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MACROECONOMIC VARIABLES AND INDIAN STOCK MARKET RETURNS: - AN EMPIRICAL ANALYSIS

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Abstract

This paper examines the relationship between Indian Stock Market Returns (Nifty 50) and five Macroeconomic Variables Namely, Consumer Price Index (CPI), Index of Industrial Production (IIP), Balance of Trade (BoT), Gold Price and Foreign Exchange Reserve (FER). The analyses of data, a period of the fifteen years (2000-2014) have been taken into consideration. The Descriptive statistical techniques, Augmented Dickey Fuller (ADF) test and OLS were employed and found a significant relationship between Macroeconomic Variables on Stock Market in India.
Keywords: Macroeconomic Variables, Stock Market Prices, Unit Root Test, and OLS.

1. INTRODUCTION

Stock -exchange is an organized market to enable buyers and sellers to effect their transactions more quickly and cheaply in existing securities. The basic economic function of stock market is to provide marketability for long term investments. Thus, stock exchange serves by providing a forum for free transferability of shares and other securities held by public. The term stock market can be used to denote individual stock exchange at various places or one market comprising all individual stock – exchange in a country. Stock exchange not only effects purchase and sale transaction in securities but also makes a continuous valuation of securities traded.

The securities contracts (Regulation) Act, 1956 u/s 2/ (3) defines a stock exchange as "an association, organization or body of individual, whether incorporated or not, established for the purpose of assisting, regulating and controlling the business of buying, selling and dealing in securities"

1.1 NIFTY 50 index

The NIFTY 50 index is National Stock Exchange of India's benchmark stock market index for Indian equity market. Nifty is owned and managed by India Index Services and Products (IISL), which is a wholly owned subsidiary of the NSE Strategic Investment Corporation Limited. IISL had a marketing and licensing agreement with Standard & Poor's for co-branding equity indices until 2013.

The NIFTY 50 index is a free float market capitalisation weighted index. The index was initially calculated on full market capitalisation methodology. From June 26, 2009, the computation was changed to free float methodology. The base period for the CNX Nifty index is November 3, 1995, which marked the completion of one year of operations of National Stock Exchange Equity Market Segment. The base value of the index has been set at 1000, and a base capital of Rs 2.06 trillion.

1.2 Consumer Price Index

A consumer price index (CPI) measures changes in the price level of a market basket of consumer goods and services purchased by households. The CPI is a statistical estimate constructed using the prices of a sample of representative items whose prices are collected periodically. Sub-indexes and sub-sub-indexes are computed for different categories and sub-categories of goods and services, being combined to produce the overall index with weights reflecting their shares in the total of the consumer expenditures covered by the index. It is one of several price indices calculated by most national statistical agencies. The annual percentage change in a CPI is used as a measure of inflation.

1.3 Index of industrial production

The Index of Industrial Production (IIP) is an index for India which details out the growth of various sectors in an economy such as mining, electricity and manufacturing. The all India IIP is a composite indicator that measures the short-term changes in the volume of production of a basket of industrial products during a given period with respect to that in a chosen base period. It is compiled and published monthly by the Central Statistical Organisation (CSO) six weeks after the reference month ends.The level of the Index of Industrial Production (IIP) is an abstract number, the magnitude of which represents the status of production in the industrial sector for a given period of time as compared to a reference period of time.

1.4 Exchange rate

An exchange rate (also known as a foreign-exchange rate, forex rate, FX rate or Agio) between two currencies is the rate at which one currency will be exchanged for another. It is also regarded as the value of one country's currency in terms of another currency. For example, an interbank exchange rate of 119 Japanese yen (JPY, ¥) to the United States dollar (US$) means that ¥119 will be exchanged for each US$1 or that US$1 will be exchanged for each ¥119. In this case it is said that the price of a dollar in terms of yen is ¥119, or equivalently that the price of a yen in terms of dollars is $1/119.

1.5 Foreign exchange market

The foreign exchange market (forex, FX, or currency market) is a global decentralized market for the trading of currencies. This includes all aspects of buying, selling and exchanging currencies at current or determined prices. In terms of volume of trading, it is by far the largest market in the world. The main participants in this market are the larger international banks. Financial centresaround the world function as anchors of trading between a wide range of multiple types of buyers and sellers around the clock, with the exception of weekends. The foreign exchange market does not determine the relative values of different currencies, but sets the current market price of the value of one currency as demanded against another.

