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A Panel Data Analysis of the Impact of Macroeconomic Indicators on Firms' Shares Performance in Nigeria

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Abstract: This paper contributes to the ongoing debate on whether the impact of macroeconomic indicators on the stock market is positive or negative or of no effect by analyzing the relationship between macroeconomic fundamentals and performance of quoted firms on the Nigeria Stock Exchange market. A sample of fifty (50) quoted firms across eight (8) major sectors of the market was selected for the study. The static panel regression technique was employed on monthly data sourced from the Nigeria Stock Exchange (NSE) and the Central Bank of Nigeria (CBN) between 2007:1 and 2013:12. Results from empirical findings reveal that varying impacts exist between the macroeconomic indicators and firm share returns in Nigeria. It goes further to affirm that inflation rate, interest rate and exchange rate are the major significant macroeconomic indicators driving firm share returns in Nigeria.

Keywords: Macroeconomic Indicators; Firm Share Returns; Nigeria

JEL Classification: E44; G12

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1. Introduction

Stock market all over the world be it in developed or developing and emerging market economies is an avenue where funds are pooled and channeled for investment purpose. The market plays a dominant role of financial intermediation by channeling idle funds from the surplus areas to the deficit units of the economy and thereby promoting economic growth and development. The stock market promotes economic growth by providing an avenue to pool large and long term capital through issuing of shares, stocks, bonds and other equities for firms and industries in dire need of finance to expand their businesses and governments for the development of infrastructures or to cover other social overhead costs. Thus, the overall development of the economy is essentially a function of how well the stock market performs. In addition, the growth of any nation is inextricably linked to the sophistication of its financial market and specifically its capital market efficiency.

With increased monetization of the Nigerian economy particularly after the deregulation of the economy in 1986, the Nigeria Stock Exchange (NSE) has been contributing immensely to the growth of the Nigerian economy through capital formation. This is made possible through the movements of millions of stocks that exchange hands on daily basis at the exchange. These stocks are highly sensitive

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to changes in macroeconomic fundamentals of the economy and to the changes in expectations about future prospects.

No doubt, domestic economic fundamentals play a determining role in the performance of the stock market. However, with increased globalization of the economy, domestic economic indicators are also subject to contagion effects and external shocks arising from changes in policies adopted or expected to be adopted by other countries or some global events. The commonest among the external factors influencing stock returns are stock prices in the global economy, interest rate and exchange rate. Contagion effects of oil price shock also influence stock returns in oil dominated economies like Nigeria since the oil price is determined externally by Organization of Petroleum Exporting Countries (OPEC). OPEC's determination of the oil price and production benchmark is a function of the demand and supply conditions in the oil market.

The recurring changes in the oil price particularly for oil dominated economies affect major economic indicators including the stock market returns. In the same vein, capital inflows and outflows are not determined only by domestic interest rate within the economy but also by changes in the interest rate in major economies of the world. Contagion effects of inflation from other countries particularly the country's trading partners also impact on the domestic price level and consequently its exchange rate. This becomes more serious for an import dependent economy like Nigeria that stands the risk of being affected by imported inflation from other countries. Hence, both internal and external macroeconomic fundamentals impact on stock returns in the domestic economy and this study attempts to capture this domestic and foreign influence on the Nigerian stock market returns.

The rest of the paper is organized as follows: Section 2 provides the review of empirical literature/evidence. Section 3 discusses the methodology and empirical findings, and section 4 concludes the study.

2. Review of Empirical Studies

Finance literature is replete with studies on the relationship between macroeconomic indicators, share returns and share prices in developed and developing countries as well as in Nigeria. Notable among them is the work of Maysami and Koh (2000). The authors affirm that the Singapore stock market is co-integrated with changes in price levels, money supply, short and long-term interest rates, and exchange rates. Sharpe (2002) suggests that rise in expected inflation reduces equity prices in the U.S. Also, Muradoglu, Taskin and Bigan (2000) examine the long run relationship between stock returns and three monetary variables for the period 1988-1995 and find that the sample period shows no co-integrating relationship. The study conducted by Dreisprong, Jacobsen and Benjiman (2003) examine whether future stock market returns can be predicted based on past oil price changes. They tested if monthly oil price changes can predict stock returns worldwide. Using data from eighteen developed countries and thirty emerging market economies, they find significant predictability in twelve of the eighteen developed countries. Emerging markets equally show the same effect, though with less significance.

