A study on Macro Economic Determinants on the Performance of Indian Stock Market

Mr. Alphin T Kallany
Lecturer, Kerala University Study and Research Centre

Abstract
The study is conducted to analyze the impact of macro-economic variables in Indian stock market performance by considering consumer price Index (CPI), Exchange rates (ER), Gross Exports (GE), Gross Imports (GI), Industrial Production (IP), Interest rates (IR), Total Reserves held by Reserve Bank of India (TR), Real GDP and Production Process Index as economic variable and Nifty Fifty as the stock market for the period of 20 years by using Johansen Cointegration, VECM and Wald test methodologies are applied and it is found that among all variables Consumer Price Index, Industrial production and total Reserve of RBI doesn't have long run causality. However these variables have short run causality on stock market in India. The influence of international markets on Indian market is analyzed by using Dow Jones Industrial Average (DJ), Nikkei Stock Index of Japanese stock exchange and India's net International Investment then found that they are not holding a long lasting relationship between stock markets. Nikkei stock index bears a role in short run causality of nifty fifty.

I. Introduction

The seventh largest and second most populous country in the world, India has long been considered a country of unrealized potential. A new spirit of economic freedom is now stirring in the country, bringing sweeping changes in its wake.

Reddy Lokeswar (2012) recommended in his study that any investor who wants to maintain actively investments in stock market must take into consideration on various macro-economic factors like GDP, inflation etc. Various controversies can also found out while assessing the impact of these, macro-economic variables. Use of high expected rate of return will decrease the value of the firm and will results in lower share price *(Patel, Samveg)*. Increase in money supply and inflation increases future cash flow of the firm, which in turn increases expected dividend and will increase stock prices. This paper empirically investigates the long-run equilibrium relationship and short-run dynamic linkage between the Indian stock market and various macro-economic variables for 20 years beginning from 1996 by way of applying Johansen Co-Integration Model.

Significance of the study

On the basis of review of literature, it is found that lot of studies have been done on the impact of macro-economic variables in stock market. Each study clearly analyzed and examined different aspects of stock market in depth. While comparing the studies from abroad and India lot of differences are seen in the movement of market. The Indian stock exchanges hold a place of prominence not only in Asia but also at the global stage. And that's what the study is significant. The Bombay Stock Exchange (BSE) is one of the oldest exchanges across the world, while the National Stock Exchange (NSE) is among the best in terms of sophistication and advancement of technology. The study pertains to comparative analysis of the Indian Stock Market with respect to various international counterparts. Exchanges are now crossing national boundaries to extend their service areas and this has led to cross-border integration.

II. Review of Past Studies

Shanmugam and Misra (2008) on their study about relationship with stock return and inflation in India the IIP, WPI and stock price data were put into the empirical model and found that stock return and inflation are negatively related and Fisher's Hypothesis got rejected while considering the entire period of study.

Reddy and Agrahari (2012) conducted a study regarding the analysis the effect of stimulus packages announced during the financial crisis in 2008-09 with respect to Indian scenario. It was found that he Indian system is much better than the world's as SEBI didn't tempt to take ad-hoc measures and no scams has emerged as Indian Regulating System was more perfect.

Enamul and Fatima (2011) on their study on the relationship between stock market and long run per capita growth rate of Bangladesh found that none of the stock market variable has any impact on assessing the growth rate of economy of Bangladesh. It has been concluded that the stock market in Bangladesh is still in transitional period and has not been developed yet.

Bhatt, Rajiv (2011) made an attempt to analyse the impact of global financial crisis on 2008-09 on Indian Economy. . The forex market was in reversal capital flows and depreciation of rupee couldn't positively affect the exports bills of India as the global markets were fell down.

Boubakari and Jin (2010) conducted a study to explore causality relationship between stock market and economic growth from five Euronext countries for the period 1995 to 2008. The findings were negative for Belgium and Portugal where the reason is small and lack of liquidity of stock market in Belgium and Portugal.

Geethaet. al, (2011) reveals that there exists long run relationship between expected and unexpected inflation with stock return and not in short run except the case of China. The researchers claim that exchange rate has bigger impact than other variables in China and Malaysia whereas GDP has bigger impact in the case of USA.

Modis, Theodore (2007) found that the DJIA (Dow Jones Industrial Average) pattern is more irregular than those of sunspots. Another result of the analysis was that the correlation between DJIA and GDP turns out to be scientifically insignificant.

Joseph et. al, (2011) on their working paper addressed issues with India's potential growth rate, trends of Agrarian sector, fiscal impulse, trade balance trend etc.. the fall in savings and investment rates reflects the fall in potential growth rate of Indian economy during crisis period. The study also reveals that there exists a long run relationship between RGDP and other variables such as REER, M3, fiscal impulse etc.

Reddy, Lokeswar (2012) found that RGDP was the most important variable influencing the stock price. The researcher further recommended that active investors in the stock market should consider macro-economic factors.

Patel, Samveg (2012) on studying the effect of macro-economic determinants on the performance of the Indian stock market found that there exists long run relationship between macro-economic variables and stock market indices after considering eight macro-economic variables viz. interest rate, inflation, exchange rate, IIP, money supply, gold price, silver price and oil price.

Rajkumar and Mahadevan (2015) observed that economic reforms shall yield to ease of doing business. Fiscal consolidation shows a positive results but the deficit is yet gratifying. The tax reforms paved the way for high tax revenues and foreign capital inflows has been increased substantially. GDS has been declined due to high persistent inflation.

Filis, George (2009) made an attempt to examine the relationship of the cyclical components of CPI, Industrial Production, stock market in Greece and the influences of oil price on those variables. Applying the HP filter it was found that the stock market receives negative and significant influence from oil and CPI. IP affects stock market cycles positively but the influence is not significant at the same time negative influence from CPI.

Ramaratnamet. al. (2013) conducted a study to assess the FII investment and movement of Sensex on the basis of empirical data and also tests any significant difference exists in terms of FII investment towards equity and debt. Pearson correlation test shows that there is good relationship between FII investment and Sensex. The study has also found that there exists a significant difference on FII investment between the debt and equity segment by way of ANOVA Test.

Hsing Yu (2014) made a study with regard to impact of macro-economic factors on the stock market of Estonia. After coefficient and regression analysis it has been found that Estonian stock market index is positively affected by GDP and foreign index and negatively associated with exchange rate, domestic interest rate, expected inflation rate and Gov. bond yield.

Yogeswariet. al. (2012) made an attempt to construct a model through the examination of the effect of macro-economic variables on stock price movement in Indonesia stock exchange. The change in inflation gives positive impact where change in interest rate gives negative results to stock prices. Increase in inflation leads to higher stock price and high rate of return.

Hsing, Yu (2011) made a study on the effect of macro-economic variables on stock market with respect to Czech Republic. The results show that the stock market is positively associated with real GDP; the foreign index is negatively influenced by the ratio of Government borrowing to GDP. Increased money supply would be favorable to stock market.

