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Macroeconomic Determinants of Stock Market Fluctuations: The Case of BSE-30

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Abstract: The purpose of this study is to analyze the impacts of some prominent macroeconomic factors on the Indian Stock Market index, BSE-30 (Bombay sensitivity index-30). For centuries, and mostly since the 20th century, stock markets are the heart of economies. In the present era, the largest economic crises arise from the stock market instabilities and thus, the stock markets are the focus of interest of the economy. Economists, investors, and policymakers predict the tendency of share prices, which substantially depend on foreign and domestic macroeconomic factors. Within this purpose, this study tries to investigate the impact of some selected macroeconomic factors on BSE-30 index over the 2000–2018 period. The findings obtained from the data via the ARDL Bounds Test suggest that economic growth, the relative value of the domestic currency, portfolio investments and foreign direct investments raise the stock market index while interest rate and crude oil prices negatively affect it. The results briefly reveal that the Indian Stock Exchange Market needs stronger domestic currency, higher international capital inflows, and lower energy and investment costs.

Keywords: stock market; macroeconomic indicators; BSE-30; autoregressive distributed lag (ARDL) bounds test.

Introduction

Stock markets have been at the focus of economies for centuries. Any instabilities occurring in these markets have partial or general effects on the economy. Since the 17th century, the world economy experienced many crises that arose from financial and more specifically, stock exchange markets (Garber 1990, p. 36). Thus, the economic administration of countries and policymakers carefully observe the progress of stock markets so as to take precautions in case of unexpected instabilities. Daily fluctuations of the stock markets might arise from economic and political affairs. However, stock markets are not independent of domestic and global macroeconomic conditions. Investors are directly or indirectly affected by the changes in macroeconomic factors and make their decisions on shares by examining the overall situation of the market. Therefore, examining the determinants of stock market fluctuations matters for economists and investors. The present study mainly deals with this issue specific to India and investigates the determinants of Bombay sensitivity Index (BSE-30).Especially in early 1990, India has adopted liberalized economic policies and has opened both goods and financial markets to foreign countries. Subsequently, foreign trade volume, portfolio investments and foreign direct investments (FDI) showed a substantial increase.

BSE (Bombay Stock Exchange) is one of the most popular stock exchanges and was established in the year 1875, and is one of the oldest stock exchanges in Asia and the first in the country to be granted permanent recognition under the Securities Contract Regulation Act, 1956, has had an interesting rise to prominence over the past 143 years.In 1995 the BSE switched to electronic trading from floor trading exchange.The key stock market index on the BSE is the BSE 30 / BSE SENSEX also known as just SENSEX. It is a free float market cap weighted index of 30 top companies representing the various sectors of the economy. More than 5,500 listed companies on the BSE with the current market cap of all BSE listed companies stands at more than Rs. 90 lakh crores.

In recent history, the global financial crisis of 2008—which mainly arose from the US economy— affected many countries. However, the 2008 financial crisis only slightly affected the Indian economy compared to the US and continental Europe. In the post-2008 period, there has been an abundance of liquidity in the world from which India has benefited. The interest rates were at significantly lower levels and this led to a market boom in domestic markets. Although the interest rates in India have decreased during the mentioned period, they have been relatively higher than the interest rates offered by many developed countries. Thus, foreign capital inflows to India have shown a substantial increase. Since India is an emerging economy and provides relatively higher returns in financial markets for many years, portfolio investment inflows have considerably increased in the post-2008 period. FDI inflows, on the other hand, have also increased but the period of the increase has started only after a recovery process, in 2010. The Indian economy has benefited from the liquidity excess, which valued the domestic currency over a few years. The nominal exchange rates and inflation rates were almost stable and enabled the economy to be strong.

Within this perspective, the study investigates the effects of some prominent macroeconomic factors such as interest rate, real effective exchange rate, market activity, portfolio investment inflows, FDI inflows and crude oil prices on the Bombay Stock Exchange by employing an autoregressive distributed lag (ARDL) model over the 2000–2018 period. After presenting some brief information on the structure and history of the Indian economy, the study continues with a literature review in the next section. In the third section, the data and the empirical methodology of the study will be described; and lastly, the findings of the econometric analysis will be presented and discussed.

