

Factors Affecting the Indian Stock Market

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Abstract

One of the important contributions of this study is that in India, very little/almost no work has been done to understand the factors affecting the stock market prices after the recent recession. The present study examines the relationship between stock prices and a set of macroeconomic variables to examine if there is any specific variable which has the most influence on the stock market of India. The study aims to find out the factors affecting the Indian stock market by using correlation and regression analysis. To investigate the correlation between SENSEX, Consumer Price Index (CPI) which is a proxy of inflation, Foreign Institutional Investment (FII), Exchange Rate, NASDAQ index, Gold prices, Index of Industrial Production (IIP) in India from the period 2018 to 2021. The results show that the highest correlation exists between SENSEX and NASDAQ followed by NASDAQ and Gold prices. Furthermore, SENSEX is positively related to all of the selected variables. To assess the impact of each variable on SENSEX returns, SENSEX is taken as a dependent variable and all other variables are taken as independent variables in the regression analysis. The regression outputs of only NASDAQ and Gold are statistically significant at 5% level. Granger Causality suggests no bidirectional relationship among any of the variables. However, there exists a unidirectional relationship between some of the variables.

Keywords: CPI, IIP, SENSEX, NASDAQ, Gold, FII, Exchange Rate, Stock Market, Sher Bazaar

1. Introduction

With the advent of open-source information, especially the internet-based applications in the stock markets at the world level, information describing the macroeconomics and microeconomics is readily accessible. This flow of information has perhaps made the capital markets more efficient than earlier as the stakeholders are better placed to assess and act in agreement with the changing dynamics of the environment. According to the efficient-market hypothesis (EMH) theory (Fama, 1970), an efficient capital market is one in which stock prices change rapidly as soon as the new information is available. Many studies have found a correlation between changes in world economy and macroeconomic variables. These studies also show that the movement of stock market indices is highly sensitive to the changes in the fundamentals of the economy.

An instrument in the macroeconomic environment promotes the profitability of business, which pushes them forward to a stage where they can access securities for consistent growth. Generally, the instruments for measuring the performance of an economy include GDP (Gross Domestic Product) growth, rate of inflation, the exchange rate, fiscal position, and many other factors. These macroeconomic factors are the main determinants of the growth for an economy. Further, the stock prices precisely reflect the underlying fundamentals. India's economy has been one of the stars of global

economies, as it is one the fastest growing and fourth largest economy in terms of purchasing power parity in the world. The capital investment boom in the country pushes the current growth phase of the Indian economy. The Indian capital market has shown phenomenal growth in the recent years which has given the investors great returns and having said that India is the largest economy it has proven it by having many foreign investments in the country such as FII (Foreign Institutional Investment), FDI (Foreign Direct Investment), etc.

As the global market is utterly connected with each other, any movement or recession in the foreign market can affect the Indian market. The Indian economic scenario has changed a bit due to the recent recessionary global pressures as there are so many connected scenarios happening in and around the world. These pressures have caused significant movements in the capital markets of India as foreign hedge funds unwind their positions in various capital markets. The Indian market has faced the brunt and has been adversely affected, as there is appreciation in the currency due to higher inflow of foreign exchange, decline in exports, and fall in stock prices of various sectors. The FII's investment is one of the key drivers of the Indian capital market as the foreign investors get higher return. However, this situation has created a risky environment for the other investors as the market becomes more volatile day by day as the information passes faster than ever before.

In this study SENSEX, NASDAQ, FII, IIP, CPI proxy of inflation, Gold rate, and Exchange Rate are taken to investigate the factors which affect the Indian capital market. BSE index SENSEX is taken to know which of the other internal and external factors are affecting these selected variables. FII investments, NASDAQ, Gold price is taken to find which external factor has the most effect on the variability of SENSEX as it is seen in various studies that NASDAQ has a very strong influence over SENSEX. The correlation analysis in this study between the variables have also shown that NASDAQ has the highest influence on SENSEX change followed by Gold price.

2. Review of Literature

Remzi GÖK and Erhan ÇANKAL (2020) investigate the stock-bond relationship in Turkey by employing weekly price observations of stock indices and interest rates over a period ranging from 2005-04-01 to 2016-12-30. Wavelet analysis reveals the existence of the cointegration and a unidirectional causal relationship in the long-run and bi-directional causality between the fluctuations in bond yields and equity returns in the medium and long term. The results of frequency causality test shows that the predictive power of the financial index returns on the interest rate fluctuations increases across frequencies.

