Implications of Macroeconomic Instability on Stock Market Returns in Nigeria

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Abstract: This study investigated the implications of instability of some selected macro-economic indicators on stock market returns in Nigeria. The objective of the study was to analyse the level of significant relationships of the dependent variable-stock market returns represented by the Nigerian stock exchange All-share price index and independent variables comprised of some selected macroeconomic variables. A quantitative research approach with a time series data covering the periods 1987 to 2014 were used in the study. Vector Error Correction test (VERC) model, VAR Granger’s causality test, variance decomposition and impulse response function were applied to test the five hypotheses arising from the research objectives. Also some tests, using Augmented Dickey Fuller (ADF) unit root and Johansen’s Co-integration tests, were executed to establish the validity of the model assumptions. From the unit root stationarity test conducted, all the variables were co-integrated at the \( I(1) \) – meaning that they were all stationary at first difference. The major findings from the study include, that much of the movements in stock returns can be explained by historic trends in the Nigerian stock market than from macroeconomic conditions which accounted for less than 10% especially within the first 9 quarters after the shock. The study further showed that RGDP, Exchange Rate and Treasury Bills Rate were found to have significant impact on stock market returns. Interestingly, the study revealed that international crude oil price had no significant relationship nor co-integrated with stock market returns. We therefore recommend a long term policy package that should focus on the stabilization of real and macroeconomic policy variables in the Nigerian economy. Also, institutional and operational reforms in the country’s capital market are inevitable for the level of efficiency in the market to be enhanced. Investors in Nigerian stock market should not only rely on the historic trend in the market for the explanation of changes in stock market returns but should also accommodate the core macroeconomic variables in their predictions.

Key words: Macroeconomics, Instability, Stock Market Return, Nigeria, Economic Growth

INTRODUCTION

Before the introduction of the Structural Adjustment Programme (SAP) in Nigeria, the capital market was grossly underutilized and only very few Nigerians invested in the capital market as a result of inadequate awareness and apathy by Nigerians. But since the deregulation of the economy in 1986, the stock market has grown very significantly [1].

Recent events in Nigerian Stock Market seem to indicate that it is no way exempted from the proven imperfections in financial markets through-out the world. While the market has been the toast of investors for nearly a decade and growing sporadically since the turn of the 21st century, the banking consolidation seemingly led to a flurry of activities in the market that culminated in sharp increases in the values of a majority of stocks in the

Nigerian stock exchange [2]. Stocks price movements were strong and investments in the stock market yielded superior returns relative to other channels of investment in the country. It became fashionable to join the investment train. With a growth of about 74.5 percent in 2007, the Nigerian Stock Market was acclaimed one of the world’s fastest growing markets and was an all investors’ toast. Investors confidence was very high and market capitalization peaked at N12.6 trillion as at the first week of March, 2008, multiple returns, particularly in capital appreciation were reaped by a number of investors and market awareness was at an all time high as at end of 2007 [3].

However, the trend changed dramatically beginning from the second week of March 2008. The market began to slide in both capitalization and All-share Indices. For instance, market capitalization of the then 303 equities
which had opened on January 1, 2008 at N10.180 trillion as at March 2008, suffered its highest fall in the 50-year history of the Nigerian Stock Exchange, depreciating by N3.223 trillion or 32 percent to N6.957 trillion by the year end [4]. The all-share index (indexed in 1984 at 100) which had risen to 66,016.56, as at March 5, 2008, equally dropped drastically by the end of the same year [5].

In the last few years, the global financial markets have been engulfed in systematic crisis posing a source of policy concerns to policy makers and financial experts serious concern. Indeed, since August 2007, the world has witnessed an extra-ordinary collapse of financial institutions, loss in asset value/share price particularly of mortgaged related securities, Stock Market declines, speculative bubbles and currency crisis among others [6].

As in many other stock markets of the world under the same circumstances as reported above, there have been competing arguments as to the cause of this development since the start of the world economic crash. Explanations as to its cause have ranged from the very plausible to the down-right ridiculous. While some believe the market has always been overvalued and is undergoing self-correction indicating that the reduction in share prices will be permanent, others see the correction as temporary. This difference in perception also arises because of differences in understanding of what really is driving the fall in market value of shares. While it is believed in some quarters that share prices rose faster than both market and other economic fundamentals, some see the Nigerian Stock Market as not having even grown up to its fundamentals and so still having opportunities for further growth, indicating that the correction is very temporary [7].