Hussainey and Ngoc (2009) investigated regarding the effect of macro-economic indicators such as interest rate, industrial production and international effects on Vietnamese stock prices. The results was that industrial production has positive effect on Vietnamese stock prices at the same time long term and short term interest rates are not affecting the stock prices. It has been found that the US real production activity has stronger effect on Vietnamese share price that in comparison with the US money market.

Salmankhan Muhammed (2014) examined the relationship between KSE index and macro-economic variables and the results indicates a strongest positive relation between stock prices and macro- economic factors like exchange rate, inflation and GDP growth rate where as a negative relation with interest rates.

Rafique Asama et. al., (2013) on their study on assessment of the impact of macro-economic variables on stock market index of Pakistan examined that selected explanatory variables have significant impact on KSE index where CPI possess high explanatory power. GDS and GDP per capita has positive relation and discount rate and CPi has negative relation with stock price.

Hsing Yu (2011) made an attempt to examine the behavior of Bulgarian stock market by specifying a model incorporating fiscal policy, monetary policy, exchange rate, world stock index, world interest rate etc. to estimate their respective impacts. The study found that more real GDP, lower Gov. deficit on GDP ratio, higher money supply on GDP ratio, a lower interest rate or expected inflation rate, a higher US stock market index and lower Euro Gov. bond yield would increase favorable performance of Bulgarian Stock Market.

Rehman, Abdul (2009) on their study relating to macro-economic determinants of Malaysian stock Market employed on Kula Lumpus Composite Index found that positive association between KLCI and reserves and industrial production and negative relationship with interest rates, money supply and real exchange rate.

Zhu Bing (2012) conducted a study to investigate the performance of Shanghai Stock Market and to discover the association between a set of macro-economic variables and stock return found that exchange rates, exports and imports, foreign reserve and unemployment rate have significant impact on stock returns of China.

Sirucek, Martin (2012) on his work on effect, implication and relationship between selected macro-economic variables with regard to US stock market found that the impact of those selected variables on DJIA appears to be statistically significant, where a negative correlation has been found out in inflation and unemployment levels.

Mohanamani and Sivagnanasithi (2014) by considering six macro-economic variables Granger Causality test is conducted after stationary test such as ADF test and arrived at the findings that causal relationship exists between macro-economic variables and Indian stock market. The results identified an inverse relationship between money supply and interest rates. It is concluded that stock market reacts to money supply only if it causes the changes in the interest rates.

Hsing Yu (2011) studied macro-economic determinants of the stock market index of Hungry by applying GARCH Model and the results indicated that Hungary's stock index is positively associated with real GDP, ratio of Gov. debt to GDP, exchange rate and German stock index and is negatively associated with real interest rate, expected inflation rate, Gov. bond yield in Euro.

Alam and Rashid (2014) realized that CPI, money supply, exchange rate and interest rate are negatively associated with stock return whereas industrial production is positively correlated. But the relationship found to be significant. The findings of the study further suggested that in long run, the Pakistani stock market is reactive to macro-economic indicators.

Sireesha, Bhanu (2013) found that GDP shows a direct relation with stock returns and inverse relation with inflation, industrial production and money supply. But net investments made by FIIs are not significant as there is randomness in returns and exchange rates.

Kudal, Pallavi attempted to examine the relationship amongst various macro-economic variables and to develop a regression equation to forecast the stock market in India. The test signifies that there exists unidirectional causal relationship exchange rate and index as the exchange rate have more impact than others. The study reflects adverse effect of gold and trade deficits on Indian stock market along with the exchange rate.

Kumar, Rajesh (2013) analyzed CNX Nifty index based on monthly averages and the study revealed three factors labeled intuitively as Macro-Environment, Industrial Performance and Policy Rate having high responsiveness in the Indian market.

Kumar and Verma (2016) examined that market index has been significantly influenced by macro-economic factors. Among all variables Interest rates and Inflation Rate contribute the highest responsive factor. The indexes used for this study were IT index, Automobile index, FMCG index, Banking index, Metal Index.

Izedonmi and Abdullai (2011) on the study indicate that macro-economic factors tested have no significant influence in the Nigerian Exchange Market.

The review of past studies helped to have an overlook on various research tools applied and need for econometric models in statistics. And that's why, the study is employed with varies of Econometric models to arrive at the accurate and precise conclusions.

III. Objectives

Though there were different studies conducted in different nations with regard to the relationship between macro-economic variables and stock market. In India also, several studies has taken place. Though, a long period analysis along with recent data and facts isn't explored by the researcher while conducting review of past studies. Thus, a gap is felt on the area of Co-integration of aggregate of macro-economic variables.

The objectives of the study are to examine the relationship between macro-economic variables and Indian stock market index. The primary objectives of this study are classified into two. They are:
1.   To check the long run co-integration between macro-economic variables Indian Stock Market Index.
2.   To examine the causality relationship between macro-economic variables Indian Stock Market Index.

IV.   Methodology

National stock exchange of India (NSE) is the leading and very popular exchange for stock trading in India. Therefore research is carried out by considering NSE as representative of Indian stock market and particularly its Indian Nifty Fifty is employed in the study. The data were collected from various websites of RBI, SEBI, and database of World Bank, Yahoo Finance, and International Financial Statistics of IMF etc. Secondary data is used to satisfy the objectives of the study. The co-integration is tested at Nifty fifty and other macro-economic variables. The variables included in the study are Consumer Price Index, Dow Jones, Exchange Rate, Exports and Imports, Balance of Payment, IIP, Interest rates, Total Reserves of RBI, Real GDP, Production Process Index, Nikkei, Net International Investment, Balance of Payment and Gov. Bond rate.
The analysis of this study is done through the following steps.
1.   Time series data is data collected over time for a single or a group of variables. For this kind of data the first thing to do is to check the variable that contains the time or date range and make sure is the one need for the study.
2.   Preliminary analysis is done through line graphs and descriptive statistics.
3.   Checking the stationarity properties through Augmented Dickey Fuller and Philip Perron test through Akai-Info- Criteria
4.   Analyse the Long term relationship between spot and futures market is determined by using Johansen Co-integration Model
5.   Make use of Vector Error Correction mechanism and Vector Auto Regression models to rectify the results of co-integration.
6.   Analyse the long run causality and short run causality among variables adopted for the study.
7.   Ascertainment of Wald co-efficient to check short run causality.

Period of the Study
The study pertains to a period of 20 years, beginning from first quarter 1996 to second Quarter of 2016. So a total of 78 observations are derived for Analysis and Hypothesis Testing. However certain variables such as Dow Jones Industrial Average and India's Net International Investments are not available to certain periods. They are provided from 2000 onwards.

4.6 Limitations of the study
The following are the limitations of this study
1.   The data adopted in this study pertains to a period of twenty years only.
2.   The study pertains with only quarterly data instead of intraday or tick by tick data and those variables which quarterly data are not available are excluded from the study.
3.   The study is based on secondary data and errors in collection, compilation of data may cause imperfections on data.
4.   Although some of the areas which are not touched by the researcher still the study is able to come up with good results and research implications.
These econometrics models are briefly explaining in the chapter. It will definitely give the basic ideal on the each model and its application of the different context.

