CHAPTER - V

MACROECONOMIC VARIABLES AND STOCK MARKET RETURNS

5.1 Relationship between Macroeconomic Variables and Stock Market Returns

The result of relationship between macroeconomic variables and stock market returns in India has been tested with the help of econometric techniques and the results are presented in fifth chapter. To examine the relationship between macroeconomic variables and stock market return, the first step is to convert all the series into natural logarithm values. Table 4.5.1 depicts the results of descriptive statistics. The table presents the summary statistics of all the variables used in the study. It can be seen from the Table 4.5.1 that the mean value of BSE prices is 9.060331 with maximum value of 9.928623 and minimum value of 7.941509. While the mean value of Industrial Production remained during the study period 5.273799 with maximum value of 5.671259 and minimum value of 4.943070.

As far as the log of Consumer Price Index in concerned, its average value was 5.693798 with maximum 6.385194 and minimum value 4.787492 respectively. In addition, it can be seen from the Table 4.5.1 that the mean value of Exchange Rate is 3.821372 with maximum value of 3.975092 and minimum value of 3.671733 and the mean value of Call Money Rates was 1.727874 with maximum value of 2.644045 and minimum value of -0.314711 respectively. All the variables exhibit a positive mean return. Moreover, Bombay Stock Exchange returns, Consumer Prices Index (CPI), Exchange Rate and Call Money Rates exhibit a negative skewness which implies that they have a long left tail. The value of zero skewness and three at kurtosis represented the observed distribution is normally distributed.

Table 4.5.2 depicts the results of descriptive statistics as per the growth rates. It can be seen from the Table 4.5.2 that the mean value of BSE-Sensex returns is 0.009718 with maximum value of 0.248851 and minimum value of -0.272999. While the mean value of growth rate of Industrial Production remained during the study period 0.000183 with maximum value of 0.125043 and minimum value of -0.638204. As far as the Consumer Price Index in concerned, its average value was -0.006700 with maximum 0.045074 and minimum value -1.589235 respectively. In addition, it can be seen from the Table 4.5.2 that the mean value of the change in Exchange Rate is 0.001049 with maximum value of 0.069472 and minimum value of -0.060743 and the mean value of the change in the Call Money Rates was -0.000690 with maximum value of 2.156846 and minimum value of -1.198478 respectively.

In order to test the relationship between macroeconomic variables and stock market returns in India, the econometric methodology has been used. The following steps have been used:

- The unit root test has been used to check whether all the series are stationary or not. In the study the stationarity of the series has been checked with the help of Augmented Dickey Fuller test and Philips-Perron test.
- If the series are stationary, as per the methodology the cointegration test has been used. In the study after testing the stationary of series, the cointegration test has been applied.
- As per the econometric methodology, if the series are cointegrated, applied the Vector Error Correction Model (VECM) for testing the short term affects. The econometric model has been constructed after using the Vector Error Correction Model (VECM).

TABLE 4.5.1

DESCRIPTIVE STATISTICS

(1 JANUARY 2001-31 DECEMBER 2011)

Variables	LBSE	LIPR	LCPI	LEXR	LMYSY	LCMR
Mean	9.060331	5.273799	5.693798	3.821372	10.29166	1.727874
Median	9.195608	5.262949	6.144186	3.828315	10.24026	1.762141
Maximum	9.928623	5.671259	6.385194	3.975092	11.18750	2.644045
Minimum	7.941509	4.943070	4.787492	3.671733	9.454365	-0.314711
Std. Dev.	0.666340	0.196926	0.630918	0.059707	0.521065	0.352306
Skewness	-0.322807	0.099421	-0.300388	-0.535604	0.127027	-1.571471
Kurtosis	1.575174	1.728476	1.193261	3.431627	1.702242	10.35013
Jarque-Bera	13.45821	9.109709	19.93881	7.335839	9.617958	351.4635
Probability	0.001196	0.010516	0.000047	0.025530	0.008156	0.000000
Observations	132	132	132	132	132	132

Source: Author's calculation using E-views software package

TABLE 4.5.2

DESCRIPTIVE STATISTICS

(1 JANUARY 2001-31 DECEMBER 2011)

