

THE IMPACT OF SELECTED MACROECONOMIC VARIABLES ON NSE 50 STOCK PRICES

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***Abstract.** Stock market performance is considered as the reflector of financial and economic conditions of a country. Since 1980's, the dynamic linkage between macroeconomic variables and stock prices has fetched increasing amount of attention from economists, financial analysts, investors and policy makers.*

The relationship between macroeconomic variables and stock prices has been the focus of an immense body of theoretical and empirical research since the 19th century. The debate over the decades has been whether the movement in stock prices leads to the change in economic activity or it is one of the causes of change. Stock prices can be considered as an indicator of a country's economic status and social mood and are seen as a leading indicator of the real economic activity. This research examines the relation between selected macroeconomic variables and closing price of nifty 50. Experimental results show that short run and long run equilibrium relationship exists between the independent variables like Wholesale price index, call money rate, exchange rate, IIP and the dependent variable which are the stock prices in the NSE. The data was collected from FY'06 to FY'17.

***Keywords:** Stock market, IIP, FII, Exchange rates, NSE.*

1. Introduction

The Indian stock market plays a pivotal role in the growth of Indian economy. Its every movement puts an impact on the performance of the economy. The stock market is a place at where investors, whether Indians or foreigners can invest or take the funds for capital appreciation. Their decision to invest or withdraw the funds depends upon the numerous factors. The various proponents opined that the macroeconomic variables are the one of them. Macroeconomics is the analysis of the nation's economy as a whole. Many researchers have said that stock returns vary due to changes in macroeconomic factors. Although the precise cause and

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effect relationship between macroeconomic variables and stock prices is not known, they are believed to be related. Furthermore, evidence of stock return predictability using macroeconomic variables for emerging markets is rather scarce whilst such evidence is extensively available for the developed economies.

The aim of this study is to investigate the long run relationship between macroeconomic variables and stock prices for the emerging Indian stock market. This is done by taking closing prices of all the companies in the National Stock Exchange (NSE) from the period 2006 to 2017 and the data is taken monthly wise. All the data of the variables are collected from the RBI website. The base year for all of the variables is 2001-02. Macroeconomic variables such as Index of Industrial Production (IIP), call money rate, exchange rates, Wholesale Price Index (WPI) and Foreign Institutional Investment (FII) have been taken as some of the major determinants of stock prices in this research. The Wholesale Price Index (WPI) is the price of a representative basket of wholesale goods. Country like Philippines use WPI changes as a central measure of inflation. But now India has adopted new CPI to measure inflation. However, United States now report a producer price index instead. Hence, it is important to understand how these variables relate to the stock market and specifically their potential impact on stock price formation. Another macroeconomic variable is Foreign Institutional Investment which can have impact on stock prices. There are a number of studies which have investigated the relationship between exchange rate movements and stock returns using data from developed markets. Finance theory as well as prior empirical evidence suggests that shocks to macroeconomic variables should affect stock market returns; indeed, several multifactor asset pricing models, such as the arbitrage pricing theory, have been developed on the basis of this assumption. Previous studies have assumed either perfect integration among markets whereby share returns have a linear relation with a number of global factors (e.g. Ferson and Harvey, 1994; Dumas and Solnik, 1995; Harvey, 1995) or complete segmentation with share returns determined by local economic variables (e.g. Chen et al., 1986; Ahmed and Imam, 2007; Mahmood and Dinniah, 2009).

2. Literature review

Many academic researchers, financial and industry analysts and practitioners have tried to envisage the relationship between macroeconomic variables and stock market movements from the past

decades. They have done several empirical and descriptive studies to check the effect of macroeconomic variables on stock prices or vice versa and the existing relationship between the two. The different conclusions have been provided by the various conducted studies according to the selection of variables, methodologies, techniques and tests used.

Many studies have been conducted to find out the determinants of changes in stock prices in nifty. Usually various measures were used to analyze the stock prices like exchange rate, IIP, FII, WPI and call money rate. There are a number of studies which have investigated the relationship between exchange rate movements and stock returns using data from developed markets.

