

## **Inflation and Stock Prices: The Nexus**

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### **ABSTRACT**

*This study analytically considered the relationship between inflation and stock prices of firms quoted in Nigeria Stock Market by using data that spanned 1986 to 2014 culled from the Central Bank of Nigeria and National Bureau of Statistics. Ordinary Least Square, Unit Root (Stationarity) Test, Johansen Cointegration and Granger Causality Test were employed to analyse the data to reveal that Money Supply and Exchange Rate portray statistically significant relationships with Stock prices. It also revealed that all but Interest Rate shows positive relationship with stock prices and no long run relationship were observed between any of the endogenous variables and the exogenous variable. Furthermore, uni - directional causal relationships from All Share Price Index to Interest Rate and Exchange Rate to All Shares Price Index. Consequently, it was recommended that Nigeria's resource or revenue portfolio should be broadened to reduce the market shocks or reaction to the performance of any of such fundamentals, interest rate should be reduced to engender investment in the stock market to propel investments which will ultimately reduce inflation as is propelled by cost, the market should be deepened to accommodate additional investments to it consequent on rising exchange rate and increased money supply, efforts should be made (as a matter of policy) to channel a minimum proportion of such capital gains to reinvestment.*

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**Keywords:** *Inflation rate, Money Supply, Stock Prices, All Price Index.*

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### **INTRODUCTION**

Inflation has sweet and sour implications on every economy; the sour consequences being most pronounced and comprise a systematic decrease in purchasing power as well as other monetary variables over time. Consequently, uncertainty over future prices may discourage investment and savings, and if inflation levels rise quickly, there may be shortages of goods as consumers begin to hoard out of anxiety that prices may increase in the future. According to Geetha et al. (2011), financial theorists believe that there are direct and indirect aftermaths of inflation in every sector of the economy ranging from exchange rates, investment, unemployment, interest rates, and stock markets among others. These researchers concluded that inflation and stock markets share a very close association, and that the rate of inflation influences stock market volatility and risk (Kimani and Mutuku, 2013).

The stock market plays a pivotal role in growing industries and commerce of a country that eventually affect the economy. Its importance has been well acknowledged in industries and investors perspectives. The stock market avail long-term capital to the listed firms by pooling funds from different investors and allow them to expand in business and also offers investors alternative investment avenues to put their surplus funds in. The investors carefully watch the

performance of stock markets by observing the composite market index which provides historical stock market performance (Pramod-Kumar & Puja, 2012), before investing funds. Price volatility is a normal trend in the market, as stock prices are affected either positively or negatively by a number of factors within and outside the economic system. Such factors include company profits, political factors, economic performance, interest rate, inflation rate and Real Gross Domestic Product. Investment in the stock market is long-term in nature; any development that could affect the stability of the polity or economy usually has serious impact on the stock prices. Since the introduction of the Structural Adjustment Programme (SAP) in 1986, stock prices on the Nigerian Stock Exchange (NSE) have been volatile and consistently lost points leading to sharp declines in their prices. The downward trend in the market performance has been attributed to varying reasons in line with those stated by Corrado, et al. (2002).

Stock prices, however have a high degree of volatility due to market fluctuations especially when pressure is being exerted to keep controlled interest rate closer to market prices, which are more likely to reflect inflation and scarcity of funds. The effect of inflation on stock prices are reflected especially where there is a change in the expected inflation rate. If the earning streams of a company remain unchanged and inflation changes from expected, stock prices experience a decline, then, investors who own stock in such a company will experience negative returns. However, Onagoruwa (2006 as cited in Ifionu and Ibe, 2015) was of the view that stocks with history of good performance and fundamental attributes are good to buy at times when prices are down and more affordable because they are most likely to bounce back since they have the capacity to absorb the depression in the market. The enormous performance of the Nigeria Capital market has been acknowledged recently by many scholars. The market has been able to meet the long term financial needs of public and private economic agents to aid fixed investments like buildings, plants, machinery, bridges, etc.