Variables	**$\Delta LBSE_t$ = $LBSE_t$- $LBSE_{t-1}$**	**$\Delta LIPR_t$ = $LIPR_t$- $LIPR_{t-1}$**	**$\Delta LCPI_t$ = $LCPI_t$- $LCPI_{t-1}$**	**$\Delta LEXR_t$ = $LEXR_t$- $LEXR_{t-1}$**	**$\Delta LMYSY_t$ = $LMYSY_t$ - $LMYSY_{t-1}$**	**$\Delta LCMR_t$ = $LCMR_t$ - $LCMR_{t-1}$**
Mean	0.009718	0.000183	-0.006700	0.001049	0.013230	-0.000690
Median	0.011469	0.007177	0.006179	-0.000508	0.010774	0.008180
Maximum	0.248851	0.125043	0.045074	0.069472	0.057334	2.156846
Minimum	-0.272999	-0.638204	-1.589235	-0.060743	-0.001619	-1.198478
Std. Dev.	0.076920	0.076976	0.139534	0.019904	0.010577	0.262651
Skewness	-0.511319	-4.323398	-1.119440	0.568420	1.312164	3.095232
Kurtosis	4.241424	37.27595	-11.26362	5.546861	5.459344	41.21322
Jarque-Bera	14.12030	6846.778	128.2561	42.45988	70.60612	8179.705
Probability	0.000859	0.000000	0.000000	0.000000	0.000000	0.000000
Observations	131	131	131	131	131	131

Source: Author's calculation using E-views software package

Results of Unit Root Test (ADF and PP tests) for Selected Variables

Now ADF test is used to check here to see whether all of the variables have unit root or not. For this purpose, two tests namely Augmented Dickey Fuller (ADF) test and Phillip Perron (PP) has been applied. Table 4.5.3 shows that the Unit root test results both at level and at first difference.

Dickey and Fuller presented three different equations. These are:

Y_t is random walk

$$\Delta Y_t = \delta Y_{t-1} + u_t$$

Y_t is random walk with drift

$$\Delta Y_t = \beta_1 + \delta Y_{t-1} + u_t$$

Y_t is random walk with drift around a stochastic trend

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + u_t$$

Decision rule:

If t > ADF critical value = not reject null hypothesis, i.e., unit root exists.

If t < ADF critical value = reject null hypothesis, i.e., unit root does not exist.

The results in the Table 4.5.3 revealed that the hypothesis of unit root test can't be rejected in all of the variables at level but the hypothesis of unit root test can be rejected in all of the variables at first difference. All the variables are stationary at first difference. Here the case of BSE Sensex's returns, Industrial Production, Consumer Price Index, Exchange Rate, Money Supply, Call Money Rates (at first difference), the ADF Calculated Value (-18.44111), (-8.050551), (-8.037024), (-15.99750), (-8.476046), (-10.55269) is less than the critical values at 1%, 5% and 10% level of significance. It means BSE Sensex's returns, Industrial Production, Consumer Price Index, Exchange Rate, Money Supply, Call Money Rates series has no unit root problem. It means the BSE Sensex's returns, Industrial Production, Consumer Price Index, Exchange Rate, Money Supply, Call Money Rates series is stationary. Though the results of ADF and PP test it can be concluded that all of the variables are stationary at first difference After taking the value of changes in series, the Table 4.5.3 also found that the

results of ADF and PP test concluded that all of the variables are stationary at first difference.

TABLE 4.5.3

RESULTS OF UNIT ROOT TESTS AT LEVEL AND FIRST DIFFERENCE (1 JANUARY 2001-31 DECEMBER 2011)

Variables	**ADF**		**PP test**	
	Level	**Ist difference**	**Level**	**Ist difference**
LBSE	1.846060	-18.44111	1.426060	-18.20113
ΔLBSE	2.885854	-18.51389	2.883456	-18.63049
LIPR	-0.658664	-8.050551	-1.744277	-17.15693
ΔLIPR	1.005679	-5.068469	-0.823649	-17.26795
LCPI	-2.052404	-8.037024	-2.055615	-11.27147
ΔLCPI	1.125714	-19.23495	-1.271477	-20.16520
LEXR	1.696881	-15.99750	0.6968810	-16.97779
ΔLEXR	0.659436	-14.69462	0.2469943	-15.69438
LMYSY	-1.952247	-8.476046	-1.956408	-11.17435
ΔLMYSY	0.476046	-12.49934	1.017428	-18.94449
LCMR	-2.194010	-10.55269	-2.580005	-12.97896
ΔLCMR	2.950723	-18.79895	-2.95073	-18.79895
Critical Values 1%	-4.0309	-4.0314	-4.0309	-4.0314
Critical Values 5%	-3.4447	-3.4450	-3.4447	-3.4450
Critical Values 10%	-3.1469	-3.1471	-3.1469	-3.1471

Note: ADF & PP tests results of both of the variables from 1 January 2001 to 31 December 2011

Results of Johansen's Cointegration Test (Relationship between Industrial Production and Stock Market Returns in India)

$$(SMI)_{it} = \alpha_i + \beta_1(IPR) + u_{it}$$

If all of the variables are stationary at same order, then cointegration test can be applied. Moreover, It is necessary for cointegration test that our variables should be non-stationary. That means they are cointegrated and indicates that there is long run equilibrium relationship between them. The existence of cointegrating relationship implies that Vector Error Correction Model (VECM) is suitable.