Ahmed Hassanein and Hanaa Elgohari (2020) applied the Dynamic Conditional Correlation (DCC) model to examine the association between stock and inter-bank bond markets in China from 2002 to 2016. The results indicate that the correlation between the stock and bond returns in China is time variant. Further, the study used the BEKK model and finds the presence of spillover effects between the stock and bond markets in both directions during the following periods: recovery and persistence, stock market shock and bond market fluctuations.

M. Venkateshwarlu and T. Ramesh Babu (2011) analyze the dynamic linkages between stock and bond prices in India using cointegration and Granger Causality test. There is no causality from stock market to bond market or vice versa in the long term (2004 to 2007, and 2008 to 2009). However, the study found that the bond and stock prices had a bivariate causal relationship in the year 2009 and univariate causal relationship in 2010.

Karam Pal and Ruhee Mittal (2011) study the long-run relationship between the Indian capital markets and key macroeconomic factors such as Interest Rates, Exchange Rates, Gross Domestic Savings (GDS) and Inflation Rate of India using cointegration and Error Correction Mechanism (ECM). The results show the existence of cointegration between macroeconomic variables and Indian stock indices in the long-run.

S. Baranidharan, N. Dhivya and Rev. Fr. A. Alex (2018) analyze the effect of Macroeconomic variables on Bombay Stock Exchange SENSEX. They have used correlation and regression analysis to explore the influences of WPI, REER, M3 and IIP on the performance of BSE SENSEX. The findings revealed a direct relationship between the REER and the BSE SENSEX at 0.01 levels and an inverse relationship between the IIP and M3 at 0.05 levels.

Mrunal Joshi (2013) investigated the major factors responsible for fluctuations in the Indian stock market. They used primary data for the analysis and found that flow of Foreign Institutional Investors, Inflation, Growth of Gross Domestic Product, Political Stability, Liquidity and different Interest Rate and Global level factors are major factors responsible for the Indian stock market volatility.

Khaled Lafi AL-Naif (2017) studies both short and long-term relationship between interest rate and Arab Monetary Fund indices for five Arabian stock market index using VAR model, Cointegration, Granger Causality test and variance decomposition. The results show that there exists a significant negative relationship between interest rate and stock market index in Egypt and a significant positive relationship between Jordan and Oman. Co-integration test concluded that the interest rate and the stock market index have a long-term association only in Qatar, but not in other indices. There exists a bidirectional relationship in Jordan, and a unidirectional relationship in Egypt going from stock market index to interest rate.

Alam M.M., and Uddin M.G.S. (2009) attempt to support the existence of share market efficiency and establish an empirical relationship between stock index and interest rate for fifteen developed and developing countries. Both time series and panel regressions have been employed. For all of the countries the study reveals that interest rate has a significant negative relationship with share price and for six countries changes in interest rate have significant negative relationship with changes in share price.

Jian Zhang, Dongxiang Zhang, Juan Wang and Yue Zhang (2013) examines the volatility spillovers between domestic equity and bond markets in the G7 and BRICS countries using the causality-invariance test newly developed by Hafner and Herwartz (2006). The results show that there are bidirectional volatility spillovers between the equity and bond markets in Brazil, France and South

Africa and unidirectional spillovers running from the bond to the equity in the US, UK and. However, no clear relationship could be seen through the LM-GARCH model in the case of Canada, India, Japan, Italy and China.

3. Results and Discussions

3.1 Data Source and Methodology

The study considers the relationship between SENSEX, CPI (Consumer Price Index), IIP (Index of Industrial Production), NASDAQ, FII (Foreign Institutional Investors), Gold and Exchange Rate. Monthly data was collected for all the variables for the time period 1-January-2018 to 1-December-2021. The data was taken from CDSL, BSE SENSEX, data.gov.in, NASDAQ GIDS, MCX and others. CPI and IIP are indices and thus unitless. SENSEX and Exchange Rate are in INR while NASDAQ and Gold are in USD. FII is measured in crores INR. Closing values have been taken for SENSEX, NASDAQ, Gold and Exchange Rate. Total value of FII is taken which includes equity, debt, debt-VRR and hybrid. IIP is constructed as a weighted average of various use-based categories with weights provided by the government of India.

The aim of this study is to find the existence of an association, if any, among the 7 variables selected and to examine the extent of that relationship. We use correlation and regression analysis for the same. The study also aims to investigate the existence of any bi-directional causality among the selected variables. For this, Granger Causality test has been employed. R Studio and EViews software have been used.

