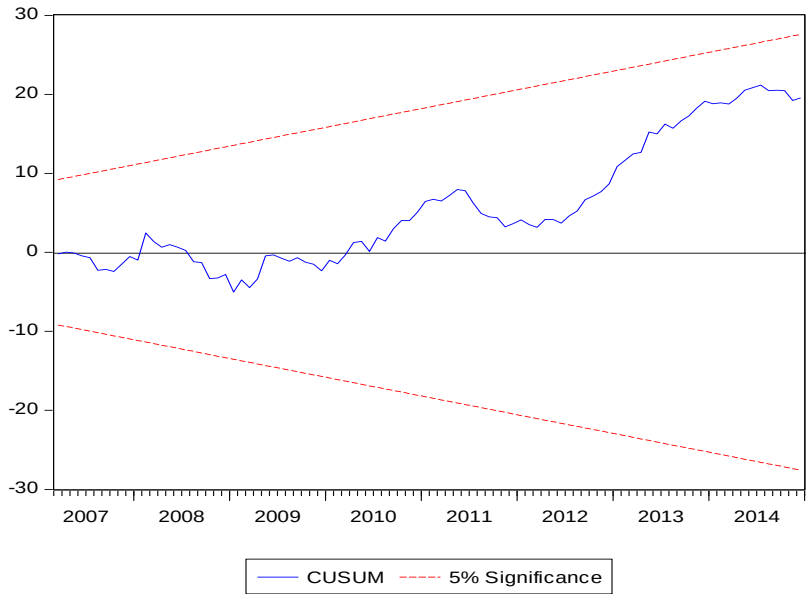

Figure 5a. Cumulative Sum plot

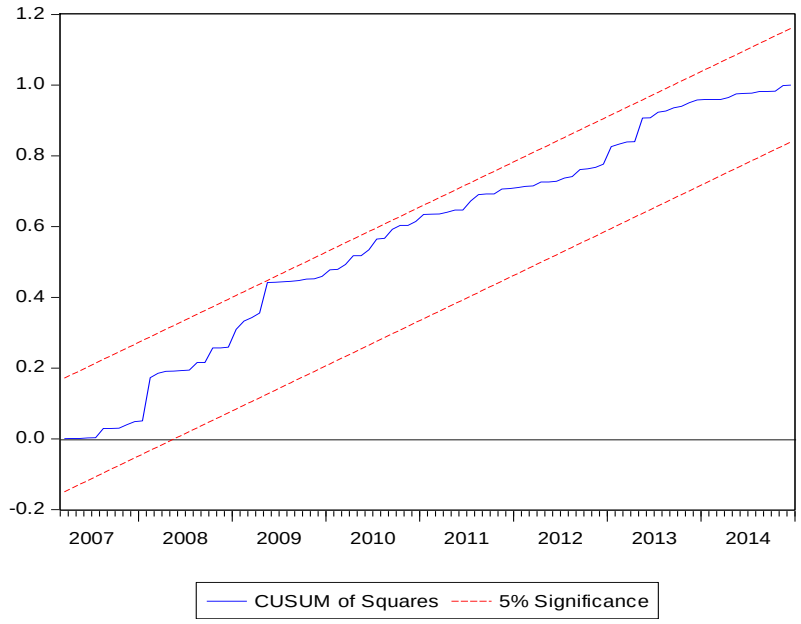

Figure 5b. Cumulative Sum of Squares plot

The graphs show no evidence of structural instability in the estimated conditional restricted equilibrium correction model since the cumulative sum and cumulative of squares of the forecast errors does not cross the 5 percent critical lines. Hence, the null hypothesis of model stability cannot be rejected.

Forecast Errors and Model Performance

The performance of the estimated model in *equation 2.1* and Table 5 was checked by studying the behaviour of the forecast errors. The actual and forecasted values were compared to ascertain the degree of association using the variance-covariance decomposition and the scale invariant Theil inequality. Table 6 shows a summary of the diagnosis.