The empirical work of Cologni and Manera (2008) analyze the effect of macroeconomic variables on stock prices in G-7 countries and therefore suggested that for all countries except Japan and UK, the null hypothesis of an influence of oil prices on the inflation rate could not be rejected. Kilan (2008) also estimates the effect of exogenous shocks to global oil production on inflation and real output in G-7 countries and claimed that an exogenous oil supply disruption typically causes a temporary reduction in real GDP growth. The study of Park and Rati (2008) reveal that oil price shocks had a statistically significant impact on real stock returns in the US and 13 European countries while there was little evidence of asymmetric effects on real stock returns of positive and negative oil price shocks for importing European countries. Xiufang (2010) in the course of studying the relationship between economic activities, stock price and oil price in Russia, China and Japan discovered that there is a long run relationship among the three variables.

Singh *et al.* (2012) also conducted a study on the influence of exchange rate and inflation on the performance of Bombay Stock Exchange (BSE) Sensex. The study employs regression analysis on monthly time series data from April, 2007 to March, 2012. The results reveal that inflation and exchange rate significantly affect the performance of BSE sensex. Also, Priyanka and Kumar (2012) observe among other factors that exchange rate, gold price and inflation have significant effects on the Indian Capital Market. Serife and Ugur (2012) examine the effects of selected macroeconomic variables such as inflation and exchange rate, interest rate, current account deficit and unemployment on stocks of 45 companies from 11 sectors in Bosnia and Hezegovinia from 2005:2 to 2012:5. The results indicate that exchange rate and interest rate are the most significant factors influencing stock price fluctuations of the companies. Other studies that have established a relationship between stock market and macroeconomic variables include Booth and Booth (1997), Wongbanpo and Sharma (2002), Onwusu-Nantwi and Kuwornuo (2011) and Naliniprava (2011).

Most of the above mentioned studies are related to the economies of advanced countries or emerging market economies in Asia and other parts of Europe. There is need to exercise caution in applying the findings from these studies to the economies of Sub-saharan countries because of the region's peculiarities and structural differences. In Nigeria, an attempt was made by Ologunde, Elumilade and Asaolu (2006) in their study of the effect of interest rate on market capitalization; the study however fails to consider the influence of other macroeconomic factors. Several other attempts made to examine the relationship between stock market and macroeconomic variables include Asogu (1991), Oresotu (1992), Ogigio (1988), Alile (1992), Daferighe and Aje (2009), Adaramola (2011) and Asaolu and Ogunmuyiwa (2011), but these studies either considered one or few of the macroeconomic variables in relation to stock movements or examined the variables' impacts on share price or stock index taken singularly.

Murtala *et al.* (2012) investigate the impact of crude oil price and stock price on some selected macroeconomic indicators in Nigeria using co-integration and error correction on time series data from 1980 to 2010. The findings reveal that crude oil price, stock price and exchange rate are significant in determining the growth of the Nigerian economy.

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Amadsu (2012) analyzes the impact of interest rate, inflation and exchange rate on stock market index in Nigeria using co-integration on annual data between 1975 and 2009. The findings reveal that some relationships exist among the variables, albeit not significant.

Ogunmuyiwa (2016) in a recent study on Macroeconomic Indicators and Firms' Shares Performance in Nigeria applied a wide range of econometric techniques such as Co-integration, Vector Error Correction Method, Difference and Systems GMM and Granger Causality test on times series and panel data between January 2007 (2007, p. 1) and December 2013 (2013, p. 12). The findings reveal that varying impacts exist between macroeconomic indicators and firm share returns on one hand and stock market index on the other hand. The study concludes that Inflation rate, interest rate and crude oil price are however found to exert strong and significant influence on firm share and stock market performance in Nigeria.

3. Methodology and Empirical Findings

3.1. The Model

This study relies on the Arbitrage Pricing Theory (APT) which uses multiple risk factors to explain security returns of an asset as the theoretical framework. Under the APT, the sensitivity of an asset's return to each factor is estimated. For each firm there will be as many betas as number of factors. For this study, a sample of fifty (50) firms that are traded at least once in a month was purposively selected from eight (8) different sectors out of a total population of two hundred and sixty five (265) firms quoted on the Nigeria Stock Exchange. The sampled sectors are banking, breweries and distilleries, consumer products, insurance, building materials, pharmaceuticals, other financial institutions and oil and gas.