3.2 Relationship among the Variables Selected in this Study

We can expect some a-priori relationship among all the 7 selected variables.

SENSEX and CPI Nexus

CPI is a measure of inflation. In times of high inflation, investors become risk averse. Hence, there is evidence of high negative correlation (about 0.86) between CPI and SENSEX. (Dr. S.D. Vashishtha, Dr. Umed Singh and Rajesh Kumar, 2013)

SENSEX and Exchange Rate Nexus

The past data of over 10 years suggests the existence of a positive correlation between rupee and stock market with a value of around 0.44. Thus, we would expect the Exchange Rate and SENSEX to move together.

SENSEX and IIP Nexus

IIP measures the general level and growth of industrial production. IT is believed to have a moderate inverse relationship with SENSEX. (Dr. S.D. Vashishtha, Dr. Umed Singh and Rajesh Kumar, 2013)

SENSEX and NASDAQ Nexus

NASDAQ is among the top stock exchanges and fluctuations in NASDAQ are bound to affect SENSEX due to the high interconnectedness of global investors. Thus, we would expect them to be positively related.

SENSEX and Gold Nexus

A unidirectional relationship exists between Gold price and SENSEX returns, though not too strong. Thus, we would expect them to move in somewhat the same direction. (S.C.B. Samuel Anbu Selvan, Ram Raj G., 2020)

SENSEX and FII Nexus

There exists an inverse relationship between SENSEX and FII. (Ashok Kumar, Kamal Kumar & Sudhir Yadav, 2011)

FII and Exchange Rate Nexus

A unidirectional causality or one-way causality is found running from FII towards Exchange Rate. (Dr Mohammad Noor Alam, Dr Md. Shabbir Alam and Dr Shariq Mohammed, 2018)

CPI and IIP Nexus

There exists a negative relationship between CPI and IIP. (Economic Times)

CPI and Gold Nexus

The co-movement between CPI and Gold has increased in recent years. The Gold-Inflation relationship is very specific to the chosen time-span. The sensitivity is related to interest rate changes. (Jonathan A. Batten, Cetin Ciner, Brian M Lucey, 2014)

3.3 Descriptive Statistics

	SENSEX	CPI	IIP	FII
Min.	29468	0.02000	54.07	-118203
1st Qu.	36043	0.03700	125.35	-7369
Median	38656	0.04750	128.76	4223
Mean	41462	0.04863	126.79	4340
3rd Qu.	46652	0.06225	133.99	16599
Max.	59307	0.07600	145.63	71046

	NASDAQ	Gold	Exch. Rate
Min.	6635	1192	63.77
1st Qu.	7637	1314	69.92
Median	8616	1558	72.27
Mean	10028	1562	71.77
3rd Qu.	12934	1786	74.14
Max.	15645	1968	75.70

There are no apparent inconsistencies in the data. FII has the highest range with both negative and positive values.

3.4 Correlation Analysis

The correlation matrix is given in Table 3.1.

Table 3.1: Correlation Analysis

	SENSEX	CPI	IIP	FII	NASDAQ	Gold	Exch. Rate
SENSEX	1						
CPI	0.138496	1					
IIP	0.285061	-0.34273	1				
FII	0.23525	0.014582	0.180144	1			
NASDAQ	0.908728	0.387092	0.071218	0.199236	1		
Gold	0.567389	0.669289	-0.19941	0.215583	0.816214	1	
Exch. Rate	0.433757	0.426505	-0.31442	-0.04968	0.641024	0.715305	1

We can see from Table 3.1 that the highest correlation exists between SENSEX and NASDAQ followed by NASDAQ and Gold prices. SENSEX is positively related to all of the selected variables.

However, in order to assess the impact of each of the variables on SENSEX returns, we need to conduct a regression analysis. For the regression analysis, we will have SENSEX as the dependent variable and CPI, IIP, FII, NASDAQ, Gold and Exchange Rate as the independent variables.

3.5 Multiple Regression Analysis

We will regress SENSEX on the other 6 variables to examine the role of each factor in changes in the SENSEX returns.

The model is of the form:

$$\text{SENSEX} \sim \text{CPI} + \text{IIP} + \text{FII} + \text{NASDAQ} + \text{Gold} + \text{Exch_Rate} \tag{3.1}$$

The regression output is given in table 3.2.

