International Journal of Business and Finance Research
Vol. 9, No. 2, 2015, pp. 69-76
ISSN: 1931-0269 (print)
ISSN: 2157-0698 (online)

IBFR
www.theIBFR.org

IMPACT OF FOREIGN EXCHANGE RESERVES ON NIGERIAN STOCK MARKET

Olayinka Olufisayo Akinlo, Obafemi Awolowo University, Ile-Ife, Nigeria

ABSTRACT

This paper investigates the relationship between foreign exchange reserves and stock market development in Nigeria over the period 1981-2011. We use a multivariate framework incorporating an interest rate variable. The results show that a long run relationship exists among exchange rate reserves, interest rates and stock market development. Foreign reserves have a positive effect on stock market growth. Bidirectional causality exists between interest rates and stock market growth. Finally, a bidirectional relationship exists between interest rates and foreign reserves.

JEL: E62

KEYWORDS: Foreign Exchange Reserves, Stock Market

INTRODUCTION

The relationship between foreign exchange reserves and stock market development has started to receive attention in the literature. The debate centers on whether foreign exchange reserves cause stock market growth or stock market growth causes foreign reserves; or whether a two-way relationship exists. The nature of the relationship between the two has significant policy implications. For example, a finding that supports positive unidirectional causality from foreign reserves to stock market is an indication that reduction in foreign reserves will adversely affect stock market. On the other hand, a unidirectional causality that runs from stock market development to foreign reserves shows that reduction in stock market activities will negatively affect foreign exchange reserves. However, if the relationship is bidirectional, it means the two are mutually beneficial.

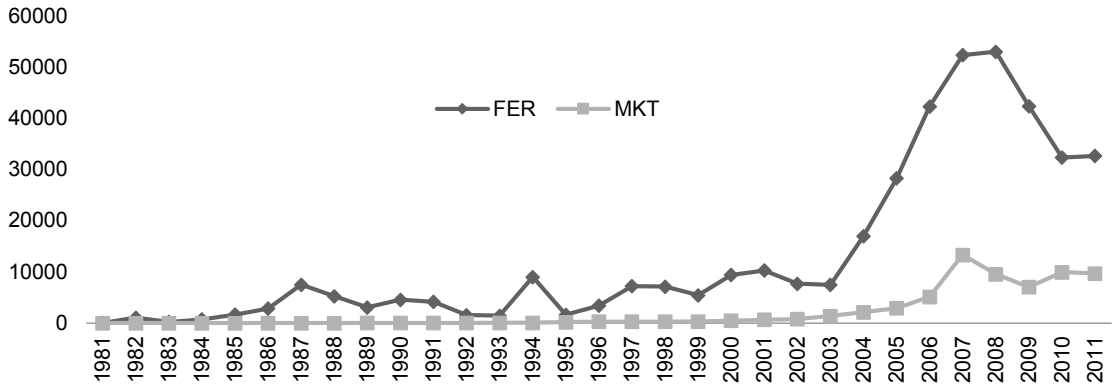
Figure 1 shows that both stock market capitalization and foreign reserves witnessed significant growth over the years in Nigeria. Total market capitalization increased from N5 billion in 1981 to N180 billion in 1995. The figure increased to N13,294.6 billion in 2007. The phenomenal increase in stock market capitalization can be attributed to the various reforms introduced by the monetary authority in Nigeria following adjustment programs in mid 1986. However, total market capitalization dropped from N13,294.6 billion in 2007 to N7,030.8 billion in 2009. The figure increased to N9,672.6 billion in 2011.

In the same vein, foreign exchange reserves showed remarkable growth over the years. It increased from $2441.60 million in December 1981 to $7,504.59 million in December 1987. The figure dropped to $1429.59 million in 1993. There was sharp increase from$1,429.59million in December 1993 to $9,009.11 million in December 1994. This was a result of stringent demand management policies introduced by the Military Government in that year. The figure increased to $10,267.1 million in December 2001 though there was a major deceleration in 1995. Foreign reserves experienced sharp increase from 2004 to 2008 but dropped in 2009 to 2011. This might not be unconnected with the world
economic recession that occurred during the end of last decade.

Interestingly, the government has introduced several measures in the recent past to enhance growth of the stock market as well as boost foreign exchange reserves. To fully understand the implication of these policies, it is important to understand the nature of the relationship between stock market development and foreign reserves. This of course constitutes the main objective of this paper.