Critical assessment of what drives the Nigerian capital market and the range of roles of macroeconomic policies can play to support the market is generally believed to be inadequate. This is likely to create a situation where policy positions may not adequately mirror the actual and or fundamental cause of the problems. In addition, probability of future recurrences is higher if the underlying causes of the problems are not unearthed. No doubt, a relationship exist between stock market development and growth of the economy and stock prices are also believed to be determined by some fundamental macroeconomic variables such as economic growth, oil price changes, exchange rate, inflation and interest rate [8].

Therefore, based on the above lapses, this research examines the long-run implications of macroeconomic instability on the stock market returns taking cognizance of other internal and market oriented indicators [9]. The study specifically poses an empirical question on whether principal economic indicators such as oil price changes, inflation rate variability, exchange rate instability, economic growth rate and interest rate are significant explanatory factors for explaining stock market returns variability in a developing country like Nigeria?

**Methodology:** Given that the aim of this study is to explain the Implications of Macroeconomic Factors on the Nigerian Stock Market Returns using time Series data spanning for the period 1987 – 2014, it therefore requires an appropriate research design. In the light of the above, the research employed the quantitative research design approach taking cognizance of the nature of data source that is purely secondary and out of the control and manipulation of the researcher. The time series data sets used in this study were sourced mostly from the various issues of the statistical bulletins and annual reports of Central Bank of Nigeria as well as Annual Abstract of Statistic of National Bureau of Statistics. The stock price data are sourced from the daily official list of the Nigerian stock exchange and other mainstream publications of the Nigerian Stock Exchange.

Considering that a co-integration approach was adopted in the analysis, annual data generated were further disaggregated into quarterly data series in consonance with the nature of the time series data as outlined in the scope of the study. Temporal disaggregation methods are mathematical and statistical procedures that allow low frequency (annual) data to be decomposed into high frequency (quarterly) data. To accomplish this, Sande and Lisman (1964) used a weighted mean of the quarterly values of the years $\alpha-1$, $\alpha$, $\alpha+1$. This procedure includes two steps.

Firstly, four quarterly values from the known annual value $A\alpha$ is built. Hence,

$$\Psi_{\alpha} = \Psi_{\alpha-1} = \Psi_{\alpha+1} = 4A_{\alpha} = \Psi_{\alpha}$$

Secondly, a system of weighted means from values $\Psi_{\alpha-1}$, $\Psi_{\alpha-1}$ and $\Psi_{\alpha+1}$ is derived in order to estimate the quarterly time series $X_{\alpha}$ in quarter $i$ of current year $\alpha$.

This system is expressed as:

$$X_{\alpha i} = 0.291 \Psi_{\alpha-1} + 0.793 \Psi_{\alpha} - 0.084 \Psi_{\alpha+1}$$

$$X_{\alpha i} = -0.041 \Psi_{\alpha-1} + 1.207 \Psi_{\alpha} - 0.166 \Psi_{\alpha+1}$$

$$X_{\alpha i} = -0.166 \Psi_{\alpha-1} + 1.207 \Psi_{\alpha} - 0.041 \Psi_{\alpha+1}$$

$$X_{\alpha i} = -0.084 \Psi_{\alpha-1} + 0.793 \Psi_{\alpha} - 0.291 \Psi_{\alpha+1}$$
The choice of this approach was principally to solve the problem of lack of quarterly data from official database in Nigeria. The real gross domestic product that normally appears on yearly basis was decomposed into quarterly data so as to allow for its incorporation in the study. However some of the variables are transformed into natural logs and lagged to reduce multicollinearity and assume linearity.

The arising expectation from the theoretical literature and previous empirical studies is that stock market return is jointly a function of oil price movement, changes in price level (inflation rate), exchange rate variability, level of economic growth and interest rate variability. It follows therefore that the stock return equation deriving from the Arbitrage Prising Theory (APT) can be constructed as;

\[ \text{Allshairindex} = \alpha_0 + \alpha_1 \text{RGDP} + \alpha_2 \text{OILPN} + \alpha_3 \text{EXR} + \alpha_4 \text{INF} + \alpha_5 \text{INT} + e_t \]  \tag{1} 

where \( \alpha_0 \) is a constant; Allshairindex represents stock market returns; RGDP, is per capita GDP growth rate; OILPN, is change in crude oil price; EXR, is real exchange rate; INF, is change in price level (inflation rate); INT, is bench mark interest rate (treasury bill rate); \( e_t \) is a white noise process.