Analysis and Interpretation
The data was collected from International Financial Statistics, databank of RBI and NSE and Yahoo Finance were put for analysis in EViews 7.1.the descriptive statistics (both individually and as group) are provided in the following table No: 1.From the table it can be realized that the data is not normal as the standard deviation is too high for variables ranging up to probability values of 2 % to 95 %. Though a detailed descriptive analysis of variables have been provided in the following table without making adjustments in raw data. The summary statistics related to the variables put into the study are given in the Table No:1.Mean, Median, Standard Deviation, Skewness, Kurtosis and Jarque-Bera values are ascertained for all macro-economic variables and for stock indices.

	BOP	CPI	D_J	ER	GBR	GEX	GIM
Mean	5109.912	95.99247	11961.51	50.18976	7.95992	2084.679	3082.37
Median	3795.048	85.07681	10885	46.78666	7.90667	1534.003	2221.67
Maximum	29185.71	147.657	17823.07	64.15194	8.91	17163.2	25256.9
Minimum	-17240.23	51.13146	7591.93	39.46243	6.42333	354.528	442.552
Std. Dev.	8537.16	35.36917	2796.393	7.472431	0.61894	2162.654	3253.43
Skewness	0.723707	0.236458	0.731017	0.632916	-0.55217	4.344682	4.05572
Kurtosis	4.598354	1.412196	2.597054	1.842957	2.98702	29.90343	27.346
Jarque-Bera	12.78678	9.377968	6.133091	10.04869	2.94769	2730.941	2249.95
Probability	0.001673	0.009196	0.046582	0.006576	0.22904	0	0
Sum	337254.2	7871.382	765537	4115.56	461.675	170943.7	252755
Sum Sq. Dev.	4.74E+09	101329.2	4.93E+08	4522.816	21.8357	3.79E+08	8.57E+08
Observations	66	82	64	82	58	82	82

	NII	IP	IR	NIFTY	NIKKIE	PPI	REAL_GDP	TR
Mean	-203993.5	84.47074	7.277439	3524.875	13880.2	95.16271	11121.2	217041.5
Median	-207021	87.0757	6.75	2990.05	13625.8	91.14813	9427.7	274263.8
Maximum	-51178.68	122.1296	9.5	8491	22531	132.7067	26883	357180.9
Minimum	-364613.2	44.44647	6	884.25	7972.71	54.44152	2523	32610.62
Std. Dev.	118039.2	24.58801	1.314688	2451.586	3840.93	27.29796	7746.7	112687.2
Skewness	-0.062324	-0.242989	0.278052	0.514812	0.27149	0.036862	0.75275	-0.48589
Kurtosis	1.418855	1.522837	1.32415	1.934247	1.97279	1.424453	2.20024	1.623485
Jarque-Bera	4.297408	8.26214	10.65223	7.502839	4.61247	8.499922	8.23411	9.700439
Probability	0.116635	0.016066	0.004863	0.023484	0.09964	0.014265	0.01629	0.007827
Sum	-8363735	6926.601	596.75	289039.7	1138176	7803.342	756242	17797406
Sum Sq. Dev.	5.57E+11	48970.17	140.0008	4.87E+08	1.19E+09	60359.46	4.02E+09	1.03E+12
Observations	41	82	82	82	82	82	68	82

From the table, while analyzing the mean and median values it can be stated that only Government Bond Rate (TB Rate) follows the normal distribution. In respect of that the kurtosis of GBR is almost up to three percentages. So it can be estimated that the probability for being stationary is higher for GBR. While considering other variables such as Balance of Payment (BOP), Consumer Price Index (CPI), Dow Jones Industrial Average (DJ), Exchange Rate (ER), Gross Exports (GE) and Gross Imports (GI) shows abnormality in its distributions. This table depicts the summary statistics of eight macro-economic variables constituting Net International Investment of India (NII), Industrial Production (IP), Interest Rate (IR), Production Price Index (PPI), Real GDP and Total Reserve of RBI along with indices. In the analysis of these basic facts it is not able to conclude that the data follows a normal distribution. While considering all variables, three variables i.e. Investment, Industrial Production and Treasury Bill Rates are negatively Skewed whereas the others are positively Skewed

**Analysis of Movements, Patterns and Trends of Macro-Economic Variables.**

LBOP

Figure No: 1

BOP
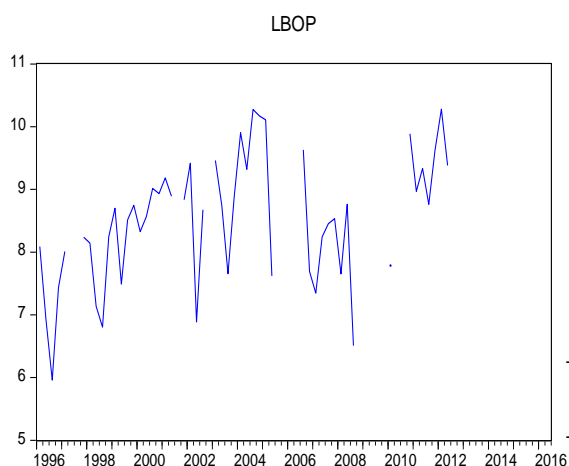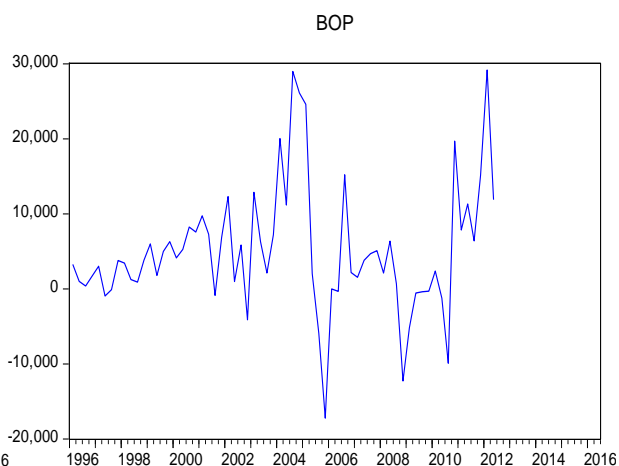
Figure No: 2

There are no log values for negative figures. As the Balance of Payment includes negative value the log values are not generated for such periods. So that is why the raw data of Balance of Payment are provided in the Graph. Log values for 2004-2006 and for 2008-2010 are missing due to negative data. However the both graph doesn't contains a general trend for the time given and follows an intercept.