Literature Review

The stock market value and its determinants are broadly discussed in the existing literature. In this section, some empirical evidence from the stock markets of other countries and India will be presented

Chen (2009) examined the behavior of the Standard and Poor's 500 (SP500) index and tried to find the most significant determinants on the prediction of the recessions in the stock market over the 1957–2007 period. The findings obtained from the monthly data reveal that the yield curve spreads and the inflation rate can significantly predict the recessions.

Mukherjee and Naka (1995) investigated the relationship between the Tokyo Stock Exchange index and some selected macroeconomic factors over the 1971–1990 period. Their findings obtained from the vector error correction model imply that there is a long-term association between the stock market index and the call money, inflation rate, exchange rate, money supply, industrial production, and government bond rate. On the other hand, **Humpe and Macmillan (2009)** made a comparative applied analysis for US and Japan. They investigated the relationship between macroeconomic variables and stock market movements. The findings of the study suggest that for the US, there is a positive relationship between stock prices and industrial production while interest rate and consumer price index are negatively associated with stock prices. They also found that money supply has no significant impact. For Japan, their findings show that stock prices are negatively related to industrial production and negatively related to money supply. However, their findings also suggest that the industrial production in Japan is negatively associated with consumer price index and interest rate. Thus, any increases in these factors most probably will reduce the stock market prices.

The stock markets in emerging economies are remarkable targets for investors and this makes the prediction of the behavior of these markets a substantial effort. **Muradoglu et al. (2000)** investigated the causalities between inflation rate, interest rate, industrial production, exchange rate and returns in global markets and the stock returns in selected nineteen emerging countries. They stated that country-specific factors might have a significant role in determining the stock market returns. Thus, they emphasized that examining each country's stock market separately rather than a panel data analysis will yield more substantial results for policy implication. Their findings suggest that indeed each emerging country has its own characteristics.

Inflation rate is the Granger cause of stock returns only in Argentina and Brazil; interest rate is the Granger cause of stock returns only in Argentina, Brazil, Pakistan and Zimbabwe; exchange rate is the Granger cause of stock returns only in Brazil, Colombia, Greece, Korea, Mexico and Nigeria; the SP500 index is the Granger cause of stock returns only in Colombia, Mexico and Portugal. Industrial production does not affect the stock returns in any of the nineteen countries. **Wongbangpo and Sharma (2002)** tested the causalities between the stock market price index and selected macroeconomic factors such as gross national product, consumer price index, money supply, interest rate and exchange rate. Their analysis mainly focused on the ASEAN-5 countries (Indonesia, Malaysia, Philippines, Singapore

and Thailand) over the 1985–1996 period. They found that all the selected macroeconomic factors are significant determinants of the stock market index in these countries. **Hajilee and Al Nasser (2014)** examined the linkage between exchange rates and stock market development in twelve emerging economies over the 1980–2010 period. Their results showed that in only six economies, significant long-run relationships are observed. According to the findings, exchange rate volatility negatively affected stock market development in China, Mexico, Pakistan and Venezuela, while positive impacts were observed in the Philippines and South Africa.

Oil price is an important factor that has the possibility to determine stock market fluctuations. By applying a VAR (vector autoregression) model including stock market index, industrial production, inflation rate, and oil prices, **Filis (2010)** dealt with the issue for Greece over the 1996– 2008 period. In regards to the stock market, the findings of the study showed that industrial production has a positive impact on the stock market index while increases in inflation rate and oil prices reduced it. **Bjørnland (2009)** investigated the oil prices–stock market relationships for Norway, an oil-exporting country, over the 1993–2005 period. As expected, the results were the exact opposite of countries that do not export oil. The structural VAR model suggests that increases in oil prices lead to an increase in stock market prices. **Degiannakis et al. (2014)** investigated the impacts of oil price shocks on stock markets in Europe over the 1999–2010 period. The findings obtained from a structural vector autoregressive model suggested that increases in oil prices significantly affect the demand side of economies, which finally cause a negative effect on stock markets. They stressed that oil price is a good indicator on predicting stock market volatility.