Aggarwal, P. and Kumar, M. M. (2012) analyzed the relationship between stock prices and macroeconomic variables in India and US, using monthly frequency data from January 1994 to December 2011. Nifty and S&P 500 were used to represent the stock prices of India and US, respectively, and the macroeconomic variables used for the study include foreign institutional investment (FII), exchange rate, gold price/ (10 gm), fiscal deficit, industrial production index (IIP), inflation (WPI), interest rate and gross domestic product (GDP). Cointegration technique was adopted as the methodology. The results suggested that the macroeconomic variables have a significant impact on stock prices.

Singh (2014) examined the relationship between macroeconomic variables and the Indian stock market. The methodology employed was multivariate stepwise regression analysis and Granger's causality test, using monthly frequency data from January 2011 to December 2012. The variables used for the study include the average monthly closing price of BSE Sensex and S&P CNX Nifty and the explanatory variables were the Index of Industrial Production (IIP), Wholesale Price Index (WPI), Money Supply (M3), Interest Rates (IR), Trade Deficit (TD), Foreign Institutional Investment (FII), Exchange rate (ER), Crude Oil Price (CP) and Gold Price (GP). The result showed significant impact of macroeconomic variables on the Indian stock market. The gold prices have its negative impact on the stock market. Further, the study proves that the Indian Stock market improves with the increase in the inflow of foreign investment.

Also, the exchange rate shows its adverse effect on the stock market during the study period.

Hojatallah and Ramanarayana opined on the impact of Foreign Institutional Investment on the Indian Stock Market Volatility during the World Financial Crisis. The Engle-Granger, Johansen and Granger tools were used to inspect the cointegration and causality between the Foreign

Institutional Investment and NSE 50. The monthly data were employed to get the results. It has been found that NSE 50 and FII were cointegrated with each other and bilateral causality exists. So the investors, institutional investors, etc. can use the available information of one variable to predict about the performance of the second variable.

Another macroeconomic variable of interest is the exchange rate since currency movements expose firms to substantial financial risks. There are a number of studies which have investigated the relationship between exchange rate movements and stock returns using data from developed markets. In the case of developing countries, Abdalla and Murinde (1997) investigate the interactions between exchange rates and stock prices in the emerging financial markets of India, Korea, Pakistan and the Philippines. Using the cointegration and Granger tests, they report unidirectional causality from exchange rates to stock prices in all the countries, except the Philippines. They also find evidence of a long-run relationship between exchange rates and stock returns for India and Pakistan. More recently, Granger, Huang and Yang (2000) using a BVAR model, examine the relationship between stock prices and exchange rates for nine Asian countries and find mixed results. Whilst their findings suggest no relationship between the stock and the exchange rate for Japan and Indonesia, they find that exchange rates lead stock prices in Korea, whereas stock prices lead exchange rates in Hong Kong, Malaysia, Thailand and Taiwan. Grambovas (2003) too examines the interaction between exchange rate fluctuations and equity prices. Using data from three European emerging financial markets including Greece, the Czech Republic and Hungary, Grambovas finds a strong link between foreign exchange and capital markets in Greece and Hungary.

The relationship between stock prices and trading volume has also received considerable attention and numerous studies have empirically examined the sensitivity of stock returns to the changes in the trading volume. There are at least four reasons why the price/volume relationship is important. First, as Karpoff (1987) suggests, price-volume relationship provides useful insights into the market characteristics. Second, the price/volume relationship is useful for event studies because if price and volume are jointly determined, then incorporating the price volume relationship would increase the power of the tests. Third, the price/volume relationship is critical for the debate about the empirical distribution of speculative prices.

Numerous studies provide results in support of a contemporaneous relationship between changes in share prices and variations in

macroeconomic variables (Bilson et al., 2001; Fifield et al., 2002; Fifield and Power, 2006) and a relationship between current changes in share prices and past changes in macroeconomic variables (Fama, 1981; Chen et al., 1986; Rapach et al., 2005). Various econometric techniques such as cointegration (Nasseh and Strauss, 2000; Acikalin et al., 2008), VAR (Abugri, 2008) and Granger causality analysis (Wongbangpo and Sharma, 2002) have been applied. However, different sets of macroeconomic variables have been found to be significantly related to equity values in different stock markets. For example, Poon and Taylor (1991) found that the macroeconomic variables that influenced UK returns were different from those that determined US equity price changes. Humpe and Macmillan (2009) found a long-run relationship between share prices and three economic variables (i.e. industrial production, the interest rate and long term interest rates) in the US market, but a long-run relationship between share prices and two economic variables (i.e. industrial production and MS) in the Japanese market. More recently, Birzand Lott (2011) examined news about GDP growth, unemployment, retail sales and durable goods, and found that only news about GDP growth and unemployment significantly affected stock returns in the US.

