MACROECONOMIC FACTORS AND PERFORMANCE OF INDIAN STOCK MARKET

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Introduction

Indian economy is witnessing a downturn, experiencing a decline in the GDP growth rate, high inflation, deteriorated performance of Industrial production, devaluation of the Indian Rupee (INR) against the US Dollar (USD), several political scams, uncertainty of government decisions regarding the reforms because of coalition government, and uncertain behavior of stock market. Performance of the economy as a whole and the performance of the stock market are in fact expected to be closely interlinked. Fundamental analysis proposes that knowledge of economic conditions and macroeconomic factors would enable investors to anticipate/predict stock market performance. This approach certainly supports the decision making of investors by identifying the business-specific and sector-specific challenges. So, along with the company news, industry news, and other technical analysis tools; it becomes important to study the macroeconomic factors that impact the stock market.

In this context, the main purpose of the paper is to examine the impact of selected macroeconomic factors on the performance of stock market. The independent macroeconomic factors which have been taken for analysis are net FIIs, the inflation rate, Index of Industrial Production (IIP) Growth, Exchange Rate (USD\INR) and Mumbai Interbank Offer Rate (MIBOR). The dependent variables are Sensex and S&P CNX Nifty returns as representative of stock market performance.

Literature Review

The relationship between macroeconomic factors and stock market returns has been extensively discussed and debated among the academicians as well as research scholars. Various studies have examined the causal relationship between macroeconomic variables and stock market indices. Naka et al. (1998) analysed relationships among selected macroeconomic variables and the Indian stock market. They found domestic inflation to be key macroeconomic indicator affecting Indian stock markets. Mukhopadhyay et al. (2003) studied the Indian stock market returns prior to and after market liberalization and the influence of macroeconomic factors on returns. For the post-liberalization period (since 1995), inflation, money supply growth, FDI, and the NASDAQ-index were found significant. Nominal exchange rate, which was significant during the pre-liberalization period (1989-1995), was not found significant post liberalization. Maysami et al. (2005) found the formation of a cointegrating relationship with changes in the short and long-term interest rates, industrial production, price levels, exchange rate and money supply with Singapore stock market index stock market. Gunasekarage et al. (2004) examined both long-run and short-run relationships between the stock market index (Sri Lanka) and the economic variables. They found that only the treasury bill rate had a significant
influence on the stock market. Gay (2008) investigated the time-series relationship between stock market index prices and the macroeconomic variables of exchange rate and oil price for Brazil, Russia, India, and China (BRIC) using the Box-Jenkins ARIMA model. However, no significant relationship was found in his study.

Data and Methodology
The objective of the study was to examine the impact of changes in macroeconomic factors on returns in the Indian Stock Market.

Data & Sources
Five macroeconomic factors were used: the inflation rate, net Foreign Institutional Investments (FIIs), the Index of Industrial Production (IIP), the exchange rate (US Dollar vs. Indian Rupee), and the Mumbai Interbank Offer Rate (MIBOR). The S&P CNX Nifty and Sensex indices were used as the representatives of performance and changes in Indian Stock Market. The study period was from Apr’04 to Mar’12. The following details the sources from which the data for the study was collected.

Inflation rate - The Wholesale Price Index (WPI) was used to compute inflation. Monthly WPI values from Apr’03 to Mar’12 was collected from the website http://eaindustry.nic.in maintained by Office of the Economic Adviser to the Government of India, Ministry of Commerce and Industry. The inflation rate was calculated as a annual percentage increase in the WPI. The variable used in the study was the first order difference in the inflation rate, or the monthly increase in the inflation rate.

Foreign Institutional Investment - Monthly data for net Foreign Institutional Investments (FIIs) from Apr’04 to Mar’12 was collected from the website www.sebi.gov.in of Securities and Exchange Board of India (SEBI). The variable used in the study was the first order difference in net FIIs, or the monthly increase in net FIIs.

Index of Industrial Production - The Index of Industrial Production (IIP) was used as a representative of the sectors like manufacturing, mining, electricity, and so on. It shows the overall changes in the industrial production of the country. Monthly IIP data from Apr’04 to Mar’12 was collected from the Reserve Bank of India website www.rbi.org.in. The variable used in the study was the monthly percentage increase in IIP.

