Humanities, Management, Arts, Education & the Social Sciences Journal

Vol 7, No. 1 March, 2019

Macroeconomic Variables, Volatility and Stock Market Returns in Nigeria

[1]Giwa Agbolade Babatunde & [2]Sheu Nurudeen Adebayo
Department of Economics
School of Arts and Social Science
Federal College of Education (Special) Oyo
E-mails: giwaagboladebabatunde@gmail.com, aramiatoke@yahoo.com

ABSTRACT

There is a growing literature on how macro-economic variables can have effects on equity returns in both developed and emerging stock markets. This paper investigates the relationship between the real Gross Domestic Product, real foreign exchange rate, inflation and net capital flow. The study determined the response of the stock returns to a shock in each of the macroeconomic variables. Engle-Granger two step method was used to establish the co-integrating relationship between stock returns and the macroeconomic variables. Threshold Generalised Autoregressive Conditional Heteroscedasticity (TGARCH) model was used to capture the leverage effects and volatility persistence at the NSE. Published time series quarterly data from 2012 to 2014 was sourced and analysed. Progression model revealed that exchange rate showed a significant relationship with stock returns. One percentage increase in depreciation of a domestic currency decreased stock returns by 1.3 percent. Real gross domestic product, real foreign exchange rate and inflation rate, net capital flow indicated insignificant relationships. TGARCH model showed that the impact of news was asymmetric and there was presence of leverage effects. There was absence of volatility persistence among all the macroeconomic variables.

Keywords: TGARCH, Macroeconomic Variables, Volatility, Stock Market and Nigeria

Journal Reference Format:
Giwa, A.B. & Sheu, N.A. (2019): Macroeconomic Variables, Volatility and Stock Market Returns in Nigeria. Humanities, Management, Arts, Education & the Social Sciences Journal. Vol. 7 . No.1, Pp 45-52
Article DOI: dx.doi.org/10.22624/AIMS/HUMANITIES/V7N1P6
Available online at www.humanitiesjournal.org

1. INTRODUCTION

A broad consensus has emerged in recent times emphasizing the idea that stock markets occupy a strategic position in both developing and industrialized nations. It has become a significant component of a country's financial system and a common feature of a modern economy (Sally, 2011). The price of shares and other assets is an important part of the dynamics of economic activities and can influence or be an indicator of social mood and business performance. History has shown that the performance of a stock market is perhaps the most potent instrument for measuring social or economic developments in any economy. Drabenstott and Meeker (1999) call it a barometer for the economy. The nature and the state of a stock market is of great concern to the government, investors and generally all stakeholders. As an economic institution, stock market plays a major role of enhancing the efficiency of capital formation and allocation.

Thus the overall development of the economy is a function of how well the stock market performs. Empirical evidence has shown that the development of a capital market is essential for economic growth (Ashaolu and Ogunmuyiwa, 2010). The relationship between stock prices and macroeconomic variables is well illustrated by the theoretical stock valuation models. According to the models, the currents prices of an equity share is approximately equal to the present value of all future cash flows, hence any macroeconomic variable that affect cash flow and the required rate of return will in turn influence the share value as well. Stock returns are generally believed to be determined by some fundamental macroeconomic variables (Evans et al, 2014). The volatility of stock returns represents the variability of stock price changes during a particular period of time. Despite being a measure of risk, excessive stock returns volatility or "noise" according to investors undermines the usefulness of the stock prices which is an indicator about the true intrinsic value of the firm (Karolyi, 2001). Growing inflation, fluctuations in exchange rates, broad money supply and interest rate will increase volatility of stock returns leading to rise in risk and the investors may think of switching their investment to less risky portfolios like bonds.

The Nigerian economy has experienced significant changes in its macroeconomic aggregates in the recent past. The inception of the Structural Adjustment Programme (SAP) in 1986 came with fundamental economic reforms, a major aspect was the far-reaching liberalization of various sectors of the economy. Similarly, the transition from a military to civilian rule in 1999 witnessed various programmes of deregulation, privatization and commercialization, with implications for stock market returns.

While economic literature has been devoted to studies on relationship between stock market returns and real macroeconomic activities in developed economies like US and Japan, there are very few attempts at unraveling this linkage in developing economies such as Nigeria. The nature of the relationship between stock returns and macroeconomic variables may differ between developed and developing countries. Therefore, this study examined the relationship between some macroeconomic variables [money supply, inflation, exchange rate, interest rate and national income] and stock market returns and analyzes the empirical applicability of the APT to pricing the Nigerian Stock Exchange (NSE) in Nigeria. The study covers the period 1975 to 2013 and uses data for all quoted firms on the Nigerian Stock Exchange.