LCPI

Figure No: 3

LDJ
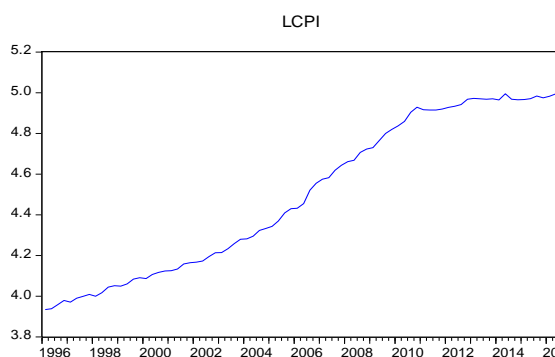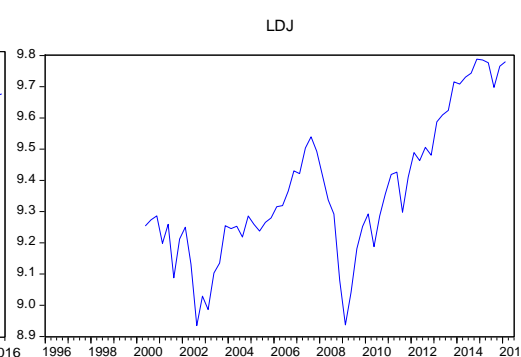
Figure No: 4

The log of Consumer Price index is depicted on the Figure No:3 . The data pertains to 20 years and shows an increasing trend. It rises from 3.955% to 5% through this period.

The Dow Jones Industrial Average of US was available from 1998 and the log values are plotted on the graph which constitutes figures for 18 years. The data is highly fluctuating in nature and is shoeing a rising trend from 2008. The reason for the decline of figures in 2002 and 2008 is that of Depression that triggered the US economy.

LER

Figure No: 5

LGBR
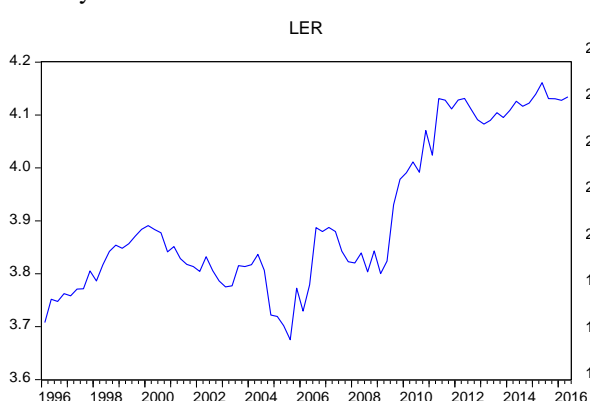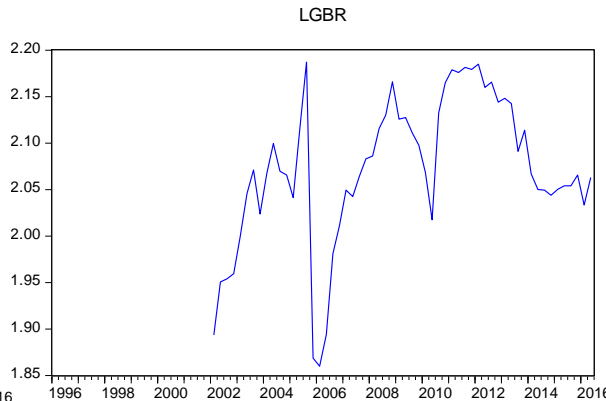
Figure No: 6

The log values of Exchange rates (ER) are plotted on the Figure No: 5. The graph shows a general trend of increase affected by two reverse trends in 2005 and 2009. While connecting the link between the Dow Jones industrial Averages, this may cause by the impact of Stimulus Packages adopted by the US Government.

From the Figure No:__ it is well understood that the data of Government Bond rate (GBR) follows a non-deterministic trend ranging from 2.20 % to 1.85 %. So while analysis the summary statistics and graph of log values it may predict that the GBR would have the peculiarities of stationality.
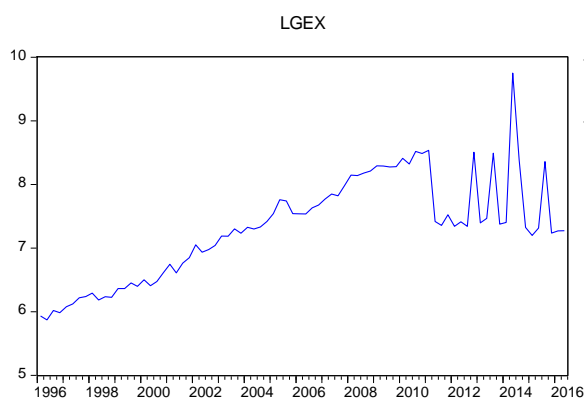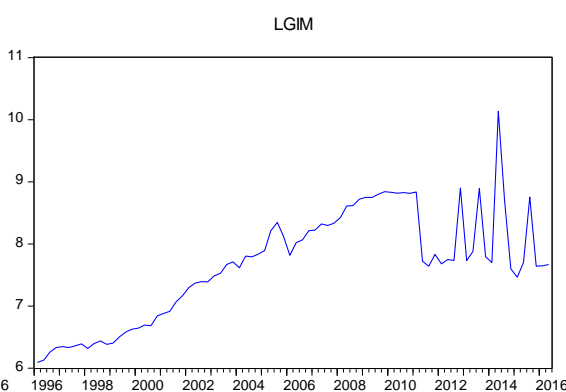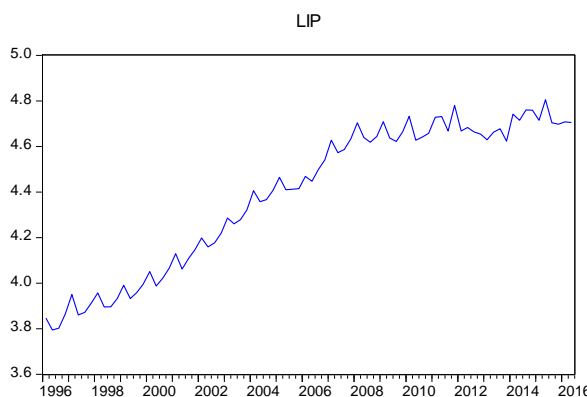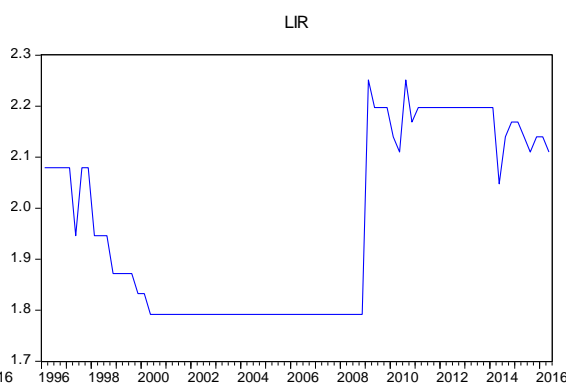