The next step in this study is to test for cointegration between industrial production and stock market returns in India. The results of Johansen's cointegration test are presented in Table 4.5.4. If both of the variables are stationary at same order, then cointegration test have been used. The value of λ_{trace} (trace statistics) corresponding to r = 0 is 44.53678 which is higher than the corresponding critical value of 19.96 at 5% level of significance.

Hence the conclusion for this is null hypothesis is rejected and alternative hypothesis is accepted that shows there is long run relationship exists between both of the variables and the null of $r \leq 1$ is also rejected by λ_{trace} because at this the trace statistics values 19.80674 is higher than the critical value 9.24 .

The same conclusion is also obtained from the $\lambda_{\max}$ statistics because in this case computed values for r = 0 and $r \leq 1$ are 22.5147 and 15.6479 also higher than the corresponding critical values 15.67 and 9.24, so reject the null hypothesis and accept the alternative hypothesis. Though λ_{trace} and $\lambda_{\max}$ results it is clearly found that long run relationship exists between industrial production and stock market returns in India.

TABLE 4.5.4

RESULTS OF JOHANSEN'S COINTEGRATION TEST

(INDUSTRIAL PRODUCATION AND STOCK MARKET RETURNS)

(1 JANUARY 2001-31 DECEMBER 2011)

$$(SMI)_{it} = \alpha_i + \beta_1 (IPR) + u_{it}$$

Unrestricted Cointegration Rank Test (Trace)				
Null Hypothesis	**Eigen Values**	**Trace Statistic**	**Critical Values (5%)**	**Prob****
None* r = 0	0.178210	44.53678	19.96	0.00
At most 1* $r \leq 1$	0.145464	19.80674	9.24	0.00
Unrestricted Cointegration Rank Test (Max Eigen values)				
Null Hypothesis	**Eigen Values**	**Max Eigen Values**	**Critical Values (5%)**	**Prob****
None* r = 0	0.178210	22.5147	15.67	0.00
At most 1* $r \leq 1$	0.145464	15.6479	9.24	0.00

Note: cointegration test of both of the variables from 2001 to 2011
*denotes the rejection of hypothesis at 5% significance level
** Mackinnon-Haug-Michelis (1999) p-values

Results of Johansen's Cointegration Test (Relationship between Consumer Price Index and Stock Market Returns in India)

$$(SMI)_{it} = \alpha_i + \beta_2 (CPI) + u_{it}$$

The next step in this study is to test for cointegration between consumer price index and stock market returns in India. The results of Johansen's cointegration test are presented in Table 4.5.5 If both of the variables are stationary at same order, then cointegration test have been used. The value of λ_{trace} (trace statistics) corresponding to r = 0 is 44.99969 which is higher than the corresponding critical value of 19.96 at 5% level of significance. Hence the conclusion for this is null hypothesis is rejected and alternative hypothesis is accepted that shows there is long run relationship exists between both of the

variables and the null of $r \leq 1$ is also rejected by λ_{trace} because at this the trace statistics values 18.97030 is higher than the critical value 9.24 .

The same conclusion is also obtained from the $\lambda_{\max}$ statistics because in this case computed values for r = 0 and $r \leq 1$ are 34.5692 and 17.6589 also higher than the corresponding critical values 15.67 and 9.24, so reject the null hypothesis and accept the alternative hypothesis. Though λ_{trace} and $\lambda_{\max}$ results it is clearly found that long run relationship exists between consumer price index and stock market returns in India.

TABLE 4.5.5

RESULTS OF JOHANSEN'S COINTEGRATION TEST

(CONSUMER PRICE INDEX AND STOCK MARKET RETURNS)

(1 JANUARY 2001-31 DECEMBER 2011)

$$(SMI)_{it} = \alpha_i + \beta_2 (CPI) + u_{it}$$

Unrestricted Cointegration Rank Test (Trace)				
Null Hypothe-sis	**Eigen Values**	**Trace Statistic**	**Critical Values (5%)**	**Prob****
None* r = 0	0.186641	44.99969	19.96	0.00
At most 1* $r \leq 1$	0.139772	18.97030	9.24	0.00
Unrestricted Cointegration Rank Test (Max Eigen values)				
Null Hypothe-sis	**Eigen Values**	**Max Eigen Values**	**Critical Values (5%)**	**Prob****
None* r = 0	0.186641	34.5692	15.67	0.00
At most 1* $r \leq 1$	0.139772	17.6589	9.24	0.00

Note: cointegration test of both of the variables from 2001 to 2011
*denotes the rejection of hypothesis at 5% significance level
** Mackinnon-Haug-Michelis (1999) p-values

Results of Johansen's Cointegration Test (Relationship between Exchange Rates and Stock Market Returns in India)

$$(SMI)_{it} = \alpha_i + \beta_3(EXR) + u_{it}$$

The next step in this study is to test for cointegration between exchange rates and stock market returns in India. The results of Johansen's cointegration test are presented in Table 4.5.6. If both of the variables are stationary at same order, then cointegration test have been used. The value of λ_{trace} (trace statistics) corresponding to r = 0 is 95.29907 which is higher than the corresponding critical value of 19.96 at 5% level of significance.

