ECONOMIC FACTORS IMPACT ON INDIAN EQUITY MARKET RETURNS – A STUDY

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ABSTRACT

The study investigates the effect of macroeconomic determinants on the returns of the Indian Stock Market using monthly data over the period April 1994 to March 2014 for eight macroeconomic variables. Augmented Dickey Fuller Unit root test, Johansen Cointegration test, Granger Causality test and Vector Error Correction Model (VECM), the study found that Interest Rate is I (0); Sensex, Nifty, Exchange Rate, Index of Industrial Production, Gold Price, Silver Price and Oil Price are I (1); and Inflation and Money Supply are I (2). It also found the long run relationship between macroeconomic variables and stock market indices. The study also revealed the causality run from exchange rate to stock market indices to IIP and Oil Price.

Keywords: Exchange rate, sensex, nifty, IIP, Inflation, gold, silver and oil price

INTRODUCTION

Financial markets play a crucial role in the foundation of a stable and efficient financial system of an economy. Numerous domestic and international factors directly or indirectly affect t returns of the stock market. The relationship between macroeconomic variables and a developed stock market is well documented in literature. The present study extends the existing literature in the Indian context. This study takes into consideration eight macroeconomic variables - Interest Rate, Inflation, Exchange Rate, Index of Industrial Production, Money Supply, Gold Price, Silver Price and Oil Price, and two widely used composite indices of the stock market of India - Sensex and S&P CNX Nifty. Money supply and Inflation have a positive relationship among themselves. However, Money Supply and Inflation have a dual effect on stock returns. First, increase in Money Supply will increase Inflation, which will again increase expected rate of return. Use of high expected rate of return will decrease value of the firm and will result in lower share prices. Secondly, increase in Money Supply and Inflation increases future cash flow of the firm, which in turn, increases expected dividend, and will increase stock prices. For this reason, the relationship between Money Supply, Inflation and Stock Return need to be investigated. A depreciation of the domestic currency against foreign currencies increases export, therefore exchange rate should have a negative relationship with the stock return. But, at the same time, depreciation of domestic currency increases the cost of imports which indicates a positive relationship between them. Hence, the relationship between exchange rate and stock returns needs to be checked. The Index of Industrial Production reflects the growth rate of industries. Positive relationship is expected between the Index of Industrial Production and Stock return. Gold and silver are used as investment avenues. Increase in gold and silver prices

attracts investors towards the commodity market, which might decrease investor preference towards the equity market. This indicates that a negative relationship is expected between gold and silver, and stock market returns. For oil supply, India is dependent on the international oil market. Therefore, higher international oil prices increase cost of production, which might decrease profit of firms, and hence decreases stock prices. Therefore, the expected relationship between oil price and stock price is negative.

The aim of this paper is to investigate the effects of macroeconomic determinants on the returns of the Indian stock market. The remainder of the paper is organized in the following sections. Section 2 provides Review of Literature. Section 3 discusses Data and Methodology. Empirical Analysis is presented in Section 4. The study is concluded in Section 5.

2. LITERATURE REVIEW

Literature related to this study is divided into the following two parts.

2.1 Macroeconomic Factors Affecting Foreign Stock Markets

Shanken and Weinstein (2006) concluded that only Index of Industrial Production is a significant factor for stock markets. Yang and Wang (2007) concluded that in the short run, although bivariate causality exists between RMB exchange rate and A-share stock index, bivariate causality does not exist between RMB exchange rate and B-share stock index. **Frimpong** (2009) concluded that with the exception of exchange rate, all other macroeconomic variables impact stock prices negatively. **Aydemir and Demirhan** (2009) reported bidirectional causal relationship between exchange rate and all stock market indices. **Adebiyi** et al. (2009) established a causal relationship from oil price shocks to stock returns, and from stock returns to real exchange rate. Ali et al. (2010) found that co-integration exists between industrial production index and stock prices. However, no causal relationship was found between other macro-economic indicators and stock prices in Pakistan. **Cagli** et al. (2010) found out that the stock market is co -integrated with gross domestic product, U.S. crude oil price, and industrial production. **Hosseini and Ahmad** (2014) found both long and short run linkages between stock market indices and macroeconomic variables like crude oil price (COP), money supply (M2), industrial production (IP) and inflation rate (IR) in India and China. **Buyuksalvarci** (2010) concluded that interest rate, industrial production index, oil price, foreign exchange rate have a negative effect, while money supply has a positive influence on Turkish Index return. On the other hand, inflation rate and gold price do not appear to have any significant effect. **Daly and Fayyad** (2014), after studying seven countries (Kuwait, Oman, UAE, Bahrain, Qatar, UK and USA), found that oil price can predict stock return better after a latest rise in oil prices. **Liu and Shrestha** (2008) found that a co-integrating relationship exists between stock prices and the macro-economic variables like money supply, industrial production, inflation, exchange rate and interest rates. **Azizan and Sulong** (2014) found that the Malaysian stock market is more integrated with other Asian countries' economic variables. It also found that stock prices and exchange rates of other Asian countries have the most impact on Malaysian stock markets.