Equation 4 was transformed into a vector autoregression (VAR) model that is adjudged to be more efficient in summarizing the relationship between variables, while at the same time accounting for causality effects in the model. An appropriate VAR model that can serve this purpose is as presented and specified as follows;

\[ \Delta \text{Allshairindex} = \alpha_0 + \sum_{i=1}^{n-1} \alpha_i \Delta \text{Allshairindex}_{t-i} + \sum_{i=1}^{n-1} \alpha_0 \Delta \text{RGDP}_{t-i} + \sum_{i=1}^{n-1} \alpha_2 \Delta \text{OILPN}_{t-i} + \sum_{i=1}^{n-1} \alpha_2 \Delta \text{EXR}_{t-i} + \sum_{i=1}^{n-1} \alpha_3 \Delta \text{INF}_{t-i} + \sum_{i=1}^{n-1} \alpha_5 \Delta \text{INT}_{t-i} + e_t \]  \tag{2} 

The base assumptions guiding the vector auto regression model are that the series must be stationary and must be co-integrated to a definite order. Therefore, the model specified in equation 1 is valid only if these assumptions are met. In order to achieve this, the unit root, co-integration tests were conducted for testing the assumptions.

### RESULTS

**Unit Root Test:** A close examination of the series, as represented in (Table 1), reveals that most of the variables are non-stationary at their levels with trend and intercept, but are all stationary at their first difference – implying that the null hypothesis of the presence of unit root cannot be rejected at any of the conventional levels.. Specifically, stock market return (presented with percentage change in the NSE Allshare index), real exchange rate and CPI have an intercept and a trend – that is, their respective series are relatively stable over time. On the other hand, real GDP growth, crude oil price and Treasury bill rate are relatively unstable over the same period. However, both the ADF and KPSS test statistics confirm that almost all the series, with the exception of inflation, are stationary at first difference at 1% level. Inflation is stationary at 10% level when tested with neither trend nor intercept. This can be interpreted to mean that they all have compatible long-run properties.

**VAR stability Condition Check:** Based on the suggested appropriateness of a VAR model for this analysis as reflected in the co-integration test above, we then go on to test whether the specified model here satisfies
the stability condition for a robust VAR estimation. Using the inverse roots of autoregressive polynomial test, Figure 1, suggest that no root lies outside the unit circle and that the VAR model satisfies the stability condition.

**VAR Granger Causality/Block Exogeneity Test:** As shown in the first part of Table 2, there is some evidence of lead-lag interaction between All-share index (or stock market returns) on one hand and real economic growth, real exchange rate and inflation on the other hand. The causality between these variables as pairs of All-share index is almost significant at 5%. Essentially, these results validly suggest that a co-movement in real GDP growth, real exchange rate and inflation appear to significantly lead movements in the NSE allshare index or stock market returns in Nigeria. No such co-integrating relationship is recorded in the case of international crude oil price and Treasury bill rate, which is surprising in the light of the fact that Nigerian economy is driven mostly by developments in international crude oil market.

**Impulse Response Functions:** A period of 12 quarters or 48 months is chosen for the impulse response analysis considering the high level of macroeconomic instability in the country and the fact that most policy changes reflect dynamics in the 4-year term political system of the country. Some related studies in countries with more stable macroeconomic environment used 60 months (5 years) period. Consistent with the major objectives of this study, stock market returns in Nigeria can be significantly influenced by the level of economic growth, volatility in international crude oil price, real exchange rate, inflation and wholesale interest rate. Although the E-views results indicate the responses of each of the variables on the other, we present only the responses of all-share index or stock market returns on changes on the other variables. Taking into consideration the signs of the responses, as shown in Table 3, an innovation or a macroeconomic shock that leads to a sudden fall in the rate of real GDP growth negatively affects the level of stock market returns in the country, though at a relatively lower speed in the short-run. This response of stock return to changes in the rate of economic growth starts smoothening from the 2nd quarter after the shock had occurred until the 4th quarter from when the response again becomes more noticeable. However, the impact remains negative all through the period.
On the other hand, the impact of an innovation in crude oil price on stock returns remains positive within the first five quarters, after which it turns persistently negative even up to the next 12 quarters or 48 months after the event. The impact of a shock in real exchange rate first appears negative up until the first six months after the shock and then subsequently becomes positive for the rest of the periods. On its own, innovation in the wholesale interest rate has positive impact on stock returns in the first 3 quarters after the shock, then subsequently turns negative through the first 12 quarters. Unique and in line with theoretical projection in the literature, inflation shock has consistent positive impact on stock returns.