Pilinkus and Boguslauskas (2009) analyzed the short-run relationships between macroeconomic variables and the stock market index in Lithuania over the 2000–2009 period. Their findings suggested that increases in GDP and money supply raise the stock market index while increases in unemployment, exchange and interest rates reduced the index value. **Eita (2012)** tried to model macroeconomic determinants of stock market prices in Namibia over the 1998–2009 period. The results obtained from the vector error correction model suggested that increases in income level and money supply raise stock prices while inflation rate and interest rate had a negative impact on stock prices. As for foreign capital inflows, FDI and portfolio investments have different features. Stock markets are one of the main directions of portfolio investments. Since portfolio inflows create an additional foreign demand on shares, this will result in a price increase and will raise the stock market return. **Froot et al. (2001)**, in their extensive study focusing on the behavior and impacts of portfolio flows, analyzed 44 countries for the 1994–1998 period. One of their substantial findings was that portfolio inflows can significantly predict the equity returns in emerging markets. **Singh and Weisse (1998)**, on the other hand, stated that portfolio investments in the developing world are mostly shortterm and speculative. Foreign investors may shift their portfolio investments in developing countries with a whim and fad profit motive. If the inflows are continuous, the portfolio investments indeed might bear fruit for the stock market. In case of a reversal, however, these kinds of capital inflows may lead to serious economic crises as in Latin America in the 1990′s. **Singh and Weisse (1998)** indicated that durable supply of capital inflows (such as FDI inflows) is more substantial for developing countries.

Pal and Mittal (2011) They attempted to explore how Indian stock market reacts to different macroeconomic variables. Macroeconomic variables such as interest rates, inflation rate, exchange rates and gross domestic savings (GDS) of Indian economy were used as independent variables and two popular stock indices of India i.e., BSE (30 share) SENSEX and S&P CNX Nifty (50 Shares) have been taken as the dependent variable. Quarterly time series data from January 1995 to December 2008 had been used. The findings of the study showed that there is a co-integration relationship between macroeconomic variables and Indian stock indices which is indicative of a long-run relationship.**Samveg Patel (2012),** studied the performance of the Indian Stock Market using monthly data over the period January 1991 to December 2011 for eight macroeconomic variables, namely, Interest Rate, Inflation, Exchange Rate, Index of Industrial Production, Money Supply, Gold Price, Silver Price & Oil Price, and two stock market indices namely Sensex and S&P CNX Nifty. The finding of the study unveils that the exchange rate contains some significant information to forecast stock market performance, Index of Industrial Production was a highly significant factor, Money supply and Inflation were major factors affecting stock markets, commodity prices like Gold, Silver and Oil were also major determinants of stock markets.**Rai, Virendra & Bairagi, Palash. (2014)** established a relationship between Crude Oil Prices and Indian Stock Market based on available past data. The span of this study includes data from 2003-12 in monthly Time Series format.The findings of the study indicate that oil

prices generally follow economic principles of supply and demand in the long run. Also there exists a weak but significant relationship between oil price changes and returns on Indian stock market (BSE Sensex).

Ranjan Dasgupta (2012) Monthly data has been used from April, 2007 to March, 2012 for all the variables, i.e., BSE SENSEX, wholesale price index, index of industrial production, exchange rate and call money rate. Results showed that all the variables contained a unit root and are integrated of order one. Johansen and Juselius's cointegration test pointed out at least one cointegration vector and long-run relationships between BSE SENSEX with index of industrial production and call money rate. The Granger causality test has found no short-run unilateral or bilateral causal relationships between BSE SENSEX with the macroeconomic 88 variables. Therefore, it is concluded that, Indian stock markets had no informational efficiency.**Ahmad M & Masood T (2009),** Macroeconomic variables included were TCI, Real effective exchange rate export based, real effective exchange rate trade based, Nominal effective exchange rate trade based, WPI, money supply, foreign exchange reserves and current account balance. Co-integration test and Granger causality test were applied. The result shows a long-run equilibrium relation between total capital inflows and real effective exchange rate – both trade and export based, and between TCI and nominal effective exchange rate – export based. It also reveals the bi-directional causality between foreign exchange reserves and TCI, and unidirectional causality from TCI to real effective exchange rate, trade based. There was a linkage between real effective exchange rate and capital inflows.