Hence the conclusion for this is null hypothesis is rejected and alternative hypothesis is accepted that shows there is long run relationship exists between both of the variables and the null of $r \leq 1$ is also rejected by λ_{trace} because at this the trace statistics values (43.27865) is higher than the critical value (9.24) .

The same conclusion is also obtained from the $\lambda_{\max}$ statistics because in this case computed values for r = 0 and $r \leq 1$ are 42.314 and 21.231 also higher than the corresponding critical values 15.67 and 9.24, so reject the null hypothesis and accept the alternative hypothesis. Though λ_{trace} and $\lambda_{\max}$ results it is clearly found that long run relationship exists between both of the variables. The results of the long run relationship between exchange rate and stock market returns in India are not consistent with the study of Kutty (2010) because Kutty (2010) in their study found the short run relationship between both of the variables not the long run relationship between exchange rates and stock market returns.

TABLE 4.5.6

RESULTS OF JOHANSEN'S COINTEGRATION TEST

(EXCHANGE RATES AND STOCK MARET RETURNS)

(1 JANUARY 2001-31 DECEMBER 2011)

$$(SMI)_{it} = \alpha_i + \beta_3(EXR) + u_{it}$$

Unrestricted Cointegration Rank Test (Trace)				
Null Hypothesis	**Eigen Values**	**Trace Statistic**	**Critical Values (5%)**	**Prob****
None* r = 0	0.331861	95.29907	19.96	0.00
At most 1* $r \leq 1$	0.285015	43.27865	9.24	0.00
Unrestricted Cointegration Rank Test (Max Eigen values)				
Null Hypothesis	**Eigen Values**	**Max Eigen Values**	**Critical Values (5%)**	**Prob****
None* r = 0	0.331861	42.314	15.67	0.00
At most 1* $r \leq 1$	0.285015	21.231	9.24	0.00

Note: cointegration test of both of the variables from 2001 to 2011
*denotes the rejection of hypothesis at 5% significance level
** Mackinnon-Haug-Michelis (1999) p-values

Results of Johansen's Cointegration Test (Relationship between Money Supply and Stock Market Returns in India)

$$(SMI)_{it} = \alpha_i + \beta_4(MYSY) + u_{it}$$

The next step in this study is to test for cointegration between money supply and stock market returns in India. The results of Johansen's cointegration test are presented in Table 4.5.7. If both of the variables are stationary at same order, then cointegration test have been used. The value of λ_{trace} (trace statistics) corresponding to r = 0 is 55.08828 which is higher than the corresponding critical

value of 19.96 at 5% level of significance. Hence the conclusion for this is null hypothesis is rejected and alternative hypothesis is accepted that shows there is long run relationship exists between both of the variables and the null of $r \leq 1$ is also rejected by λ_{trace} because at this the trace statistics values 20.26224 is higher than the critical value 9.24 .

The same conclusion is also obtained from the $\lambda_{\max}$ statistics because in this case computed values for r = 0 and $r \leq 1$ are 39.51464 and 18.64972 also higher than the corresponding critical values 15.67 and 9.24, so reject the null hypothesis and accept the alternative hypothesis. Though λ_{trace} and $\lambda_{\max}$ results it is clearly found that long run relationship exists between money supply and stock market returns in India.

TABLE 4.5.7

RESULTS OF JOHANSEN'S COINTEGRATION TEST

(MONEY SUPPLY AND STOCK MARKET RETURNS)

(1 JANUARY 2001-31 DECEMBER 2011)

$$(SMI)_{it} = \alpha_i + \beta_4 (MYSY) + u_{it}$$

Unrestricted Cointegration Rank Test (Trace)				
Null Hypothesis	**Eigen Values**	**Trace Statistic**	**Critical Values (5%)**	**Prob****
None* r = 0	0.241488	55.08828	19.96	0.00
At most 1* $r \leq 1$	0.148547	20.26224	9.24	0.00
Unrestricted Cointegration Rank Test (Max Eigen values)				
Null Hypothesis	**Eigen Values**	**Max Eigen Values**	**Critical Values (5%)**	**Prob****
None* r = 0	0.241488	39.51464	15.67	0.00
At most 1* $r \leq 1$	0.148547	18.64972	9.24	0.00

Note: cointegration test of both of the variables from 2001 to 2011
*denotes the rejection of hypothesis at 5% significance level
** Mackinnon-Haug-Michelis (1999) p-values

Results of Johansen's Cointegration Test (Relationship between Call Money Rates and Stock Market Returns in India)

$$(SMI)_{it} = \alpha_i + \beta_5 (CMR) + u_{it}$$

The next step in this study is to test for cointegration between call money rates and stock market returns in India. The results of Johansen's cointegration test are presented in Table 4.5.8. If both of the variables are stationary at same order, then cointegration test have been used. The value of λ_{trace} (trace statistics) corresponding to r = 0 is 73.19336 which is higher than the corresponding critical value of 19.96 at 5% level of significance.