However, it is worthy of note that Inflation impedes efficient resource allocation by obscuring the signalling role of relative price changes which is the most important guide to efficient economic decision-making (Fischer, 1993). Therefore, despite its immense advantages, the capital market still faces economic setbacks due to several reasons that include inflation (Owolabi and Adejare, 2013).

Another is structural and institutional deficiencies in African economies that engender fragility and susceptibility to both internal and external shocks hence macroeconomic factors are more likely to influence returns on investments in Africa. It is therefore pertinent to establish the validity or otherwise of weak economic parameters on stock market performance. Also, the relationship between macroeconomic variables and stock returns is predicated on the Capital asset Pricing Model (CAPM) which assumes that the uncertainty about future prices of securities is the only risk that the investors are concerned with (Sharpe, 1964). However, investors are also concerned about other risks that affect their investment opportunities and investment returns. For example, the uncertainty about macroeconomic variables such as Gross Domestic Product, inflation, exchange rates, money supply, and interest rates, are other risks other than the market risks (Kirui, et al. 2014).

In light of the above, this study examines the effect of inflation using other intermediating variables such as interest rate, exchange rate and money supply while reviewing their influences on All share index of all listed companies in Nigeria as this represents a truer picture of aggregate stock prices in the country,

## **REVIEW OF EXISTING (EMPIRICAL) LITERATURE**

Several investigations have been conducted on the link between inflation and the performance of stock markets, albeit with diverse methods, proxies and findings. For instance, sequel to soaring US inflation in the 70s, Nelson (1976), Bodie (1976), and Fama & Schwert (1977) studied the phenomenon basically to compare the capacity of stocks in hedging as against inflation in relation to other financial variables (Alagidede & Panagiotitis, 2006), to find that the capacity of shares to hedge against expected and unexpected inflation is weak. Jaffe & Mandelker, (1976) confirmed the negative relationship between inflation and stock returns in the short run, but provided evidence of a positive relationship when the sample was extended for a longer frame: 1875-1970. Consequently, similar studies were conducted in the United Kingdom by Firth (1979) and Gultekin (1983) who found a positive link between inflation and common stocks. Yeh & Chi (2009) used the Autoregressive Distributed Lag (ARDL) to investigate inflation and stock markets in OECD countries to find a negatively significant short-run bi-directional causality between inflation and stock markets in selected 12 OECD countries. This finding extends to the long-run in all selected countries but Ireland, France, Australia and Netherland. Fama (1981) undertook an empirical study on the nexus between stock returns, productivity, price stability and money by utilizing a large volume of data to conclude that a steep and abrupt elevation in growth rate will beyond causing an increase in stock prices, precipitate a fall in inflation due to its effect on aggregate demand for money. The study also provided evidence on the negative relationship between returns on shares and inflation, an amazing feat, considering the fact that previous studies have established that common stocks are a good hedge against inflation. Fama & Schwert (1977) classified inflation into expected and unexpected components in a bid to examine return on assets. The study found that both groups of inflation are inversely linked with stock returns. Spyros (2001) applied the Vector Autoregressive (VAR) model to test the relationship between inflation and the stock market of emerging countries to provide evidence that contradicts the position that stocks are good hedge against inflation. The study categorically established a negative but week relationship between inflation and stock returns. Taofik & Omosola (2013) used OLS and ARDL to establish the link between inflation and stock markets which were proxied by Consumer Price Index and All Share Index in Nigeria from 1997 to 2010, to find a short run positive and significant relationship between the duo; further providing evidence of a long term link. Omotor (2011) utilized stratified monthly data from 1985 to 1996, and 1997 to 2008 to study inflation and stock prices in Nigeria. Findings from descriptive analysis reveal that the first stratum (1985 -1996) had the least risk; while correlation results show a negative relationship between inflation and stock returns in the first stratum, while in the second stratum positive relations was established. Cointegration results show a long run relationship between the pair and a one directional causality which was substantiated by the Granger causality test to move from inflation to stock market returns. Adusei (2014) used monthly data from Ghana spanning 1992 to 2010; using the Granger Causality and Cointegration tests in the Error Correction Model to show that in the short-run inflation has a negative and significant relationship with stock returns, while in the long-run, the relationship is seen to be significantly positive. Hakim (2012) also investigated the phenomenon in the Nairobi Securities Exchange Market to reveal a positive and insignificant relationship between inflation and investment in the Stock exchange market.