Table 6. Forecast Residual Diagnosis

Root Mean Square Error (RMSE)	*0.0593*
Mean Absolute Error (MAE)	*0.0477*
Mean Absolute Per cent Error (MAPE)	*0.4637*
Theil Inequality	***0.0029***
Bias Proportion	0.0000
Variance Proportion	0.0014
Covariance Proportion	0.9986

The scale dependent root mean square which is the standard deviation of the forecast error when compared with standard deviation of the All-Share Index value of *0.3162* is

smaller. Similarly, the mean absolute error is smaller than the standard deviation of All-Share Index. The Theil Inequality is quite close to zero implying that the All-Share Index model is nearly perfect. Furthermore, the bias proportion (0 per cent) measuring the distance between the mean values of the forecast values and the actual All-Share Index series indicates the two series are not far apart. Similarly, the difference between the variance of the forecast and the actual series accounted for about *0.14* per cent, the unsystematic forecast errors accounted for the remaining *99.86* per cent indicating a strong association between the actual and the forecasted values of the All-Share Index series (*Figures 6a and 6b*). Forecast errors represent the impact of important shocks from unsystematic and external forces on the Nigerian stock market at various times. For example, the forecast errors were largest in February 2008, and May 2009. These dates coincided with the dawn of the global economic shock when the Nigerian Stock market experienced a market crash resulting in cross-sector price correction. Most market pundits believed this 'price correction' was imminent given the overpricing of most "blue-chip" stocks (household stocks with very high market capitalization, low volatility and long term market presence) listed on the Nigerian Stock Exchange over the years. Return on equity (ROE) of most of these companies was low due to lower earnings, which implied that most companies' price-earnings ratio (P/E) was extremely high without reflecting the true fundamentals of these companies. The P/E ratio to a large extent indicates how long it will take an average investor to recoup capital invested from the stock market. Therefore, the global financial crisis eroded investors' confidence, which led to panic selling. Consequently, the disequilibrium between market forces was huge with supply of stocks outstripping the demand resulting in rapid decline in prices. The P/E ratio relative to GDP growth rate which reflects how viable the Nigerian stock market is in terms of investment opportunity improved significantly due to the massive price correction. Furthermore, rising unemployment rate and market volatility associated with loss of investors' confidence were consequences of the financial meltdown.

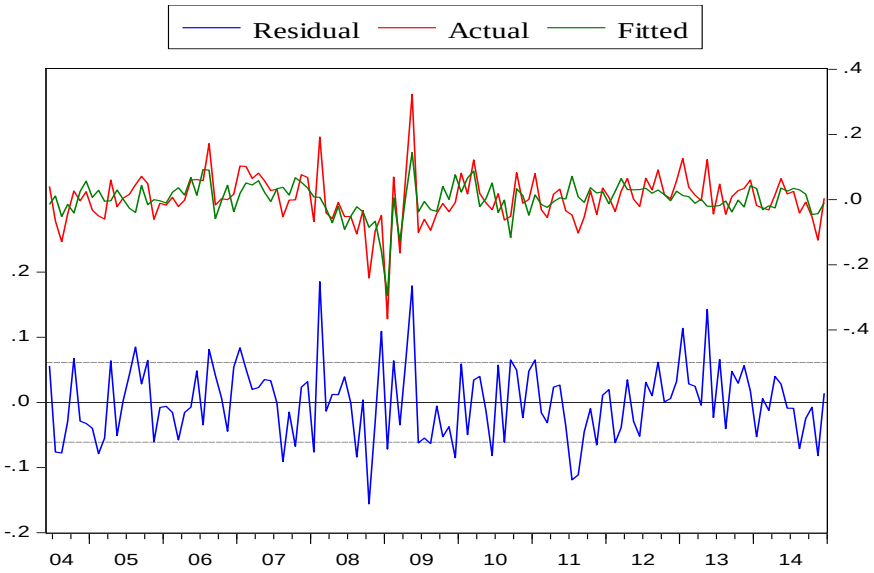

Figure 6a. AS model residual diagnosis Plot

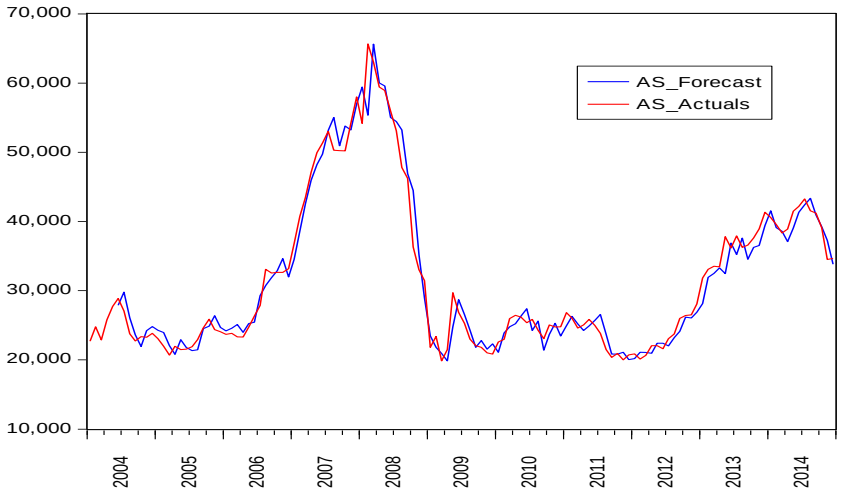

Figure 6b. AS Forecast and Actual value plot (2004-2014)