Hence the conclusion for this is null hypothesis is rejected and alternative hypothesis is accepted that shows there is long run relationship exists between both of the variables and the null of $r \leq 1$ is also rejected by λ_{trace} because at this the trace statistics values 22.59451 is higher than the critical value 9.24 .

The same conclusion is also obtained from the $\lambda_{\max}$ statistics because in this case computed values for r = 0 and $r \leq 1$ are 45.3648 and 20.6497 also higher than the corresponding critical values 15.67 and 9.24, so reject the null hypothesis and accept the alternative hypothesis.

Though λ_{trace} and $\lambda_{\max}$ results it is clearly found that long run relationship exists between money supply and stock market returns in India.

TABLE 4.5.8

RESULTS OF JOHANSEN'S COINTEGRATION TEST

(CALL MONEY RATES AND STOCK MARKET RETURNS)

(1 JANUARY 2001-31 DECEMBER 2011)

$$(SMI)_{it} = \alpha_i + \beta_5 (CMR) + u_{it}$$

Unrestricted Cointegration Rank Test (Trace)				
Null Hypothesis	**Eigen Values**	**Trace Statistic**	**Critical Values (5%)**	**Prob****
None* r = 0	0.241488	73.19336	19.96	0.00
At most 1* $r \leq 1$	0.148547	22.59451	9.24	0.00
Unrestricted Cointegration Rank Test (Max Eigen values)				
Null Hypothesis	**Eigen Values**	**Max Eigen Values**	**Critical Values (5%)**	**Prob****
None* r = 0	0.241488	45.3648	15.67	0.00
At most 1* $r \leq 1$	0.148547	20.6497	9.24	0.00

Note: cointegration test of both of the variables from 2001 to 2011
*denotes the rejection of hypothesis at 5% significance level
** Mackinnon-Haug-Michelis (1999) p-values

Relationship between all the Macroeconomic Variables and Stock Market Returns in India (Multiple Results)

Results of Johansen's Cointegration Test

$$(SMI)_{it} = \alpha_i + \beta_1 (IPR) + \beta_2 (CPI) + \beta_3 (EXR) + \beta_4 (MYSY) + \beta_5 (CMR) + u_{it}$$

The next step in this study is to test for cointegration. The results of Johansen's cointegration test are presented in Table 4.5.9. If all of the variables are stationary at same order, then cointegration test have been used. The value of λ_{trace} (trace statistics) corresponding to r = 0 is 100.0256 which is higher than the corresponding critical value of 94.15 at 5% level of significance. The value of

λ_{trace} (trace statistics) corresponding to r = 1 is 69.86768 which is higher than the corresponding critical value of 68.52 at 5% level of significance. The value of λ_{trace} (trace statistics) corresponding to r = 2 is 52.79181which is higher than the corresponding critical value of 47.21 at 5% level of significance. The value of λ_{trace} (trace statistics) corresponding to r = 3 is 30.29271 which is also higher than the corresponding critical value of 29.68 at 5% level of significance. The value of λ_{trace} (trace statistics) corresponding to r = 4 is 16.813171 which is higher than the corresponding critical value of 15.41 at 5% level of significance. The value of λ_{trace} (trace statistics) corresponding to r = 5 is 4.394755 which is higher than the corresponding critical value of 3.76 at 5% level of significance. Hence the conclusion is that the null hypothesis of no cointegration is rejected in favour of the alternative of cointegration including all the variables. That showed the long run relationship exists between macroeconomic variables and stock market returns in India.

The same conclusion is also obtained on the basis of $\lambda_{\max}$ statistics because in this case computed values for r = 0, r= 1, r = 2, r = 3, r = 4, r = 5 i.e, 62.314, 61.231, 35.246, 28.549, 17.8135, 11.35711 also higher than the corresponding critical values of 40.30, 34.40, 28.14, 22.00, 15.67, 9.24.

Though λ_{trace} and $\lambda_{\max}$ results, it is clearly found that long run relationship exist between stock market returns and macroeconomic variables. The results for both Trace statistic and Maximal Eigen statistic were reported in Table 4.5.9 and both of the tests, i.e. the Trace statistic and the Maximal Eigen statistics recognized two cointegrating vectors and therefore, the study used two cointegrating vectors in order to establish the long-run relationships among the variables.