Figure No: 7

Figure No: 8

As the log values of Balance of Payments are not ascertained due to negativity of data, the aggregate of constituents of Balance of payments are taken for the study. That is why the data regarding Gross Exports (GE) and Gross Imports (GI) are taken for the study. The log values of Gross Exports and Gross Imports are provided in the Figures No: 7 and Figure No: 8 respectively. Both the data shows an increasing trend up to 2011 and then followed a non-deterministic trend.
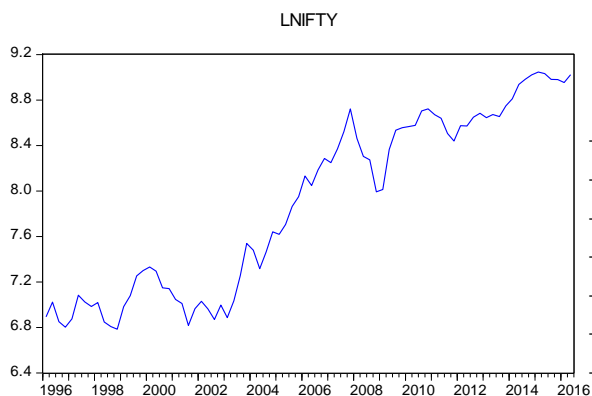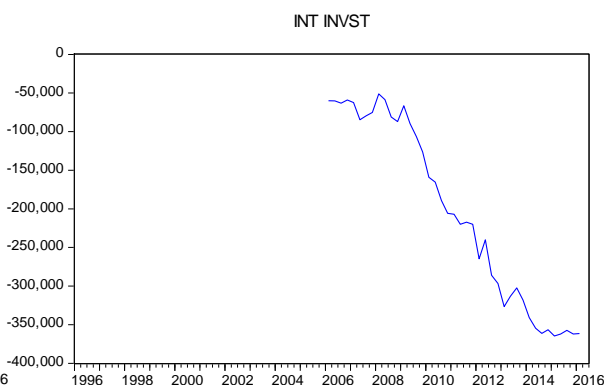

Figure No: 9

Figure No: 10

The graphical representation of log values of Industrial Production (IP) is provided in the figure No: 9. The line graph shows an increasing trend in general followed by a same rate of growth during 2000 to 2008 and then a nominal growth. However the time series graph plotted of Index of Industrial production shows that the variable follows non deterministic trend for the study period. It would be analysed that the Index of Industrial Production undergoes trend corrections at regular intervals of time. That is why the graph shows a zigzagged point at appropriate periods.

The graphical presentation of log values of Interest Rates is given in the figure No:10 .for the period 2000 to 2008 the interest rate were constant and after that a hike is occurred due to the RBI's intervention on Repos and Reverse Repos which was a part of stimulus packages by Reserve Bank of India. Then again from 2010 to 2014 the interest rate is seems to be unaltered.
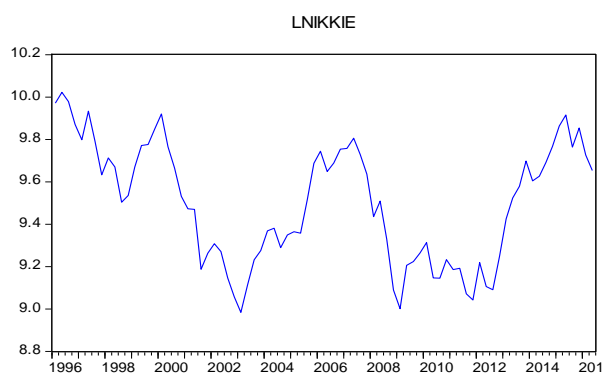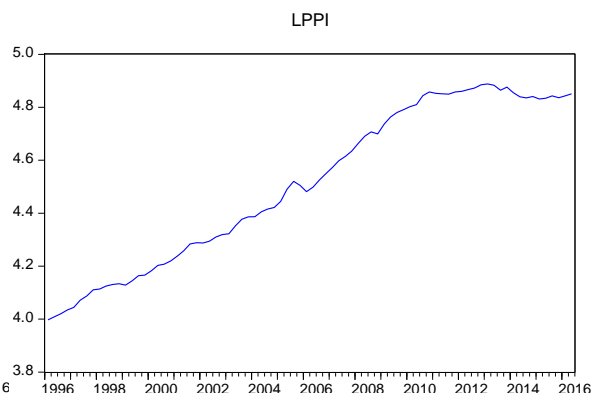
Figure No: 11

Figure No: 12

The log value representation of Nifty Fifty of National Stock Exchange shows that the index goes through a rising trend. During 2000 and 2007 it underwent for trend reversals. Though it regained its major trend by next years.

As the Net Investment of India shows negative figure, it was impossible to ascertain the log values of that variable. So in spite of ascertain log values, the raw data were considered for testing the stationality of data. The raw data of Net International Investment shows a declining trend. It means that the foreign investment in India being covered by Indian residents making investments abroad. Generally the variable shows a declining tendency.

Figure No: 13

Figure No: 14

Nikkei shows a deterministic trend when compared to nifty and Dow Jones Industrial Average. Figure No; 13 shows the rising and falling of Nikkei which is the index of Tokyo Stock Exchange, that's of the Japan. The market falls form 2000 and regained trend reversal during 2003 which continued up to the great depression of 2007. The Japanese stock exchange took four years i.e. up to 2012 to recover from the after impacts of depression. Then 2013 onwards it shows a rising trend.

The figure No:14 shows the line graph of Log of Production Process Index. This index is valid because in real GDP the total income of a nation from three sectors of the economy is being calculated. India's service sector contribute much enough to the GDP. So it would be comprehensive to analyse the relationship between Production Process Index and Stock Market.

LRGDP

LTR

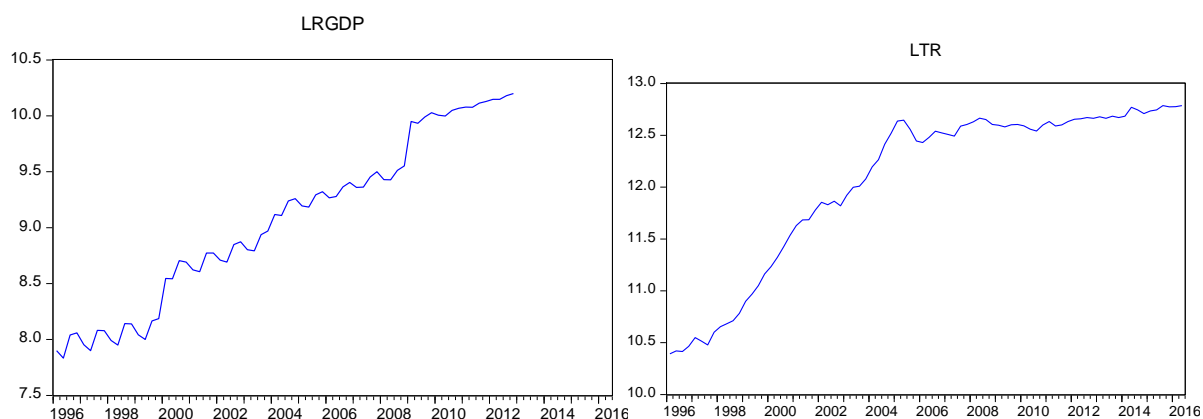<div align="center">Figure No: 15   Figure No: 16</div>

As the inflation is taken as one major variable in the study on relationship between the variables, it is necessary to eliminate the impact of inflation and price level fluctuations in computing Gross Domestic Product and that's why, the study accommodates Real GDP. The log values and its graphical representation indicate that the Real GDP doesn'tfollow a deterministic trend. It showed a steep hike for two times in the study period, i.e. in 1999 and 2009.The line graph as shown in figure No: __ indicates that the Total Reserve (TR) held by the Reserve Bank of India belongs to the increase trend at different rates. From 1996 to third quarter of2005 there occurred a hike and after that the rate of increase got decreased.