## **METHODOLOGY**

Relevant data that span from 1986 to 2014 were extracted from the Central Bank of Nigeria (CBN) and the National Bureau for Statistics (NBS) and analyzed by the Multiple Linear Regression Model, Johansen Cointegration and Granger causality test. The data for consists of end of year values for All share price index, Inflation rate, and moderating variables such

as Interest rate, exchange rate and money supply. These proxies were transformed from their various natures to a unified state – rates to enhance analysis.

### Model Specification

The multiple linear equation model used is specified thus:

$$\text{ASPIR} = f(\text{INFR}, \text{INTR}, \text{M}_2\text{R}, \text{EXR}) \text{----- (1)}$$

The above equation is deterministic, thus prone to invalidation, therefore it is transformed to a probabilistic model by the inclusion of the constant, parameters and stochastic term. Therefore, the Constant, Parameters and error term is included as below:

$$\text{ASPIR} = \beta_0 + \beta_1\text{INFR} + \beta_2\text{INTR} + \beta_3\text{M}_2\text{R} + \beta_4\text{EXR} + \mu_i \text{----- (2)}$$

Where:

ASPIR = All Share Price Index Rate

INFR = Inflation Rate

INTR = Interest Rate

M<sub>2</sub>R = Money Supply Rate

EXR = Exchange Rate

β<sub>0</sub> = Constant Parameter

β<sub>1</sub> - β<sub>4</sub> = Estimation parameters

μ = Error terms

### PRESENTATION OF RESULTS AND FINDINGS

The OLS output (in appendix A below) shows that the Constant (C) is 5.274563, implying that if all other endogenous variables are kept constant or at zero, the exogenous variable - ALSIR will increase at 5.274563 units. It is also observed that all variables but Interest Rate exhibit positive relationships with the exogenous variable. Furthermore, the coefficients of the regressors - INFR, INTR, EXR and M<sub>2</sub>, being 0.015051, 0.708155, 0.742252 and 0.163775 respectively demonstrate the magnitude of change ALSIR will have as a consequence of a unit change in any of the respective endogenous variables where the other variables are held constant. The result also shows that given the probabilities of the test statistics, only EXR and M<sub>2</sub> have significant relationships with ALSIR with 0.0076 and 0.0301 respectively. This implies that only money supply and exchange rate have been able to influence the share prices of firms in the capital market, which shows a demand leading relationship.

The computed R-square obtained is 0.938232. The implication of this is that the variables captured in the model account for about 94 percent variation of the dependent variable (ALSIR) within the confines of the study duration, while the other 6 percent variation is captured or explained within the framework of the stochastic variable in the model. This F-test for overall significance of the model using 5% (percent) level of significance (which is identified as a fair level) shows a computed value for linear regression result as 91.13713, at a probability level of 0.0000 which shows a great significant output above the level of the 0.05% significance level. Therefore, it is deduced that the parameter estimated of the regression is significant.

The Augmented Dickey Fuller ((ADF) in appendix B below) is used to determine the unit root (stationary) properties of the time series data. Consequently, the results show that all used data are stationary at first differencing I(1) as they possess higher absolute of ADF test statistics in comparison with their respective MacKinnon's critical values at 1%, 5% and 10% respectively. Thereafter, The Johansen Cointegration test was carried out to establish the long-run relationship of the variables. The results indicate absence of long-run relationships

amongst employed variables of study. In the light of the above results, there is invariably no further need to correct errors for the short and long run dynamics.

