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Effect of Macroeconomic Indicators on Stock Market Returns in Nigeria

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Abstract

Stock market plays a vital role in economic prosperity by fostering capital formation and sustaining economic growth in most economies across the world. In order to develop the market, regulatory reforms aimed at opening up the market for globalization were introduced. These reforms include Indigenization policy of 1977, Structural Adjustment Programme regime of 1986, Financial liberalization of 1995, the deregulation and post-deregulation eras, to mention but a few (NSE,2016); the expectation is that these reforms (which include some of the variables) will enhance the efficiency of the market. This study examined the effects of macroeconomic indicators on stock market performance in Nigeria. Monthly time series data were sourced from the Central Bank of Nigeria (CBN), National Bureau of Statistics (NBS) and Nigeria Stock Exchange (NSE) from 2006 to 2016 for this study. The following tests were conducted: unit root, two-step co-integration tests, Autoregressive Conditional Heteroskedasticity (ARCH) test and the first differential test. Autoregressive Distributed Lag (ARDL) was used in estimating the parameters of the model. The result revealed that broad money supply, Consumer price index (CPI), exchange rate, and a month lag of prime lending rate have significant effect on stock market performance. The study concluded that macroeconomic indicators affect stock market performance in Nigeria. It was, therefore, recommended that monetary authority should effectively monitor the selected macroeconomic indicators in order to improve stock market returns in Nigeria.

Keywords: Market return, volatility, macroeconomic indicators

JEL Classification: E44

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Introduction

The stock market has become an essential market playing a vital role in economic prosperity by fostering capital formation and sustaining economic growth in most economies across the world. Stock market is more than a place to trade securities; it operates as facilitator between savers and users of capital by means of pooling of funds, sharing risk, and transferring wealth. They are essential for economic growth as they ensure the flow of resources to the most productive investment opportunities (Udegbunam & Eriki, 2001).

The Nigeria stock market is not an exemption as it is expected to mop up fund from the area of excess to the area of need. In the process of performing this traditional role, it must be influenced by external shocks, which are outside the realm of capital market (Osisanwo & Atanda, 2012). These shocks are the macroeconomic indicators that are expected to cause variation in the stock prices movement. Macroeconomic indicators have influenced the Nigeria stock market in such a way that government cannot achieve its goal without recourse to its implication on unpredictability of stock market return.

Since there are various values for both macroeconomic indicators and the market stock price index, how can we ascertain any relationship between the key macroeconomic indicator and stock market index in Nigeria? In order to develop the market, regulatory reforms aimed at opening up the market for globalization were introduced. These reforms include Indigenization Policy of 1977, Structural Adjustment Programme regime of 1986, Financial Liberalization of 1995, the deregulation and post-deregulation eras, to mention but a few (NSE, 2016). The expectation is that these reforms will enhance the efficiency of the market (NSE, 2016). This implies that (macroeconomics variables) act as a determinant to the market performance.

Whereas studies in this area are majorly from the developed economy, this study is in furtherance of the work of Chude and Chude (2013) and considered more variables such as inflation rate, exchange rate as well as treasury bill. It also employed monthly analysis as against the previous works such as those of Maku and Atanda (2010), Osisanwo and Atanda (2012), Evans, Nelson and Perez (2014) and others who analysed their work either on a quarterly or annual basis. The macroeconomic indicators such as inflation rate, exchange rate, broad money supply, treasury bill were all examined as it affects market returns on monthly basis from 2007 to 2016; this will be more reliable. Therefore, this study contributes to existing literature by examining the effect of selected macroeconomic indicators on stock market returns in Nigeria. The study also adopted Auto Regressive Distribution Lag (ARDL) as against Ordinary Least Square method because, the variables are not integrated at any level. Therefore, this is considered most appropriate in order to avoid spurious regression. The specific objective was to identify the trend characterised by each of the selected macroeconomic variables and stock market returns. The hypothesis formulated for the study stated that: H_0: Microeconomic variables have no significant effect on Stock market return.

The rest of the study was organised as follows: Section 2 discussed the literature review; Section 3 highlighted the methodology employed in carrying out the research; Section 4 analysed the result, while the last section concluded and proffered policy recommendations based on the finding.