Some of the studies have also confirmed the long run relationship exists between macroeconomic variables and stock market returns with the help of Johansen's cointegration test such as Asaolu and Ogunmuyiwa (2011), Maysami et al. (2004), Gay and Nova (2008). On the other hand, the study of Hosseini et al. (2011) found long run as short run linkage between macroeconomic

variables and stock prices in India. The findings of the study are not consistent with the study of Kutty (2010), Tursoy, Gunsel and Rjoub (2008), Seshaiah and Tomer (1997) etc.

TABLE 4.5.9

RESULTS OF JOHANSEN'S COINTEGRATION TEST

(1 JANUARY 2001-31 DECEMBER 2011)

$$(SMI)_{it} = \alpha_i + \beta_1(IPR) + \beta_2(CPI) + \beta_3(EXR) + \beta_4(MYSY) + \beta_5(CMR) + u_{it}$$

Unrestricted Cointegration Rank Test (Trace)				
Null Hypothesis	**Eigen Values**	**Trace Statistic**	**Critical Values (5%)**	**Prob****
None* r = 0	0.272916	100.0256	94.15	0.00
At most 1	0.193368	69.86768	68.52	0.00
At most 2	0.115744	52.79181	47.21	0.00
At most 3	0.094297	30.29271	29.68	0.0001
At most 4	0.034459	16.813171	15.41	0.0005
At most 5	0.003128	4.394755	3.76	0.000
Unrestricted Cointegration Rank Test (Max Eigen values)				
Null Hypothesis	**Eigen Values**	**Max Eigen Values**	**Critical Values (5%)**	**Prob****
None* r = 0	0.272916	62.314	40.30	0.00
At most 1	0.193368	61.231	34.40	0.00
At most 2	0.115744	35.246	28.14	0.0001
At most 3	0.094297	28.549	22.00	0.0005
At most 4	0.034459	17.8135	15.67	0.00
At most 5	0.003128	11.35711	9.24	0.00

Note: cointegration test of both of the variables from 2001 to 2011
*denotes the rejection of hypothesis at 5% significance level
** Mackinnon-Haug-Michelis (1999) p-values

Results of Vector Error Correction Model (Macroeconomic variables and stock market returns in India)

Table 4.5.10 exhibits the results of Vector Error Correction Model. The error correction model in all of the cases explained that changes in BSE Sensex's returns are statistically insignificant. It concluded that no short term effect exists.

The error correction term 1 shows that the estimated t value in all of the cases is less than the critical value of t respectively and all variables in lag 1 and lag 2 for t-values are found to be insignificant. As VECM, It can be concluded no short run relationship exists between macroeconomic variables and stock market returns in India.

TABLE 4.5.10

RESULTS OF VECTOR ERROR CORRECTION MODEL (MACROECONOMIC VARIABLES AND STOCK MARKET RETURNS) (1 JANUARY 2001-31 DECEMBER 2011)

INDUSTRIAL PRODUCTION (IPR)			
Variables	**Coefficients**	**Standard Error**	**t-statistics**
EC term 1	-0.491560	(0.05364)	(-2.69426)
D(BSE(-1))	-0.186489	(0.23654)	(-1.56943)
D(BSE(-2))	-0.246590	(0.14365)	(-1.95462)
D(IPR(-1))	0.6523692	(0.35469)	(1.45619)
D(IPR(-2))	0.2567934	(0.45692)	(0.95236)
R squared	0.3954235	0.29546	
CONSUMER PRICE INDEX (CPI)			
Variables	**Coefficients**	**Standard Error**	**t-statistics**
EC term 1	-0.523649	(0.09538)	(-3.78152)
D(BSE(-1))	-0.252649	(0.19562)	(-1.25469)
D(BSE(-2))	-0.186492	(0.56276)	(-1.83732)
D(EXCH(-1))	0.692459	(0.29583)	(1.54629)
D(EXCH(-2))	0.265490	(0.45921)	(0.78168)
R squared	0.354923	0.201654	
EXCHANGE RATES (EXR)			
Variables	**Coefficients**	**Standard Error**	**t-statistics**
EC term 1	-0.621677	(0.07357)	(3.58172)
D(BSE(-1))	-0.285398	(0.14472)	(-1.97212)
D(BSE(-2))	-0.198010	(0.10777)	(-1.83732)
D(EXCH(-1))	0.717262	(0.54373)	(1.31916)
D(EXCH(-2))	0.399117	(0.43399)	(0.91964)
R squared	0.518529	0.263441	

