Research Paper

Inflation and Stock Market Returns in Nigeria: An Empirical Analysis

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ABSTRACT: *This study examines the long-run relationships and dynamic interactions between stock returns, inflation and exchange rate in Nigeria using monthly data of the All Share Price Index from the Nigeria Stock Exchange, Nigeria Consumers Price Index and Exchange Rate from 1995 to 2014. The analytical technique of vector error correction model (VECM) for short run relationship and the co-integration test to test for the long run relationship was used. From the results, it is evident that there is no existence of a long run relationship between stock returns, inflation and exchange rate. The short run dynamic model also reveals there is a short run relationship in stock returns which is attributed to the instability of prices of stocks noticed over time.*
It is recommended that the Securities and Exchange Commission (SEC) and the Nigerian Stock Exchange (NSE) should strive to improve on market capitalization of stock market by attracting listing and increased trading activities.
Keywords:*Inflation, Stock Market Returns, Vector Error Correction Model (Vecm)*

I. Introduction

The advent of oil boom in Nigeria in the early 1970's, has led to the instability of stock prices. Many factors are said to be the cause of this, some of them are:inflow of foreign capital from crude oil sales, budget deficit monetization, and financial markets creation of excess private domestic credit.Inflation rates in Nigeria has also been highly unstable; the high inflationary change was in excess of 30 percent. This is evident in the high correlation of money supply growth and high inflation due to the fact that real economic growth is less in real term to money growth. This can be observed from the growth in money supply and some structural factors such as; supply shocks arising from famine, unfavorable terms of trade and devaluation of currency. Furthermore, Structural Adjustment Program (SAP) introduced by the government in the late 1980's also accounted for the increase in price level in the economy. Consequently, inflation in Nigeria hasresponded to structural changes overtime (Uchendu 2001).

One major commodity considered in this study is the capital market stock, i.e. the Stock market. Stocks listed in Nigeria are traded on the floor of the Nigerian Stock Exchange (NSE) while the Securities and Exchange Commission (SEC) is the apex regulatory body which oversees the activities and affairs of the major players on the floor of the Stock Exchange.

The Nigeria Stock Exchange was established in September 15, 1960 but commenced business on June 5, 1961 with 19 securities listed and traded on the Lagos Stock Exchange. Based on the recommendation of the Government Financial System Review Committee in 1976, the Lagos Stock Exchange was renamed and made part of the Nigerian Stock Exchange in December 5, 1977. The Nigerian Stock Exchange has 9 branches established in major commercial cities in Nigeria. The main exchange of stocks of large enterprises are traded in the Nigerian Stock Exchange while small and medium scale enterprises are listed and traded in the Second tier Securities Market (SSM). From 1963 to 1990, the Nigerian stock exchange witnessed an overwhelming increase in government stock which exceeded the equities of industrial companies; however, this trend changed from 1991. The value of equities of industrial companies increased to billions of Naira, while government stock traded on the Nigerian Stock Exchange was worth millions of Naira this decrease continues till date, a development to the deregulation of the economy.(Ibrahim and Abaje 2013)

Despite the increase in market capitalization noticed in the economy at that period, the ratio of this amount to the Gross Domestic Product and Gross Fixed Capital Formation was still low. This increase was between 4.8% and 25.4% for gross domestic product while the ratio for gross fixed capital formation is between 28% and 55% from 1963 to 1990 (CBN, 2006). The ratio of market capitalization in the gross domestic product and gross fixed capital formation increased geometrically from 1990 to 1995. Although there was decrease in the

share of market capitalization in gross domestic product and gross fixed capital formation, the return on investment did not follow the same pattern. This decrease noticed at that period was caused by a banking crisis in which a total of 26 banks were liquidated in 1998. However, with the recapitalization of the banking sector in 2005, the industry remains the most active participant in Nigerian stock market up till date. The trend in Nigeria Stock Exchange causes the price and return on stocks to be highly volatile (Ibrahim and Abaje 2013).

This study will be looking at relationship between inflation and stocks in Nigeria and also the relationship between exchange rate and stock market returns. The study of this relationship is essential in improving and in the understanding of stock markets, thus providing standards for decision-making about asset allocation. This study contributes to the existing literature by providing evidence for whether inflation affects stock returns both in the long run and in the short run and also exchange rate affect stock returns both in long run and in short run. The layout of this paper include the following: section 2 reviews the theoretical framework and empirical evidence, section 3 discuss the methodology while section 4 present the analysis and discussion of result and section 5 gives the conclusion and recommendations.