3. Model, Data and Methodology

By considering the facts of the Indian economy and the empirical findings from the existing literature, we define the stock market index function as below:

$$BSE = f(INT, PORT, REER, BRENT, FDI, Y)$$

Therefore, the study examines whether these factors determine the stock market fluctuations in India. In this function, BSE represents the Indian Stock Market Index, INT is the commercial loan interest rate, PORT is net portfolio investment inflows (liabilities in the balance of payments), REER is real effective exchange rate, BRENT is Brent Crude Oil Price, FDI is net foreign direct investment inflows (liabilities in the balance of payments) and Y is real gross domestic product. As mentioned in the literature review section, the interest rate is a highly possible determinant for stock market fluctuations in many countries. Portfolio investments and foreign direct investments are important sources for the Indian Economy for many years. These capital inflows feed the economy both through goods and financial markets. Moreover, there exists some evidence from the existing literature on the impacts of capital inflows on stock markets. There is also a deal of evidence in the literature suggesting the importance of exchange rate and inflation rate on stock markets.we use the real effective exchange rate, which reflects the "real" value of the domestic currency both in domestic and foreign markets. Since stock market fluctuations are not independent of the relative position of the domestic country in global, following this way might yield better findings to debate over.India is an energy-importing country and its economy certainly depends on energy prices. Therefore, as a main global indicator, we use the Brent Crude Oil price (US Dollar) as a potential determinant. The implicit function given in Equation (1) might be written in an explicit, econometric form as below:

$$BSE_t = \beta_0 + \beta_1 INT + \beta_2 PORT + \beta_3 REER + \beta_4 BRENT + \beta_5 FDI + \beta_6 Y + \varepsilon_t$$

where β_0 is the constant and the ε_t is the error term of the estimated function. The parameters from β_1 to β_6 are the coefficients of the potential determinants presented in the implicit BSE function.

Data between 2000–2018 were used.All the data, except the crude oil prices, are obtained from the RBI website and the Brent Crude Oil Price data is obtained from the Ministry of petroleum and natural gas India. Table 1 presents some basic descriptive statistics and the sources of the data.

Table 4.1 Descriptive statistics

STATISTICS	SENSEX	FDI	INTEREST RATE	OIL PRICE	REER	PORTFOLIO INVESTMENT INFLOWS
Mean	9.3890	6.9482	1.8781	4.0160	4.6650	7.2384
Median	9.6951	7.3731	1.9184	4.0586	4.6492	7.1836
Maximum	10.4628	8.9770	2.4866	4.8864	4.8044	7.9458
Minimum	7.9788	4.0604	1.1714	2.9036	4.5713	6.6000
Std. Dev.	0.7561	1.1946	0.2623	0.5299	0.0550	0.2956
Skewness	-0.5459	-0.5007	-0.6546	-0.2486	0.5663	0.4349
Kurtosis	1.9197	1.9513	3.0618	1.9181	2.3737	2.4560
Jarque-Bera	21.2296	18.9229	15.3904	12.7596	15.0755	9.4736
Probability	0.0000	0.0001	0.0005	0.0017	0.0005	0.0088
Observations	216	216	215	216	216	216

The above tables shows the results of descriptive statistics for Macroeconomic variables and stock indices for the period of April 2000 to March 2018 .The standard deviation indicate that FDI(1.1946), SENSEX(0.7561),oil price(0.5299) are more volatile compared to the PORT(0.2959), Interest rate(0.2623).In addition the standard deviations of REER(0.0550) is less volatile compared to the rest of the macroeconomic variables during the same time.

Form the above table variables are not normally distributed as the median values of variables are very close to average values .Positive values of the Skewness test for REER (0.5663) and PORT(0.4349) suggest that these variables have long right tails, while other variables which has negative values have long left tails (stock and Watson,2006).The values of kurtosis indicate that the INTEREST RATE(3.0618) follow leptokurtic distribution, as the other variables are less peaked than the normal distribution, they follow platykurtic distribution. .Results obtained from Jarque-Bera statistics confirm that none of the series is normally distributed.

The study employs an autoregressive distributed lag (ARDL) model to estimate both the short run and long-run parameters, but the main purpose is to obtain evidence reflecting the long-run relationships between the stock market and its potential determinants. In the econometrics literature, there are several cointegration approaches providing long-run coefficients (i.e., Engle and Granger 1987; Johansen 1988; Johansen and Juselius 1990; Johansen 1995).ARDL Bounds Testing approach developed by Pesaran and Shin (1999) and Pesaran et al. (2001) has some advantages compared to previous ones.ARDL Bounds Test does not regard whether the variables are stationary at level or first-difference (I(0) or I(1)). Secondly, Banerjee et al. (1986) state that OLS estimation results are biased in finite samples as they do not take into account short term dynamics. The ARDL Bounds Test can provide more consistent coefficients in relatively small samples (see Panopoulou and Pittis 2004; Baek and Kim 2013).