Review of Related Literature

Conceptual Framework

Stock market is a market that trades securities issued by publicly-quoted companies and the government. The market is a vital institution in an economy which greatly determines and indicates the performance of an economy. As an economic institution, stock market plays a major role in enhancing the efficiency of capital formation and allocation. Thus, the overall development of the economy is a function of how well the stock market performs (Evans, Nelson, & Perez, 2014).

According to Junkin (2012), Stock Returns and Macroeconomic Indicators **are indicators of the overall state of a country's economy** and financial theory that make the world financial markets more liberalized. There has been an integrated relationship between stock returns and the macroeconomic indicators including interest rates, exchange rate, inflation, money supply, etc.

Theoretical Framework

This work hinges on over confidence theory and random walk theory. Over confidence theory was postulated by Plous (1992). It states that people generally rate themselves as being above average in their abilities to invest. They also overestimate the extent of their knowledge about the stock market relative to other investors. Many investors believe they can consistently predict the time market returns would be generated, but in reality there is an overwhelming amount of evidence that proves otherwise. This is as a result of fluctuation in stock market return. The theory has been used in the study of Mordecai, Hehui and Maurizio (2004) and Ulrike and Geoffrey (2015).

Random Walk Theory on the other hand, is a theory which specifies that price move randomly and unpredictably. According to Fama (1965), every security consists of intrinsic value that depends on the potential earning of the security. Samuelson (1965) stated that proper anticipated prices change randomly and stock price which fluctuates with the real activity is hard to predict, using past information. It is used in the study of Osisanwo and Atanda (2012) and Victor, Jonathan and Anthony (2013).

Empirical Framework

Evans, Nelson and Perez (2014) examined macroeconomic variables, volatility and stock market returns in Nairobi Securities Exchange, Kenya. Engle-Granger two step method was employed to establish the co-integrating relationship between stock returns and the macroeconomic variables. Threshold Generalized Autoregressive Conditional Heteroscedasticity (TGARCH) model was also used to capture the leverage effects and volatility persistence at the NSE. It was established that the exchange rate showed a significant relationship with stock returns, while Gross Domestic Product, Inflation and the Treasury bill rate indicated insignificant relationships.

From local perspective, Maku and Atanda (2010) investigated what influences the Stock Market Performance in Nigeria on the Long-Run, using Augmented Dickey-Fuller (ADF) unit root test and the Augmented Engle-Granger Cointegration test. Their outcomes established that the stock market performance in Nigeria is mainly determined by macroeconomic forces in the long-run; that NSE all share index is more responsive to changes in exchange rate, inflation rate, money supply, and real output; and, that the entire incorporated macroeconomic variables were found to have simultaneous and significant impact on the Nigeria capital market performance in the long-run.

Similarly, Osisanwo and Atanda (2012) employed the linear regression

model with the ordinary least square (OLS) method, which is based on time series variables from the CBN between 1984 and 2010 to examine determinants of stock market returns in Nigeria. Their findings revealed that interest rate, previous stock return levels, money supply and exchange rate are the main determinants of stock returns in Nigeria.

Furthermore, Emeka and Aham (2013) investigated the impact of macroeconomic factors on stock returns, using empirical evidence from the Nigeria Stock Market; the study employed generalized Autoregressive Conditional Heteroskedasticity (GARCH) model and annual data range between (1985-2009). The results showed that the six macroeconomic variables employed inflation, government expenditure, index of manufacturing output and interest rate exert strong significant influence on stock returns. On the one hand, inflation and government expenditure had a positive significant impact, while index of manufacturing output and interest rate had a negative significant impact, on the other hand. Money supply and foreign exchange rate exert no significant influence on stock returns in Nigeria.

Moreover, Chude and Chude (2013) who examined the effect of money supply on the stock market returns in Nigeria employed stationary test, co-integration test and error correction model. It was reported that there was a long run relationship between broad money supply and stock market returns in Nigeria, and that broad money supply had been relatively higher over the years and had a significant positive impact on the stock market returns in Nigeria.