II. THEORETICAL FRAMEWORK AND EMPIRICAL EVIDENCE

The relationship between stock market returns and inflation has captured the interest of researchers and practitioners alike particularly since the twentieth century. The foundation of the discourse is the Fisher (1930) equity stocks declaration. According to the generalized Fisher (1930) hypothesis, equity stocks represent claims against real assets of a business; and as such, may serve as a hedge against inflation. If this holds, then investors could sell their financial assets in exchange for real assets when expected inflation is pronounced. In such a situation, stock prices in nominal terms should fully reflect expected inflation and the relationship between these two variables should be positively correlated *ex ante* (Ioannides, et.al., 2005). This argument of stock market serving as a hedge against inflation may also mean that investors are fully compensated for the rise in the general price level through corresponding increases in nominal stock market returns and thus, the real returns remain unchanged.

Since equities are claims as current and future earnings, then it is expected that in the long run as well, the stock market should equally serve as a hedge against inflation. Fama (1981) however, put up a proxy hypothesis when he argued the relationship between high rates of inflation and future real economic growth rates as a negative impact. Views that rationalize the negative co-movements between inflation rates and real stocks returns however differ from one author to another.

The inflation illusion hypothesis of Modigliani and Cohn (1970) indicates, that the real effect of inflation is caused by money illusion. According to Bekaert and Engstrom (2007), inflation illusion suggests that when expected inflation rises, bond yields duly increase, but because equity investors incorrectly discount real cash flows using nominal rates, the increase in nominal yields leads to equity under-pricing and vice versa. In Fama (1981) hypothesis, which is based on money demand theory; correlation between inflation and stock market returns is not a causal one; rather, it is a spurious relationship of dual effect. Yeh and Chi (2009) in explaining the Fama's hypothesis observed that the reason for the revised correlation is because when inflation is negatively related to real economic activity, and there is a positive association between real activity and stock returns, the negative relationship and stock returns holds. This flow of relationship according to them is not direct.

Hoguet (2008), explanation of stock-inflation neutrality is anchored on two stances as outlined from Giammarino (1999) that companies can pass on one-for-one costs; and 2) that the real interest rate which investors use to discount real cash flows does not rise when inflation rises and in addition, inflation has no long-term negative impact on growth. The appropriate direction of the relationship or the neutrality between inflation and stock market returns relationship have equally generated a large body of evidence in the empirical literature. Earlier studies by Bodie (1976), Nelson (1976), and Fama and Schwert (1977) were aroused by the rising inflation of the 1970s in the US. Spyrou (2004) study of ten emerging economies further provide evidences that may suggest equity providing an effective hedge against inflation and that the inflation could be explained by a significant relationship between money and consumer prices in the emerging markets.

Laopodis (2005) examines the dynamic interaction among the equity market, economic activity, inflation, and monetary policy. Researcher looks into the first issue concerning the role of monetary policy. Advance econometrics using co integration, causality and error methods using bivariate and multivariate Vector Autoregressive (VAR) or multivariate Vector Error-Correction (VEC) models. With bivariate results, they found that the real stock returns-inflation pair weakly support negative correlation between stock market and inflation, meanwhile stock market can hedge against inflation. On the other hand, bivariate resultsclaims a negative and unidirectional relationship from stock returns to FED funds rate in the 1990s but a very weak one in 1970s. With multivariate, they found strong support of short term linkages in the 1970s along with the same unidirectional linkage between the two in the 1990s. this showed that stock returns do not respond positively to monetary easing, which took place during the 1990s, or negatively to monetary tightening. There were no consistent

dynamic relationship between monetary policy and stock prices. This conclusion seems to contradict Fama's (1981) proxy hypothesis, which said that inflation and real activity were negatively related but real activity and real stock returns were positively related.

Patra and Poshakwale (2006) used the error correction model (ECM) to conduct a study on the impact of economic variables on market returns in Greece from 1990 to 1999. Empirical results show that some macroeconomic variable like money supply, inflation, volume of trade and exchange have both short-run and long-run relationship with a stock price in equilibrium in Greece while there was no short-run or long run relationship noticed between exchange rate and stock prices.