Unit Root Test

As the log values of Balance of Payment are not sufficient to conduct the Unit Root Test, the raw data is considered for Unit Root Test. The unit root test of raw data indicates that the Balance Of Payment is stationary at level form and hence Johansen Co-integration could not be applied. The t-statistic of Balance of Payment in Unit Root Test is -4.664 where the probability value is 0.0003. The test critical value of data at one percent level of significant is -3.53 which is higher than t-statistic. Thus there is no sufficient evidence to reject the null hypothesis that the Balance of Payment has a Unit Root.

Log values of the Consumer Price Index were taken for the Unit Root Test and the results shows that the data is non-stationary at level form and the null hypothesis that Consumer Price Index has been rejected as the test statistic is higher than the critical values. The data becomes stationary when it undergoes at first level with 11 lag intervals.

Variables	Level				First Difference			
	ADF		PP		ADF		PP	
	T Statistic	P Value	T Statistic	P Value	T statistic	P Value	T statistic	P Value
BOP	-4.664137	0.0003	-4.71293	0.0003	-11.05387	0.0000	-15.79421	0.0000
LCPI	-2.773799	0.2118	-0.682247	0.9707	-3.765669	0.0237	-6.969535	0.0000
LDJ	-2.495415	0.3294	-2.381665	0.3853	-7.599916	0.0000	-7.59974	0.0000
LER	-1.782404	0.7043	-1.886432	0.6524	-9.970681	0.0000	-9.906383	0.0000
LGBR	-3.285687	0.0202	-3.22076	0.0238	-7.977816	0.0000	-9.821406	0.0000
LGEX	-1.945618	0.3101	-2.638004	0.0896	-2.886856	0.0521	-17.95736	0.0001
LGIM	-1.864439	0.3473	-2.447418	0.1323	-3.09202	0.0318	-16.95004	0.0001
LIP	0.308469	0.9984	-2.083078	0.5471	-4.365874	0.0044	-22.41242	0.0001
LIR	-1.613619	0.4711	-1.400165	0.5783	-10.86224	0.0001	-10.86224	0.0001
LNIFTY	-3.039019	0.1284	-2.380067	0.387	-7.517509	0.0000	-7.415292	0.0000
NII	-2.260015	0.4451	-2.260015	0.4451	-7.080686	0.0000	-7.076532	0.0000
LNIKKIE	-2.520454	0.1145	-2.282847	0.1799	-7.651273	0.0000	-7.619001	0.0000
LPPI	-2.659034	0.2566	0.962262	0.9999	-6.124775	0.0000	-6.267344	0.0000
LRGDP	-0.567964	0.8700	-0.33759	0.9129	-9.05404	0.0000	-10.95339	0.0000

| LTR | -1.012049 | 0.9360 | -0.743118 | 0.9660 | -6.221545 | 0.0000 | -6.163427 | 0.0000 |

The Dow Jones Industrial Average which follows intercept without trend shows that the data is non-stationary as the null hypothesis is being rejected due to the dominance of test statistic over critical values. The data becomes stationary at first difference and are suitable for Johansen co-integration test.

While conducting Unit Root test for exchange rate the null hypothesis that the Exchange rate has a unit root is being rejected and the data is found to be non-stationary at level form and became stationary at first difference. The test statistic value is -1.782 where the probability value is greater than .05 i.e. .704.

As described in the analysis of descriptive statistics of Government Bond Rates the data follows a normal distribution and the log values of Government bond rates (GBR) follows the peculiarities of Stationary Data. It means that the data is stationary at level form hence there is absence of evidence to reject the null hypothesis that the Government Bond rates has a unit root.

The augmented Dickey Fuller test of Unit Root depicts that the null hypothesis that the Gross Exports (GEX) has a unit has been rejected as the Probability value is 0.30 which is greater than .05. However the data becomes stationary at first level form.

The Unit Root Test of Gross Imports (GI) depicts that the data is Non-Stationary at level form as the Probability Value is 0.34 and 0.13 respectively for Augmented Dickey Fuller Test and Philips-Perron Test. The Null Hypothesis that the Industrial Production (IP) has a unit root is seemed to be valid as there is no sufficient evidence to reject it. The t statistic of LIP exceeds the critical values at 1 % level of Significance.

The Interest Rate (IR) doesn't seem to have a generalized trend and follows a deterministic trend; found that LIR follows non-stationary characteristics in Unit Root Analysis which shows 0.4711 and .05783 P Values respectively. The base variable of the study is LNIFTY (Log value of Nifty Fifty). The nifty followed a non-deterministic trend with high variations in the trends. As stated in the Unit Root Analysis, quarterly data of Nifty is Non-Stationary at raw form and becomes Stationary at first difference.

The log values of Net International Investment (NII) haven't been produced because of the reason that India's Net Investment shows negative figures for the study period. Thus there is lack of variables to conduct the unit root test. So the raw data itself is considered for ascertaining the stationality. The Unit Root test of raw data indicated that, NII is non-stationary at level form and became stationary at first difference.

The Nikkei index follows non deterministic trend where the c is intercepted twice. The data showed the peculiarities of LDJ and LNIFTY and there is no sufficient data to reject the null hypothesis that the data of Nikkei index has a unit root. The Nikkei index is stationary at its first difference form. The Production Process Index (PPI) which followed a non-deterministic trend found to be non-stationary at level form with p values 0.25 and 0.99 respectively for ADF Test and PP test and stationary at first difference.

As the inflation is taken into consideration for the study, instead of taking log values of GDP, LRGDP (log values of Real Gross Domestic Product) is ascertained. There was no disparity in the unit root test as the P values indicated 0.87 and 0.91 respectively in ADF and PP test, which shows that it is highly non-stationary at level form and stationary at the form of First Difference.

Total Reserves (TR) including gold reserves held by the central bank shows a fluctuating trend. Even though the data is found to be non-stationary as sufficient evidence if not provided by the Unit Root Analysis to reject the null hypothesis that LTR has a unit root. The data is stationary at first difference.

Testing Hypothesis
H0: There is no co-integration between macro-economic variables and Indian Stock Market Index
H0: There is no causality relationship macro-economic variables and Indian Stock Market Index
Johansen Cointegration Model can be applied to test the null Hypothesis that there is no co-integration between macro-economic variables and Indian Stock Market Index. As Balance of Payment and Gov. Bond Rates are found to be stationary at level form, they are excluded from the testing of Hypothesis as Johansen Cointegration is applicable to those data which is non-stationary at level form and became stationary at first difference. The causality relationships in long run as well as in short run are also explained by the Vector Error Correction Model and Vector Auto regression Restrictions, as the case may be, along with the Wald Test.