Methodology

The data used for this study are monthly time series data covering the period 2006 to 2016. All the data were sourced from the Central Bank of Nigeria Statistical Bulletin, the Nigeria Stock Exchange publications and National Bureau of Statistics Bulletin. The estimate techniques used for the model was the First Difference Autoregressive Distributed Lag (ARDL). This method was chosen because all variables in the model are not stationary at level but stationary at first difference, indicating they are integrated of order one [I(1) series]. Also, the co-integration test shows that they are not co-integrated. Their respective first difference was used to estimate them in stationary form. Unit root tests was also conducted in this study using the Augmented Dickey-Fuller (ADF) procedure to ascertain if the variables used in this model are stationary or non-stationary series.

In examining the determinants of Stock Market returns in Nigeria, Osisanwo and Atanda's (2012) model was adopted with modification. This is as a result of similarities in the area of study, and the econometric model is expressed as:

$$LNSEDX_t = \beta_0 + \beta_1 LEXC_t + \beta_2 CPI_t + \beta_3 INT_t + \beta_4 M2g_t + \beta_5 RPCIg_t + \mu_t \ldots\ldots\ldots\ldots (1)$$

In their work, they proxy Nigeria stock market as NSE all share index and macroeconomic variables are proxy as log of Official Exchange Rate (EXR), percentage change in Consumer Price Index i.e. inflation rate (PCI), Interest Rate i.e. Lending Rate (INT), Annual growth rate of Broad money supply (M2g) and Annual growth rate of Real Per capita income (RPCIg). Therefore, the modified logarithms of all indicators changing Annual growth rate of Broad money supply (M2g) to log of monthly broad money supply, while real Per Capita Income (PCI) is substituted for log of monthly Treasury bill. The model was modified in order to incorporate variables that are available on monthly basis since monthly data are more accurate in testing volatility and to improve the fitness of the model. Unlike in the study

of Osisanwo and Atanda (2012) in which the Ordinary Least Squares (OLS) method was employed to estimate the parameters of the model, this study employed the First Difference Autoregressive Distributed Lag (ARDL) model to estimate the parameters of the model in order to ensure all variables are in stationary form and avoid the possibility of a spurious regression result. Therefore, the First Difference ARDL econometric model that reveals the dynamic effects of macroeconomic variables on stock market returns in Nigeria for this study is specified as:

$$\Delta LNASI_t = \beta_0 + \beta_1 \Delta LNASI_{t-1} + \beta_2 \Delta LNASI_{t-2} + \beta_3 \Delta LNASI_{t-3} + \beta_4 \Delta LNASI_{t-4} + \beta_5 \Delta LNEXCH_t + \beta_6 \Delta LNCPI_t + \beta_7 \Delta LNM2_t + \beta_8 \Delta TB_t + \beta_9 \Delta MPR_t + \beta_{10} \Delta PL_t + \beta_{11} \Delta PL_{t-1} + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where: LNASI = Log of NSE all share index;

LNEXCH = Log of Official Exchange rate (#/1$)

LNCPI = Log of Percentage Change in Consumer Price Index i.e. inflation rate.

PL = Prime Lending rate

LNM2 = Log of Broad Money supply

LNTB = Log of Treasury Bill

MPR = Monetary Policy Rate

β_0 = Intercept

$\beta_1 - \beta_{11}$ = slope of the explanatory variables

ε_t = Stochastic Error term for each period

Result and Discussion

Unit Root Test

Following the submission made by Dickey and Fuller (1979), there is the likelihood of obtaining a spurious regression if the series that generated the results are non-stationary. This necessitates our investigation of the time series properties of the data by conducting unit root test for stationarity using Augmented Dickey Fuller (ADF) unit root test. The results are presented in Table 1 (see the appendix).

Presented in Table 1 (see the appendix) is a test for the presence of unit root in each of the variables used in the model. This was conducted using the Augmented Dickey-Fuller (ADF) procedure. It indicated that all variables are stationary at first difference, hence regarded as integrated of order one I(1) series. The implication of this result is that using Ordinary Least Squares (OLS) method to estimate the parameters will lead to a spurious regression results since they are non-stationary at level series. This necessitated the test of cointegration to check if at all there is a long-run relationship among the non-stationary variables used in the model. A more accurate technique which will control the non-stationary nature of those series can then be used. The result of Engle-Granger Cointegration test is presented in Table 2 (see the appendix).