Pierrel and Kwoks (1992) used a Vector-Autoregresive (VAR) model to estimate and tests the alternative versions of hypotheses that explain the relationship between these two variables. The study employs distributed lags in order to empirically arrive at a dynamic structure of inflation. Pierrel and Kwoks concluded that this dynamic structure conform to Fama (1981).

Yeh and Chi (2009) used Autoregressive Distributed Lag (ARDL) model to test the validity of the various Hypotheses that explain this relationship. The empirical result of this study of 12 OECD countries shows that these countries exhibit a short-run negatively significant co- movement between stock returns and inflation. Moreover, countries like Australia, France, Ireland and Netherland do not display a long-run relationship between the two variables in equilibrium. This result is consistent with the hypotheses of Fama (1981), Modigliani et al (1979) and Feldstein (1980) which suggested that an increase in inflation reduces real returns on stock. This result is also in line with Caporale and Jung (1997) and Rapach (2002). They argue respectively that there exist a negative significant effect of inflation on real stock returns after controlling for output shock and that inflationary trends do not erode returns on stocks.

III.   METHODOLOGY

In this section, appropriate econometric model which theoretically establish the relationship between variables of interest is specified and used to practically demonstrate the impact of inflation on stock market returns. This paper uses monthly data for a period of nineteen (19) years from 1995 to 2014. The population of the study is all companies listed on the Nigerian Stock Exchange (NSE). Stock return represented by all share indexes (ASI) is the dependent variable while the explanatory variable is inflation represented by consumer indexes (CPI) and exchange rate. This is represented in the functional form below:

$ASI_t = f(CPI_t + EXR_t + DOP_t)$ (1)

The general econometrics model that describe the relationship between the variables can be specified as:

$ASI = \beta_0 + \beta_1 CPI_1 + \beta_2 EXR_2 + \mu$ (2)

Where ASI is the explained variable, CPI, EXR and DOP are the explanatory variables β_0 is the intercept. β_1 and β_2 are the coefficient and μ is the error term. The explanation with the regard to the coefficient are $\beta_1 > 0$ and $\beta_2 > 0$

The VECM model specifications of the long-run relationship between stock return (ASI), inflation (CPI) and exchange rate (EXR) is:

$\Delta ASI = C_0 + \sum_{i=1}^{k} \beta i \, \Delta ASI_{t-1} + \sum_{i=1}^{k} \alpha i \, \Delta EXR_{t-1} + \sum_{i=1}^{k} \alpha 2 \, \Delta CPI_{t-1} + \rho_i ECT_{t-1} + \mu_t$ (3)

Where:
ASI = All Share Index
CPI = Consumer Price Index
EXR= Exchange rate
K = number of lags length
Δ = difference operator
α= parameter to be estimated
ECT_{t-1}= error terms derived from the long term co-integration relationship
μ= error term

IV.   ANALYSIS AND DISCUSSION
Table 4.0: Descriptive statistics of the variables

	CPI	LNASI	LNEXR
MEAN	70.72722	9.671517	4.517621

MEDIAN	60.65276	9.975185	4.849007
MAXIMUM	164.4354	11.09213	5.133914
MINIMUM	14.36082	7.734253	3.085852
STD.DEV	43.18932	0.793178	0.731183
SKEWNESS	0.629489	-0.310264	-1.366469
KURTOSIS	2.158222	1.997180	3.060530
JARQUE- BERA	22.93616	13.90701	74.72610
PROBABILITY	0.000010	0.000955	0.000000
SUM	16974.53	2321.164	1084.229
SUM SQ.DEV.	445810.9	150.3622	127.7761
OBSERVATIONS	240	240	240

Source: Computed from E-view Program

The result of the descriptive statistics in the table presented above shows that the growth rate in CPI (1995-2014) was around 70%, the growth rate of ASI was around 9% and the growth rate of EXR was around 4%.The table also shows that the highest real growth rate of CPI in the period was 164% while the lowest growth rate of CPI was 14%. In the same vein the maximum real growth rate of all share index (ASI) occurred in Feb 2008 with the growth rate of 11.09213% while the minimum growth rate was around 7% which occurred in Jan 1995. The maximum growth rate of exchange rate (EXR) which occurred in Dec 2014 was 5.1% and the minimum was 3.0% which occurred in Jan 1995.

Thus what can be established is that the indicator reported their minimum and maximum in different years: however, the indicators recorded fluctuations in the growth thus decrease in the growth rate. This is an indication that the stock market returns are not improving thereby low returns.