2. LITERATURE REVIEW

Chen Roll and Ross (1986) investigated the sensitivity of macroeconomic to stock returnsby hypothesizing and testing a set of macroeconomic data series to explain US stock return. They tested seven macroeconomic variables; term structure, industrial production, risk premium, inflation, market return, consumption and oil prices in the period of January 1952 – November 1984. They assume that the underlying variables are not serially correlated and all innovations are unexpected. Their research found several of these economic variables to be significant in explaining expected return. They found that consumption, oil prices and market index are not priced by financial market. They conclude that stock returns are exposed to systematic economic news that is priced by the market.

Rizwan and Khan (2007) further explained varying importance of domestic macroeconomic variables in explaining the relationship between stock returns and volatility in Karachi stock exchange. A decline in exchange rate uncertainty also enhances price transparency increasing the efficiency of price mechanisms at international level (De Grauwe, 2005; Schnabl, 2007). Lower transaction costs and greater pries transparency also affect growth performance by increasing capital markets efficiency in capital allocate and by lowering risk premium and real interest rates (Dornbush, 2001).

In addition, if there are credit constraints, or if investment is irreversible, lower aggregate nominal exchange rate volatility is likely to translate into higher growth. Tursoy et al (2008) tested seven macroeconomic variables of Turkish economy. They separated into expected and unexpected series by a regression process then two step testing methodology is implemented on these series. The study covered 54 stocks for the period oof January 1989 to July 1995. The result was beta coefficient of expected factors is found to be significant for asset return. Zhou (1996) found that interest rates have a significant impact on stock returns, but the hypothesis that expected stock returns move one-for-one with ex ante interest rate was rejected. His results show that long-term interest rate explains a major part of the variation in price-divided ratio.

He also proposed that the high volatility of the stock market is related to the high volatility of long-term bond yields which may be accounted for by hanging the future forecasts of discount rates. Campbell (1987) analysed the relationship between the yield spread and stock market returns instead of using either short-term or long-term interest rates. He argued that the same variable was used in predicting excess returns in the term structure also predicts excess stock returns. Deducing that a concurrent analysis of the returns on bills, bonds and stock should be beneficial. His results supported the effectiveness of the term structure of interest rates in predicting excess returns on the US stock market.

Gupta and Modice (2013), employing a predictive framework studied the relationship between the South African stock returns and movements in the macroeconomic variables in a modification of the arbitrage pricing theory. They found that a number of interest rates, money supply and oil production growth did have a significant impact on the evolution of stock returns in the Johannesburg stock exchange. Their out of sample results also showed that both the interest rates and money supply had some predictive power over short horizons while inflation showed a very strong ability to produce forecasts of the stock returns from 6 months and beyond.

Najand and Rahman (1991) use the GARCH model to examine the relationship between volatility of stock returns and volatility of macroeconomic variables for four countries, and find statistically significant positive coefficients for the monetary base. According to Brunner (1961) the changes in money supply results in the equilibrium position of money with regard to other asset in the portfolio f investors. Therefore a new equilibrium is reached through both adjustments of proportions of asset portfolios and changes in the prices of various assets. Asprem (1989) approach to the relation between stock price and macroeconomic variables in ten European countries is providing relation of money supply to stock returns. According to cooper (1974) Monetary portfolio theory suggests that changes in money supply alters the equilibrium position of money, thereby altering the composition and price of assets in an investor's portfolio additionally, change in money supply in real economic variables suc as a decrease in money supply will raise short-term interest rate and decrease expenditures and capital investments thereby having a lagged influence on stock returns.

Spyridis et al (2012) also set out to validate the influence of macroeconomc factors on the movement of stock returns in the Athens Stock exchange (ASE). Applying a panel data, their findings revealed that some macroeconomic variables did have some influence on the evolution of stock returns over a twelve year period from 1989 to 2010. Recording R-squared values above 0.40 for the various factors tested. This finding led to the conclusion that macroeconomic factors had information which could be useful in predicting stock market returns. Gul and Khan (2013) applied the APT to data from 2000 to 2005 of the Karachi Stock Exchange (KSE-100) but concluded that the macroeconomic factors tested had no significant relationship with the index.