The paper is organized as follows: in section 2, we provide a review of empirical literature on the relationship between stock market development and foreign reserves. Section 3 describes the methodology and data used in estimation. Section 4 provides the estimates and discussion of findings. Section 5 concludes the paper.

Figure 1: Plots of Foreign Exchange Reserves and Stock Market Development



This figure plots foreign exchange reserves and stock market development.

REVIEW OF EMPIRICAL LITERATURE

Many empirical works exist on the determinants of stock market developments or the impact of macroeconomic fundamentals such as inflation, exchange rate, trade balance among others on stock market development (Nishat and Shaheen 2004, Gay, 2008, Dimitrova 2005, Hussain 2009). However, few of these studies focus specifically on the nexus of the relationship between foreign exchange reserves and stock market development. Bhattacharya and Mookherjee (2003) analyzed the causal relationship between stock market and exchange rates, foreign exchange reserves and value of trade balance. They adopted the Toda and Yamamoto (1995) Granger non-causality methodology for the sample period April 1990 to March 2001. The results showed no causal link between stock prices and effective exchange rates, foreign exchange reserves as well as trade balance.

One study that examined factors that determine stock market development without necessarily incorporating foreign exchange reserves is Nishat and Shaheen (2004). They examined the impact of macroeconomic variables such as industrial product index, consumer price index and money supply on the Karachi Stock Market. The study adopted a vector error correction model and found a causal relationship between stock market development and the economy. The results showed that industrial production was the largest positive determinant of Pakistani stock prices, while inflation was the largest negative determinant of stock prices. The result showed that macroeconomic variables Granger-caused stock price movements. Reverse causality was found in the case of industrial production.

Dimitrova (2005) examined the relationship between stock prices and exchange rates using multivariate analysis for the U.S. and U.K. The results of the analysis showed that a relationship exists between exchange rates and stock markets. However, the study asserted that this relationship would be positive when stock

prices are the lead variable and negative when exchange rates are the lead variable. In the line, Doong, et al. (2005) showed bidirectional causality between stock prices and exchange rate for Indonesia, Korea, Malaysia and Thailand. However, the results showed significant negative relation between stock returns and contemporaneous change in the exchange rates for all countries studied except Thailand.

Sohail and Hussain (2009) examined the impact of macroeconomic variables on the stock market in India from 2002 and 2008. The results showed that inflation impacted stock returns negatively, while industrial production, real effective exchange rates and money supply had a significant positive effect on the stock returns in the long run. The study by Hussain (2009), focused on the impact of macroeconomic variables including foreign exchange reserves on the Kenyan stock market. The study used quarterly data for the period 1986 to 2008. The results show that after reforms in 1991, the foreign exchange rate and foreign exchange reserves had a significant effect on stock prices. However, variables such as industrial production index and capital formulation had no significant impact on stock prices.

Two known studies focused specifically on the relationship between foreign exchange reserve and stock market development. Elite Forex Signal (2013) examined the relationship between foreign exchange reserves and the Karachi stock market over the period 2001 and 2009. Using a simple linear regression model, the study showed positive but not significant relationship between foreign exchange reserves and the stock market. The study by Ray (2013) examined the relationship between foreign exchange reserves and stock market capitalization in India over the period 1990-2011. The results showed that foreign exchange reserves had a positive impact on stock market capitalization. Moreover, the results showed that there was unidirectional causality from foreign exchange reserves to stock market capitalization.

METHODOLOGY

To examine the relationship between foreign exchange reserves and stock market development a function in which stock market development depends on foreign reserves is formally stated as:

$$SMK = f(FER) \tag{1}$$

However, it is believed that other variables could have great impact on stock market growth. The omission of these variables could bias the direction of causality between stock market growth and foreign exchange reserves. In view of this, the study incorporates a control variable discount rate to avoid simultaneous bias in our regressions. Incorporation of a discount variable helps overcome the problem associated with bivariate analysis. Therefore equation (1) becomes

$$SMK = f(FER, INT) \tag{2}$$

Taking the log results in:

$$ln\, SMK_t = \alpha_1 + \alpha_2 lnFER + \alpha_3 INT + \mu_t) \tag{3}$$

Where *SMK* is stock market development incurred as market capitalization, *FER* is foreign exchange reserves and *INT* is the interest rate. In estimation, the study adopted the Engle-Granger (1987) two-step procedure. However, to test for robustness, the Johansen Juselius (1990) cointegration approach was adopted.