Under the null hypothesis, the ARDL Bounds Test suggests no cointegration relationship. To consider whether the variables are I(0) or I(1), the Bounds Test produces two different asymptotic critical values. The estimated model in the ARDL Bounds Testing form is given below;

$$\Delta \square\square\square_{\square} = \square_0 + \sum_{\square=1}^{\square} \square_1 \ \Delta \square\square\square_{\square-1} + \sum_{\square=0}^{\square} \square_2 \ \Delta \square\square\square_{\square-1} + \sum_{\square=0}^{\square} \square_3 \ \Delta \square\square\square\square_{\square-1}$$
$$+ \sum_{\square=0}^{\square} \square_4 \ \Delta \square\square\square\square_{\square-1} + \sum_{\square=0}^{\square} \square_5 \ \Delta \square\square\square\square\square_{\square-1} +$$

$$\sum_{□=0}^{□} □_6\ \Delta□□□_{□-1} + \sum_{□=0}^{□} □_7\ \Delta□_{□-1} + □_1□□□_{□-1} + □_2□□□_{□-1} + □_3□□□□_{□-1} + □_4□□□□_{□-1}$$

$$+□_5□□□□□_{□-1} + □_6□□□_{□-1} + □_7□_{□-1} + □_□$$

Here, the α parameters represent the short-run relationships while the λ parameters represent the long-run relationships.

To examine a potential cointegrated relationship between variables, the ARDL Bounds approach tests the null hypothesis of no cointegration ($\lambda_1 = □_2 = □_3 = □_4 = □_5 = □_6 = □_7 = 0$) against the alternative hypothesis of cointegration ($\lambda_1 \neq □_2 \neq □_3 \neq □_4 \neq □_5 \neq □_6 \neq □_7 \neq 0$) via the F-test. The F Statistic obtained from the Bounds Test is compared with the lower and upper bound values proposed by Pesaran et al. (2001).

The Bounds Test part of the ARDL approach only provides information on whether the variables are cointegrated or not. If the variables are cointegrated, the long-run coefficients of each variable can be estimated through an error correction model as below:

$$\Delta□□□_□ = □_0 + \sum_{□=1}^{□} □_□\ \Delta□□□_{□-□} + \sum_{□=0}^{□} □_□\ \Delta□□□_{□-□} + \sum_{□=0}^{□} □_□\ \Delta□□□□_{□-□} + \sum_{□=0}^{□} □_□\ \Delta□□□□_{□-□} + \sum_{□=0}^{□} □_□\ \Delta□□□□□_{□-□} + \sum_{□=0}^{□} □_□\ \Delta□□□_{□-□} + \sum_{□=0}^{□} □_□\ \Delta□_{□-□} + □□□□_{□-1} + □_□$$

Here, the ECT term denotes the error correction term and the μ parameter is the speed of adjustment. A negatively estimated, significant μ parameter implies a correction mechanism on the deviations from the equilibrium. In other words, a negative μ parameter suggests a converging process to the equilibrium path.

Results

First the time series analysis is examining the stationarity of the variables. As suggested by Granger and Newbold (1974), nonstationary series might lead to spurious regression problems. Thus, to test the stationarity of the variables, the Augmented Dickey–Fuller (ADF), the Phillips–Perron (PP) and Kwiatkowski–Phillips–Schmidt–Shin (KPSS) unit root tests, developed by Dickey and Fuller (1979), Phillips and Perron (1988), and Kwiatkowski et al. (1992), respectively, are used in this study. The unit root test results in Table 2 present the test results for level and first-difference of the variables estimated through intercept and intercept with trend. Note that the null hypothesis for the ADF and the PP tests is that the variable has unit root (nonstationary) while the alternative hypothesis suggests stationarity. However, the null hypothesis for the KPSS test is that the variable is stationary. Thus, the KPSS test should be inversely interpreted as against the ADF and PP unit root tests. Combining three different unit root tests enable us to examine both the null hypothesis of stationarity and nonstationarity.

According to the test results, some of the variables are stationary at level while some others are not. But according to the test results for the first difference of the variables, we may suggest that all the variables become stationary. As compared to other cointegration methods, the ARDL Bounds Test has an advantage with respect to the stationarity of the variables. The ARDL Bounds test can powerfully analyze the long-run association between these variables regardless of their order of integration.

Table 2. Unit Root Test Results.