Co-integration Test

The Table 2 (see the appendix) presents seven equations, i.e. an equation for each variable. The decision rule behind Engle-Granger cointegration test is that if any of the p-values is less than the level of significance, there is evidence of long-run relationship; hence, the null hypothesis is rejected. Checking the p-values, it can be detected that none of them is less than the significance level, i.e. none of them is significant. Therefore, the null hypothesis that there is no long-run relationship among the variables is accepted. This indicated that standard OLS regression cannot be employed to estimate the parameters of the model.

The Volatility Model

The Autoregressive Conditional Heteroskedasticity (ARCH) family of models is usually used in volatility models.

This is because these models are capable of dealing with the volatility (variance) of the series. Since the assumption is that stock prices and performance are usually volatile, the use of volatility model is important in order to have a reliable result.

A plot of percentage change in ASI is given in the appendix to show the movement of stock market performance over time. The figure 2 shows that the series (ASI) is not much volatile. From the time plot of the series in the figure 2, it can be seen clearly that periods of lesser volatility are more than periods of greater volatility. So the possibility of ARCH effects is quite low.

Table 3: Breusch-Pagan Heteroskedasticity Test: ARCH

F-statistic	0.018253	Prob. F(1,127)	0.8927
Obs*R-squared	0.018538	Prob. Chi-Square(1)	0.8917

Source: Author's Computation, 2017.

The result presented above shows the test for ARCH effect. The null hypothesis of this test is that there is homoskedasticity (i.e. there is no ARCH effect). The decision rule is to reject the null hypothesis if probability value is less than significance level and accept null hypothesis if otherwise. The F-statistic and Obs*R-squared values presented above are 0.018253 and 0.018538 with probability values of 0.8927 and 0.8917, respectively. This clearly suggests the acceptance of the null hypothesis of homoskedasticity and the conclusion that there is absence of ARCH effect.

Since the test for ARCH effect suggests that there is no volatility in the series, the usual linear models can be conducted. Having the variables being non-stationary with no cointegration suggests that a First Differenced Autoregressive Distributed Lag (ARDL) model is appropriate to estimate the parameters of the model.

Regression Analysis

Table 4: First Difference ARDL Model Result

Dependent Variable: D(LNASI)
Number of models evaluated: 62500
Selected Model: ARDL(4, 0, 0, 0, 0, 0, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNASI(-1))	0.105426	0.087141	1.209831	0.2288
D(LNASI(-2))	-0.593001	0.091188	-6.503068	0.0000
D(LNASI(-3))	0.061717	0.091100	0.677466	0.4995
D(LNASI(-4))	-0.331665	0.089914	-3.688700	0.0003
D(LNBROADMONEY)	0.482112	0.078107	6.172456	0.0000
D(LNCPI)	0.700537	0.075355	9.296490	0.0000
D(LNEXCHANGERATE)	-0.103838	0.012680	-8.189116	0.0000
D(LNTREASURYBILL)	0.007821	0.149582	0.052288	0.9584
D(MPR)	0.007443	0.038032	0.195704	0.8452
D(PRIMELENDING)	-0.086380	0.063179	-1.367239	0.1742
D(PRIMELENDING(-1))	-0.150611	0.057233	-2.631547	0.0097
C	0.014773	0.032846	0.449779	0.6537
R-squared	0.718310	Durbin-Watson stat		2.020359
Adjusted R-squared	0.688916			
F-statistic	24.43752			
Prob(F-statistic)	0.000000			

Source: Author's Computation, 2017.