2. LITERATURE REVIEW

Menike (2006) inspects the effects of macroeconomic variables on stock prices in emerging Sri Lankan stock market. The results indicate that most of the companies report a higher R2 which justifies higher explanatory power of macroeconomic variables in explaining stock prices. These findings hold practical implications for policy makers, stock market regulators, investors and stock market analysts. **HusamRjoub, TurgutTursoy and Nil Gunsel (2009)** examined the performance of the arbitrage pricing theory (APT) in the Istanbul Stock Exchange (ISE) by taking in to consideration six pre-specified macroeconomic variables namely the term structure of interest rate, unanticipated inflation, risk premium, exchange rate and money supply. By least square method results show that there are big differences among market portfolios against macroeconomic variables.**EmrahOzbay (2009)** through Granger causality model causal relationship between stock prices and macroeconomic factors namely interest rate, inflation, exchange rates, money supply and real economy has been found. As a result, it is inferred by the author that interest rate is the negative determinant of stock prices in the Turkey's stock market.**John K. M. Kuwornu (2011)** Full Information Maximum Likelihood Estimation procedure was used in establishing the relationship between macroeconomic variables and stock market returns in Ghana. As a result, it has been found by the author that there is significant relationship between the stock market return and macro-economic variable such as inflation rate, exchange rate and Treasury bill rates.**Mahmood Yahyazadehfar and Ahmad Babaie (2012)** investigate the impact of macroeconomic variables such as interest rate, house price and gold price on stock price in capital market of Iran. By using vector auto regression (VAR) model and Johansen-JuseliusCointegration positive relationship between stock price and house price and negative relationship between nominal interest rate and gold price and stock price has been found.**MahediMasuduzzaman (2012)** strives to explore the long-run relationship and the short-run dynamics among macroeconomic fundamentals and the stock returns of Germany and the United Kingdom. Above stock markets were examined individually by applying Johansen co-integration, error correction model, variance decomposition and impulse response functions on Johansen co-integration, error correction model, variance decomposition and impulse response functions consumer price index (CPI), interest rates, exchange rates, money supply and industrial productions as macro -economic variable as a result counteraction among variables has been found.**Saeed Samadi,OzraBayani,MeysamGhalandari (2012)** In this study the impact of macroeconomic variables including exchange rates, world gold prices,

inflation, liquidity and oil price on the stock returns index in Tehran Stock Exchange data is evaluated by "GACH "economic model. Results showed that the gold price, inflation and exchange rate variables influencing on the stock return and oil price and liquidity had no impact on the stock returns.**Zakir Hussain, (2012)** study the response of stock prices to macroeconomic variables and exchange rate on three stock indices that is ISE10 index, LSE25 index, and KSE100 index relating three stock exchanges namely Islamabad Stock Exchange, Lahore Stock Exchange, and Karachi Stock Exchange respectively. The results showed that industrial production has long run positive impact on stock prices in all three markets. Exchange rate was positively affecting all indices except ISE10 index.**DonatasPilinkus (2013)** analyzes whether stock prices may serve as a leading indicator for macroeconomic variables in Lithuanian economy or a group of macroeconomic variables may serve as a leading indicator for stock returns in Lithuania. The research reveals that some macroeconomic variables (e.g., GDP deflator, net export, foreign direct investment, etc.) lead Lithuanian stock market returns, some macroeconomic variables (e.g., GDP, material investment, construction volume index, etc.) are led by the OMXV index and, finally, some macroeconomic indices (e.g., money supply, payment balance, etc.) and the stock market returns Granger- cause each other.**Mondherbellalah, Olivier Levyne, Omar Masood Thema (2013)** investigates the long run relationship between macroeconomic indicators of terms of trade, oil prices, rate of interest, money supply (M3), index of industrial production and stock exchange prices indices for the USA Japan and China by focusing on the global financial recession. This study examines whether the same model can explain USA, Japanese and Chinese stock markets, while yielding consistent factors loading. Our results vary from one country to another. An explanation of the difference in behavior between the three stock markets may lie as USA economy is most affected by financial crises, 2007 and Japanese economy slump after 1990, china is least affected economy by financial crises, 2007.

3. OBJECTIVES

The main objective is to investigate the relationship between Indian stock market and four macroeconomic variables namely Index of Industrial production (IIP), Consumer price Index (CPI), Dollar Price (DP),The foreign exchange market (FX). Nifty has been considered as representing Indian stock market.