Data Measurement, Description and Sources

The data utilized are annual data for Nigeria over the period 1981-2011. The data are stock market capitalization, *SMK*, foreign reserves, *FER,* and interest rate, *INT*. The data were obtained from the Central

Bank of Nigeria, Statistical Bulletin (2011). All variables are expressed in logarithm. Descriptive statistics of the variables are as shown in Table 1. The descriptive statistics reveal that all the series display a high level of consistency as their mean and median are perpetually within the maximum and minimum values of the series. Also, the standard deviations are generally low showing that the deviations of the actual data from their mean values are small.

Table 1: Descriptive Statistics

	SMK	FER	INT
Mean	2078.5	12960	12.998
Median	262.60	7107.5	13.500
Maximum	13,295	53,000	26.000
Minimum	5.0000	11.000	6.0000
Std. Dev.	3733.6	16026	4.3848
Skewness	1.783	1.402	0.6702
Kurtosis	4.800	3.547	3.7772
Jarque-Bera	20.602*	10.536**	3.1008
Probability	0.00003	0.0052	0.2122
Sum	64,433	401,747	402.94
Sum Sq. Dev.	0.0000	0.0000	576.80
Observations	31	31	31

*Table 1 shows the results from descriptive statistics and the Jacque-Bera normality test. * and ** denote significance at 1% and 5% level respectively. This is established by the p-values under the Jarque-Bera values*

EMPIRICAL RESULTS

Table 2 presents the results of the unit root tests obtained using the Augmented-Dickey Fuller (Dickey and Fuller, 1979) and KPSS (Kwiatkowski-Phillips-Schmidt-Shin, 1992) tests. The results show that all the variables are integrated of order one or I(1).

Table 2: Unit Root Test

Series	ADF		KPSS	
	Level	1st difference	Level	1st difference
SMK (constant)	-0.264	-3.830	0.858	0.141
(constant and trend)	-2.885	-3.725	0.112	0.113
FER (constant)	-1.751	-4.821	0.772	0.304
(constant and trend)	-2.426	-4.950	0.085	0.135
INT (constant)	-1.847	-4.881	0.200	0.351
(constant and trend)	-1.793	-6.124	0.200	0.076

Critical values for ADF are -3.680, -2.968 and -2.623(constant only at level); -3.689, -2.972 and -2.625 (constant only at 1st difference); -4.310, 3.574 and -3.222 (constant and linear at level), (constant and linear at 1st difference)at 1%, 5% and 10% level of significance respectively. Critical values for KPSS test are 0.739, 0.463 and 0.347 (constant); 0.216, 0.146 and 0.119 (constant & linear) at 1%, 5% & 10% respectively.

Cointegration Results

As the variables are I(1) , we investigate whether or not stock market development, foreign exchange reserves and interest rate are cointegrated. To achieve this, we use the Engle-Granger two-step procedure. First, the static ordinary least squares (OLS) regression was estimated using the following equations:

$$ln\, SMK_t = \alpha_t + \beta_1 lnFER_t \quad (4)$$

and

$$ln\, SMK_t = \alpha_t + \beta_1 lnFER_t + \beta_2 lnINT_t \quad (5)$$

The results are reported in Table 3. Next, we examined the unit roots of residuals generated from the first step by using the ADF statistic. The results showed that the residuals are stationary at the 5% level of significance for equations 5 and 6 respectively. This simply means that there is a long run relationship between stock market development, foreign reserves and interest rates. The results in Table 3 show that foreign reserves have positive effect on stock market development.

Table 3 Engle-Granger First Step

Dependent Variable SMK		
	Equation 1	Equation 2
Constant	-5.359***	-2.069
	(-3.459)	(-0.810)
FER_t	1.229***	1.262***
	(6.913)	(7.232)
INT_t	---	-1.420
		(-1.595)*

*The figure in each cell is the regression coefficient while those underneath in parenthesis are t values. *** denotes significance at 1% while * denotes significance at 12% level.*

To check for robustness of the results, the study further employed Johansen-Juselius (1990) cointegration testing technique using the trace and the maximum eigenvalue statistics. The results are reported in Table 4. The results show that the null hypothesis of no cointegration can't be rejected at the 5 percent level for maximum eigenvalue and trace tests. The two tests both suggest one cointegrating vector meaning that long run relationship exists amongst the three variables.