Table Continued 4.5.10……

MONEY SUPPLY (MYSY)			
Variables	**Coefficients**	**Standard Error**	**t-statistics**
EC term 1	-0.594619	(0.09564)	(-7.15942)
D(BSE(-1))	-0.359439	(0.12546)	(-1.29841)
D(BSE(-2))	-0.234952	(0.95842)	(-1.57246)
D(EXCH(-1))	0.615933	(0.24561)	(1.249535)
D(EXCH(-2))	0.259439	(0.34954)	(0.348516)
R squared	0.452942	0.25649	
CALL MONEY RATES (CMR)			
Variables	**Coefficients**	**Standard Error**	**t-statistics**
EC term 1	-0.715366	(0.02594)	(-6.15946)
D(BSE(-1))	-0.259423	(0.09436)	(-2.69426)
D(BSE(-2))	-0.215934	(0.09765)	(-1.59436)
D(EXCH(-1))	0.5642910	(0.23649)	(1.216942)
D(EXCH(-2))	0.4943690	(0.56492)	(0.516943)
R squared	0.4236940	0.394263	

Note: Results of Vector Error Correction Model between all of the variables and stock market returns in India (1 January 2001 to 31 December 2011)

Results of Vector Error Correction Model (VECM) (Multiple Results)

The results of the Vector Error Correction Model are summarized in Table 4.5.11. Table 4.5.11 exhibits the results of Vector Error Correction Model (VECM). The overall results of the Vector Error Correction Model exhibits no short terms effects among all of these variables. The vector error correction model provides weak relationship between stock market returns and macroeconomic variables. The following equation present statistical results on Vector Error Correction Model with the lag specifications:

D (log BSE) = -0.009309 [log (BSE (-1) - 0.539305 log (IP(-1) + 4.149429log (CPI(-1) -3.375868 log (EXR(-1) - 2.123252 log (MS (-1) - 3.392544 log (CMR (-1) + 0.047573] + (0.79514)+ (3.02045) + (4.86673) + (4.98993) + (2.38678)

TABLE 4.5.11

RESULTS OF VECTOR ERROR CORRECTION MODEL

(1 JANUARY 2001-31 DECEMBER 2011)

(MULTIPLE RESULTS)

Cointegrating Eq:	**CointEq1**					
BSE(-1)	1.000000					
IP(-1)	-0.539305					
	(0.79514)					
	(-0.67825)					
CPI(-1)	4.149429					
	(3.02045)					
	(1.37378)					
EXR(-1)	-3.375868					
	(4.86673)					
	(-0.69366)					
MS(-1)	-2.123252					
	(4.98993)					
	(-0.42551)					
Cointegrating Eq:	**CointEq1**					
CMR(-1)	-3.392544					
	(2.38678)					
	(-1.42139)					
C	0.047573					
Error Correction:	**D(BSE)**	**D(IP)**	**D(CPI)**	**D(EXR)**	**D(MS)**	**D(CMR)**
CointEq1	-0.009309	0.005779	-0.021569	0.003858	-0.000952	0.568773
	(0.01759)	(0.01657)	(0.03133)	(0.00426)	(0.00269)	(0.03680)
	(-0.52921)	(0.34872)	(-0.68836)	(0.90661)	(-0.35360)	(15.4544)
D(BSE(-1))	-0.675179	0.114241	-0.018909	0.010281	-0.004273	-0.454434

Table Continued 4.5.11……

	(0.09974)	(0.09397)	(0.17768)	(0.02413)	(0.01526)	(0.20869)
	(-6.76935)	(1.21570)	(-0.10643)	(0.42610)	(-0.27998)	(-2.17756)
D(BSE(-2))	-0.392376	0.093789	0.241377	0.030864	-0.007768	-0.167328
	(0.09888)	(0.09316)	(0.17615)	(0.02392)	(0.01513)	(0.20689)
	(-3.96816)	(1.00674)	(1.37032)	(1.29030)	(-0.51333)	(-0.80878)
D(IP(-1))	0.015338	-0.983447	-0.214363	0.023410	-0.014640	0.015424
	(0.09408)	(0.08864)	(0.16760)	(0.02276)	(0.01440)	(0.19685)
	(0.16303)	(-11.0949)	(-1.27904)	(1.02862)	(-1.01688)	(0.07836)
D(IP(-2))	0.033864	-0.355491	-0.049295	0.031670	-0.010345	-0.086598
	(0.09209)	(0.08676)	(0.16405)	(0.02228)	(0.01409)	(0.19268)
	(0.36773)	(-4.09721)	(-0.30049)	(1.42162)	(-0.73409)	(-0.44943)
D(CPI(-1))	0.046226	-0.005237	-0.508544	-0.014142	0.013301	-2.159330
	(0.07505)	(0.07071)	(0.13370)	(0.01815)	(0.01149)	(0.15703)
	(0.61594)	(-0.07406)	(-3.80377)	(-0.77893)	(1.15812)	(-13.7511)
D(CPI(-2))	0.042435	-0.023946	-0.247165	-0.018979	0.012119	-1.291506
	(0.06192)	(0.05833)	(0.11030)	(0.01498)	(0.00948)	(0.12955)
	(0.68537)	(-0.41049)	(-2.24091)	(-1.26714)	(1.27899)	(-9.96936)
D(EXR(-1))	-0.702745	-0.102919	0.398022	-0.393914	-0.011874	2.060264
	(0.42309)	(0.39862)	(0.75369)	(0.10235)	(0.06475)	(0.88524)
	(-1.66099)	(-0.25819)	(0.52810)	(-3.84882)	(-0.18339)	(2.32736)
D(EXR(-2))	-0.474054	0.718699	0.337103	-0.240995	-0.029418	1.612726
	(0.41788)	(0.39371)	(0.74441)	(0.10109)	(0.06395)	(0.87434)
	(-1.13442)	(1.82545)	(0.45284)	(-2.38404)	(-0.46003)	(1.84450)
D(MS(-1))	-0.303231	0.096369	-3.385911	0.145576	-0.605271	0.939314
	(0.61315)	(0.57768)	(1.09226)	(0.14832)	(0.09383)	(1.28290)
	(-0.49455)	(0.16682)	(-3.09990)	(0.98148)	(-6.45064)	(0.73218)