**Vector Auto Regression Estimation:** Since the variables included in the VAR model are found to be co-integrated, the next step ought to be to estimate a Vector auto-regression model. However, considering that all the variables are co-integrated from the $I(1)$ – that is being only stationary at first difference it will not appear the most appropriate estimating techniques in this case. As an alternative, the reduced Vector Error Correction (VERC) Model is used. In essence, this is a generalization of the error correction model to a system of equations describing multivariate non-stationary time series [13]. It also estimates the speed of adjustment from short-run to long-run equilibrium.
The VERC is estimated using two lagged differences of the explanatory variables and a constant. The fact that the coefficient of the co-integrating equation (-0.01897) appears with the expected negative sign and is significant at conventional level reconfirms the results of the impulse response and co-integration analyses earlier reported. It implies that a deviation from the long-run equilibrium position between economic growth and stock market returns, for instance, will most likely to be corrected.

The VERC results capture some interesting long-run and short-run effects of the exogenous macroeconomic variables on all-share index. First, the fact that the coefficient of the second lag of all-share index, 0.464706, is positive and highly significant at 1% level (4.38785) confirms the assertion arising from the variance decomposition analysis that very high proportion of changes in all-share index is explained by historic innovations in itself. Also, there appears to be both short and long-run negatively significant impact of economic growth on all-share index. As shown in Table 8, real gross domestic product is correctly signed and significant at 5% significance level thus showing about 50% speed of adjustment from short-run to long-run equilibrium that is -0.496573 (t-statistic = -2.77019) at Lag-1 and also correctly signed at lag-2 with a coefficient of -0.363156 (t-statistic = -1.97337). Essentially what this implies is that an improvement in real GDP growth slows down the level of stock market returns. This observation is conventional with the general notion that the rate of stock market returns in developing economies are in most cases higher than the rate of returns in developed economies. Furthermore most capital market theories hold that the stock market performance expectedly should move in tandem with the level of economic activities. In other words the higher the economic activities the higher the level of stock market returns. But this thesis has proved that in Nigeria’s case, the stock market performance and macroeconomic variables can sometimes move in opposite direction. The general believe that the stock market index mirrors the volume of economic activities had in the past had very negative implications on the savings and investment patterns in the country. For instance at the start of the recent global recession between 2007 and 2008, while industrial and manufacturing activities were on the decrease, the prices of most stock in the exchange were ironically skyrocketed leading to a situation where the investing public were attracted to invest huge amount of their savings in buying stocks. The implication was that by 2009, the increase in stock prices which had no fundamental basis has started crashing thus negating the earlier theories in literature as stated above.

The result on the impact of changes in crude oil prices on all-share index reveals a positively and fairly significant coefficient only for the second lag, that is 0.138138 (t-statistic = 1.76528). It suggests that the impact of changes in international crude oil on stock market returns can only be significantly felt in the long-run and not necessarily in the short-run. This is not surprising considering that while crude oil prices are exogenously determined; the Nigerian Stock Exchanges remained poorly integrated with other major exchanges across the globe. Again not much of the revenues from crude oil actually find their ways back to the Exchange. The coefficient of the real exchange rate variable turns negative in Lag-1and significant at 5% level of significance that is, -0.220055 (-2.35405) thereby showing a 22% speed of adjustment. On the other hand, although inflation appears with positive sign, the impact does not seem to be significant at both the first and the second lags. This is as compared to the coefficient of Treasury bill rate (or wholesale interest rate), which is positive and significant at conventional level in the case of the first lag. The positive sign of interest rate is in agreement with the asset shifting hypothesis – where an increase in bank lending rate for instance, is expected to induce more demand for capital market securities.
Table 5: Pairwise Granger Causality Tests

