Empirical Relationship between Stock Exchange Transactions and Key Macroeconomic Variables in Nigeria

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Abstract

The study determined the influenced of some macroeconomic variables on the government stock, industrial/equities stock and total stock transactions in the Nigerian stock exchange market. Time series data were used in the study that covers the period 1970 to 2010. Unit root test (Augmented Dicker Fuller test) conducted on the data shows that some were stationary at levels and some were not. Double log multiple linear models were specify and estimated using ordinary least squares technique. The empirical results reveal that inflation; domestic savings, nominal exchange rate of ₦/$, value of total import and liberalization period are significant macroeconomic variables affecting the value of industrial/equities trading in the Nigerian stock exchange market. Also, external debt, nominal exchange rate, external reserves, and industrial capacity utilization rate are significant macroeconomic variables that affect the value of government stock transaction in the stock market. The study further reveals that the value of total stock transaction is significantly affected by inflation rate, domestic savings, oil revenues, and industrial capacity utilization rate. The result calls for a long term policy package that should focused on stabilization of real and monetary policy variables in the Nigerian economy. Also, institutional and operational reforms in the country's capital market are inevitable in a bit to increase the subsector's efficiency.

Key Words: Stock market, macroeconomic, government stock, industrial stock, liberalization period, variables

1.0 INTRODUCTION

Stock market transaction plays a critical role in stimulating economic activities in most developing economies through mobilization of fund to real sector and in supporting government capital and deficit expenditures (Ndi Okereke, 2010). Basically stock exchange market serves as a channel through which surplus funds are moved from lender-savers to borrower-spenders who have shortage of funds (Black, 1988). It provides a platform to individuals, governments, firms and organizations to trade and invest in savings through the purchase of shares. The Nigerian Stock Exchange started as the Lagos stock exchange in 1960; and later in December 1977 it became "The Nigerian Stock Exchange" with branches established in some of the major commercial cities of the country. The Nigerian stock exchange is a private, non-profit making organization, limited by guarantee. It was incorporated through the inspiration and support of businessmen and the federal government through the Central Bank of Nigeria, but presently owned by over 300 members. At present, there are ten branches of the Nigerian Stock Exchange. The branches are in: Lagos established in 1961; Kaduna in 1978; Port Harcourt in 1980; Kano in 1989; Onitsha in 1990; Ibadan in 1990; Abuja in 1999, Yola in 2002 and recently in Ilorin and Uyo in 2004.

The relationship between macroeconomic factors and activities of the stock market development has mixed responses from researchers and operators of the system. Most studies suggest that key macroeconomic fundamentals like overall economic growth, inflation rates, gross domestic product, exchange rates, interest rates, current account, money supply, monetary policy, government fiscal policy, public indebtedness, and taxation policies among others have significant influence on the stock movements or market capitalization (Kurihara, 2006 and Ologunde et al., 2006). Maintaining macroeconomic stability through the achievement of the basic economic objectives has been among the major challenges facing most developing countries (Iqbal, 2001). It is believed that government policies and macroeconomic events have large influence on general economic activities including the stock market transaction. This has motivated many researchers to investigate the dynamic relationship between stock market transactions and macroeconomic variables fluctuations (Aydemir and Demirhan, 2009). For instance, Chen et al., (1986) established an empirical linked among some macroeconomic variables and stock returns in the US stock markets. The result shows that changes in risk premiums, industrial production, and changes in the term structure positively correlate with the expected stock returns, while both the anticipated and unanticipated inflation rates negatively relate to the expected stock returns. Hamao (1988) shows that inflation rate significantly influenced Japanese stock returns. Mukherjee and Naka (1995) found that exchange rate positively relates to stock prices in Japan and Indonesia. On the contrary, Soenen and Hennigar (1988) reported that US dollar effective exchange rate negatively affected US stock market index during 1980 to 1986. Atje and Jovanovic (1993) and Levine and Zervos (1996) found a significant association between economic growth and the value of stock market for over forty countries in the period 1976 to 1993. Wongbangpo and Sharma (2002) examine the effects of long term interest rates on stock prices in five Asian countries. A negative long term linkage between stock price and interest rate was observed in the Philippines, Singapore and Thailand. However, a positive relation was detected in Indonesia and Malaysia. Maysami et al., (2004) established that the Singapore's stock market is significantly affected by changes in the short and long-term interest rates, industrial production, price levels, exchange rate and money supply. Nishat and Shaheen, (2004) in Pakistan found a significant negative long-term equilibrium relationship between inflation and Stock Exchange Index. Industrial production however exhibited a positive influence on the stock exchange.