Johansen Cointegration Test

H0	Eigen value	Trace Statistics	Critical Value at 5%	P Value	Max-Eigen Statistic	Critical Value at 5%	P Value
r = 0	0.909411	592.0623	239.2354	0.0000	156.0922	64.50472	0.0000
r = 1	0.814685	435.9702	197.3709	0.0000	109.5704	58.43354	0.0000
r = 2	0.750844	326.3998	159.5297	0.0000	90.32891	52.36261	0.0000

r = 3	0.71322	236.0708	125.6154	0.0000	81.18764	46.23142	0.0000
r = 4	0.588047	154.8832	95.75366	0.0000	57.64498	40.07757	0.0002
r = 5	0.439904	97.23823	69.81889	0.0001	37.67712	33.87687	0.0167
r = 6	0.373462	59.56111	47.85613	0.0027	30.39046	27.58434	0.0212
r = 7	0.282072	29.17065	29.79707	0.0589	21.54008	21.13162	0.0438
r = 8	0.106759	7.630565	15.49471	0.5057	7.338421	14.2646	0.4499
r = 9	0.004484	0.292143	3.841466	0.5888	0.292143	3.841466	0.5888

In order to conduct the Johansen Co-Integration Test an Assumption is made that the variables follows a linear deterministic trend as the data is non-stationary at level form. In the table r stands for number of equations which denotes that there exists seven co-integration at 5% level of significance. For seven equations the P Value stands below the critical value i.e. .05. Thus the null hypothesis is being rejected that the data are not co-integrated as sufficient evidence has received to reject the null hypothesis from Johansen Co-Integration Test.

Johansen Cointegration Test

H0	Eigen value	Trace Statistics	Critical Value at 5%	P Value	Max-Eigen Statistic	Critical Value at 5%	P Value
r = 0	0.467956	45.81736	47.85613	0.0768	23.97911	27.58434	0.1354
r = 1	0.298616	21.83824	29.79707	0.3076	13.47858	21.13162	0.4092
r = 2	0.143349	8.359666	15.49471	0.4278	5.879545	14.2646	0.6287
r = 3	0.063182	2.480121	3.841466	0.1153	2.480121	3.841466	0.1153

As the index leads to non-linear matrix, those variables are tested separately and the Co-integration Test reveals that there is no long run relationship between Nikkei and Dow Jones Industrial Average as there was no sufficient evidence to reject the null hypothesis that there is no co-integrations between these variables. The P values of all equations belong to higher range than that of critical values at 5 % level of significance. The analysis of Trace Statistics and Max-Eigen Statistics reveals that, the all equations are not in a position to reject the null hypothesis that there is no co-integration between variables. The trace statistics are 45.81, 21.83, 8.35 and 2.48 respectively for critical values 47.8, 29.7, 15.49 and 3.84.

Vector Error Correction

Vector Error Correction (CointEq1)			
Variables	**Co-efficient**	**Std. Error**	**T-Statistic**
NIFTY(-1)	1	-	-
CPI(-1)	-98.10325	-42.8744	[-2.28816]
ER(-1)	-320.0684	-56.0355	[-5.71188]
GEX(-1)	-1.721454	-0.66351	[-2.59446]
GIM(-1)	0.339941	-0.3996	[0.85070]
IP(-1)	-276.5541	-29.5088	[-9.37192]
IR(-1)	-55.5803	-223.956	[-0.24817]
TR(-1)	-0.017426	-0.00434	[-4.01808]
RGDP(-1)	-0.338045	-0.11533	[-2.93109]
PPI(-1)	554.3754	-62.7086	[8.84051]
C	3629.915	-	-

The Vector Error Correction Model is employed in the study in order to rectify the discrepancies in the co-integration model. The co-efficient divided by standard error will produce t-statistic. We can realize that the variables like Exports, Imports and Resrves held by RBI deosn't seems to a lack of cointegration in short run.

Vector Auto-Regression

	NIFTY	NIKKIE	DJ	NII
NIFTY(-1)	0.995625	-0.25776	0.142964	1.080123
	[5.41408]	[-0.48555]	[0.48080]	[0.17305]
NIKKIE(-1)	-0.019132	0.874255	0.121304	1.899445
	[-0.23312]	[3.69013]	[0.91410]	[0.68187]
DJ(-1)	-0.004517	0.11974	0.776636	-4.450749
	[-0.03119]	[0.28647]	[3.31726]	[-0.90563]
NII(-1)	0.000456	0.017564	0.012	0.644854
	[0.07842]	[1.04757]	[1.27776]	[3.27100]
C	1957.375	3363.983	3698.855	-46251.5
	[3.23408]	[1.92541]	[3.77965]	[-2.25147]

The vector Autoregression (VAR) is applied and in order to define the causality, wald test is applied as follows. It shows that even though Nikkei, Dow Jones and Net International Investment of India don't have a long term relationship, but have short run causality.

Wald Test

Test Statistic	Value	df	Probability
F-statistic	8.1075	(3, 44)	0.0002
Chi-square	24.3225	3	0
Null Hypothesis: C(4)=C(13)=C(17)=0			

V.   Findings

As it has been found that even though –co-integrated certain variables don't show any impact on long run equilibrium such as Consumer Price Index, Industrial Production, Total Reserve Wald Test is conducted to analyse its short run relationship's Wald Test is employed in the study. So the null hypothesis was that (4)=C(13)=c(17)=0. In f-test and chi-square test under Wald test, we got sufficient evidence to reject the null hypothesis that Consumer Price Index, Industrial Production and Total Reserves have no short run causality. As the P Values for the test is significant, it can be concluded that these variables though don't posses long run causality have short run impact on Nifty Fifty.

The study conducted to analyse the impact of macro-economic variables in stock market performance in India, revealed the following facts and truths with regard to the relationship between those variables considered for the study.

1. There exists co-integration between macro-economic factors and stock market performance.
2. Macro-economic variables such as consumer price Index (CPI), Exchange rates (ER), Gross Exports (GE), Gross Imports (GI), Industrial Production (IP), Interest rates (IR), Total Reserves held by Reserve Bank of India (TR), Real GDP, and Production Process Index etc. are highly co-integrated with Nifty index. It means that there exists a long run relationship between these variables.
3. Among all such variables Consumer Price Index, Industrial production and total Reserve of RBI doesn't have long run causality. However these variables have short run causality on stock market in India.
4. However, Dow Jones Industrial Average (DJ), Nikkei Stock Index of Japanese stock exchange, India's net International Investment is not holding a long lasting relationship between stock markets.
5. Nikkei stock index bears a role in short run causality of nifty fifty where the relationship is proved as scientifically significant.

VI.   Conclusion

This study sheds some lights on the relationship between stock prices and macro-economic components. Among the findings of the study, it is comprehensive to conclude that there are at least 7 co-integrating equations which are consistent with the theoretical prediction, whereby there is no long run with foreign stock indices such as Dow Jones Industrial Average, Nikkei index etc. However there exists strong short run relationship between NSE Nifty and Nikkei Index. The results of the study are not controversial to the previous studies of Tafri et.al. (2009), Caroline et. Al (2011) ,Patel Samveg (2012), Reddy (2012) etc.