Interpretation of Results

The result obtained from the estimation output of E-View 7.1 for the empirical model at its transformed variables form is presented in Table 4. The specified model formulated to capture the effect of macroeconomic indicators – official Exchange rate (#/1$), consumer Price Index i.e. inflation rate, prime lending rate, broad money supply, treasury bill, monetary policy rate NSE all-share index are expressed as:

$$\Delta LNASI_t = \beta_0 + \beta_1 \Delta LNASI_{t-1} + \beta_2 \Delta LNASI_{t-2} + \beta_3 \Delta LNASI_{t-3} + \beta_4 \Delta LNASI_{t-4} + \beta_5 \Delta LNEXCH_t + \beta_6 \Delta LNCPI_t + \beta_7 \Delta LNM2_t + \beta_8 \Delta TB_t + \beta_9 \Delta MPR_t + \beta_{10} \Delta PL_t + \beta_{11} \Delta PL_{t-1} + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

The estimated model based on the result presented in Table 4 is given as:

$$\Delta LNASI_t = 0.0148 + 0.1054 \Delta LNASI_{t-1} - 0.5930 \Delta LNASI_{t-2} + 0.0617 \Delta LNASI_{t-3} - 0.3317 \Delta LNASI_{t-4} - 0.1038 \Delta LNEXCH_t + 0.7005 \Delta LNCPI_t + 0.4821 \Delta LNM2_t + 0.0078 \Delta TB_t + 0.0074 \Delta MPR_t - 0.0864 \Delta PL_t - 0.1506 \Delta PL_{t-1} + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

The estimated result for the multiple parameters regression specified to capture the effect of macroeconomic indicators on the stock market return proxy as the NSE all share index in Nigeria

between 2006 and 2016 presented in Table 4 revealed the effect of incorporated macroeconomic indicators for the analysis of the study. The Table 4 reports that changes in ASI in a month lag and three months' lag, broad money supply, CPI, Treasury bill, and MPR exert positive effects on stock market return in Nigeria. This outcome is in line with the works of Osisanwo and Atanda (2012), Chude and Chude (2013), and Emeka (2013). However, the effect of ASI in two months and four months' lag, exchange rate, and prime lending are exerting negative effects on changes in ASI. All of these effects conform with the a priori expectations except the effect of inflation rate (CPI) which is expected to exert negative effect on changes in ASI and the effect of ASI in two months' and four months' lag which are expected to exert positive effect on changes in ASI based on sign.

In terms of magnitude of effect, a percent increase in broad money supply and CPI increases ASI by approximately 0.48% and 0.7%, respectively. This implies that increase in the stock of money in circulation and the general price level brings about an appreciation in stock market returns. Also, other incorporated effects of stock market returns, ASI in two months' and four months' lag, exchange rate, and prime lending were found to retard the returns of Nigeria stock market between 2006 and 2016.

The result further revealed that a percent increase in ASI two and four months ago, exchange rate and a month lag of prime lending rate decrease current ASI by approximately 0.59%, 0.33%, 0.1%, and 0.15%, respectively. This implies that past values of stock market return in lag of two and four months have negative influence on present return, while higher exchange rate is detrimental to the return of stock market. This is contrary to a non-significant relationship obtained by Victor, et al (2013) that higher lending rate is detrimental to stock market return. This finding is in line with Emeka and Aham's (2013) study which stated that interest rate have a negative significant impact on the sock returns. It is inconsistent with random walk theory which states that price move randomly and unpredictably. However, the finding is in line with the Overconfidence theory which is of the opinion that many investors believe they can consistently time the market because market return can be easily predicted. This is in line with Mordecai, Hehui and Maurizio (2004).

In assessing the partial significance of the estimated parameters for the incorporated macroeconomic indicators, the t-statistics results are presented in Table 4. The result shows that the estimated parameter for changes in ASI in two months and four months' lag, broad money supply, CPI, exchange rate, and a month lag of prime lending were found to be partially statistically significant at 5% critical level because their *p-values* are less than 0.05, while the estimated parameters for the ASI in a month and three months' lag, Treasury bill and MPR were found partially insignificant at both 5% and 10% critical level.