A static panel data regression model was used to capture the impact of macroeconomic variables on firm's share returns using data from 2007:1 to 2013:12. The panel data regression model is specified as follows.

$$\ln FSP_{it} = \beta_{0i} + \beta_1 \ln CPI_{it} + \beta_2 \ln INT_{it} + \beta_3 \ln EXR_{it} + \beta_4 \ln MS_{it} + \beta_5 \ln COP_{it} + + + + \epsilon_{it} \dots\dots\dots (1)$$

Where   ln = natural logarithm

FSP_{it} = firm share performance for i company at time t,

CPI_{it} = consumer price index for company i at time t

INT_{it} = interest rate for company i at time t

EXR_{it} = exchange rate for company i at time t

MS_{it} = money supply for company i at time t

COP_{it} = crude oil price for company i at time t

ϵ_{it} = error term of the regression

β_0 = is the intercept of the regression and

β_1 - β_5 are the coefficients of variables.

For meaningful analysis, the panel data regressions were carried out on the overall fifty (50) firms being sampled to determine the effect of macroeconomic indicators on firm share returns.

(i) The Firm Share Performance (FSP) was measured using the firm share returns of individual companies selected in the sampling process. (ii) Monthly Consumer Price Index (CPI) was used to measure the rate of inflation from the overall point of the economy.(iii)   Monthly Treasury Bill Rate (TBR) is used to measure interest rate. (iv) Exchange Rate was measured by nominal exchange rate on monthly basis. (v) Broad money (M_2) was used to measure money supply on monthly basis. (vi) Month end crude oil price per barrel was used to measure the price of crude oil. In a-priori terms, the following relationship is expected among the variables

$$\beta_1 < 0; \ \beta_2 < 0; \ \beta_3 < 0 \quad and \quad \beta_4 > 0; \ \beta_5 > 0\ldots\ldots\ldots\ldots\ldots\ldots\ldots. (2)$$

3.2. Findings from Empirical Results

Table 1. Descriptive Statistics on FSR and Systematic Risk Factors

Variables	Observation	Mean	Std Dev	Min	Max
Firms	4200	25.5	14.4325	1	50
Year	4200	2010	2.0002	2007	2013
T (month)	4200	42.5	24.2498	1	84
FSR	4200	38.7478	83.3743	.09	1249.5
CPI	4200	10.6176	2.6626	5.4	13.93
COP	4200	94.1098	23.3797	44.95	138.74
EXR	4200	148.7113	17.0706	118.11	180.63
INTR	4200	21.8654	2.3451	17.17	25.11
MS	4200	32.1584	81.5771	5.56	1284
New t	4200	605.5	24.2498	5644	647

Source: Authors Compilation, 2016.

Before proceeding to actually analyze the impacts and interactions between macroeconomic indicators and firm share performance, the summary of the panel regression output as provided in table 1 need be discussed. The total number of observation of 4200 has a mean of 25.5 and a standard deviation of 14.43. The mean year sampled is 2010, that is, the break point period between the minimum (2007) and maximum (2013) years sampled is 2010. Firm share return has a mean of 38.74, a standard deviation of 83.37 and minimum and maximum values of 9 Kobo and N1249.5 respectively. This indicates that from the 50 firms sampled, the average share returns is N38.74 and the minimum share price is 9 Kobo characterized by share prices in the insurance sector and a maximum share price value of N1249.5 represented by the share price of Nestle Nigeria PLC. The summary also shows that the average inflation rate proxied by CPI for the sampled period is 10.61 percent with a minimum and maximum inflation rates between 2007 and 2013 of 5.4 and 13.93 percent respectively. Crude oil price has a mean price of $94.10 with a lowest price of $44.95 and a maximum of $138.74 throughout the sampled period. The average exchange rate of the naira to the dollar stands at N148.71 to the dollar with N118.11as lower bound and N180.63 as upper bound. The average interest rate stands at 21.86 percent with a lower limit

of 17.17 percent and an upper limit of 25.11 percent. Average money supply growth rate stood at 32.15 percent with minimum and maximum values of 5.56 and 12.84 percent respectively.