4. STATEMENT OF HYPOTHESIS

The hypothesis for this study has been stated below:

H0: There is no significant relation between Macroeconomic Variables and Indian Stock Market Returns

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5. DATA, VARIABLES AND METHODOLOGY

5.1 Data, Variables: In this study monthly data from January, 2000 to December, 2014 was taken to examine the relationships between the selected macroeconomic variables and Nifty (used as a proxy to Indian stock markets) Index and other macroeconomic variables, i.e., the Consumer Price Index (used as a proxy to domestic inflation), the Index of Industrial Production (used as a proxy to Indian GDP), Indian Rupee to US Dollar (used as a proxy to India's foreign exchange rate), andforeign exchange market (used as a proxy to trading of currencies) were used in this study. The data were obtained from Annual Reports of Nifty, monthly bulletins of Reserve Bank of India (RBI).

5.2 Research Methodology

The present study employs the time series data analysis to study the relationship between Indian stock market and macroeconomic variables taken for study.

5.2.1 Descriptive Statistics

Descriptive statistics are used to describe the basic features of the data in a study. They provide simple summaries about the sample and the measures. Here researcher computed mean, median, standard deviation, skewness, kurtosis and JarqueBera tests for the selected economic variables.

5.2.2 Correlation matrix analysis

Correlation is a term that refers to the strength of a relationship between two variables. A strong, or high, correlation means that two or more variables have a strong relationship with each other while a weak, or low, correlation means that the variables are hardly related. Correlation coefficients can range from -1.00 to +1.00. The value of -1.00 represents a perfect negative correlation while a value of +1.00 represents a perfect positive correlation. A value of zero means that there is no relationship between two variables.

5.2.3 Granger Causality Test

The Granger causality test as proposed by C. J. Granger in 1969 establishes short-run relationships between stock prices and macroeconomic variables. It enables us to identify leading, lagging and coincidence microeconomic and macroeconomic variables for the stock market's performance It also used as a measures the precedence and information content but does not itself has causality in the more common use of the term. If the computed F-value exceeds the critical F-value at the chosen level of significance, the null hypothesis is rejected. This would imply that macroeconomic variable „Granger cause" or improve the prediction in stock prices and vice versa. Under the Granger causality test, the null hypothesis is $\Sigma \alpha i = 0$ for all values of i. To test this F-test is used. If the computed F-value exceeds the critical F-value at the chosen level of significance, the null hypothesis is rejected. This would imply that macroeconomic variable „Granger cause" or improve the prediction in stock prices and vice versa.

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6.EMPIRICAL RESULTS AND DISCUSSIONS

6.1 Descriptive Statistics

Table 1: Descriptive Statistics

	LCPI	LER	LFX	LIIP	LNIFTY
Mean	1.822442	-3.849743	11.84620	4.771726	7.940787
Median	1.837125	-3.837730	12.05308	4.807918	8.133946
Maximum	2.786011	-3.671735	12.62766	5.201873	8.748940
Minimum	0.802557	-4.198319	10.37165	4.306728	6.817666
Std. Dev.	0.479863	0.094889	0.729392	0.269235	0.652584
Skewness	-0.068518	-1.085700	-0.738098	-0.259450	-0.349545
Kurtosis	1.936707	4.869682	2.111778	1.662524	1.546114
Jarque-Bera	8.045595	57.47480	20.77667	14.40670	18.21758
Probability	0.017903	0.000000	0.000031	0.000744	0.000111
Observations	168	168	168	168	168

Source: Author's Computation

The above table 1 represents the descriptive statistics of variables which is taken in to consideration under study. The monthly average of variables under study that is LCPI, LER, LFX, LIIP and LNIFTY are lie from 1.822442,3.849743, 11.84620, 4.771726 and 7.940787 respectively during the study period from January 2000 to December 2014 with a standard deviation 0.479863 ,0.094889, 0.729392,0.269235 and 0.652584 respectively implying steady or stable stock market means there is not much fluctuation in the stock market. The maximum and minimum value of the variables under study are lie under the range 12.62766 to 0.802557 which shows the fluctuation in stock market but due to less fluctuation it is assume that the amount of liquidity is available in the market and investor are ready to invest in the Indian stock market.The reason behind that in recent trend, the Government of India has undertaken the necessary steps to reduce the interest rate in order to encourage the investors to invest in the Indian Stock market.

The value of skewness of the variable which is taken in to consideration are negatively skewed which means that the mean of the observations is less than the median.

The value of kurtosis of given variables that is LCPI, LFX, LIIP and LNIFTY are 1.936707 4.869682, 2.111778, 1.662524 and 1.546114 respectively which shows the platykurtic distribution because the value of kurtosis is less than 3. But the LER (4.869682) had leptokurtic because value is more than 3 and also shows that the values are more concentrated around the mean and have thicker tails.