Finally, the Granger causality test output (in appendix D below) portrays uni-directional causality exists from ALSI to Interest Rate (INTR) and Exchange Rate (EXR) also granger caused All share price index (ASPI). It also reveals that Inflation Rate (INFR) promotes Money Supply ( $M_2$ ) and Money Supply ( $M_2$ ) granger causes Interest Rate (INTR). The deduction therefrom is that stock prices influence the cost of funds, while the exchange rate variations culminate in changing stock prices in the Nigerian Stock Market.

### **IMPLICATIONS AND RECOMMENDATIONS**

The implication of the on the Nigerian economy is that even if the endogenous variable had a neutral value, the Nigerian economy will be on a trajectory of growth, this might not be unconnected with the fact that the Nigerian capital market utilizes information from the fundamentals of the Nigerian economy (especially crude oil) in shaping performance. The inverse relationship between Interest Rate and performance of the Stock Market could be justified as higher interest rate could imply reduction of investment and by implication decline in stock market activities to the benefit of aggregate savings, while the positive relationship between the other endogenous variables and the Stock market implies that for instance, higher levels of money supply culminates in greater stock market activities and investment, also higher inflation rate spurs market performance. Furthermore, although all endogenous variables influence All Shares Index, the exchange rate and money supply have the capacity to propel remarkable impact on the stock market. More so, the market performance is fundamental to the interest rate as increased activities in the market portends increased investment which culminates in increased interest rates to sustain deposit-loan ratio and encourage saving and liquidity.

Inflation in Nigeria has almost always been above a digit, this is seen to greatly influence the stock market performance albeit positively, indicating that the market presents a veritable avenue of hedging assets against inflation.

Consequently, it is recommended that:

1. In order to sustain the upward trajectory and reduce shocks in the stock market, Nigeria's resource or revenue portfolio should be broadened to reduce the market shocks or reaction to the performance of any of such fundamentals.
2. Increasing Interest Rate in order to curb inflation could be counter-productive, therefore alternatively, interest rate should be reduced to engender investment in the stock market to propel investments which will ultimately reduce inflation as is propelled by cost.
3. The market should be deepened to accommodate additional investments to it consequent on rising exchange rate and increased money supply.
4. The direction of causality from market performance to Interest Rate implies the utilization of capital gains in consumption rather than investment, therefore, it is recommended that efforts should be made (as a matter of policy) to channel a minimum proportion of such capital gains to reinvestment.

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## APPENDICES

### A. Multiple Linear Regression (OLS) Result

*Dependent Variable: LOG(ASPIR)*

*Method: Least Squares*

*Date: 02/09/16 Time: 09:16*

*Sample: 1986 2014*

*Included observations: 29*

<i>Variable</i>	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-Statistic</i>	<i>Prob.</i>
<i>C</i>	<i>5.274563</i>	<i>1.799535</i>	<i>2.931070</i>	<i>0.0073</i>
<i>LOG(INFR)</i>	<i>0.015051</i>	<i>0.091579</i>	<i>0.164352</i>	<i>0.8708</i>
<i>LOG(INTR)</i>	<i>-0.708155</i>	<i>0.576324</i>	<i>-1.228745</i>	<i>0.2311</i>
<i>LOG(EXR)</i>	<i>0.742252</i>	<i>0.254601</i>	<i>2.915355</i>	<i>0.0076</i>
<i>LOG(M2R)</i>	<i>0.377682</i>	<i>0.163775</i>	<i>2.306094</i>	<i>0.0301</i>
<i>R-squared</i>	<i>0.938232</i>	<i>Mean dependent var</i>	<i>8.578571</i>	
<i>Adjusted R-squared</i>	<i>0.927937</i>	<i>S.D. dependent var</i>	<i>1.858824</i>	
<i>S.E. of regression</i>	<i>0.498993</i>	<i>Akaike info criterion</i>	<i>1.603137</i>	
<i>Sum squared resid</i>	<i>5.975863</i>	<i>Schwarz criterion</i>	<i>1.838878</i>	
<i>Log likelihood</i>	<i>-18.24549</i>	<i>Hannan-Quinn criter.</i>	<i>1.676968</i>	
<i>F-statistic</i>	<i>91.13713</i>	<i>Durbin-Watson stat</i>	<i>1.620928</i>	
<i>Prob(F-statistic)</i>	<i>0.000000</i>			

Source: E-VIEWS 8 Extract.