3. METHODOLOGY

A. Data Series

The study generated date from secondary sources. This includes the IMF Direction of Trade Statistics Yearbook and the Central bank of Nigeria Statistical Bulletin where data on volumes and values of Gross Domestic Product, foreign exchange rates, inflation rates and net capital flow was obtained; to measure the sensitivity to a number of macroeconomic factors. Data on stock indices was sourced from stock exchange quarterly publications and nominal figures were used for study. The data was tested for stationary or the order of intergration of the data series using the augmented Dickey Fuller test. The data covers the second quarter of the year 2012 to the second quarter of the year 2014 giving the number of observations as 50.

B.Theoretical Framework

The methodology adopted by this study was anchored on Market Model. The model provides an underlying concept that supports the analysis of investment portfolios. It explains the realized returns by capturing a linear relationship with realized returns on the market.

The model is given as:

$$R_i = \alpha_i + \beta_i R_M + \varepsilon_i \quad \text{..... (1)}$$

Where $R_i$and $R_M$are the realized returns on share i and the market respectively. α_i and β_i are constants. ε_i is a random variable uncorrelated with and having a distribution with zero expected value.

The Macroeconomic variables given by the vector, (F_1, $F_{2.....}$ F_k) of each security has k sensitivities (β_1, β_2, ...β_k) then, the K factor model takes the following form:

$$R_{it} = \alpha_{it} + \beta_{1i}F_{1t} + \beta_{2i}F_{2t} + \beta_{ki}F_{kt} + \varepsilon_{it} \quad \text{..... (2)}$$

When returns are generated by multi-factors, equation (1) is obtained. Since this equation is a straight-line, there will be a linear relationship between the expected returns and the sensitivities.

C. Model Specification and the Estimation Procedure

The relationship between stock returns and the macroeconomic variables are implicitly specified as follows:

$$R = f(\text{GDP, ER, INF, NCF}) \quad \text{.....(3)}$$

Where R is the market stock returns and the variables on the right hand side are the real Gross Domestic Product (GDP), real foreign exchange rate (ER), inflation (INF) and net capital flow (NCF).

$$R_t = \beta_0 + \beta_1 \text{LnGDP}_t + \beta_2 \text{LnER}_t + \beta_3 \text{LnINF}_t + \beta_4 \text{LnNCF}_t + \varepsilon_t \quad \text{.....(4)}$$

The effects of change in macroeconomic variables on stock returns volatility was investigated using Threshold Generalized Autoregressive Conditional Heteroscedasticity (TGARCH) model. Symmetric GARCH models would not have been appropriate since it cannot capture leverage effects. TGARCH model was estimated to capture the impact of news to macroeconomic variables on stock returns volatility. It was developed by Zakoian (1994) and Glosten et al (1993).

It explains the impact of news on volatility. The generalized version is given as:

$\delta_t^2 = w + \alpha\delta_{t-1}^2 + \gamma d_{t-1}\varepsilon_{t-1}^2 + \beta\varepsilon_{t-1}^2$ .....(5)

$d_{t-1} = \begin{cases} 1, if E_{t-1} \leq 0, bad news \\ 0, if E_{t-1} \geq 0, good news \end{cases}$ .....(6)

γ(Coefficient of the ARCH term) is the parameter which measure leverage effect or asymmetry. GARCH term coefficient (α) measures the forecast variance from last period. α + γmeasures the persistence of shocks to volatility which depends on α + γ parameters such that α + γ< 1imply a tendency for the volatility response to decay overtime, α + γ = 1 imply indefinite volatility persistence to shocks overtime, andα + γ > 1 imply increasing volatility persistence overtime. The presence of volatility persistence is a sign of market inefficiency. When γ is significant and positive, negative shocks have a larger effect on volatility (δ_t^2) than positive shocks (Carter, 2007; Evans et al, 2014).

Engle-Granger two-step method was used to establish long run relationship which is residual based approach determining co-integration among the variables. After establishing the existence of co-integration among variables, an Error Correction Model was estimated to test for the short and long-run dynamics. An error correction model was formulated by regressing the first differences of the dependent variable on the values of the first difference of the explanatory variables plus the lagged value of the ECM as shown in equation (6)

$R_t = \beta_0 + \beta_1\Delta LnGDP_t + \beta_2\Delta LnER_t + \beta_3\Delta LnINF_t + \beta_4\Delta LnNCF_t + \lambda Ecm_{t-1} + \varepsilon_t$.....(6)

4. PRESENTATION OF RESULT

A. The relationship between Macroeconomic Variables and Stock Returns

The relationship between the stock returns and the macroeconomic variables was established by estimating a regression equation. This requires regressing differenced value of stock returns on the first difference vales of log of Gross domestic Product, log of exchange rate, log of inflation and log of net capital flow. The results are presented in Table 1.