But according to Indian context this work would contribute a little light to the explanations of long run relationship between fundamental aspects of an economy and the performance of stock market. This paper has several focuses. First, this paper attempt to test long term relationship of macro-economic variables with NSE Nifty. Second the causal relationship between those variables under study. Third, Johansen Cointegration is applied with VECM and VAR to determine whether the error variance may be a function in cointegrating equations.

Bibliography

Research Articles

[1]. Alam, Z., & Rashid, K. (2014). Time Series Analysis of the Relationship between Macroeconomic Factors and the Stock Market Returns in Pakistan. *Journal of Yasar University*, 6361-6370.
[2]. Bhatt, R. K. (2011). Recent Global Recession and Indian Economy: An Analysis. *International Journal of Trade, Economics and Finance*, 212-217.
[3]. Boubakari, A., & Jin, D. (2010). the role of Stock Market development in Economic Growth: Evidence from Euronext Countries. *International Journal of Financial Research*, 14-20.
[4]. Filis, G. (2009). The relationship between stock market, CPI and Industrial Production in Greece and impact of oil prices: Are any new findings emerging from the examination of their cyclical components, using recent data? *International Conference of Applied Economics-ICOAE*, 163-176.
[5]. Geetha, C., Mohindin, R., Chandran, V. V., & Victoria, C. (2011). The relationship between inflation and stock market: Evidence from Malaysia, United States and China. *International Journal of Economics and Management Sciences*, 1-16.
[6]. Haque, M. E., & Fatima, N. (2011). Influences of stock market on real economy: a case study of Bangladesh. *The Global Journal of Finance and Economics*, 49-60.
[7]. Hsing, Y. (2011). Effects of Macroeconomic Variables on the stock market: The case of Czech Republic. *Theoritical and Applied Economics*, 53-64.
[8]. Hsing, Y. (2011). Impacts of Macroeconomic Variables on the stock Market in Bulgaria and Policy Implications. *Journal of Economics and Business*, 41-53.
[9]. Hsing, Y. (2011). Macroeconomic Determinants of the Stock Market Index and Policy Implications: The case of a Central European Country. *Eurasian Journal of Business and Economics*, 1-11.
[10]. Hsing, Y. (2014). Impacts of Macroeconomic Factors on the Stock Market in Estonia. *Journal of Economics and Development Studies*, 23-31.
[11]. Joseph, M., Singh, K., Dash, R. K., Bhattacharya, J., & Tewari, R. (2011). Indian Economy: Selected Methodological Advances. *Working Paper*, 1-19.
[12]. Khaled, H., & Khanh Ngoc, L. (2009). the impact of macroeconomic indicators on Vietnamese stock prices. *The Journal of Risk Finance*, 321-332.
[13]. Khan, M. S. (2014). Macroeconomic Variables and its Impact on KSE-100 Index. *Universal Journal of Accounting and Finance*, 33-39.
[14]. Kudal, P. (n.d.). Impact of Macroeconomic Variables on Indian StockMarket and Strategies for Investors-Post Global Financial Crisis. *APOTHEOSIS: Tirpude's National Journal of Business Research (TNBJR)*.
[15]. Modis, T. (2007). Sunspots, GDP and the Stock Market. *Elsevier*, 1508-1514.
[16]. Mohanamani, P., & Sivagagasithi, T. (2014). Indian Stock Market and Aggregate Economic Variables: Time Series Analysis. *IOSR Journal of Economics and Finance*, 68-74.
[17]. Patel, S. (2012). The effect of Macroeconomic Determinants on the performance of Indian Stock Market. *NMIMS Management Review*, 117-127.
[18]. Rafique, A., Amara, Naseem, M. A., & Sultana, N. (2013). Impact of Macroeconomic Variables on Stock Market Index (A Case of Pakistan). *Elixir International Journal*, 14099-14104.
[19]. Rahman, A. A., Sidek, N. Z., & Tafri, F. H. (2009). Macroeconomic determinants of Malaysian Stock Market. *African Journal of Business Management*, 95-106.
[20]. Rajkumar, K. P., & Mahadevan, G. (2015). A Review of the impact of Reforms on Economy and Stock Markets in India. *Acme Intellects International Journal of Research in Management, Social Sciences and Technology*, 1-12.
[21]. Ramaratnam, S., Jayaraman, R., & Krishnamoorthy, V. (n.d.). impact of FII on the Indian Stock Market: Study with special reference to BSE-SENSEX. *ABHINAV*, 165-171.
[22]. Reddy, T. K., & Agrahari, G. (2012). Impact of Fiscal Stimulas on stock market and economy: an Indian Scenario. *Economics and Business Journal: Inquiries and Perspectives*, 112-133.
[23]. Reddy, V. L. (2012). Impact of Inflation and GDP on Stock Market Returns in India. *International Journal of Advanced Research in Management and Social Science*, 120-136.
[24]. Security Analysis and Portfolio Management. (n.d.).
[25]. Shanmugam, K. R., & Swarup Misra, B. (2008). Stock returns-inflation relation in India. *Working paper*, 1-32.
[26]. Singh, P. (2014). Indian Stock Market and Macroeconomic Factors in Current Scenario. *IMPACT: International Journal of Research in Business Management*, 43-53.
[27]. Sireesha, P. B. (2013). Effect of selected Macroeconomic Variables on Stock Returns in India. *International Journal of Marketing, Financial Services and Management Research*, 197-209.
[28]. Sirucek, M. (2012). Macroeconomic Variables and Stock Market: US Review. *IJCSMS International Journal of Computer Science and Management Studies*.
[29]. (n.d.). SECURITY ANALYSIS & INVESTMENT MANAGEMENT. In S. Tiwari, *FM - 304* (pp. 356-377). HISAR: Directorate of Distance Education Guru Jambheshwar University of Science and Technology.
[30]. Yogaswari, D. D., Nugroho, A. B., & Astuti, N. C. (2012). The effect of Macroeconomic Variables on Stock Price Volatility: Evidence from Jakarta Composite Index, Agriculture and Basic Industry Sector. *IPEDR*, 96-100.
[31]. Zhu, B. (2012). The effects of Macroeconomic Factors on Stock Return on Energy Sector in Shanghai Stock Market. *International Journal of Scientific Research and Publication*, 1-4.
[32]. Jose, D B. Determinants and impact on future return in futures market in India. 2008.

Web sites
[33].   <http://data.imf.org/regular.aspx?key=60998109>
[34].   https://in.finance.yahoo.com/q/hp?s=%5EBSESN>
[35].   http://data.imf.org/?sk=7CB6619C-CF87-48DC-9443-73E161ABEB&sid=1420495318386&ss=1420495322854>
[36].   <https://www.rbi.org.in/Scripts/Statistics.aspx>
[37].   <www.google.scholars.com/google.books.com>

Ph. D Thesis
[38].   Dr. Babu Jose. Information Efiiciency of Future Market in India. (Ph D Thesis) 2008.