Similarly, there is mixed evidence regarding the nature of the relationship between particular economic factors and share returns. For example, some studies have documented a negative relationship between share price changes and inflation (Fama, 1981; Chen et al., 1986); while others have reported a positive association between share prices and inflation in hyper-inflationary environments in countries such as Argentina, Chile, Mexico and Venezuela (Choudhry, 2001). Wongbangpo and Sharma (2002) suggested that the reason for a positive association between the two variables in hyper-inflationary economies is that share prices act as a hedge against inflation. However, Sing and Low (2000) and Zhou et al. (2005) called this reasoning into question by suggesting that equity investments are poor hedges against inflation. The evidence from existing studies on the relationship of the exchange rate and MS with share prices is also mixed.

3. Problem Statement

The problem is to find out how does some of the selected macroeconomic variables affect the stock prices of NSE 50 from the year 2006 to 2017.

4. Objectives of the study

- Primary Objective: To identify the macroeconomic variables;
- Secondary Objective: To investigate the relationship that exist between the independent variables which are the selected macroeconomic variables and the dependent variable, the stock prices of the firms listed in NSE 50.

5. Significance of the study

The present study is expected to add several primary contributions to the existing literature. First, it will add to the present literature by examining the relationship of the stock market with a set of macroeconomic variables in emerging markets like India, in the present context. This study is expected to offer some insights for Indian policymakers, investors, researchers and portfolio managers. Investors may be able to make informed decisions based on macroeconomic dynamics and it is possible for them to decide the ideal time to buy and sell the stocks. It also helps to identify what all economic factors should be considered before buying the stock. The study will be advantageous to know the relationship of prices and economic activity; the direction of the outcome of the relationship may enhance the predictive ability of policy makers; thus, both contractions and expansion of the Indian economy may be forecasted and predicted with some degree of certainty. Policymakers are mainly interested in exploring the determinants of the stock market, and how stock market reflects the changes in domestic and international macroeconomic variables of the economy, thus, the study will provide them a background to determine the variables, which are expected to influence the stock market. Moreover, economic theory suggests that stock prices should reflect expectations about future corporate performance, and the corporate profits generally reflect the level of economic activities. If stock prices accurately reflect the underlying fundamentals, then the stock prices should be considered as the leading indicators of future economic activities, and not the other way around. Therefore, the study of the causal relations and dynamic interactions between macroeconomic variables and stock prices will help in the formulation of the nation's macroeconomic policy. Further, the study will provide an insight to researchers for future research in the area.

6. Scope of the study

The study suggests further scope for the research to increase the understanding about the dynamic relationship between the macroeconomic variables and stock prices in India. Further research may either eliminate some of the limitations or expand the scope of relationship already done in the present research. Future work might re-examine the issues addressed in this research using a relatively more comprehensive data set (i) including more recent share price data; and

(ii) the data of major leading stock indices of developed economics can also be included. This research would be particularly valuable as a more recent time period and inclusion of share prices of developed economies will give a better insight to predict the movement of share prices by tracking the changes in leading share markets of the world. Examining how the developed markets of the UK and the US affect the emerging markets like India could be valuable.

7. Research Methodology

Research Design:

The type of research adopted is quantitative study and it has a clear statement of the problem and the hypothesis.

Sample Design

Population: The Stock Prices of the companies listed in the NSE
Sample: Closing price of Nifty Stock Prices from the year 2006 to 2017.
Sampling Framework: The secondary data collected from RBI website

Tools of data analysis:

Linear regression, unit root, Johansen cointegration, vector Autoregression Estimate and Granger causality test are the analysis used for this data analysis and is done using SPSS software and Eviews.

Variables definition:

➤ Dependent Variable:

The closing price of stock prices is a very important measure to determine how macroeconomic variables have an impact on stock prices. It represents the weighted average of 50 Indian company stocks in 12 sectors and is one of the two main stock indices used in India.