Table 1: Determinants of Stock Returns (2012 - 2014)

Variable	Coefficient Estimates	t-statistics	P-value
Differenced Log of Gross Domestic Product	0.03981	1.6324	0.113
Differenced log of Exchange Rate	-1.354***	-4.433	0.000
Differenced log of Inflation	0.0366	1.275	0.211
Differenced log of Net Capital Flow	0.5233	1.465	0.102
Error Correction Term	-0.761***	-4.943	0.000
Constant	0.013	0.341	0.656
Adj. R^2	0.490	0.490	0.490
F-statistic			
Durbin Watson	1.932	1.932	1.932

***P<0.01, **P<0.05, *P<0.1

It is evident from the table above that 49% of the variations in the value of stock returns were explained by GDP, Exchange rates, Inflation and Net Capital Flow. The F-statistic is significant (P<0.01) which shows that there was a relationship between the stock returns and the selected macroeconomic variables. The value of Durbin-Watson statistic is 1.9 hence, model is not susceptible to autocorrelation problem (since DW ≈ 2.0).

A percentage increase in depreciation of a domestic currency predicts stock returns to decease by 1.3 percent. First difference values of log of inflation rate, log of Gross Domestic Product, log of Capital Flow show no effect on the first difference values of stock returns. The insignificant effect of these variables on stock returns may be attributable to the influence of other internal and external macroeconomic factors namely, budget deficits, balance of trade, changes in oil prices on the stock market return which were not captured in this study. The coefficient of the error correction term in the model is negative and statistically significant (P<0.01). The estimated coefficient value of -0.76 of error correction mechanism (ECM) suggests that the system corrected its previous period's disequilibrium from the long-run estimates by 76% quarterly. The high significance of the coefficient of ECM term supports the existence of a long-run equilibrium relationship between stock returns and the macroeconomic variables which influences it.

Table 2. TGARCH Estimates for Gross Domestic Product and Stock returns Relationship

Variable	Coefficient	z-statistics	p-value
Constant (w)	0.006	1.524	0.1730
GARCH Term (α)	-0.058	0.114	0.4617
Leverage effect or ARCH Term (γ)	1.044**	2.096	0.0430

***P<0.01, **P<0.05, *P<0.1

The TGARCH results provide evidence that news impact is asymmetric since $\gamma \neq 0$. The coefficient of leverage effect γ is significant and positive (P<0.05) meaning that negative shocks had a larger effect on volatility (δ_t^2) than positive shocks. This is an indication that bad news increase volatility in the market implying that there is existence of leverage effect. The significance is also further evidence that bad news has a significant impact on stock return volatility than good news. Volatility persistence was absent since $\alpha + \gamma$is significant.

Table 3. TGARCH Estimates for Exchange rate and Stock Returns Relationship

Variable	Coefficient	z-statistics	p-value
Constant (w)	0.006	1.511	0.347
GARCH Term (α)	-0.054	-0.335	0.435
Leverage effect or ARCH Term (γ)	1.914*	1.794	0.071

***P<0.01, **P<0.05, *P<0.1

Exchange rate γ was significant and positive (P<0.1) which lends credence to the presence of leverage effect. The significance of this coefficient implies that negative shocks (bad news) have a larger effect on the conditional variance (volatility) than positive shocks (good news) of the same magnitude. There was absence of volatility persistence as the value of α + γ was not important.

Table 4. TGARCH Estimates for Inflation rate and stock Returns Relationship

Variable	Coefficient	z-statistics	p-value
Constant (w)	0.006	0.118	1.473
GARCH Term (α)	-0.054	0.661	-0.392
Leverage effect or ARCH Term (γ)	0.890	0.043	2.022

***P<0.01, **P<0.05, *P<0.1

The effect $\gamma \neq 0$ and significant which suggest the presence of leverage effects in the returns series and that bad news had a larger impact on stock return volatility. Also, being significant implies that these effects are more pronounced during the sample periods. Volatility persistence is not reported since its coefficient is insignificant.

5. SUMMARY, CONCLUSION AND POLICY IMPLICATION

A. Summary

This study examined the relationships between the NSE stock returns and a set of macroeconomic variables during the period of January 2012 to June 2014. The time series data set employed in this study comprised the quarterly observations of the NSE, real Gross Domestic Product (GDP), real foreign exchange rate (ER), inflation (INF), net capital flow (NCF) and External reserve (ETR). Engle-Granger two-step method test was used to examine the existence of long run relationship among the variables. Error correction model was used to investigate the speed of adjustment of the co-integrating variables. Volatility of stock returns in response to changes in macroeconomic variables was traced by TGARCH model which was estimated in this study.