Panel A: Augmented Dickey–Fuller (ADF) Unit Root Test				
	Intercept		Trend and Intercept	
Variable	Level	First Difference	Level	First Difference
LBSE	−2.480	−5.436 ***	−3.728 **	−5.529 ***
LINT	−3.112 **	−4.957 ***	−2.538	−5.313 ***
LPORT	−5.648 ***	−8.092 ***	−5.614 ***	−8.013 ***
LREER	−2.219	−8.561 ***	−3.394 *	−5.684 ***
LBRENT	−2.74 *	−6.036 ***	−1.723	−6.169 ***
LFDI	−3.430 **	−7.179 ***	−3.445 *	−7.417 ***
LY	−0.265	−2.716 *	−2.818	−2.668

Panel B: Phillips–Perron Unit Root Test				
	Intercept		Trend and Intercept	
Variable	Level	First Difference	Level	First Difference
LBSE	−2.336	−5.326 ***	−2.945	−5.346 ***
LINT	−2.817 *	−4.950 ***	−1.891	−5.335 ***
LPORT	−5.599 ***	−23.049 ***	−5.563 ***	−22.751 ***
LREER	−2.240	−9.383 ***	−3.398 *	−13.614 ***
LBRENT	−2.084	−5.913 ***	−1.772	−6.090 ***
LFDI	−3.286 **	−11.901 ***	−3.223 *	−12.508 ***
LY	−1.642	−14.272 ***	−6.295 ***	−14.073 ***

Panel C: Kwiatkowski–Phillips–Schmidt–Shin Unit Root Test				
	Intercept		Trend and Intercept	
Variable	Level	First Difference	Level	First Difference
LBSE	0.885 ***	0.249	0.146 **	0.062
LINT	0.573 **	0.354 *	0.234 ***	0.053
LPORT	0.114	0.138	0.082	0.133 *
LREER	0.543 **	0.291	0.256 ***	0.082
LBRENT	0.335	0.190	0.220 **	0.060
LFDI	0.430 *	0.158	0.161 **	0.025
LY	0.958 ***	0.131	0.136 *	0.125 *

*Note: All the variables are tested in their natural logarithmic form. ***, ** and * denote statistical significance at 10%, 5% and 1% respectively. The lag lengths for the ADF and PP tests are automatically chosen by Schwarz Information Criteria.*

The result for the ARDL Bounds Test is presented in Table 3. The table shows that the optimal model determined by the Schwarz Information Criteria is ARDL (7, 3, 4, 3, 1, 2, 3). The estimated F-statistic value is greater than the upper critical values, which are based on Pesaran et al. (2001). Therefore, one may suggest that the null hypothesis of no cointegration is rejected regardless of whether the regressors are I(1) or I(0). Since the variables are cointegrated, we can now continue with the estimation of the cointegration form of the model and the long-run coefficients.

Table 3. The Results for Autoregressive Distributed Lag (ARDL) Bounds Test.

Model: F(LBIST | LINT, LPORT, LREER, LBRENT, LFDI, LY)					
Optimal Lag Length: ARDL (7, 3, 4, 3, 1, 2, 3)					
F-statistic: 9.402					
Critical Values					
10%		5%		1%	
I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
1.99	2.94	2.27	3.28	2.88	3.99

Note: The critical values of I(0) and I(1) bounds are based on Pesaran et al. (2001).
The lag lengths are chosen by Schwarz Information Criteria.

Table 4 shows the long-run and short-run coefficients of the model. First, the diagnostic test results imply that the model has no serial correlation, heteroskedasticity and misspecification problem, and the residuals are normally distributed. Additionally, the plots of the cumulative sum of recursive residuals and the cumulative sum of squares of recursive residuals imply that the estimated parameters are between the critical bounds and stable. The short-run estimation results imply that the error correction term (ECT(−1)) is statistically significant with a negative coefficient as it should be. Narayan and Smyth (2006) suggest that if the negative coefficient of the error correction term is between −1 and −2, which is −1.07 here; the system converges to the equilibrium path by fluctuating around the long-run value instead of a monotonic process.

The long-run estimation results, which constitute our main concern, are presented in the top of Table 4. The findings imply that the stock market index, the BSE-30 decreases by −0.35% as the interest rate increases by 1%. Since higher interest rates convey investors to term deposit, the demand for stock shares decreases and their prices go down. Moreover, higher interest rates raise investment costs and obstruct the expanding behavior of firms that release their shares to the stock market.