In Ghana Adam and George (2008) examine the effect of macroeconomic variables on the movement of stock prices. They established that in the short-run, inflation and exchange rates matter for share price movements in Ghana, however, interest rate and inflation prove very significant in the long-run. Mahmudul and Gazi (2009) in their study (based on the monthly data from January 1988 to March 2003) found that interest rate exerts significant negative relationship with share price for markets in Australia, Bangladesh, Canada, Chile, Colombia, Germany, Italy, Jamaica, Japan, Malaysia, Mexico, Philippine, South Africa, Spain, and Venezuela. Rahman et al., (2009) explores the interactions between selected macroeconomic variables and stock prices in Malaysia. Their result shows that changes in Malaysian stock market index have stronger dynamic interaction with reserves and industrial production index as compared to money supply, interest rate, and exchange rate. Lijuan and Xu (2010) show that China's stock prices are significantly affected by exchange rates, interest rates, macroeconomic prosperity index, consumer's confidence index and the corporate goods price index. Khrawish1 et al., (2010) in Jordan examines the effect of interest rates on the stock market capitalization rate in Amman Stock Exchange (ASE) in the period 1999-2008. The result revealed that there is significant and positive relationship between government prevailing interest rate and stock market capitalization rate. The study also shows that Government development stock rate exerts negative influence on stock market capitalization rate and the prevailing interest rate. Hsing (2011) in Hungary discovered that stock market index has a positive relationship with real GDP, the ratio of the government debt to GDP, the nominal effective exchange rate and the German stock market index, a negative relationship with the real interest rate, the expected inflation rate and the government bond yield in the euro area, and a quadratic relationship with real M_2 money supply.

In Nigeria, Ologunde et al., (2006) examined the relationships between stock market capitalization rate and interest rate in Nigeria. They employed the ordinary least-square (OLS) regression method and found that the prevailing interest rate exerts positive influence on stock market capitalization rate. Also, that Government development stock rate exerts negative influence on stock market capitalization rate. Augustine and Salami (2010) analyzed the impact of stock market development on long-run economic growth in Nigeria. The regression result showed that stock market size and turnover ratios are positive in explaining economic growth, while stock market liquidity coefficient was negative in explaining long-run growth in Nigeria.

Despite numerous literature on the relationship between stock exchange transaction and macroeconomic variables, few literature exist on Nigeria. Stock exchange market in Nigeria is seen as an emerging financial super power, that

if its potentials are well harnessed, it could speed up the country economic development as well as been a good complement to formal Banking sector (Capasso, 2003 and NSE, 2008). Stock market that is well developed is expected to accelerate economic growth, by providing a boost to domestic savings and increasing the quality of investments (Singh, 1997). The stock market encourages savings by proving individual, NGO'S, firms and government with an additional financial instrument that might increase the savings rate (Levine and Zervos, 1996). Stock markets therefore are able to optimistically influence economic growth through effective mobilization of savings amongst individuals, promoting capital formation, creating wider avenues of investment, providing financial resources for public and private purpose as well as fund for development purposes. Thus, stock market promotes corporate control, by improving financial discipline, which is expected to provide the best guarantee of efficiency in the use of assets. An active stock market might be relied upon to measure the extent of industrial development and changes in the general economic activities using the stock market index (Singh, 1997, and Obadan, 1998). Providing wide marketability to securities, liquidity creation, foreign inflows, risk diversification and investment priorities as well as safety are some of the additional contributions of stock markets to economic growth (Demirguc-Kunt and Levine, 1993 and Osinubi, 2001). Given the multifarious roles played by the stock market, its efficiency can only be strengthen by sound economic policies, strong financial resources and institutions, political stability and increasing self reliance economies (Singh, 1999). Nigerian economy is an emerging economy that is characterized by fluctuations in some key macroeconomic variables and these play a major role in shaping the activities in the stock exchange Market in the country. Since the stock market is an integral part of the economic system, therefore understanding the relationship among individual components is a prerequisite to achieving the much needed economic development in the country. Such knowledge will ensure that only significant policy variables are used to formulate intervention policy in areas of high priority in the economy such as the stock exchange market. Therefore, the study specifically sought to determine the statistical relationship between the total stock transactions in the Nigerian stock exchange and some key macro economic variables in Nigeria.

1.1 Methodology

Study area and data source: The study was conducted in Nigeria; the country is situated on the Gulf of Guinea in the sub Saharan Africa. Nigeria lies between 4^0 and 14^0 north of the equator and between longitude 3^0 and 15^0 east of the Greenwich. Nigeria has a total land area of 923,768.622km^2 or about 98.3 million hectares, and population of over 140 million peoples (NPC, 2006). Data used in the study were from the Nigerian stock exchange annual reports account of various issues and the Central Bank of Nigeria (CBN); National Bureau of Statistics; Federal Ministry of Finance and Federal Ministry of Agriculture and Rural Development publications. The data covered the period 1970 to 2010.