➤ Independent Variables:

1. IIP

The index of Industrial Production (IIP) is the overall production in the industrial sector for a given period of time. It measures the level of economic activity in an Indian economy. On the basis of sector, it is categorized into three segments. They are manufacturing, mining & quarrying and electricity. The base year taken is 2001-02.

2. Call money rate

It is the rate at which short term funds are borrowed and lent in the money market. Some of the participants of the call money market are RBI, banks, and primary dealers.

3. FII

Foreign Institutional Investment is an investment made by an investor in the securities or markets of foreign nation. The stock prices can vary if there are huge flows of foreign investments in India. This can be done only if the companies get registered in the stock exchanges of India.

4. WPI

Wholesale Price Index (WPI) is the price of the representative basket of wholesale goods. Some studies have shown that changes in WPI have changed the stock prices in the Indian stock market.

5. Exchange rate

It is a medium of financial transactions between the countries. The entire import and export process of any country depends upon the exchange rate of his currency. If, the country currency will depreciate immediately increase its import value and decrease its exports value or vice versa.

Hypotheses:

The following null hypotheses were framed which need to be tested.

H01: There is no significant relation between the “IIP” and “Nifty stock prices”

H02: There is no significant relation between the “call money rate” and “Nifty stock prices”

H03: There is no significant relation between the “FII” and “Nifty stock prices”.

H04: There is no significant relation between the “WPI” and “Nifty stock prices”.

H05: There is no significant relation between the “exchange rate” and “Nifty stock prices”.

8. Analysis and interpretation

Monthly data are chosen to avoid spurious correlation problem often found in the quarterly and the annual data. However, the choice of monthly data was constrained by the fact that the variables used in this study were available only at monthly intervals. First the descriptive statistics was done. Then, the data was tested for stationarity and checked whether the variables are cointegrated or not. Finally, the Vector Autoregression Estimate was done to check the probability of cointegration.

Descriptive Statistics

Table 8.1.
Descriptive Statistics

Variables	N	Minimum	Maximum	Mean	Std. Deviation
Nifty	134	2755.10	8901.85	5680.4627	1697.39036
IIP	134	108.8	198.7	160.305	20.9872
Call money rate	134	.05	9.00	4.9000	1.84346
FII	134	-19921.000000	28630.000000	1161.62064263	4404.163941672
WPI	134	104.9	185.9	149.981	26.9123
Exchange rate	134	39.3200	68.6160	52.495905	9.0447668
Valid N (list wise)	134				

The above table shows the descriptive statistics of the variables. It includes the mean, standard deviation, range of observations and the number of observation. The mean value of nifty, IIP, call money rate, FII, WPI, and exchange rate are 5680.4627, 160.305, 4.9000, 1161.62064263, 149.981 and 52.495905 respectively. The standard deviation tells us about the variations of the value from the mean value.

Unit Root Test

The unit root test was used to check the stationarity of the data i.e. to check whether the data has trend or no trend. If the probability value of the variables is less than 0.05, it can be said that the data is stationary and there is no trend. If the probability values of the variables are more than 0.05, then the data is non-stationary and there is trend. The unit root test for all the variables are given in the table.

NIFTY

Table 8.2.

Null Hypothesis: NIFTY has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=12)

	<i>t</i> -Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.117658	0.7077
Test critical values:		
1% level	-3.480038	
5% level	-2.883239	
10% level	-2.578420	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(NIFTY)
 Method: Least Squares
 Date: 03/11/18 Time: 17:58
 Sample (adjusted): 2006M01 2017M01
 Included observations: 133 after adjustments

Variable	Coefficient	Std. Error	<i>t</i> -Statistic	Prob.
NIFTY(-1)	-0.019171	0.017153	-1.117658	0.2658
C	151.5277	101.2454	1.496638	0.1369
R-squared	0.009445	Mean dependent var		43.04323
Adjusted R-squared	0.001884	S.D. dependent var		332.3997
S.E. of regression	332.0864	Akaike info criterion		14.46359
Sum squared resid	14446862	Schwarz criterion		14.50705
Log likelihood	-959.8288	Hannan-Quinn criter.		14.48125
F-statistic	1.249158	Durbin-Watson stat		2.001770
Prob(F-statistic)	0.265759			

The ADF test in the table 8.2 proved that the variable nifty has a unit root because the probability is greater than 0.05 which is 0.7077. This tells us that we can accept the null hypothesis that the variable nifty has a unit root. The ADF test statistic value is -1.117658 which is lesser than the critical values at 1%,5% and 10% significant level. So we can confirm that the variable nifty is non-stationary.