Table. 3.2: Regression Estimates

Coefficients	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	3.108e+04	1.272e+04	2.444	0.018917 *
CPI	-1.685e+04	3.144e+04	-0.536	0.594886
IIP	4.356e+01	2.816e+01	1.547	0.129570
FII	1.543e-02	1.267e-02	1.218	0.230000
NASDAQ	3.426e+00	2.264e-01	15.129	< 2e-16 ***
Gold	-1.289e+01	3.394e+00	-3.798	0.000475 ***
Exch. Rate	-1.200e+02	1.775e+02	-0.676	0.502702

Signif. Codes: 0 , ‘***’ 0.001 , ‘**’ 0.01 , ‘*’ 0.05 , ‘.’ 0.1 , ‘ ’ 1

Residual Standard Error: 2223 on 41 degrees of freedom

Multiple R-squared: 0.9311, **Adjusted R-squared:** 0.921

F-statistic: 92.38 on 6 and 41, **DF, p-value:** < 2.2e-16

The regression output suggests that only NASDAQ and Gold have a statistically significant impact on SENSEX returns at 5% level of significance. For 1 USD increase in NASDAQ returns, SENSEX returns increase on average by 3.426 INR. Similarly, for 1 USD increase in Gold prices, SENSEX returns decrease by 12.89 INR.

The low p value of the F test suggests that the model is a good fit. This is confirmed by the high R square value of 0.921.

Thus, both our correlation and regression results are consistent. Changes in NASDAQ returns and Gold prices have a significant bearing on the SENSEX returns. Hence, these 2 variables can be used in order to predict SENSEX returns as well, although this is beyond the scope of this study.

We will now move on to the second part of our analysis and assess the bi-directional relationship among our variables.

3.6 Granger Causality Test

All the variables are stationary at first difference. The output of the Granger Causality test is given in Table 3.3.