1.1.1 Analytical Techniques

The result of the unit root test reveals that all the variables used in this study are not integrated of the same order [i.e. I(1)]. It therefore follows that, the application of the conventional co-integration techniques and parsimonious error correction model become inappropriate. The result of the unit root test leads to the specification of a static log linear multiple regression models as follow:

$$STCK_t = \gamma_0 + \gamma_1 TIM_t + \gamma_2 EXR_t + \gamma_3 PGDP_t + \gamma_4 ICUR_t + \gamma_5 INFL_t + + \gamma_6 EXDT_t + \gamma_7 OLP_t + \gamma_8 INTER_t + \gamma_9 IAGP_t + \gamma_{10} ERS_t + D + U_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..\ldots.(1)$$

Where all variables apart from dummy (D) are expressed in natural logarithm;

$STCK_t$ = Government stock, industrial/equities stock and total stock in the Nigerian stock exchange market (₦m)

TIM_t = real value of total imports (₦m)

EXR_t = nominal exchange rate of ₦/$

$PGDP_t$ = real per capita GDP (2003=100) as a proxy of aggregate demand shock (₦m/person)

$ICUR_t$ = industry's capacity utilization rate (%)

IFL_t = inflation rate (%)

$DSAV_t$ = domestic saving as a ratio of GDP

$EXDT_t$ = external debt as a ratio of GDP

OLP_t = value of oil production as a ratio of total revenue in Nigeria

$INTER_t$ = interest rate (lending rate) (%)

$IAGP_t$ = index of agricultural production

EXS_t = external reserves as a ratio of GDP

D = dummy variable which takes the value 0 during the period (1970- 1985) and 1 during   liberalization period (1986-2010).

U_t = stochastic error term and $U_t \sim$ IID $(0, \delta^2_U)$.

Ordinary Least Squares method was used to estimate equation (1).

1.1.2 RESULT AND DISCUSSION
Unit root test for variables used in the analysis

Table 1 in shows the result of ADF test for variables (logged) defined in equations (1). PC-Give 10 econometric software was used to carry out the test. The result shows that the following variables are stationary at levels: value of government stock, industrial/equities stock, value of oil production (OLP_t) and inflation rate ($INFL_t$). On the other hand, the following variables are non-stationary at level but stationary at first difference: total import (TIM_t), external reserves (EXS_t), per capita GDP ($PGDP_t$), industry's capacity utilization rate ($ICUR_t$), domestic savings ($DSAV_t$), external debt ($EXDT_t$), interest rate (lending rate) ($INTER_t$), index of agricultural production ($IAGP_t$), nominal exchange rate of ₦/$ (EXR_t), and value of total stock.

1.1.3 Regression Results
Table 2 presents result of the OLS estimates of industrial/equities stock transaction equation in Nigeria. The result of the diagnostic test revealed the R^2 of 0.979 which implies that the specified explanatory variables explain about 97.9% of the adjusted total variations in industrial/equities stock transaction in the Nigeria stock exchange market. The F-statistic of 163.8 is significant at 1% probability level, indicating that the R^2 is significant and this indicates that the equation has goodness of fit. The Durbin-Watson value of 1.90 indicates that autocorrelation is not a problem in the estimated equation. The normality test is significant at 5% probability level which confirmed the symmetry nature of the regression error term and it justifies the use of the ordinary least squares technique in estimating industrial/equities stock transaction equation in Nigeria.

The elasticity of industrial/equities stock transaction in the Nigerian stock market with respect to inflation rate ($INFL_t$) has a negative coefficient and is significant at 10% probability level. The result implies that the activities of industrial/equities stock transaction in the stock market in Nigeria decreases with increase in the national inflation rate. The finding agrees with the results reported by Chen et al., (1986) in USA; Hamao (1988) in Japan; Shahen (2004) in Pakistan; Adam and George (2008) in Ghana.

The domestic savings per GDP has a significant (at 5% level) positive effect on the industrial/equities stock transaction in the Nigerian stock market. A unit increase in the domestic savings per GDP increases the industrial/equities stock transaction by 1.325 units. The finding suggests that increases in domestic savings per GDP increases the tendency of individual with excess idle savings to invest in stock business.