IIP

Table 8.3.

null Hypothesis: IIP has a unit root

Exogenous: Constant

Lag Length: 12 (Automatic - based on SIC, maxlag=12)

	<i>t</i> -Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.788168	0.0629
Test critical values: 1% level	-3.485115	
5% level	-2.885450	
10% level	-2.579598	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(IIP)

Method: Least Squares

Date: 03/09/18 Time: 10:16

Sample (adjusted): 2007M01 2017M01

Included observations: 121 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IIP(-1)	-0.089904	0.032245	-2.788168	0.0063
D(IIP(-1))	-0.459587	0.081760	-5.621134	0.0000
D(IIP(-2))	-0.213124	0.090436	-2.356627	0.0203
D(IIP(-3))	-0.111346	0.091886	-1.211783	0.2283
D(IIP(-4))	-0.311920	0.089564	-3.482663	0.0007
D(IIP(-5))	-0.333379	0.090583	-3.680355	0.0004
D(IIP(-6))	-0.253030	0.093143	-2.716564	0.0077
D(IIP(-7))	-0.255345	0.094107	-2.713343	0.0078
D(IIP(-8))	-0.334444	0.092433	-3.618241	0.0005
D(IIP(-9))	-0.313067	0.092681	-3.377887	0.0010
D(IIP(-10))	-0.205710	0.097254	-2.115169	0.0367
D(IIP(-11))	-0.251713	0.097008	-2.594769	0.0108
D(IIP(-12))	0.405946	0.087797	4.623687	0.0000
C	16.62599	5.484995	3.031178	0.0031
R-squared	0.769316	Mean dependent var		0.493388

Adjusted R-squared	0.741289	S.D. dependent var	9.876092
S.E. of regression	5.023337	Akaike info criterion	6.174509
Sum squared resid	2700.029	Schwarz criterion	6.497989
Log likelihood	-359.5578	Hannan-Quinn criter.	6.305887
F-statistic	27.44912	Durbin-Watson stat	2.136346
Prob(F-statistic)	0.000000		

The ADF test in the table 8.3 proved that the variable IIP has a unit root because the probability is greater than 0.05 which is 0.0629. This tells us that we can accept the null hypothesis that the variable IIP has a unit root. The ADF test statistic value is -2.788168 which is lesser than the critical values at 1% and 5% significant level. So we can confirm that the variable IIP is non-stationary.

CALL MONEY RATE

Table 8.4.

Null Hypothesis: CALL_MONEY_RATE has a unit root

Exogenous: Constant

Lag Length: 2 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
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Augmented Dickey-Fuller test statistic		-2.692343	0.0780
Test critical values:	1% level	-3.480818	
	5% level	-2.883579	
	10% level	-2.578601	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(CALL_MONEY_RATE)

Method: Least Squares

Date: 03/11/18 Time: 18:05

Sample (adjusted): 2006M03 2017M01

Included observations: 131 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CALL_MONEY_RATE(-1)	-0.202216	0.075108	-2.692343	0.0081
D(CALL_MONEY_RATE(-1))	-0.411831	0.094803	-4.344079	0.0000
D(CALL_MONEY_RATE(-2))	-0.257711	0.085757	-3.005124	0.0032

C	0.985422	0.387124	2.545499	0.0121
R-squared	0.296991	Mean dependent var	-0.001908	
Adjusted R-squared	0.280384	S.D. dependent var	1.612558	
S.E. of regression	1.367936	Akaike info criterion	3.494541	
Sum squared resid	237.6485	Schwarz criterion	3.582334	
Log likelihood	-224.8925	Hannan-Quinn criter.	3.530215	
F-statistic	17.88398	Durbin-Watson stat	1.948874	
Prob(F-statistic)	0.000000			

The ADF test in the table 8.4. proved that the variable call money rate has a unit root because the probability is greater than 0.05 which is 0.0780. This tells us that we can accept the null hypothesis that the variable call money rate has a unit root. The ADF test statistic value is -2.692343 which is lesser than the critical values at 1% and 5% significant level. So we can confirm that the variable call money rate is non-stationary.