Table 2. Static Effect Regression Results (2007, pp. 1-2013, p. 12)

Dependent Variable: lnFSR

Variables	POOLED EFFECT		FIXED EFFECT		RANDOM EFFECT	
	Coeff	P-values	Coeff	P-values	Coeff	P-values
lnCOP	-.2172 (.-1.99)**	0.047	-.1287 (-3.34)***	0.001	-.1289 (-3.34)***	0.001
lnCPI	-.5860 (-3.62)***	0.000	-.4803 (-8.41)***	0.000	-.4805 (-8.41)***	0.000
lnINTR	-.3922(.-0.74)	0.461	-.4891(-2.61)***	0.009	-.4889 (-2.61)***	0.009
lnEXR	-2.092 (-3.68)***	0.000	-1.6553 (-8.25)***	0.000	-1.6561 (-8.24)***	0.000
lnMS	-.1252 (-2.03)**	0.043	-.0145 (-0.67)	0.504	-0147 (.0218)	0.498
Cons	16.7976 (7.59)	0.000	13.9294 (17.81)	0.000	13.9349 (.8075)	0.000

*T-values are in parenthesis. Author's computation, 2016. ***, ** and * indicate significance at 1, 5 and 10 percent respectively.* Source: Authors Compilation, 2016.

The pooled regression results show that inflation rate proxied by consumer price index, interest rate and exchange rate are correctly signed based on theory and are in line with a-priori expectation while crude oil price and money supply are not in conformity with a-priori expectation. These varying impacts are in conformity with the earlier finding of Adaramola (2011). The coefficients of the variables are inelastic with the exception of exchange rate with a coefficient of 2.09. This justifies the fall in the value of the naira with respect to major international currencies in the world during the sampled period. The t-statistics show that crude oil price is significant at 5 percent, inflation at 1 percent, exchange rate at 1 percent and money supply at 5 percent while interest rate is found to be insignificant. The R^2 and adjusted R^2 stand at .051 and .050 respectively and this indicates that approximately 50 percent variation in firm share returns is being jointly explained by the explanatory variables. The F-statistics of 45.37 also confirms the significance of the parameter estimates in the regression at 1 percent. The fixed effect results from table (2) depict a similarity with the pooled data results, albeit with a moderate difference. Inflation rate, interest rate and exchange rate maintain their signs in line with theoretical expectation. This finding is consistent with Serife and Ugur (2012), Singh et al. (2012), Sharfe (2002) and Tangard (2002). Equally, crude oil price and money supply maintain their signs but not in conformity with a-priori expectation. The explanatory variables including interest rate are significant at 1 percent with the exception of money supply which remains insignificant. The R^2 within and between still confirms that 50 percent variation in firm share returns is explained by the joint factors and F-value of 358.35 is found to be significant at 1 percent confirming the robustness of the overall regression parameters in the model.

The random effect outcomes by observation show no significant difference with the fixed effect results. All the variables almost maintain their outcomes. Inflation rate, interest rate and exchange rate are correctly signed in line with theory and significant at the one percent level. This outcome is in confinement with Serife and Ugur (2012), Singh et al. (2012), Sharfe (2002) and Tangard (2002). Crude

oil price and money supply are not correctly signed but crude oil price is significant at 1 percent and money supply remains insignificant at permissible levels. The R^2 still confirms that 50 percent variation in the dependent variable is explained by the explanatory variables. The Wald Chi test of 1788 is significant at 1 percent. This confirms the robustness of the regression parameter estimates. The Hausman test as propounded by Hausman (1978) is formulated to assist in making a choice between fixed and random effect approaches. The test compares the estimated (β) and Variance (β) of fixed with random effects i.e. it compares the constant estimates and the standard errors of regression of both fixed and random effects to know if the difference is large. From the Hausman test outcome, the difference between the statistics is not large and therefore insignificant with a calculated value of $Chi^2 = 0.05$. Hence, the random effect is more appropriate.

4. Conclusion and Policy Recommendations

The study on the relationship between firms shares returns and macroeconomic indicators in Nigeria shows that a significant relationship exist between macroeconomic indicators and the companies sampled. Albeit, varying impacts exist, findings from the pooled, fixed and random regressions affirm that inflation rate, interest rate and exchange rate are the most significant macroeconomic indicators determining movements in share returns and prices in the stock market of the Nigerian economy. Sequel to the outcomes of this study, it thus shows that the Nigerian stock market is highly sensitive to macroeconomic indicators. Hence, to improve portfolio performance, investors in the Nigeria stock market need to be cognizant of the varying impacts of macroeconomic indicators particularly those that have been found to exert strong influence on stock returns like inflation rate, interest rate and exchange rate. The varying impacts of macroeconomic indicators on stock returns also signal that investors can diversify and shuffle their portfolio investment strategies through risk return trade off. In an economy like Nigeria that heavily depends on oil revenue, practical and urgent steps need to be taken to develop alternative sources of revenue. Fall in oil prices spells doom for an oil dependent economy like Nigeria. The sensitivity to oil volatility and other contagion effects can be reduced if the vast non-oil avenues available locally can be explored.

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