<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>Obs</th>
<th>F-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRUDEOIL does not Granger Cause ALLSR</td>
<td>88</td>
<td>4.12771</td>
<td>0.0043</td>
</tr>
<tr>
<td>ALLSR does not Granger Cause CRUDEOIL</td>
<td></td>
<td>1.89404</td>
<td>0.1197</td>
</tr>
<tr>
<td>EXR does not Granger Cause ALLSR</td>
<td>88</td>
<td>4.82189</td>
<td>0.0016</td>
</tr>
<tr>
<td>ALLSR does not Granger Cause EXR</td>
<td></td>
<td>0.5006</td>
<td>0.7353</td>
</tr>
<tr>
<td>GRGDP does not Granger Cause ALLSR</td>
<td>88</td>
<td>2.06134</td>
<td>0.0938</td>
</tr>
<tr>
<td>ALLSR does not Granger Cause GRGDP</td>
<td></td>
<td>0.32607</td>
<td>0.7297</td>
</tr>
<tr>
<td>INFL does not Granger Cause ALLSR</td>
<td>88</td>
<td>3.75862</td>
<td>0.0075</td>
</tr>
<tr>
<td>ALLSR does not Granger Cause INFL</td>
<td></td>
<td>0.53669</td>
<td>0.7092</td>
</tr>
<tr>
<td>INT does not Granger Cause ALLSR</td>
<td></td>
<td>0.67727</td>
<td>0.6097</td>
</tr>
<tr>
<td>ALLSR does not Granger Cause INT</td>
<td>88</td>
<td>1.97913</td>
<td>0.1057</td>
</tr>
</tbody>
</table>

Source: Author’s calculation

Granger Causality between All-Share Index and each of the Exogenous Variables: Whereas the VERC model has shown the existence of a significant relationship between all-share index and some of the macroeconomic variables, it does not specifically indicate the direction of the effect. As a follow-up to the above reported statistical relationship, therefore, this section summarizes the direction of causality. Table 5, shows that indeed, changes in crude oil prices granger cause all-share index, but not the other way round. Similarly, exchange rate, real GDP growth and inflation granger cause all-share index, but not the other way round. Among the selected macroeconomic variables, it is only interest rate that was not found to granger cause all-share index.

CONCLUSION

Employing Johansen's methodology for multivariate analysis and quarterly time-series data and to eliminate the possibility of spurious results, the researcher generated and made use of the first difference of the series in estimating their respective relationship. In line with the methodology adopted by other researchers on the subject, vector error correction models are used in estimating the relationships. The dynamic interrelations between some selected macroeconomic variables and stock returns are examined. Various variables such as economic growth (RGDP), oil price changes, exchange rate, inflation rate (CPI) and interest rate (TB-Rate) are selected to examine the way in which the macroeconomic movements impact on the performance of the stock market returns for Nigeria. Compared to previous studies, the restrictive VAR (VERC-model) analysis employed, based on innovation accounting, provides a study of the dynamic relations among the variables without imposing a priori restrictions.

One of the major findings of the analysis is that some of the core macroeconomic activities studied significantly affect stock market returns in Nigeria and there exists lead lag interaction between them and the dependent variable. However, the fluctuations of the Nigeria stock market returns are not wholly predictable by the macroeconomic indicators rather a greater percentage of explanations are done by the historic trends in the Nigerian stock market. This was as noticed in the variance decomposition test that showed just about 10% explanation of stock market returns variability by the macroeconomic variables in the first nine quarters. This typically shows the fact that the market is detached from the mainstream economy, a condition that makes it less contributory to economic development of the country.

Impulse response analysis shows that all the macroeconomic variables are important in explaining stock price movements. The impact of innovation in RGDP on stock returns remained negative all throughout the 12 quarters, crude oil price was positive in the first 5 quarters and turned negative up to the next 48 months after the shock while real exchange rate appeared negative until the first six months and subsequently became positive for the rest of the periods. However, while interest rate had had positive impact on the stock returns in the first three quarters after the event and subsequently turned negative through the first 12 quarters, inflation presented a unique and in line with theoretical projections in literature a consistent positive impact on stock returns.

By the findings of this study in relation to the set objectives, this work has further yielded some empirical evidence that RGDP, exchange rate and TB - rate are important explanatory macroeconomic variables to changes in stock market returns variability in Nigeria. The non significant and no lead-lag interaction recorded in the case of international crude oil price and stock
market returns however depicts a scenario where the realized oil revenue generated in Nigeria was not properly utilized nor transmitted to boost the stock market operation on one hand and the economy as a whole. This shows a distortive long-run impact of oil price volatility on stock returns in a major oil exporting country. In previous studies for other major oil exporting countries, oil revenue were found to be very supportive to stock market development which as this study showed is not the case for Nigeria.

REFERENCES