Although the F-statistic shows a value of 24.43752 and a p-value of 0.0000, this indicates that macroeconomic indicators included in the model had a joint significant effect on stock market return. This means that the overall model is significant at 5% critical level while the Adjusted R-squared show values of 0.688916 which indicate that about 68.9 percent after adjusting for loss of degree of freedom of variation in All Share Index (ASI) is explained by macroeconomic variables. This implies that macroeconomic indicators have high explanatory power on stock market return. This indicates that the model is in good fit. The Durbin-Watson statistics shows a value of 2.020359. Since this value is close to 2, a

conclusion can be made that there is absence of serial correlation in the model.

Conclusion and Recommendations

The study considered macroeconomic indicators of special emphases on inflation rate, exchange rate, broad money supply, treasury bill, MPR and prime lending rate as they affect market returns on monthly basis especially from 2006 to 2016.

Empirical results revealed that Broad money supply and CPI effectively influence the stock market during 2006 - 2016 in Nigeria. They both have positive influence on stock market return. This is an indication that more money in circulation implies higher return of the stock market.

On the other hand, exchange rate and prime lending also influence stock market in Nigeria negatively during this period. This is an indication that increase in exchange rate which translates to depreciation in Naira is detrimental to stock market return.

On the basis of the F-Statistic result, this study rejects the null hypothesis "macro-economic indicators have no significant effect on stock market return" at 5% significance. Therefore, it was concluded that macroeconomic indicators have significant effect on stock market return in Nigeria. However, the effect of unemployment rate on stock market return is not yet known from this study and this will serve as a gap to be filled for other future studies on Nigeria stock market. Our econometric evidence is also in line with the findings of scholars reviewed in section two such as Osisanwo and Atanda (2012), Chude and Chude (2013), Emeka (2013) and Maku and Atanda (2010). The study recommends that effective monitoring of macroeconomic indicators should be done by the Monetary Authority in order to improve stock market return in Nigeria.

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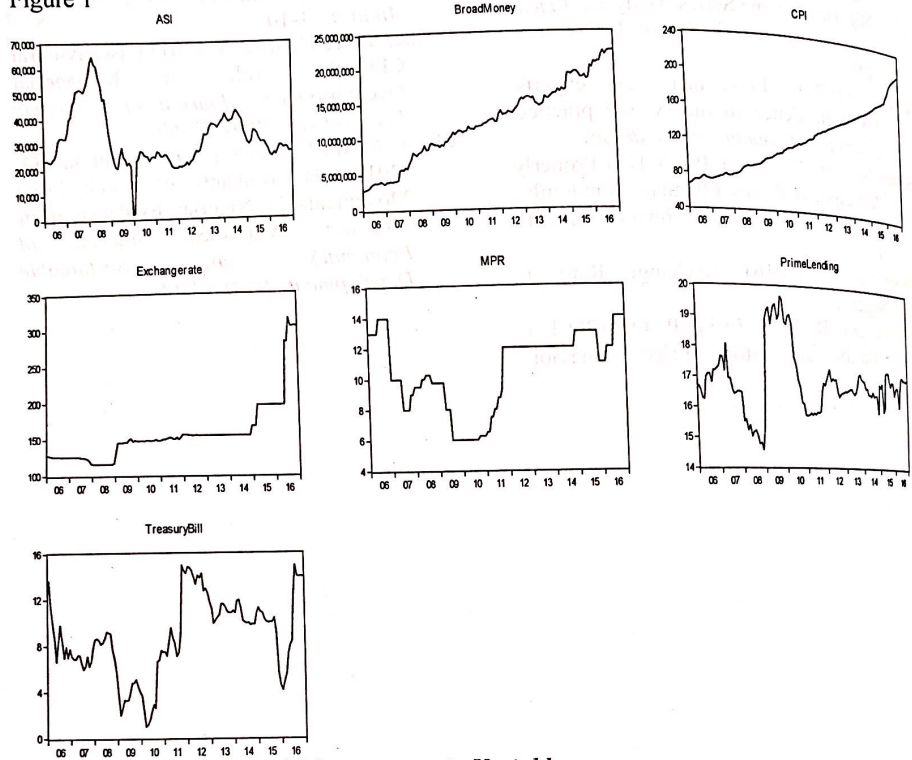
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APPENDIX

Figure 1



Trend Analysis of ASI and Macroeconomic Variables

Source: Author's Computation.