Exchange Rate - Monthly average of the exchange rate (USD\INR) has been taken from www.indiastat.com for the period from Apr’04 to Mar’12. The variable used in the study was the monthly percentage increase in USD\INR exchange rate.

MIBOR - The data for Mumbai Interbank Offer Rate (MIBOR) has been taken from www.indiastat.com for the period April 2004 to March 2012. The variable used in the study was the first order difference in MIBOR, or the monthly increase in MIBOR.

NIFTY - Monthly Nifty index values were collected from the website www.nseindia.com of National Stock Exchange of India Limited from Apr’04 to Mar’12. The variable used in the study was the monthly rate or return on Nifty, or the monthly percentage increase in Nifty.

SENSEX - The Monthly Sensex index values were collected from the website www.bseindia.com of the Bombay Stock Exchange, Limited from Apr’04 to Mar’12.
The variable used in the study was the monthly rate or return on Sensex, or the monthly percentage increase in Sensex.

**Tools & Techniques**

The following are the tools and techniques which are used for analysis in the study: the Augmented Dickey-Fuller (ADF) unit root test, Vector Auto-regressive (VAR) Model, and the Granger Causality Test (Dash, 2014).

To check the stationarity of the variables, the augmented Dickey-Fuller (ADF) unit root test was performed. The model for the test was as follows:

\[ \Delta x_t = a + bt + cx_{t-1} + \sum d_j \Delta x_{t-j}, \]

where \( a \) is the constant term, \( b \) is the coefficient of a time trend and \( p \) is the lag order of the autoregressive process. The null hypothesis of a unit root (i.e. a non-stationary autoregressive series) is rejected when the coefficient \( c \) of the \( x_{t-1} \) term is negative and statistically significant.

The study uses a vector autoregressive (VAR) model to test for the impact of the macroeconomic variables on stock index returns. The unrestricted VAR model is as follows:

\[ r_t = a + \sum b_j^r r_{t-j} + \sum b_j^e e_{t-j} + \sum b_j^{inf} \Delta inf_{t-j} + \sum b_j^{iip} iip_{t-j} + \sum b_j^{mib} \Delta mib_{t-j} + \sum b_j^{fii} \Delta fii_{t-j}, \]

where \( r_t \) represents SENSEX or NIFTY returns, \( e_t \) represents the percentage change in the USD\text{-}INR exchange rate, \( \Delta inf_t \) represents the change in the rate of inflation, \( iip_t \) represents percentage change in the IIP, \( \Delta mib_t \) represents the change in the MIBOR and \( \Delta fii_t \) represents the change in the net flow of FIIs in India. The model uses different monthly lags as determined through the partial autocorrelation function for each of the variables.

The Granger causality was performed to determine the significance of the impact of each macroeconomic variable on stock index returns. This was done by removing each independent variable and its lags in turn from the model, and testing for significance of the variable using the F-test:

\[ F_{cal} = \frac{(SSE_R - SSE_U)}{k}, \]

where \( SSE_U \) and \( MSE_U \) are the residual sum of squares and residual mean square from the unrestricted model above, and \( SSE_R \) is the residual sum of squares from the restricted model obtained by removing the variable and its lags. Also, if the estimated lagged coefficient \( b_j^{i0} \) is statistically significant, then it can be inferred that changes in the macroeconomic variable \( j_0 \) causes changes in the stock index returns.

**Analysis and Findings**

The outcome of the augmented Dickey-Fuller (ADF) unit root test is shown in the Table 1.

The results of the ADF tests were significant, which shows the stationarity of the time series data. This validates the use of the data for analysis through econometric models such as vector autoregressive model or Granger causality tests in the present context.