2.2 Macroeconomic Factors Affecting the Indian Stock Market

Ahmed (2008), by applying Toda and Yamamoto Granger causality test, variance decomposition and impulse response functions, concluded that stock prices in India lead economic activity except movement in interest rate. Interest rate seems to lead the stock prices. **Debasish** (2009) concluded that spot price volatility and trading efficiency was reduced due to introduction of future trading. The author found that the futures market clearly leads the cash market. It also found that the index call options lead the index futures more strongly than futures lead calls, while the futures lead puts more strongly than the reverse, by using GARCH analysis, confirmed no structural change after the introduction of futures trading on Nifty. Besides **Bansal and Pasricha** (2009) found volatility is significantly reduced after the permission of foreign investment in the equity sector. **Goudarzi and Ramanarayanan** (2014) established that BSE500 stock index and FII series are co-integrated and bilateral causality exists between them. **Gupta** (2014) concluded that foreign institutional investment affects stock prices significantly.
Ghosh et al. (2010) found that dollar price, oil price, gold price and CRR have a significant impact on stock market returns. However, food price inflation and call money rate do not affect stock market return. **Agrawal and Srivastava** (2014) found bidirectional causality between exchange rate and stock market; and positive significant relationship between volatility in stock returns and exchange rates through the GARCH model. **Agrawalla and Tuteja** (2007) provided evidence of a stable long run equilibrium relationship between stock market developments and economic growth in India. **Srivastava (2010)** concluded that in the long term, stock market was more affected by domestic macroeconomic factors like industrial production, wholesale price index and interest rate than global factors. **Agrawalla and Tuteja** (2008) reported causality running from economic growth proxies by industrial production to share price index. In support to this, **Padhan (2007),** by applying Toda-Yamamota non-causality tests, found that both the stock price (BSE Sensex) and economic activity (IIP) are integrated of order one, i.e. I (1) and bi-directional causality exists.

3. DATA and METHODOLOGY

The aim of this paper is to investigate the effects of macroeconomic determinants on the returns of the Indian Stock Market. The study uses monthly data over the period April 1994 to March 2014. Data for all macroeconomic variables except oil price is collected from the database of the Indian economy maintained by Reserve Bank of India. International oil prices data is collected from the database of International Monetary Fund. Sensex and S&P CNX Nifty data is obtained from the respective stock exchanges.

Table 1: Description of Data

Name of Variables	Symbol Used	Proxy Used
Interest Rate	IR	Weighted Average Call Money Rates
Inflation	IF	Consumer Price Index (CPI)
Exchange Rate	ER	Monthly Average Rupees per unit of US $
Index of Industrial Production	IIP	General Index Numbers Of Industrial Production
Money Supply	MS	Broad Money(M3)
Gold Price	GP	Mumbai Average Price Rupees per 10gms.
Silver Price	SP	Mumbai Average Price Rupees per kg.
Oil Price	OP	International Crude Oil Price, Dated Brent, US$ per barrel

Table 1 indicates symbol and proxy used for macroeconomic variables. The following model is used to identify the effect of macroeconomic variables on stock market return:

SENSEX = f (IR, IF, ER, IIP, MS, GP, SP, OP)

NIFTY = f (IR, IF, ER, IIP, MS, GP, SP, OP)

There can be both short-run and long-run relationships between financial time series. Correlation coefficients are used for examining short-run co-movements and multi- collinearity among the variables. If correlation coefficient is greater than 0.8, it indicates that multi-collinearity exists. The population correlation coefficient, ρ, ($-1 < p < 1$) measures the degree of linear association between two variables.