International capital flows, on the other hand, are another substantial determinant of the stock market.According to the coefficients, the stock market index increases by 0.17% and by 0.13% as portfolio investment inflows and FDI inflows increase by 1% respectively. Although the coefficients are quite close to each other, the findings show that the portfolio investment inflows are a bit more influential on stock market prices. Since India is an emerging country and promises higher relative returns in financial markets, the portfolio investments have been flowing into the Indian Economy for many years. The descriptive statistics on the portfolio investment inflows in India implies a volatile trend and the fluctuations significantly affect the stock market behavior. The FDI inflows, which are more persistent than portfolio investment inflows show a more stable flow in the Indian Economy. Since FDI leads to a direct increase in the capital accumulation of India, the stock market absolutely takes advantage of these flows. However, the results imply that portfolio investments are more influential in India as expected from an emerging country.

Table 4. The Long-Run and Short-Run Estimation Results.

Dependent Variable: BSE-30 Index	
Long-Run Estimations	
Regressors	**Coefficients**
LINT	−0.356 (0.048) ***
LPORT	0.175 (0.050) ***
LREER	0.881 (0.301) ***
LBRENT	−0.146 (0.063) **
LFDI	0.137 (0.024) ***
LY	1.804 (0.112) ***
Constant	−29.528 (3.286) ***
Short-Run Estimations (Cointegrating Form)	
Regressors	**Coefficients**
LBSE(−1)	0.634 (0.095) ***
LBSE(−2)	0.599 (0.107) ***
LBSE(−3)	0.091 (0.093)
LBSE(−4)	−0.027 (0.080)
LBSE(−5)	0.087 (0.068)
LBSE(−6)	−0.215 (0.061) ***
LINT	−0.441 (0.088) ***
LINT(−1)	0.286 (0.099) ***
LINT(−2)	0.245 (0.097) **
LPORT	0.022 (0.012) *
LPORT(−1)	−0.111 (0.018) ***
LPORT(−2)	−0.071 (0.014) ***
LPORT(−3)	−0.051 (0.012) ***
LREER	1.176 (0.165) ***
LREER(−1)	−0.626 (0.184) ***
LREER(−2)	−0.474 (0.189) **
LBRENT	0.087 (0.048) *
LFDI	0.032 (0.018) *
LFDI(−1)	−0.078 (0.020) ***
LY	0.580 (0.101) ***
LY(−1)	−0.744 (0.120) ***
LY(−2)	−0.412 (0.100) ***
ECT(−1)	−1.072 (0.108) ***
Diagnostic Tests	
Serial Correlation (p-value)	0.196 (0.82)
Heteroskedasticity (p-value)	0.893 (0.61)
Normality (p-value)	0.976 (0.61)
Functional Form (p-value)	0.766 (0.39)
CUSUM	Stable
CUSUMQ Stable	Stable

*Note: Standards errors are given in parentheses. ***, ** and * denote statistical significance at 10%, 5% and 1% respectively.*

The relative value of Indian currency is positively related to the stock market value. The results suggest that the stock market index increases by 0.88% as the real effective exchange rate increases by 1%. Note that higher values of the real effective exchange rate imply an appreciation of Indian rupee as against other currencies of the trade partners. Since the REER variable reflects both the fluctuations of the nominal exchange rate and the ratio of consumer price indices of the home country and partner countries. The result obviously reveals that the Indian stock market is positively influenced by the appreciation of the Indian currency. So indeed, most of the economic crises and recessions in India are caused by the instability of the currency. The previous studies mentioned in the literature review section dealt with the issue only through nominal exchange rate and found a negative relationship between stock market and nominal exchange rate. Thus, our findings on real effective exchange rate here confirm the previous findings.

The crude oil price, which is a substantial determinant of stock market fluctuations, is significantly estimated for the Indian Stock Exchange Market. The findings imply that the stock market index decreases by 0.14% as the Brent Crude Oil price increases by 1%. The negative impact here confirms the previous findings mentioned in the literature review section. Since India is an energy and oil importing country, any increase in the energy sources directly affects the Indian Economy and the responses are seen in the stock market fluctuations.

Lastly, to control the variations in market activity, the impact of gross domestic product variables has been estimated. The effect of GDP might be interpreted either as the impact of market activity or the impact of economic growth. The results show that the stock market index increases by 1.8% as GDP increases by 1%. As mentioned in the literature review section, some previous studies employed industrial production index while some others employed GDP to proxy market activity. The findings of the present study confirm the empirical findings in the existing literature as expected. Stock markets benefit from active and growing domestic economies regardless of their development path. If the economy is on a growth path, this will bear fruit for the stock market.