JarqueBera test statistic measures the difference of the skewness and kurtosis of the data series from the normal distribution. The results from the above table show that the data do not support the supposition that each variable has a normal distribution.

6.2 Pearson coefficient of Correlation

Table 2: Pair wise Pearson coefficient of Correlation					
	LCPI	**LER**	**LFX**	**LIIP**	**LNIFTY**
LCPI	1	-0.36313	0.78037	0.85819	0.81116
LER	-0.36316	1	-0.13139	-0.29091	-0.15369
LFX	0.78037	-0.13139	1	0.94882	0.92176
LIIP	0.85819	-0.29094	0.94882	1	0.93253
LNIFTY	0.81116	-0.15369	0.921764	0.93251	1
Source: Author's Computation					

The above table shows the relationship among the variable, Namely, LCPI, LER, LFX, LIIP and LNIFTY.

6.3 Ordinary Least Square Method

$$\text{Nifty} = \beta 0 + \beta 1 LCPI + \beta 2 LER + \beta 3 LFX + \beta 4 LIIP + \upsilon i$$

Where,
Nifty = Stock market index
LCPI = Log of consumer price index
LER = Log of exchange rate
LFX = Log of forex
LIIP= Log of index of industrial production
υi= Error term
R square value of 0.89 shows that 89% of Nifty fluctuations could be explained by macroeconomics variable, while the 11% is explained by other factors.

6.4 Augmented Dickey Fuller Test

Table 3: Augmented Dickey Fuller Test	
Variables	**Probability**
LCPI	0.0000
LER	0.0000
LFX	0.0001
LIIP	0.0000
LNIFTY	0.0000
Source: Author's Computation	

The null hypothesis (Ho) of the existence of a unit root is, the decision rule for the ADF Unit Root Test states if probability of Z(t) is less than 0.05, the time series is said to be stationery, otherwise it is considered as non-stationery. The results of unit root test presented in table 3 indicate that p value of considered variables under consideration is less than 0.05, hence are

stationery. Consideration of lag length is priori in unit root testing E-views provide it automatically, here lag length is considered thirteen according to SIC criterion.

6.5 Granger Causality Test

Table 4: Granger Causality Test

Null Hypothesis	P-Value	Result	Relationship
LER does not Granger Cause LCPI	0.9904	ACCEPT	NO RELATION
LCPI does not Granger Cause LER	0.1770	ACCEPT	
LFX does not Granger Cause LCPI	0.0079	REJECT	UNIDIRECTIONAL RELATION
LCPI does not Granger Cause LFX	0.1016	ACCEPT	
LIIP does not Granger Cause LCPI	0.0006	REJECT	UNIDIRECTIONAL RELATION
LCPI does not Granger Cause LIIP	0.8476	ACCEPT	
LNIFTY does not Granger Cause LCPI	0.0005	REJECT	UNIDIRECTIONAL RELATION
LCPI does not Granger Cause LNIFTY	0.3462	ACCEPT	
LFX does not Granger Cause LER	0.6677	ACCEPT	NO RELATION
LER does not Granger Cause LFX	0.1461	ACCEPT	
LIIP does not Granger Cause LER	0.1205	ACCEPT	NO RELATION
LER does not Granger Cause LIIP	0.0819	ACCEPT	
LNIFTY does not Granger Cause LER	0.4486	ACCEPT	NO RELATION
LER does not Granger Cause LNIFTY	0.2160	ACCEPT	
LIIP does not Granger Cause LFX	0.6075	ACCEPT	UNIDIRECTIONAL RELATION
LFX does not Granger Cause LIIP	0.0079	REJECT	
LNIFTY does not Granger Cause LFX	0.1109	ACCEPT	UNIDIRECTIONAL RELATION
LFX does not Granger Cause LNIFTY	0.0239	REJECT	
LNIFTY does not Granger Cause LIIP	0.1793	ACCEPT	UNIDIRECTIONAL RELATION
LIIP does not Granger Cause LNIFTY	0.0055	REJECT	

Source: Author's Computation

The table above shows granger causality test for four macroeconomic variables and Nifty. It can be concluded that there is a unidirectional relation between Forex and CPI, IIP and CPI, Nifty and CPI, IIP and Forex, Nifty and IIP.

7. CONCLUSION

Macroeconomics is considered as important factor for investing in India. It is proved that macroeconomics brings significant impact to the stock priceThe Descriptive statistical techniques, Augmented Dickey Fuller (ADF) test and OLS were employed and found a significant relationship between Macroeconomic Variables on Stock Market in India.

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