B. Conclusion

There is a negative relationship between stock returns and the exchange rate. It is concluded that exchange rate affects stock returns. Other macroeconomic variables were not important in explaining stock returns. The effect of changes in macroeconomic variables on volatility of stock returns revealed that negative shocks (bad news) or negative news about changes in macroeconomic variables under study had a larger effect on the conditional variance (volatility) of stock returns than positive shocks (good news) of the same magnitude.

C. Policy Implications

The government should put in place appropriate policy measures to ensure that the exchange rate is stabilized. This is because empirical evidence from study has shown that exchange rate affects stock returns. Depreciation in the exchange rate leads to a decline in returns and once the currency is stabilized, it will create investors' confidence. The government should seek to minimize fluctuations of the variables ; exchange rate, GDP growth and the interest rates through external reserve.

This is because empirical findings revealed that NSE is volatile which is as a result of fluctuations in macroeconomic variables.

REFERENCES

1. Ashaolu, T.O., & Ogunmuyiwa, M.S. (2011). An Econometric Analysis of the Impact of Macro Economic Variable on Stock Market Returns, Journal of Empirical Finance, 13, 6 477-457
2. Asprem, M. 1989, "Stock Prices, asset portfolios and macroeconomic variables in ten European countries", Journal of Banking and Finance, 13, 589-612.
3. Brunner, k. (1961) Some Major Problems in Monetary Theory, American Economic Review. 4, 47-56
4. Campbell, J. (1987) Stock Returns and the Term Structure, Journal of Financial Economics, 18: 373-399.
5. Chen, Roll & Ross (1986) Economic forces and the stock market. Journal of Business 39 (3): 283-403.
6. Cheng, A.C.S. (1995) The UK Stock Market and Economic Factors: A New Approach. Journal of Business Finance and Accounting. 22 (1): 129-142
7. De Grauwe P. (2005), Economics of Monetary Union (Oxford University Press).
8. Drabenstott, T.G. and Meeker O.P (1999) Stock Returns, Stock Pricing and Economic Growth, Review of Financial Studies, 21, 1187-1222.
9. Evans, T.M. and Kenneth B., (2014). Volatility and Investment: Interpreting Evidence from Developing Countries. Economica, 60, 57-70.
10. Gupta, R., and M.P. Modise, 2013, "Macroeconomic variables and South African stock Return Predictability", Economic Modelling, 30, 612-622
11. Karolyi, C. (2011), The Causes of Volatility in a Small Internationally Integrated Stock Market: Ireland. Journal of Financial Research, 21.
12. Najand, M & Rahman, H (1991) Stock Market Volatility and Macroeconomic Variables: International Evidence. Journal of Multinational Financial Management, 21, 1-19.
13. Ozcam, M. (1997) An Analysis of the Macroeconomic Factors that Determine Stock Return in Turkey. Capital Market Board of Turkey Publication No. 75
14. Poon, S. & Taylor, S.J. (1991) Macroeconomic Factors and the UK stock Market. The Journal of Business Finance and Accounting 18(5), 619-636.
15. Rizwan, M.F and Khan, S.U. (2007). " Stock return Volatility in Emerging Equity Market (Kse): the Relative Effects of Country and Global factors", International Review of Business Research Papers, 3(2), 362-375
16. Sally J.K. (2011) Macroeconomic Determinants of Stock Market Returns, Asian Journal of Social Studies. 44 (9), 63.
17. Schnabl, G. (2007). Exchange Rate Volatility and Growth in Small Open Economies at the EMI Periphery. ECB Working Paper, No.773.
18. Spyridis, t., Z. Sevic, and N. Theriou, 2012, "Macroeconomic vs. Statistical Approach in the Athens Stock Exchange", International Journal of Business, 17 (1), pp. 39-64.
19. Tursoy, T., Gunsel, N. & Rjoub, H. (2008) Macroeconomic Factors, the APT and the Istanbul Stock Market. International Research Journal of Finance and Economics ISSN 1450-2887 Issue 22.
20. Zhou, C. (1996) Stock Market Fluctuations and the Term Structure, Board of Governors of the Federal Reserve System, Finance and Economics Discussion Series: 96/03.