The coefficient (0.609) of nominal exchange rate is statistically significant at 5% level and is positively related to the industrial/equities stock transaction. This means that the industrial/equities stock transaction in the Nigerian

stock market is inelastic with respect to the nominal exchange rate in Nigeria. The result implies that increase in the nominal exchange rate of ₦/$ decreases the value of the industrial/equities stock transaction in the stock market. The result is in line with the findings reported by Hennigar 1988 in USA; Mukherjee 1995 in Japan and Indonesia; Hsing 2011 in Hungary; Lijuan and Xu 2010 in China; and Rahmanl et al., 2009 in Malaysia and Adam and George 2008 in Ghana.

The coefficient of total import is statistically significant at 1% probability level and is positively related to industrial/equities stock transaction. This relationship implies that increase in the total import increases the industrial/equities stock transaction in Nigeria. The result indicates that a unit increase in value of total import will increase the industrial/equities stock transaction by 1.256 units. The liberalization policy period (D) has a significant negative influence on the industrial/equities stock transaction in the Nigerian stock exchange market. The finding reveals that the stock market policies embedded in the liberalization period have negative significant influence on industrial/equities stock transaction in the Nigerian stock market.

Table 3 presents result of the OLS estimates of government stock transaction equation in Nigeria. The diagnostic tests for government stock equation reveal that the explanatory variables significantly explain the total variations in the government stock transaction in the Nigerian stock exchange market. The empirical result indicates that coefficients of the external debt per GDP ($EXDT_t$), external reserves as a ratio of GDP (ERS_t), and industry's capacity utilization rate ($ICUR_t$) are positive and significant at 1%, 10%, and 10% probability levels respectively. The result implies that as these variables increase, government stock in the stock exchange market increases. For instance, as external debt increases, economic growth will likely be hinder due to insufficient fund and part of the government response might be to increases it activities in the stock market in order to raise sufficient fund to finance deficit budget. Hsing (2011) in China has reported similar result on debt/GNP and Rahman et al., (2009) in Malaysia on external reserves. On the other hand, government stock activities exhibited significant negative elastic relationship with respect to the ₦/$ nominal exchange rate in the country. The result shows that increase in the nominal exchange rate, retard the value of government activities in the stock market

Table 4 presents result of the OLS estimates of the value of total stock transaction equation in Nigeria. The diagnostic tests for the value of government stock equation confirm the reliability of estimates. However, there is evidence of autocorrelation in the time series. The empirical results reveal that inflation rate, oil revenue and lending rate of commercial Banks have significant negative relationship with the total stock transaction in the Nigerian stock exchange market. The result implies that increase in these variables will result in the reduction in the value of total transaction in the stock market. On the other hand, coefficients of domestic savings, industrial capacity utilization, and value of total import have significant positive effect on the value of total stock. It means that a unit increase in these variables will cause an increase in the total value of stock transaction in the Nigerian stock market.

1.1.4 SUMMARY AND POLICY RECOMMENDATIONS
The study determined significant macroeconomic variables that affect industrial/equities stock, government stocks, and the total stock transaction in the Nigerian stock exchange market. Time series data were used in the study that covers the period 1970 to 2010. Unit root test (Augmented Dicker Fuller test) was conducted on the data to ascertain their stationarity. The result reveals that some variables were stationary at level and some were not. This invalidates the use of co-integration and error correction models and implies that only static relationship could be established among the specified variables.

Double log multiple linear models were specify and estimated using ordinary least squares technique. The empirical results reveal that inflation; savings, exchange rate, value of total import and liberalization period are significant macroeconomic variables affecting the value of industrial/equities trading in the Nigerian stock exchange market. Also, external debt, nominal exchange rate, external reserves, and industrial capacity utilization rate are significant variables that affect government stock transaction in the stock market. Furthermore, the total stock transaction was significantly affected by inflation rate, domestic savings, oil revenues, and industrial capacity rate. The result calls for a long term policy package that should focused on stabilization of real and monetary policy variables in the Nigerian economy. Also, institutional and operational reforms in the country's capital market are inevitable in a bit to increase the subsector efficiency.

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Table 1: Augmented Dicker Fuller Unit root Test

Variables	Level	First difference	Order of integration
LnGovt stock	-4.018**	−	1(0)
Lnindustrial/equities	-3.621**	−	1(0)
LnTotal stock	-1.652	-7.538***	1(1)
LnInflation	-4.395***	−	1(0)
LnSavings	-1.743	-5.651***	1(1)
LnExt. debt	-1.013	-5.993***	1(1)
Lnoil Revenue	-6.064***	−	1(0)
LnPCRGDP	-2.232	-6.038***	1(1)
LnICUR	-1.489	-4.912***	1(1)
LnExchange rate	-2.025	-5.055***	1(1)
LnExt. Reserves	-2.425	-6.472***	1(1)
LnValue of import	-1.960	-6.943***	1(1)
LnInterest R	-1.878	-8.717***	1(1)

LnIndex of Agric. P	-2.464	-6.504***	1(1)

Note: At level, critical value at 5% = -3.52, and at 1% = - 4.20; at first difference, critical value at 5% = -3.53 and at 1% = -4.21. Asterisks * ,**and *** represent 10%, 5% and 1% significance levels, respectively. Variables are as defined in equation (1) .These tests were performed by including drift and a deterministic trend in the regressions.