Table 8.5.

FII

Null Hypothesis: FII has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=12)

	<i>t</i> -Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-11.61824	0.0000
Test critical values: 1% level	-3.480038	
5% level	-2.883239	
10% level	-2.578420	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(FII)

Method: Least Squares

Date: 03/11/18 Time: 18:06

Sample (adjusted): 2006M01 2017M01

Included observations: 133 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FII(-1)	-1.014921	0.087356	-11.61824	0.0000
C	1171.821	397.9740	2.944467	0.0038

R-squared	0.507488	Mean dependent var	-13.21008
Adjusted R-squared	0.503729	S.D. dependent var	6297.491
S.E. of regression	4436.363	Akaike info criterion	19.64798
Sum squared resid	2.58E+09	Schwarz criterion	19.69144
Log likelihood	-1304.591	Hannan-Quinn criter.	19.66564
F-statistic	134.9836	Durbin-Watson stat	2.001271
Prob(F-statistic)	0.000000		

The ADF test in the table 8.5 proved that the variable FII does not have a unit root because the probability is less than 0.05 which is 0.0000. This tells us that we can reject the null hypothesis and accept the alternate hypothesis that the variable FII has a unit root. The ADF test statistic value is -11.61824 which is greater than the critical values at 1%, 5% and 10% significant level. So we can confirm that the variable FII is stationary.

WPI

Table 8.6.

Null Hypothesis: WPI has a unit root
 Exogenous: Constant
 Lag Length: 1 (Automatic - based on SIC, maxlag=12)

	<i>t</i> -Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.036198	0.7390
Test critical values:		
1% level	-3.480425	
5% level	-2.883408	
10% level	-2.578510	

*MacKinnon (1996) one-sided p-values.
 Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(WPI)
 Method: Least Squares
 Date: 03/11/18 Time: 18:07
 Sample (adjusted): 2006M02 2017M01
 Included observations: 132 after adjustments

Variable	Coefficient	Std. Error	<i>t</i> -Statistic	Prob.
WPI(-1)	-0.003361	0.003244	-1.036198	0.3020
D(WPI(-1))	0.496206	0.076512	6.485373	0.0000

C	0.813477	0.500419	1.625593	0.1065
R-squared	0.257479	Mean dependent var	0.603788	
Adjusted R-squared	0.245967	S.D. dependent var	1.134901	
S.E. of regression	0.985492	Akaike info criterion	2.831114	
Sum squared resid	125.2841	Schwarz criterion	2.896632	
Log likelihood	-183.8535	Hannan-Quinn criter.	2.857737	
F-statistic	22.36627	Durbin-Watson stat	1.973425	
Prob(F-statistic)	0.000000			

The ADF test in the table 8.6 proved that the variable WPI has a unit root because the probability is greater than 0.05 which is 0.7390. This tells us that we can accept the null hypothesis that the variable WPI has a unit root. The ADF test statistic value is -1.036198 which is lesser than the critical values at 1%,5% and 10% significant level. So we can confirm that the variable WPI is non-stationary.

EXCHANGE RATE

Table 8.7.

Null Hypothesis: EXCHANGE_RATE has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=12)

	<i>t</i> -Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.218449	0.9320
Test critical values:		
1% level	-3.480038	
% level	-2.883239	
10% level	-2.578420	

* MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(EXCHANGE_RATE)

Method: Least Squares

Date: 03/11/18 Time: 18:08

Sample (adjusted): 2006M01 2017M01

Included observations: 133 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
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EXCHANGE_RATE(-1)	-0.002878	0.013173	-0.218449	0.8274
C	0.321732	0.700022	0.459604	0.6466
R-squared	0.000364	Mean dependent var		0.170996
Adjusted R-squared	-0.007267	S.D. dependent var		1.354186
S.E. of regression	1.359097	Akaike info criterion		3.466442
Sum squared resid	241.9761	Schwarz criterion		3.509906
Log likelihood	-228.5184	Hannan-Quinn criter.		3.484104
F-statistic	0.047720	Durbin-Watson stat		1.883756
Prob(F-statistic)	0.827420			

The ADF test in the table 8.7 proved that the variable exchange rate has a unit root because the probability is greater than 0.05 which is 0.9320. This tells us that we can accept the null hypothesis that the variable exchange rate has a unit root. The ADF test statistic value is -0.218449 which is lesser than the critical values at 1%, 5% and 10% significant level. So we can confirm that the variable exchange rate is non-stationary.