Table 4: Johansen Cointegration Test

Null	Alternative r	λ-max	Critical values	Trace	Critical values
0	1	34.625**	21.132	46856**	29.798
≤1	2	8.745	14.265	12.230	15.495
≤2	3	3.485	3.841	3.486	3.841

*This table shows the Johansen cointegration test using λ-maximum and trace tests. The third and fourth columns show λ-max statistics and critical values while fifth and sixth column show the trace statistic and critical value. The r implies the number of cointegrating vectors and the critical values are from MacKinnon-Hang-Michelis table (1999). **reject null hypothesis at 5% level of significance.*

Granger Causality

When results show a cointegrating relationship among foreign reserves, stock market development and interest rates, there must be Granger causality in at least one direction. However, the direction of temporal causality between the variables is not indicated. The following bivariate regression was estimated to run examine Granger-causation:

$$ln\, SMK_t = \beta_0 + \sum ln\beta_i FER_{t-i} + \sum \delta_i\, lnINT_{t-i} + \varepsilon_t \quad (7)$$

$$ln\, FER_t = \beta_0 + \sum ln\beta_i SMK_{t-i} + \sum \delta_i\, lnINT_{t-i} + \varepsilon_t \quad (8)$$

$$ln\, INT_t = \beta_0 + \sum ln\beta_i SMK_{t-i} + \sum \delta_i\, lnFER_{t-i} + \varepsilon_t \quad (9)$$

The short run causal effects are obtained by the f-test of the lagged explanatory variables. Table 5 shows the results. The Granger causality test statistic reveals that interest rates Granger cause stock market growth. In the same way, interest rates Granger cause international reserves. The results show that both stock market growth and international reserves Granger cause interest rates. This shows bidirectional relation between

stock market growth and interest as well as between interest rates and international reserves. The results show no evidence of causality between international reserves and stock market development.

Table5: Granger Causality Test

	$\Delta\ln(SMK)$	$\Delta\ln(FER)$	$\Delta\ln(INT)$
$\Delta\ln(SMK)$	--	1.16(0.33)	2.64(0.09)*
$\Delta\ln(FER)$	2.00(0.16)	--	5.69(0.01)***
$\Delta\ln(INT)$	2.60(0.09)*	2.79(0.08)*	--

*This table shows the Granger causality test results. *** denotes significance at 1% while * denotes significance at 12% level.*

The error correction causality estimates based on the equation are:

$$\Delta ln\, SMK_t = \alpha_0 + \sum \alpha_{li} \Delta ln \beta_i SMK_{t-i} + \sum \beta_{li}\, \Delta lnFER_{t-i} + \sum \delta_{li}\, \Delta lnINT_{t-i} + \gamma ccm_{t-1} + \varepsilon_{it} \quad (10)$$

Table 6 shows the result obtained by performing long run causality test and the short run adjustment to re-establish long run equilibrium-the joint significance of the sum of lagged terms of each explanatory variable and the ECT by joint F-test. Short run bidirectional causality is found between interest rates and both stock market growth and international reserves. The significance of the joint test in the international reserves and interest rate equations is consistent with the presence of bidirectional Granger causality between interest rates and international reserves on one hand and between interest rate and stock market growth on the other hand. Finally, significance of the error correction term on the interest rates equation is consistent with the result of cointegration among the three variables found using Engle-Granger and Johansen-Juselius tests.

Table 6: ECM Model

	ΔSMK	ΔFER	ΔINT	ECT_{t-1}	Joint Test
F statistic				t statistic	
ΔSMK	--	1.04(0.37)	2.74(0.08)*	-0.64	1.35(0.28)
ΔFER	1.55(0.23)	--	4.66(0.02)***	0.38	2.56(0.05)**
ΔINT	2.86(0.07)*	2.92(0.07)*	--	-1.98**	2.98(0.03)**

The values in parenthesis are the p-values. *' **' *** denote significance at 10%, 5% and 1% critical level respectively.