As an essential step of Vector Error Correction Model, Augmented Dickey - Fuller (ADF) (1979, 1981) test has been applied. It is based on the simple logic that non-stationary process has infinite memory as it does not show decay in a shock that takes place in the process. Therefore, it behaves like AR (1) process with $\rho = 1$. Dickey Fuller test is designed to examine if $\rho = 1$. The complete model with deterministic terms such as intercepts and trends is shown in equation (1):
The ADF unit root test is based on the null hypothesis H_0: Yt is not I (0). If the calculated ADF statistic is less than the critical value, then the null hypothesis is rejected; otherwise accepted. If the variable is non-stationary at level, the ADF test will be performed at the first difference. In the second step, the Johansen's cointegration test (Johansen and Juselius, 1990) has been applied to check whether the long run equilibrium relationship exists between the variables. The Johansen approach to cointegration test is based on two test statistics, viz., trace statistic, and maximum eigenvalue statistic. The trace statistic can be specified where λi is the largest eigenvalue of matrix Π, and T is the number of observations. In the trace test, the null hypothesis is that the number of distinct cointegrating vector(s) is less than or equal to the number of cointegration relations (r). The maximum eigenvalue test examines the null hypothesis of exactly r cointegrating relations against the alternative of r + 1 cointegrating relations with the test statistic:

Table 2: Descriptive Statistics of Variables

	SENSEX	NIFTY	IR	IF	ER	IIP	MS	GP	SP	OP
Skewness	1.08	1.08	2.65	0.58	-0.88	0.57	1.16	1.93	2.45	1.2
Kurtosis	2.64	2.68	12.09	2.65	2.91	2.26	3.24	6.12	8.99	3.42
Jarque-Bera	50.8	50.5	1165.28	15.58	32.68	19.3	57.28	259.43	630.26	63.13
Probability	0	0	0	0.0004	0	0.00006	0	0	0	0

From Table 2, it is clear that all variables except exchange rate are positively skewed. Kurtosis values reveal that Interest Rate, Gold Price and Silver Prices follow Leptokurtic distribution; Sensex, Nifty, Inflation, IIP and Oil Price follow Platykurtic distribution and Money Supply follows Mesokurtic distribution. Jarque-Bera statistic tests the null hypothesis that data follow normal distribution. By using probability values of Jarque-Bera statistics, null hypothesis is rejected for all variables even at 1% level of significance. This shows randomness and inefficiency of the market. Correlation analysis results between stock market indices and macroeconomic variables are reported in Table 3. It indicates that Inflation, Index of Industrial Production, Money Supply, Gold Price, Silver Price and Oil Price are highly positively correlated with stock market indices. These very high correlations also give the signal of multi-co linearity among the variables.

Table 3: Pair-wise Pearson Coefficient of Correlation

	SENSEX	NIFTY	IR	IF	ER	IIP	MS	GP	SP	OP
SENSEX	1	0.99	-0.33	0.88	0.44	0.91	0.92	0.87	0.84	0.92
NIFTY	0.99	1	-0.33	0.89	0.45	0.92	0.93	0.88	0.85	0.93

The result of ADF unit root test is reported in Table 4. The null hypothesis of no unit roots for all the variables except Interest Rate are not rejected at their level in both the models (i.e. constant and constant & trend) since the ADF test statistic values are higher than the critical values. This shows that Interest Rate is I (0). After taking the first difference again, ADF test statistics are compared with critical values, and found that null hypothesis of unit root are rejected for all variables except Inflation and Money Supply. Thus, Sensex, Nifty, Exchange Rate, IIP, Gold Price, Silver Price and Oil Price are stationary and integrated of the first order, i.e., I(1). Inflation and Money Supply become stationary at the second difference, so these two variables are I(2).

Table 4: Results of Augmented Dickey-Fuller Unit Root Test

Name of Variable	Constant	Constant & Trend	Constant	Constant & Trend
	ADF Test Value	ADF Test Value	ADF Test Value	ADF Test Value
Sensex	-0.72821	-1.9118	-15.1027*	-15.0804*
S&P CNX Nifty	-1.00876	-2.49364	-6.95845*	-6.951165*
Interest Rate	-6.41185*	-7.66021*	-14.4251*	-14.41896*
Inflation	1.625297	-0.54835	-2.07243	-2.748777
Exchange Rate	-2.69988***	-2.93564	-11.7991*	-11.87369*
Money Supply	2.593617	1.984509	1.672333	-0.985938
IIP	3.646512	0.557808	-6.17785*	-7.29449*
Gold Price	5.853275	3.37149	-6.91757*	-15.36092*
Silver Price	2.892092	1.502587	-5.43735*	-6.068685*
Oil Price	-1.22174	-3.86585**	-10.0131*	-10.02126*

*, **, *** indicates ADF test value is significant at 1%, 5% and 10% level of significance respectively.