The outcome of the F-tests of the vector autoregressive model for the significance of the impact of each macroeconomic variable on SENSEX and NIFTY returns are shown in the Table 2.
Table 1. Unit Root Tests

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coeff.</th>
<th>T-Stat</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIFTY</td>
<td>-0.106</td>
<td>-2.919</td>
<td>0.004**</td>
</tr>
<tr>
<td>SENSEX</td>
<td>-0.101</td>
<td>-2.891</td>
<td>0.005**</td>
</tr>
<tr>
<td>Inflation rate</td>
<td>-0.152</td>
<td>-2.257</td>
<td>0.027*</td>
</tr>
<tr>
<td>Foreign Institutional Investments (net FIIs)</td>
<td>-0.551</td>
<td>-3.046</td>
<td>0.003**</td>
</tr>
<tr>
<td>Index of Industrial Production (IIP)</td>
<td>-0.256</td>
<td>-2.596</td>
<td>0.012*</td>
</tr>
<tr>
<td>USD\INR Exchange Rate</td>
<td>-0.126</td>
<td>-2.776</td>
<td>0.007**</td>
</tr>
<tr>
<td>Mumbai Interbank Offer Rate (MIBOR)</td>
<td>-0.906</td>
<td>-3.436</td>
<td>0.001**</td>
</tr>
</tbody>
</table>

Table 2. F-Tests

<table>
<thead>
<tr>
<th>Dependent</th>
<th>Macroeconomic factors</th>
<th>F-Stat</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIFTY</td>
<td>USD\INR Exchange Rate</td>
<td>1.863</td>
<td>0.153</td>
</tr>
<tr>
<td></td>
<td>net FIIs</td>
<td>5.636</td>
<td>0.007**</td>
</tr>
<tr>
<td></td>
<td>Inflation</td>
<td>0.664</td>
<td>0.793</td>
</tr>
<tr>
<td></td>
<td>IIP Growth</td>
<td>1.286</td>
<td>0.254</td>
</tr>
<tr>
<td></td>
<td>MIBOR</td>
<td>0.064</td>
<td>0.992</td>
</tr>
<tr>
<td>SENSEX</td>
<td>USD\INR Exchange Rate</td>
<td>1.625</td>
<td>0.200</td>
</tr>
<tr>
<td></td>
<td>net FIIs</td>
<td>4.030</td>
<td>0.026*</td>
</tr>
<tr>
<td></td>
<td>Inflation</td>
<td>0.802</td>
<td>0.661</td>
</tr>
<tr>
<td></td>
<td>IIP Growth</td>
<td>1.068</td>
<td>0.417</td>
</tr>
<tr>
<td></td>
<td>MIBOR</td>
<td>0.130</td>
<td>0.970</td>
</tr>
</tbody>
</table>

The results of Granger causality tests indicate that the only variable which has a significant causal effect on NIFTY and SENSEX returns is the change in the net FIIs.

Concluding Observations

Understanding of macroeconomic factors and trends of the economy surely helps in better decision making for investments. The results of the study showed that movements in net FIIs greatly affect the market. Therefore, Investors should track the movement of net FIIs in the country in order to anticipate/predict stock market performance. However, the current study has examined only selective macroeconomic factors; other factors such as GDP growth rate, money supply, and so on should also be examined. It can also be argued that the movement of net FIIs is indirectly affected by performance of the economy and its various indicators such as GDP growth rate, IIP growth rate, inflation rate, interest rates, and so on. It implies that along with keeping an eye on the net FIIs, Investors have to look for the probable reasons for the inflow and outflow of FIIs. In this way there is scope for further study to examine factors which affect most to the movement of the net FIIs in the country, which directly affects the performance of the stock market through increased liquidity and their affect on policy makers as well.
References

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Abstract
With the global financial crisis, the Indian economy is witnessing a downturn, with an overall weakening of its macroeconomic indicators. In particular, performance of the economy as a whole and the performance of the stock market are expected to be closely inter-linked; fundamental analysis proposes that knowledge of economic conditions and macroeconomic factors would enable investors to anticipate/predict stock market performance. This study examines the impact of selected macroeconomic factors on stock market performance in India using the Granger causality test. The results of the study showed that the only macroeconomic factor which had a significant causal effect on the performance of Indian stock markets was movements in net FIIs.

Keywords: macroeconomic factors, fundamental analysis, Granger causality test, net FIIs