Table 1: Augmented Dickey Fuller Unit Root Test

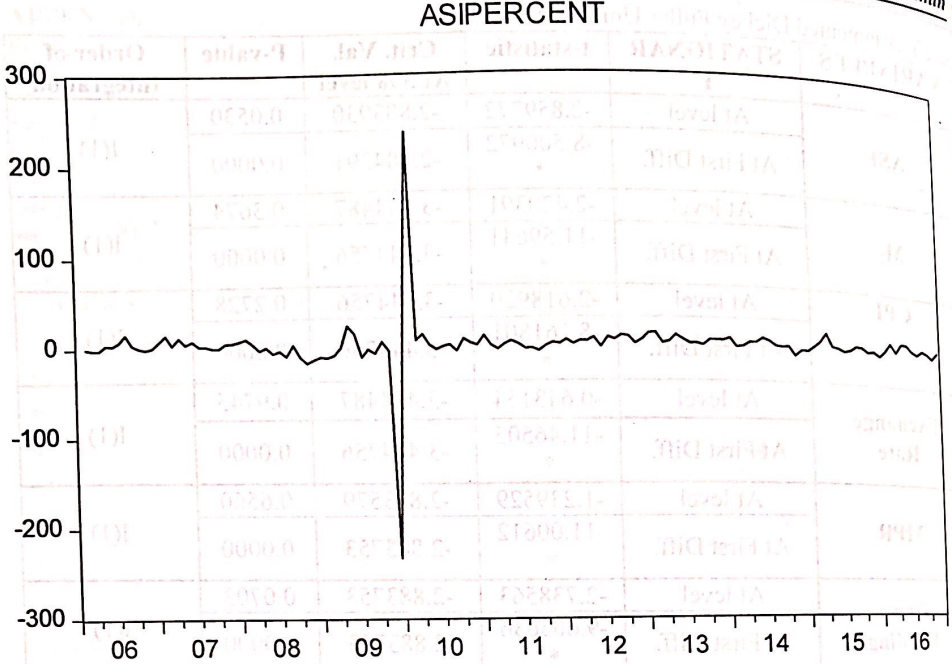
VARIABLES	STATIONARY	t-statistic	Crit. Val. At 5% level	P-value	Order of Integration
ASI	At level	-2.859772	-2.883930	0.0530	I(1)
	At First Diff.	-8.500972 *	-2.884291	0.0000	
M_2	At level	-2.420391	-3.444487	0.3674	I(1)
	At First Diff.	-11.59641 *	-3.444756	0.0000	
CPI	At level	-2.618920	-3.444756	0.2728	I(1)
	At First Diff.	-8.161801 *	-3.444756	0.0000	
Exchange Rate	At level	-0.643154	-3.444487	0.9745	I(1)
	At First Diff.	-11.46505 *	-3.444756	0.0000	
MPR	At level	-1.239529	-2.883579	0.6560	I(1)
	At First Diff.	-11.00612 *	-2.883753	0.0000	
Prime Lending	At level	-2.738563	-2.883753	0.0703	I(1)
	At First Diff.	-9.603636 *	-2.883753	0.0000	
Treasury Bill	At level	-2.653425	-2.883753	0.0851	I(1)
	At First Diff.	-8.652671 *	-2.883753	0.0000	

Note: * indicates significance at 5% and 1% level; D denotes number of differencing
Source: Author's Computation.

Table 2: Engle-Granger Single Equation Cointegration Test

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
ASI	-3.968360	0.4042	-34.44530	0.1921
Broad Money	-2.939452	0.8677	-15.26825	0.9055
CPI	-2.794170	0.9054	-15.22744	0.9065
Exchange Rate	-1.678018	0.9968	-8.819264	0.9918
Treasury Bill	-3.447704	0.6674	-21.77407	0.6750
MPR	-3.088984	0.8194	-17.90897	0.8271
Prime Lending	-3.551984	0.6159	-23.19427	0.6128

*MacKinnon (1996) p-values.
Source: Author's Computation.
Figure 2



Plot of Percentage Change of ASI
Source: Author's Computation.