It is said that interest rate, portfolio investment inflows, FDI inflows, real effective exchange rate, crude oil prices, and market activity are substantial determinants of the BSE-30, Bombay Stock Exchange Market. The findings suggest that the Indian Stock Exchange Market is negatively affected by any increase in the costs. Increases in interest rate (cost of investment) and crude oil price (cost of operation) significantly reduce the stock market index. Thus, to keep the market value stable or sustain its growth trend, policymakers should focus to reduce the interest rate. Since crude oil price is a global indicator, the policymakers of the domestic country have no chance to keep it stable. However, since the crude oil prices are in foreign currency (US Dollar), the domestic country may try to reduce nominal exchange rate, which will finally lead to reduce the crude oil price in Indian rupee. Secondly, the real value of the domestic currency against foreign currencies is another substantial determinant of stock market index. To sustain the stock market's increase, policymakers should appreciate the currency. Since real effective exchange rate variables consist of the price index of the home country, the price indices of the foreign partner countries and the nominal exchange rate, policymakers may try to reduce nominal exchange rate and consumer price index (inflation rate) in their home country. Any efforts on these two indicators will serve the purpose and benefit the stock market. Thirdly, international capital inflows raise the stock market value. Both portfolio and FDI inflows lead to an increase in the stock market index. Therefore, to feed the stock exchange market, policymakers should sustain these inflows to the country. Portfolio investments, however, are more liquid compared to FDI.

Thus, to benefit from these inflows effectively, the economy administration should use this advantage in respect to the balance of payments and try to canalize these positive additions into productive sectors such as the manufacturing industry. Following such a strategy will create a multiplier effect and sustain the country's economic growth process. Fourthly, market activity is also a significant determinant of stock market fluctuations in India. Any recession in the economy directly affects stock markets and causes decreasing returns in the markets, which will lead to a decrease in international capital inflows. In the sequel of such a cycle, both the stock market and the whole economy will be harmed.

Conclusions

This study investigated the impact of some outstanding macroeconomic factors on the Indian Stock Exchange Market, BSE-30. Since stock markets provide substantial information on the home country economies, economists and policymakers attentively observe the fluctuations in these markets and try to predict the forthcoming fluctuations

through the factors determining the stock market conditions. Within this perspective, the study examined the impacts of interest rate, real effective exchange rate, portfolio investment inflows, FDI inflows, crude oil price and market activity on BSE30 index over the 2000–2018 period.

The findings obtained from ARDL Bounds Test suggest that there is a cointegrated long-run relationship between the factors and the stock market index. Therefore, an error correction model is employed to observe the long-run effects of each factor. The results of the long-run analysis imply that increases in market activity, portfolio investment inflows, FDI inflows, and real effective exchange rate raise the stock market index while increases in interest rate and crude oil prices reduce it. These evidences briefly suggest that increasing costs of investment and costs of operation significantly lower the market value (interest rate and crude oil prices respectively). Since India is still in a developing country, which needs growing physical investment, lower interest rates are required to sustain the growth process. On the other hand, India is an energy importer country and an increase in energy prices negatively influences the economy. The estimated impact of the crude oil price indicates the energy-dependent position of the Indian Economy. International capital inflows have been of great importance in India for many years. The findings of the present study show that both portfolio investment and FDI inflows positively affect the stock market value. The findings also imply that portfolio investment inflows, which are more liquid have a bit more influential on the stock market. Market activity has a positive impact on the stock market as observed for almost all economies in the existing literature. Lastly, the real effective exchange rate which reflects the “real” value of the domestic currency in global has a significant positive impact on the stock market value. India is an exchange rate-sensitive country for decades and has had important recessions and crises caused by unexpected exchange rate volatilities. Since the real effective exchange rate includes price indices and reflects relative values (higher values imply a valuation of Indian currency), this coefficient can be interpreted as the need of lower inflation and lower nominal exchange rate.

Policymakers and economists concerned with predictions of the Indian Stock Exchange Market should necessarily consider the estimated factors in the present study. Moreover, to raise the stock market value, India should induce international capital inflows, raise the real effective value of the domestic currency, raise market activity and implement a lower interest rate. There might be also some endogenous relationships for some variables. Further research should also analyze this point and observe the interactions from an endogenous perspective.