Also, the 2008 global financial crisis led to speculative trading in the crude oil futures culminating in the crash in price in 2008 and 2009. There exist strong negative long-run and short-run relationship between crude oil price and exchange rate in Nigeria [20][9]. [20] also emphasized that past and current crude oil price is highly significant in predicting the future value of nominal exchange rate in Nigeria. Therefore, via the exchange rate channel by [20], a 45 per cent slump in crude oil price during the second half of 2014, accounted for 9.5 per cent (more than half) of the 17.9 per cent decline in the All-Share Index in the short-run[11]. The value of Naira against the US dollar depreciated significantly partly due to higher forex demands and rising foreign currency debt especially during the financial crisis, which gave rise to increased inflationary pressures and therefore higher interest rate. Inflation rate rose significantly above the target limit [9%], interest rate moved in the same direction leading to higher public and private debts. The Central Bank of Nigeria depleted the foreign reserve to augment the short fall in foreign exchange demand. Government domestic debt burden rose by more than 200 per cent between 2008 and 2013. Whilst, foreign debt burden rose by nearly 97 per cent during the same period, interest payments rose by about 70 per cent between 2008 and 2012 - *CBN statistical database* [20]. Also, the debt/GDP ratio which measures the relative health of the economy averaged geometrically 35.96 per cent from year 2000 to 2013 representing 4.04 per cent and 20.04 per cent below the fiscal and IMF ceiling of 40 per cent and 56 per cent respectively [20].

3. Conclusions

In this paper, we have attempted to answer the research question "do macroeconomic variables explain stock market in the long-, short-run or both?" Using the bounds testing approach to cointegration, we conclude that a long-run co-movement exists between the Nigerian All-Share Index and three major economic indicators such as the risk-free Treasury bills, nominal exchange rate and inflation rate. This was achieved by estimating a conditional restricted equilibrium correction model in form of an ARDL(4,3,2,2) through ordinary least squares (OLS). Whilst the relationship between Treasury bills and All-Share Index is not significantly different from zero, nominal exchange rate and inflation rate are negatively related with All-Share Index in the long-run. The speed of adjustment to disequilibrium to shocks from these three economic indicators is relatively slow. The short-run dynamics indicated negative causal relationships between All-Share Index and these economic indicators, with the All-Share Index declining the most under the influence of nominal exchange rate during the period under review. The proportion of foreign currency debt has been on the rise leading to significant increase in the foreign exchange rate risk. The performance of the model revealed that all stability conditions were satisfied and the forecast errors, which signify when the most is happening in the economy, accounted for the various external forces influencing the Nigerian stock markets between 2008 and 2009. These forces include crude oil price crash[10], declining foreign reserve, eroding investor's confidence, change in government, rising public and private debts. The recent downturn in crude oil prices since June 2014, present an opportunity for energy subsidy, tax reforms and the much talked about diversification of the Nigeria economy from an oil based one to other viable non-oil sectors such as services, industry, building and construction, wholesale and retail trade and agriculture. Although the 2008 global financial crisis had an insignificant negative impact on the stock market, this paper revealed a weak fiscal policy discipline on the part of the Nigerian government whose recurrent expenditure rose significantly during periods of crisis resulting in higher inflation with consequential repercussion on the Nigerian Stock Market. Monetary policy stability is crucial to price level control because inflation is a monetary phenomenon in Nigeria. Therefore, the efficient use of Treasury bills as apparatus of monetary policy (inflation-targeting) and major source of government financing is essential to the growth of the Nigerian stock market. In addition to efficient monetary policy through interest rate and exchange rate, a secure fiscal discipline through effective government spending will likely have a positive effect on the All-Share Index rapidly and directly.

[9] According to the model postulated by [20], a supply driven decline of 45 per cent in crude oil price will be associated with about 7.8 per cent and 4.5 per cent depreciation in the value of the Naira to the US dollars in the long- and short-run respectively.

[10] Unlike the 2008 crude oil price crash which was as a result of speculative trading in oil futures, the recent crash since June 2014 has been associated with increase in unconventional oil, global supply outstripping global demand, policy shift by OPEC, crisis in the Middle East and major crude oil producers and depreciation in the value of Naira. The impact of unconventional oil through alternative sources such as oil sands, tight oil, oil shale, thermal depolymerisation, coal and gas conversion remained the major causes of this recent price crash in crude oil. This is a policy concern for the Nigerian government.

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