Table: 4.1 Result of Unit Root Test

VARIABLES	Augmented Dickey Fuller Test			
	5% Critical Value	Level	1st Difference	Order of Integration
LNASI	-2.873492	-2.590244	15.33021	I(1)
LNEXR	-2.873492	-1.781785	15.93538	I(1)
CPI	-2.873492	3.409146	-8.090040	I(1)

The variables estimated from the above show the result of the unit root test obtained using ADF Test and the critical values indicated that CPI, LNASI and LNEXR are integrated of order one I(1). Therefore, the absolute values of the ADF test statistics are greater than the critical values of ADF in absolute values therefore concluded that the variables estimated are statistically significant due to the stationarity obtained at the first differencing.
Co- integration Test Result

After using the ADF test to establish the data's stationarity. This study now goes further to ascertain whether or not there exist a long run relationship between the variables i.e LNEXR,LNASI and CPI. In testing the co-integration, the study made use of the Johansen Co-integration Test. In order to ascertain if along run relationship exist this study will obtain the Trace statistics and the Maximum Eigen Value from the Johansen Co-integration test result and their corresponding probabilities

The primary step in the Johansen Co-integration Test is to obtain the optimal lag length for the VAR model. This is because the Johansen Co-integration Test is sensitive to lag length. The optimal lag length will be determined by the Akaike information Criterion (AIC) and Schwarz Information Criterion (SC). However, in a case where they both give different optimal lag lengths, this research will go with Schwarz Information Criterion (SC).

Table 4.2: Optimal Lag Selection

VAR Lag Order Selection Criteria						
Endogenous variables: LNASI LNEXR CPI						
Exogenous variables: C						
Date: 03/22/16 Time: 01:14						
Sample: 1 240						
Included observations: 237						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1553.792	NA	101.8858	13.13748	13.18138	13.15518
1	170.0705	3389.535*	5.29e-05*	-1.333928*	-1.158330*	-1.263151*
2	177.0939	13.63185	5.38e-05	-1.317248	-1.009951	-1.193388

3	182.6436	10.63117	5.54e-05	-1.288132	-0.849137	-1.111189
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

The AIC and SC determined the optimal lag length for LNEXR, LNASI and CPI as both the AIC and SC are in agreement that the optimal lag test is 1. Since this has been determined, the Johansen Co-integration test is implemented to test for the long run relationship between the various independent variables (LNEXR, CPI) and the dependent variable (LNASI) all are in real terms and expressed in their logged term using the Johansen Co-integration Test (bearing in mind the optimal lag length)

Table: 4.3 Unrestricted Cointegration Rank Test (Trace)

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None	0.077483	28.76594	29.79707	0.0654
At most 1	0.030924	9.813381	15.49471	0.2954
At most 2	0.010293	2.431463	3.841466	0.1189
Trace 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				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None	0.077483	18.95256	21.13162	0.0982
At most 1	0.030924	7.381918	14.26460	0.4450
At most 2	0.010293	2.431463	3.841466	0.1189
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				

From the Johansen co-integration test, we report the value of the trace and Max-Eigen statistic with their critical values. The trace statistics is 28.76594 with a critical value of 29.79707 and Max-Eigen statistic is 18.95256 with a critical value of 21.1316. This result therefore shows that using the Trace statistic and Max-Eigen statistics, there is no long-run relationship between the Consumer price index (CPI), Exchange Rate (LNEXR) and All share index (LNASI) in Nigeria

4.1 Long Run Equation

Following the trace test and Max Eigen test of the Johansen Co-integration test, we accept the null hypothesis at the 0.05 level and conclude that there is no long run relationship between the various independent variables (LNEXR,CPI) and Stock market returns (LNASI) at 5% level of significance.

Re-writing the co-integrating equation with Standard error in () and T-Stat in []:

$$LNASI = -0.134120LNEXR + 0.009723CPI \qquad\qquad (4)$$
$$\quad (0.45893) \qquad\quad (0.29224)$$
$$\quad [0.29224] \qquad\qquad [1.19273]$$

The long run equation above shows that there exist a negative relationship between Exchange rate (LNEXR) and all share index i.e stock market returns (LNASI) in their logged forms which does not meet the a-priori expectations but there is positive relationship between Consumer price index (CPI) and all share index i.e stock market returns (LNASI) which meets a-priori expectations. That is to say, a 1% change in LNEXR will bring about a 0.134120% fall in LNASI, a 1% change in CPI will cause a 1.19273% rise in LNASI.