Table Continued 4.5.11……

D(MS(-2))	0.097019	0.329195	-2.190379	0.012205	-0.265277	1.040176
	(0.62932)	(0.59292)	(1.12107)	(0.15223)	(0.09631)	(1.31674)
	(0.15416)	(0.55521)	(-1.95382)	(0.08017)	(-2.75452)	(0.78996)
D(CMR(-1))	0.011577	0.004879	-0.180673	-0.005510	0.000207	0.455684
	(0.04118)	(0.03880)	(0.07336)	(0.00996)	(0.00630)	(0.08616)
	(0.28112)	(0.12575)	(-2.46289)	(-0.55317)	(0.03289)	(5.28871)
D(CMR(-2))	0.031227	0.008809	-0.058754	-0.002417	-0.001622	0.110477
	(0.03010)	(0.02836)	(0.05362)	(0.00728)	(0.00461)	(0.06298)
	(1.03744)	(0.31063)	(-1.09575)	(-0.33196)	(-0.35219)	(1.75418)
C	0.001022	-2.96E-05	-0.000181	0.000382	-0.000172	0.000130
	(0.00767)	(0.00723)	(0.01366)	(0.00186)	(0.00117)	(0.01605)
	(0.13321)	(-0.00409)	(-0.01327)	(0.20607)	(-0.14639)	(0.00811)
R-squared	0.348423	0.536718	0.471921	0.296968	0.299264	0.618484
Adj. R-squared	0.273463	0.594925	0.411168	0.216088	0.218648	0.797602
Sum sq. resids	0.842467	0.747828	2.673477	0.049299	0.019729	3.688150
S.E. equation	0.086345	0.081351	0.153815	0.020887	0.013214	0.180661

To sum up (the relationship between macroeconomic variables and stock market returns in India), found that there is a long run relationship exists between all of the macroeconomic variable and stock market returns in India over the period and with the help of Vector Error Correction Mode (VECM), found that there is no shot term effect between macroeconomic variables and stock market return in India over the period. Therefore we concluded that the null hypothesis of the relationship between the industrial production and stock market returns in India ($Hypothesis_{401}$) is rejected and the alternative hypothesis of the relationship between the industrial production and stock market returns in India ($Hypothesis_{411}$) is accepted. That concluded there is a significant relationship between the industrial production and stock market returns in India. Moreover, it also concluded that the null hypothesis of the relationship between the consumer price index and stock market returns in India ($Hypothesis_{402}$) is rejected and the alternative hypothesis of the relationship between the consumer price index and

stock market returns in India ($Hypothesis_{412}$) is accepted. That concluded there is a significant relationship between the consumer price index and stock market returns in India. In addition, it also concluded that the null hypothesis of the relationship between the exchange rates and stock market returns in India ($Hypothesis_{403}$) is rejected and the alternative hypothesis of the relationship between the exchange rates and stock market returns in India ($Hypothesis_{413}$) is accepted. That concluded there is a significant relationship between the exchange rates and stock market returns in India. Moreover, it also concluded that the null hypothesis of the relationship between the money supply and stock market returns in India ($Hypothesis_{404}$) is rejected and the alternative hypothesis of the relationship between the money supply and stock market returns in India ($Hypothesis_{414}$) is accepted. That concluded there is a significant relationship between the money supply and stock market returns in India. In addition, it also concluded that the null hypothesis of the relationship between the call money rate and stock market returns in India ($Hypothesis_{405}$) is rejected and the alternative hypothesis of the relationship between the call money rates and stock market returns in India ($Hypothesis_{415}$) is accepted. That concluded there is a significant relationship between the call money rates and stock market returns in India. The overall conclusion of the relationship between macroeconomic variables and stock market returns in India found that over the period, the study showed, there is a long run relationship exists between macroeconomic variables and stock market returns in India.