CONCLUSION

The goal of this paper was to examine the relationship between foreign exchange reserves and stock market growth. To achieve this goal, a multivariate modeling approach that introduced interest rate was undertaken. The study made use of annual data for Nigeria over the period 1981-2011 sourced from the CBN statistical data. The results showed among other things that a long run relationship existed among the variables at both bivariate and multivariate levels. Also, the results showed that foreign reserves had positive effect on stock market growth. The results from Granger causality showed that a bidirectional relationship existed between interest rates and stock market growth. In the same vein, there was a bidirectional relationship between interest rate and external reserves. Finally, the results showed the interest rate is very important in analyzing stock market-international reserves nexus.

The main implications of the findings are as follows: The Nigerian government needs to get the interest rate right to bolster stock market development and enhance international reserves in Nigeria. Moreover, efforts at enhancing international reserves will have a positive impact on stock market growth in Nigeria. A limitation of this study is that it has not considered the probable structural breaks during the period under consideration. Subsequent studies should apply unit root test allowing for structural breaks.

REFERENCES

Bhattacharya, B. & Mukherjee, J. (2003) "Causal Relationship between Stock Market and Exchange Rate, Foreign Exchange Reserves and Value of Trade Balance: A Case Study for India". Paper Presented at the fifth Annual Conference on Money and Finance in the Indian Economy.

Central Bank of Nigeria (CBN) (2011), Annual Statistical Bulletin, Abuja, Lagos.

Dickey, D. A. & Fuller, W.A. (1979) "Distribution of the Estimators for Autoregressive Time Series with a Unit Root," *Journal of the American Statistical Association*, vol.74, p. 427-431.

Dimitrova, D. (2005) "The Relationship between Exchange Rates and Stock Prices: Studies in Multivariate Model," *Issues in Political Economy,* vol. 14, p. 1-25

Doong, S. Ch., Yang, Sh.-Y., Wang, A. (2005) "The Dynamic Relationship and Pricing of Stocks and Exchange Rates: Empirical Evidence from Asian Emerging Markets", *Journal of American Academy of Business,* vol. 7(1), p. 118-123.

Elite Forex Signal (2013) "Impact of Foreign Reserves on Karachi Stock exchange Market of Pakistan" http://www.eliteforexsignals.com. Accessed November.

Engle, R.F. & Granger, C.W. (1987) "Co-integration and Error Correction: Representation, Estimation and Testing," *Econometrica*, vol. 55, p. 251-276.

Gay, R. D. (2008), "Effect of Macroeconomic Variables on Stock Market Returns for Four Emerging Economies – Brazil, Russia, India and China," *International Business & Economic Research Journal*, vol. 7(3), p. 1-8

Hussain, D. I. (2009) "Why does Pakistan Have to Accumulate Foreign Reserves? http://ishrathusain.iba.edu.pk/papers, p.1-22. Accessed November.

Johansen, S. & Juselius, K. (1990) "Maximum Likelihood Estimation and Inference on Cointegration with Application to the Demand for Money," *Oxford Bulletin of Economics and Statistics*, vol. 52, p. 169-210.

Kwaitowski, D., Phillips, P. C. B., Schmidt, P & Shin, Y. (1992) "Testing the Null Hypothesis of Stationarity against the Alternative of a Unit Root: How Sure Are We that Economic Time Series Have a Unit Root", *Journal of Econometrics*, vol. 54, p.159-178.

Nishat, D. M., & Shaheen, R. (2004) "Macro-Economic Factors and Pakistani Equity Market", *Pakistani Development Review*, vol.43 (4), p.619-637.

Ray, S. (2012) "Foreign Exchange Reserve and its Impact on Stock Market Capitalization: Evidence from India," *Research on Humanities and Social Sciences*, vol. 2(2), p. 46-60.

Sohail, N., & Hussain, Z. (2009) "Long Run and Short Run Relationship between Macro Economic Variables and Stock Prices in Pakistan- The case of Lahore Stock Exchange", *Pakistan Economic and Social Review,* vol. 47, p. 183-198.

Toda, H. Y. & Yamamoto, T. (1995) "Statistical Inference in Vector Autoregressions with possibly Integrated Processes," *Journal of Econometrics*, vol. 66, p.225-250.

BIOGRAPHY

Akinlo, Olayinka O. is a senior Lecturer in the Department of Management and Accounting, Obafemi Awolowo University, Ile-Ife, Nigeria. She can be contacted at the Department and through email yinkakinlo@gmail.com, yakinlo@oauife.edu.ng or through telephone on +2348037193075.