4.2 Vector Error Correction Model –Short Run Dynamics

When co-integration is present it makes it possible to estimate vector error correction model (VECM). The VECM adds error correction features to a multi-factor model such as a Vector Auto-regression (VAR) Model. Apart from explaining both short and long-run dynamics of the variables tested, it helps to correct for disequilibrium

Table 4.4: Result of Vector Error Correction Model (VECM)

Vector Error Correction Estimates			
Date: 03/21/16 Time: 13:12			
Sample (adjusted): 1995M04 2014M12			
Included observations: 237 after adjustments			
Standard errors in ( ) & t-statistics in [ ]			
CointegratingEq:	CointEq1		
LNASI(-1)	1.000000		
LNEXR(-1)	-0.134120		
	(0.45893)		
	[-0.29224]		
CPI(-1)	0.009723		
	(0.00815)		
	[1.19273]		
C	-9.765673		
Error Correction:	D(LNASI)	D(LNEXR)	D(CPI)
CointEq1	-0.008765	-0.008112	0.232387
	(0.00433)	(0.00597)	(0.07767)
	[-2.02399]	[-1.35913]	[2.99190]
D(LNASI(-1))	0.151695	-0.040462	1.912194
	(0.06474)	(0.08923)	(1.16122)
	[2.34301]	[-0.45347]	[1.64671]
D(LNASI(-2))	0.170221	-0.053770	-1.328609
	(0.06509)	(0.08971)	(1.16750)
	[2.61502]	[-0.59937]	[-1.13800]
D(LNEXR(-1))	-0.025174	-0.012046	0.078950
	(0.04822)	(0.06646)	(0.86493)
	[-0.52201]	[-0.18125]	[0.09128]
D(LNEXR(-2))	-0.005248	-0.013922	-0.134942

From the above, the VECM gives the same co-integrating (long run) relationship as the Johansen Cointegration Equation. The result imply that there is a negative relationship between exchange rate and stock returns which is not in line with our a-prior expectations, most likely due to the fluctuation in exchange rate or the high exchange rate over the years. There is a positive relationship between Consumer price index and stock market returns meaning as consumer price index increase, stock returns will increase.

Analyzing the result of the short-run a 1% increase in D(LNASI(-1)) will cause the D(LNASI) to increase by 0.151695% i.e a 1% increase in the differenced ASI of the previous year will cause the present ASI to increase by 0.151695%. The R-squared and Adjusted R-square are given as 0.091888 and 0.064129 respectively. While the R-squared and show that about 9.2% of the variations in LNASI are explained by the model, the Adjusted R-square adjusted fot the number of regressors and degree of freedom shows that about 6.4% of the variations in LNASI are explained by the model. Since the F-stat(3.310228) is greater than its critical value (1.85), we conclude that all the independent variables in the VECM jointly have significant influence on the dependent variable (LNASI)

V. CONCLUSION
The study examined the impact of inflation on stock market returns in Nigeria. As stated earlier, the major objectives of study is to determine the relationship between inflation and stock market returns in Nigeria.

The study covered the period of 1995-2014. The econometric tools used in this study include: the Augmented Dickey Fuller Test, Johansen Co-integration techniques, Vector Error Correction Model and Granger Causality tests which were all used in order to determine the long run relationships between stock returns and various component

From the study we established the following:
- All variables used were integrated of order one i.e are stationary at first difference
- There is no long run relationship between the various variables at 5% level of significance. However there was a short run relationship in the all share price index but not in other variables
- There is a negative relationship between Exchange rate (LNEXR) and all share index i.e stock market returns (LNASI)
- There is positive relationship between Consumer price index (CPI) and all share index i.e stock market returns (LNASI) which meets a-priori expectations

The study therefore recommends that, the Securities and Exchange Commission (SEC) and the Nigerian Stock Exchange (NSE) should strive to improve on market capitalization of stock market by attracting listing and increased trading activities. The problem of double digits inflation should be tackled by the Central bank of Nigeria (CBN). Formulate and use policy instrument that will maintain inflation at a reasonably low level so that it will not erode the real value of stock gains. Finally, the Central bank of Nigeria should tackle the fluctuation in the exchange rate in order for investors to invest in stock.

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