For constant model, critical values at 1%, 5% and 10% level of significance are -3.4563, -2.8729 and - 2.5729 respectively. For constant and trend model, critical values at 1%, 5% and 10% level of significance are -3.9950, - 3.4278 and -3.1373 respectively.

In the next step, the cointegration between non-stationary variables has been tested by the Johansen's Trace and Maximum Eigenvalue tests. The results of these tests are shown in Table 5. At $r \leq 5$, first time hypothesis of no cointegration is not rejected. Therefore, both the tests indicate that five cointegrating vectors exist at 5% level of significance.

Table 5: Results of Johansen's Cointegration Test

	H_0	Trace Test	5% Critical Value	Maximum Eigenvalues Test	5% Critical Value
Sensex and Macroeconomic Variables	r = 0	393.6571*	197.3709	119.5208*	58.43354
	r ≤ 1	274.1363*	159.5297	76.30895*	52.36261
	r ≤ 2	197.8273*	125.6154	67.21131*	46.23142
	r ≤ 3	130.6160*	95.75366	52.23492*	40.07757
	r ≤ 4	78.38109*	69.81889	36.99501*	33.87687
	r ≤ 5	41.38607	47.85613	21.53232	27.58434
	r ≤ 6	19.85375	29.79707	13.52732	21.13162
	r ≤ 7	6.326431	15.49471	6.109237	14.26460
	r ≤ 8	0.217194	3.841466	0.217194	3.841466
Nifty and Macroeconomic Variables	r = 0	395.7781*	197.3709	118.5463*	58.43354
	r ≤ 1	277.2318*	159.5297	80.38487*	52.36261
	r ≤ 2	196.8470*	125.6154	68.23802*	46.23142
	r ≤ 3	128.6089*	95.75366	51.62558*	40.07757
	r ≤ 4	76.98336*	69.81889	34.95963*	33.87687
	r ≤ 5	42.02374	47.85613	21.03714	27.58434
	r ≤ 6	20.98659	29.79707	14.16242	21.13162
	r ≤ 7	6.824175	15.49471	6.692389	14.26460
	r ≤ 8	0.131786	3.841466	0.131786	3.841466

*indicates that test values are significant at 5% level of significance.

Trace test & Max-eigenvalue test indicates 5 cointegrating eqn(s) at the 0.05 level

Now, the pair-wise Granger Causality test is performed between all possible pairs of variables to determine the direction of causality. Only rejected hypotheses are reported in Table 6. The results show that the Exchange Rate granger causes both stock market indices, i.e. both Sensex and Nifty. Both these stock market indices, in turn, granger cause IIP and Oil Prices.

Table 6: Results of Granger Causality Tests

Null Hypothesis	F-Statistic	Probability	Decision
LNER does not Granger Cause LNSENSEX	2.98946	0.0033	Reject
LNER does not Granger Cause LNNIFTY	2.44532	0.0148	Reject
LNSENSEX does not Granger Cause LNIIP	2.76363	0.0062	Reject
LNSENSEX does not Granger Cause LNOP	2.57435	0.0105	Reject
LNNIFTY does not Granger Cause LNIIP	1.99935	0.0476	Reject

5. CONCLUSION

This paper investigated the effect of macroeconomic determinants on the returns of the Indian Stock Market by using monthly data for the period April 1994 to March 2014. The empirical analysis found three interesting results. First, Interest Rate is I(0); Sensex, Nifty, Exchange Rate, Index of Industrial Production, Gold Price, Silver Price and Oil Price are I(1); Inflation and Money Supply are I(2). Second, there exists a long run equilibrium relation between stock market indices and all macroeconomic variables. Third, it provides evidence of causality running from exchange rate to stock market indices to IIP and Oil Price. The findings of this study have some important policy implications. First, exchange rate contains some significant information to forecast stock market returns. Therefore, Reserve Bank of India should try to maintain a healthy exchange rate. Second, as Index of Industrial Production is a highly significant factor, policy makers should try to support industry growth through appropriate policy. Third, Money supply and Inflation are major factors affecting stock markets, so the regulatory body should try to control them through Repo and Reverse Repo rates. Fourth, commodity prices like Gold, Silver and Oil are also major determinants of stock markets. Mostly prices of these commodities are determined at the global level, but still by proper import duty and local taxes, policy makers should try to maintain competitive price levels. Finally, autonomous regulatory bodies and visionary system of government can definitely contribute in efficient working and development of the Indian Stock Market.

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