Johansen Cointegration Test

The Johansen cointegration test was conducted to check whether there is long term relationship between the variables. If the probability values of the variables are less than 0.05, it is proved that there is long term relationship. If the probability values of the variables are more than 0.05, it is proved that there is no long term relationship. The cointegration for all the variables are given below.

Table 8.8.

Sample (adjusted): 2006M05 2017M01
 Included observations: 129 after adjustments
 Trend assumption: Linear deterministic trend
 Series: NIFTY IIP CALL_MONEY_RATE FII WPI EXCHANGE_RATE
 Lags interval (in first differences): 1 to 4

Unrestricted Cointegration Rank Test (Trace)

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.281232	123.2973	95.75366	0.0002
At most 1 *	0.258244	80.69926	69.81889	0.0053
At most 2	0.130645	42.16252	47.85613	0.1542

At most 3	0.088078	24.10202	29.79707	0.1962
At most 4	0.074181	12.20812	15.49471	0.1472
At most 5	0.017407	2.265235	3.841466	0.1323

Trace test indicates 2 cointegrating eqn(s) 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 No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.281232	42.59800	40.07757	0.0255
At most 1 *	0.258244	38.53674	33.87687	0.0129
At most 2	0.130645	18.06050	27.58434	0.4901
At most 3	0.088078	11.89390	21.13162	0.5582
At most 4	0.074181	9.942881	14.26460	0.2157
At most 5	0.017407	2.265235	3.841466	0.1323

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

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

From Table 8.8, trace statistic value indicates that there is cointegration among the variables as *p*-value (0.0002) is less than 0.05 and critical value (95.75366) is less than the trace statistic value (123.2973). Max-Eigen value also indicates there exists cointegration as *p*-value (0.0255) is less than 0.05 and critical value (40.07757) is less than Max-Eigen statistic (42.59800). We also reject the null hypothesis that there are at most one cointegrated equations. Therefore, both the tests indicate that there exists cointegration among the variables. Hence, there is long term relationship between these variables.

Vector Autoregression Estimates

Table 8.9.

Vector Autoregression Estimates
Date: 03/12/18 Time: 13:45
Sample (adjusted): 2006M02 2017M01
Included observations: 132 after
Adjustments
Standard errors in () & *t*-statistics in []

NIFTY

NIFTY(-1)	0.791803 (0.08972) [8.82480]
NIFTY(-2)	0.136111 (0.08860) [1.53618]
IIP	-2.079539 (1.91157) [-1.08787]
CALL_MONEY_RATE	-35.34945 (16.0393) [-2.20393]
FII	0.025878 (0.00674) [3.84061]
WPI	6.364478 (3.34890) [1.90047]
EXCHANGE_RATE	-0.469832 (6.29477) [-0.07464]
R-squared	0.967417
Adj. R-squared	0.965853
Sum sq. resids	11980709
S.E. equation	309.5895
F-statistic	618.5502
Log likelihood	-940.7563
Akaike AIC	14.35994
Schwarz SC	14.51282
Mean dependent	5722.306
S.D. dependent	1675.355

Table 8.9 tells us about the Vector Autoregression Estimates for all the variables. The VAR model shows that the R-square is 96% which means that 96% of variations can be explained using this model. The model is good and can be projected publically. But with VAR model we cannot predict the significant value. So we estimate it using probability values. The three values of each variable are regression coefficient, standard error and *t*-statistics.

Table 8.10.