### B. Results of Stationarity (Unit Root) Test

<b>Variable</b>	<b>ADF t-statistics</b>	<b>Critical Value 5%</b>			<b>Order of Integration</b>	<b>Prob.</b>
		<b>1%</b>	<b>5%</b>	<b>10%</b>		
D(LOG(ASPIR))	-3.898190	-3.699871	-2.976263	-2.627420	I(1)	0.0099
D(LOG(INFR))	-7.666958	-3.699871	-2.976263	-2.627420	I(1)	0.0000
D(LOG(INTR))	-4.930930	-3.711457	-2.981038	-2.629906	I(1)	0.0005
D(LOG(EXR))	-5.255110	-3.699871	-2.976263	-2.627420	I(1)	0.0002
D(LOG(M2R))	-3.896248	-3.699871	-2.976263	-2.627420	I(1)	0.0093

Note: D(LOG(ASPIR)), D(LOG(INFR)), D(LOG(INTR)), D(LOG(EXR)) and D(LOG(M2R)) all represents the difference logged value of employed variables in the study.

Source: E-Views 8 Extract.



### C. Results of Johansen Unrestricted Cointegration Rank Test

#### Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.627429	26.65783	33.87687	0.2821
At most 1	0.617564	25.95223	27.58434	0.0797
At most 2	0.439857	15.64818	21.13162	0.2461
At most 3	0.286460	9.112939	14.26460	0.2769
At most 4	0.094854	2.690806	3.841466	0.1009

Max-eigenvalue test indicates no cointegration at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

### D. Results of Pair-wise Granger Causality Tests

#### Pairwise Granger Causality Tests

Date: 02/09/16 Time: 09:26

Sample: 1986 2014

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LOG(INFR) does not Granger Cause LOG(ASPIR)	27	0.08149	0.9220
LOG(ASPIR) does not Granger Cause LOG(INFR)		2.56179	0.1000
LOG(INTR) does not Granger Cause LOG(ASPIR)	27	2.36019	0.1179
LOG(ASPIR) does not Granger Cause LOG(INTR)		4.36255	0.0254
LOG(EXR) does not Granger Cause LOG(ASPIR)	27	4.92170	0.0171
LOG(ASPIR) does not Granger Cause LOG(EXR)		2.89760	0.0764
LOG(M2R) does not Granger Cause LOG(ASPIR)	27	0.41722	0.6640
LOG(ASPIR) does not Granger Cause LOG(M2R)		0.62200	0.5460
LOG(INTR) does not Granger Cause LOG(INFR)	27	1.28052	0.2978
LOG(INFR) does not Granger Cause LOG(INTR)		2.05091	0.1525
LOG(EXR) does not Granger Cause LOG(INFR)	27	1.91858	0.1706
LOG(INFR) does not Granger Cause LOG(EXR)		1.71982	0.2023
LOG(M2R) does not Granger Cause LOG(INF)	27	2.41022	0.1131
LOG(INF) does not Granger Cause LOG(M2R)		3.99678	0.0331
LOG(EXR) does not Granger Cause LOG(INTR)	27	2.73805	0.0867
LOG(INTR) does not Granger Cause LOG(EXR)		0.70121	0.5067
LOG(M2R) does not Granger Cause LOG(INTR)	27	4.44594	0.0239

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<i>LOG(INTR) does not Granger Cause LOG(M2R)</i>		0.27711	0.7606
<i>LOG(M2R) does not Granger Cause LOG(EXR)</i>	27	0.24590	0.7841
<i>LOG(EXR) does not Granger Cause LOG(M2R)</i>		1.29199	0.2948

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Source: E-VIEWS 8 Extract.