Table 2: The OLS estimates of industrial/equities stock transaction equation in the Nigerian stock exchange market

Variables	Coefficient	Std. error	t-value	t- prob.
Constant	-15.579	9.489	-1.64	0.111
$LnINFL_t$	-0.327	0.184	-1.78*	0.085
$LnDSAV_t$	1.325	0.599	2.21**	0.035
$LnPGDP_t$	-0.124	0.340	-0.37	0.718
$LnICUR_t$	-0.228	0.766	-0.29	0.768
$LnEXR_t$	0.609	0.311	1.96**	0.050
$LnINTER_t$	-0.149	0.791	-0.19	0.852
$LnIAGP_t$	2.103	1.700	1.24	0.225
LnTIMt	1.256	0.274	4.58***	0.000
D (Policy period)	-1.689	0.965	-1.75*	0.090

Sigma = 0.822   **Normality test** = 0.5879 (0.0453)**
R^2 = 0.979   **Hetero test** = 0.743(0.722)
Log-likelihood = -44.45   **RESET test** = 6.652 (0.015)**
RSS = 20.991   **DW- test** = 1.9
F-statistic = 163.8***

Note: Asterisk *,** and ** represent 10%, 5% and 1% significance levels respectively. Variables are as defined in equation (1).

Table 3: The OLS estimates of the Government stock transaction equation in the Nigerian stock exchange market

Variables	Coefficient	Std. error	t-value	t- prob.
Constant	-16.84	51.14	-0.33	0.744
$LnINFL_t$	0.032	0.993	0.032	0.975
$LnEXDT_t$	2.519	0.725	3.49***	0.002
$LnOLP_t$	-0.909	3.874	-0.24	0.816
$LnEXR_t$	-3.072	1.625	-1.89*	0.083
$LnERS_t$	1.852	0.965	1.92*	0.081
$LnIAGP_t$	5.782	7.871	0.74	0.468
$LnICUR_t$	9.535	4.382	2.18**	0.038
$LnTIM_t$	-1.589	1.454	-1.09	0.283
D (Policy period)	2.234	5.110	0.44	0.665

Sigma = 4.616   **Normality test** = 7.424(0.024)***

R^2 = 0.527		**Hetero test** = 1.7143 (0.1731)	
Log-likelihood = -112.19		**RESET test** = 6.8506 (0.0139)**	
RSS = 639.30		**DW- test** = 2.2	
F-statistic = 3.709***			

Note: Asterisk *,** and ** represent 10%, 5% and 1% significance levels respectively. Variables are as defined in equation (1).

Table 4: The OLS estimates of the Total stock transaction equation in the Nigerian stock exchange market

Variables	Coefficient	Std. error	t-value	t- prob.
Constant	3.237	10.05	0.32	0.750
$LnINFL_t$	-0.314	0.177	-1.77*	0.087
$LnDSAV_t$	1.083	0.579	1.87*	0.081
$LnEXDT_t$	-0.191	0.182	-1.05	0.304
$LnOLP_t$	-0.029	0.010	-3.04***	0.000
$LnPGDP_t$	0.162	0.425	0.38	0.706
$LnICUR_t$	0.865	0.406	2.13**	0.034
$LnEXR_t$	0.597	0.544	1.10	0.282
$LnERS_t$	0.271	0.234	1.16	0.256
$LnTIM_t$	0.688	0.329	2.09**	0.046
$LnINTER_t$	-0.813	0.428	-1.90*	0.067
$LnIAGP_t$	-0.457	1.842	-0.25	0.806
D (Policy period)	-0.709	0.943	-0.75	0.459

Sigma = 0.761		**Normality test** = 1.231(0.540)***	
R^2 = 0.966		**Hetero test** = 0.228 (0.986)	
Log-likelihood = -37.95		**RESET test** = 27.068 (0.000)***	
RSS = 15.617		**DW- test** = 1.84	
F-statistic = **63.45*			

Note: Asterisk *,** and ** represent 10%, 5% and 1% significance levels respectively. Variables are as defined in equation (1).