System: UNTITLED
 Estimation Method: Least Squares
 Date: 03/12/18 Time: 12:33
 Sample: 2005M12 2017M01
 Included observations: 134
 Total system (balanced) observations 134

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-3653.286	690.8973	-5.287741	0.0000
C(2)	21.10594	7.862629	2.684336	0.0082
C(3)	29.25463	9.704183	3.014642	0.0031
C(4)	0.021799	0.017495	1.246004	0.2150
C(5)	40.50942	19.38393	2.089846	0.0386
C(6)	-120.2388	43.73456	-2.749286	0.0068
Determinant residual covariance		710333.8		

$$\text{Equation: NIFTY} = C(1) + C(2)*IIP + C(3)*WPI + C(4)*FII + C(5) \\ *EXCHANGE_RATE + C(6)*CALL_MONEY_RATE$$

Observations: 134

R-squared	0.751600	Mean dependent var	5680.463
Adjusted R-squared	0.741897	S.D. dependent var	1697.390
S.E. of regression	862.3402	Sum squared resid	95184728
Durbin-Watson stat	0.255071		

Table 8.10 shows the probability of cointegration. We can see that all the coefficients of variables except FII have probability less than 0.05 which means that we can reject the null hypothesis for all the variables except for FII. The null hypothesis tells us there is no cointegration among the variables. So we can say that all the variables except FII can have impact on nifty.

Granger Causality Test

The granger causality test was done to know which variable influences which other variables. If the probability value is more than 0.05, then the null hypothesis is accepted and if the probability value is less than 0.05, then the null hypothesis is rejected. The granger causality test for the non-stationary and cointegrated variables is shown below.

NIFTY AND IIP

Table 8.11.

Sample: 2005M12 2017M01

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
IIP does not Granger Cause NIFTY	132	1.16052	0.3166
NIFTY does not Granger Cause IIP		3.75579	0.0260

From the table, we accept the null hypothesis that IIP does not granger cause nifty but we reject the null hypothesis that nifty does not granger cause IIP. So we can say that nifty can influence IIP.

NIFTY AND CALL MONEY RATE

Table 8.12.

Sample: 2005M12 2017M01

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
CALL_MONEY_RATE does not Granger Cause NIFTY	132	2.49194	0.0868
NIFTY does not Granger Cause CALL_MONEY_RATE		0.61999	0.5396

From the table 8.12, both the probability value is more than 0.05 and thus leading to the acceptance of the null hypothesis which means that both the variables do not influence each other.

NIFTY AND WPI

Table 8.13.

Sample: 2005M12 2017M01

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
WPI does not Granger Cause NIFTY	132	1.72682	0.1820
NIFTY does not Granger Cause WPI		0.11421	0.8922

From table 8.13, both the probability value is more than 0.05 and thus leading to the acceptance of the null hypothesis which means that both the variables do not influence each other.

NIFTY AND EXCHANGE RATE

Table 8.14.

Sample: 2005M12 2017M01
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
EXCHANGE_RATE does not Granger Cause NIFTY	132	5.41485	0.0055
NIFTY does not Granger Cause EXCHANGE_RATE		2.65807	0.0740

From table 8.14, we can see that we can reject the null hypothesis that exchange rate does not granger cause nifty which means that exchange rate can influence nifty. We need to accept the null hypothesis that nifty does not granger cause exchange rate because the probability is greater than 0.05.

9. Findings

- All the variables except FII are non-stationary and has a unit root. So we can say that there is a trend in nifty, IIP, call money rate, WPI and exchange rate.
- The Johansen cointegration test show us that there is cointegration among the variables which indicates that there is long term relationship between these variables.
- The VAR model shows that the R-square is 96% which means that the model is good and can be projected to the population.
- All the coefficients of variables except FII have probability less than 0.05 which indicates that all the variables except FII can have impact on nifty.
- The granger causality test indicates that nifty can have impact on IIP.
- The test also shows us that nifty and call money rate does not influence each other.
- Nifty and WPI also do not influence each other.
- The granger causality test also indicates that exchange rate can have influence on nifty but nifty does not influence exchange rate.

10. Conclusions

This study investigates the short run and the long run equilibrium relationship between a set of macroeconomic variables and stock prices using data for the period 2006 to 2017 from the Indian stock market. This article has analyzed only some of the macroeconomic variables which is one of the limitations of this study. The economic variables comprise Index of Industrial Production, call money rate, Foreign Institutional Investment, Wholesale Price Index and exchange rate. Data Analysis and interpretation were done using SPSS and Eviews software. The unit root tests indicate that only FII does not have unit root. The evidence obtained from the cointegration tests suggests that the variables have long term relationship with nifty stock prices in the Indian stock exchange. But the VAR model suggests FII cannot influence nifty stock prices. The Granger causality test indicates that exchange rate can have impact on nifty. Overall the model of this study is fit.

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