Table 3.3: Granger Causality Estimates

Pairwise Granger Causality Tests

Date: 08/08/22 Time: 14:00

Sample: 2018M01 2021M12

Lags: 2

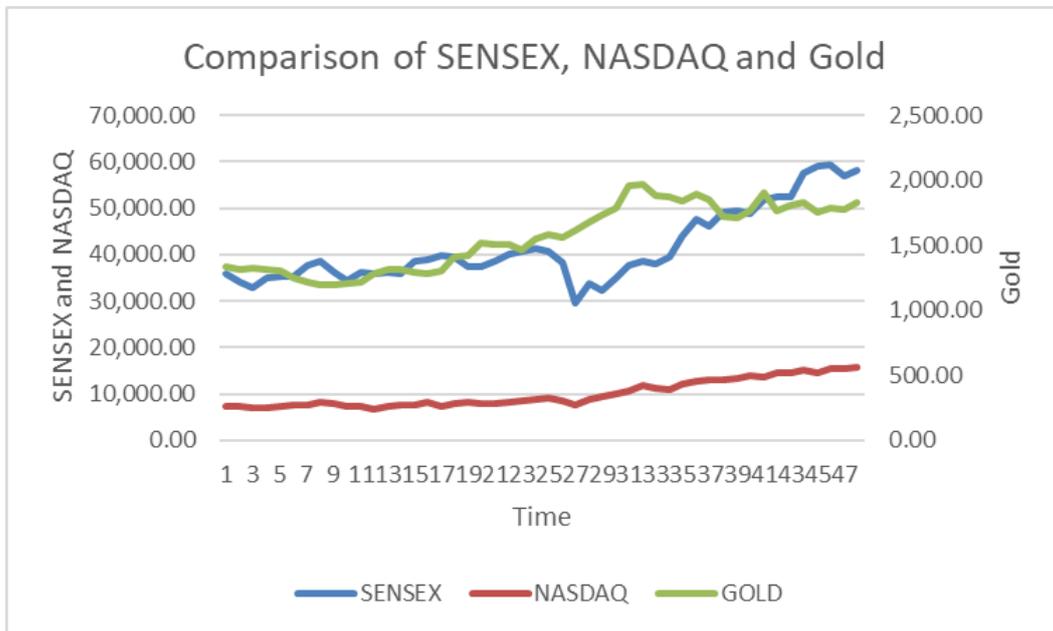
Null Hypothesis:	Obs	F-Statistic	Prob.
CPI does not Granger Cause SENSEX	46	0.03605	0.9646
SENSEX does not Granger Cause CPI		3.66457	0.0343
IIP does not Granger Cause SENSEX	46	0.77658	0.4666
SENSEX does not Granger Cause IIP		10.5074	0.0002
FII does not Granger Cause SENSEX	46	1.23788	0.3006
SENSEX does not Granger Cause FII		4.84653	0.0129
NASDAQ does not Granger Cause SENSEX	46	3.90572	0.0280
SENSEX does not Granger Cause NASDAQ		1.95251	0.1549
GOLD does not Granger Cause SENSEX	46	1.63179	0.2080
SENSEX does not Granger Cause GOLD		0.92821	0.4034
EXCH_RATE does not Granger Cause SENSEX	46	1.08341	0.3479
SENSEX does not Granger Cause EXCH_RATE		0.60361	0.5516
IIP does not Granger Cause CPI	46	0.09540	0.9092
CPI does not Granger Cause IIP		1.51387	0.2321
FII does not Granger Cause CPI	46	3.78779	0.0309
CPI does not Granger Cause FII		0.68711	0.5087
NASDAQ does not Granger Cause CPI	46	0.32102	0.7272
CPI does not Granger Cause NASDAQ		1.04517	0.3608
GOLD does not Granger Cause CPI	46	1.74671	0.1871
CPI does not Granger Cause GOLD		1.22228	0.3051
EXCH_RATE does not Granger Cause CPI	46	1.30297	0.2827
CPI does not Granger Cause EXCH_RATE		1.86844	0.1673
FII does not Granger Cause IIP	46	14.0606	2.E-05
IIP does not Granger Cause FII		1.41676	0.2541
NASDAQ does not Granger Cause IIP	46	2.22930	0.1205
IIP does not Granger Cause NASDAQ		3.28159	0.0476
GOLD does not Granger Cause IIP	46	1.55806	0.2228
IIP does not Granger Cause GOLD		1.30328	0.2827
EXCH_RATE does not Granger Cause IIP	46	2.62795	0.0844
IIP does not Granger Cause EXCH_RATE		0.14797	0.8629
NASDAQ does not Granger Cause FII	46	1.08043	0.3489
FII does not Granger Cause NASDAQ		0.25313	0.7776
GOLD does not Granger Cause FII	46	1.29421	0.2851
FII does not Granger Cause GOLD		0.30917	0.7358
EXCH_RATE does not Granger Cause FII	46	1.33919	0.2733
FII does not Granger Cause EXCH_RATE		0.00475	0.9953
GOLD does not Granger Cause NASDAQ	46	3.41555	0.0425
NASDAQ does not Granger Cause GOLD		0.04186	0.9590
EXCH_RATE does not Granger Cause NASDAQ	46	2.06956	0.1392
NASDAQ does not Granger Cause EXCH_RATE		0.69729	0.5037
EXCH_RATE does not Granger Cause GOLD	46	3.71051	0.0330
GOLD does not Granger Cause EXCH_RATE		1.54289	0.2259

The results of Granger Causality show that there is no bi-directional causality between any of the given variables. However, a unidirectional relationship runs from SENSEX to CPI, from SENSEX to IIP, from FII to IIP, from FII to CPI, from NASDAQ to SENSEX, from Gold to NASDAQ and from Exchange Rate to Gold. These results are in line with our a-priori expectations.

3.7 Graphical Representation

The relationship between NASDAQ, SENSEX and Gold can be easily seen through the graph in Figure 3.1.

Figure 3.1: Graphical Comparison of SENSEX, NASDAQ and Gold Returns



4. Summary and Conclusions

The paper has made an attempt to examine the impact of macroeconomic variables on Indian capital markets. In today’s globalized era, where markets are becoming increasingly integrated and connected, it has become important to understand the underlying fundamentals affecting the markets at domestic and global level. Thus, macroeconomic variables, i.e., CPI (Consumer Price Index), a proxy of inflation rate, Exchange Rate of INR against USD, IIP (Index of Industrial Production), FII (Foreign Institutional Investment), NASDAQ, Gold price are chosen to examine their degree of association with SENSEX returns. The correlation analysis shows that NASDAQ and SENSEX have the highest positive correlation with a magnitude of 0.908728 followed by NASDAQ and Gold price having the next best correlation with a magnitude of 0.816214.

However, in order to assess the impact of each of the variables on SENSEX returns, we need to conduct a regression analysis. For the regression analysis, we will have SENSEX as the dependent variable and CPI, IIP, FII, NASDAQ, Gold and Exchange Rate as the independent variables. The output shows that NASDAQ and Gold prices have a significant impact on SENSEX return. In Figure 3.1, the graphical comparison of SENSEX, NASDAQ and Gold returns, shows that all the three variables have a consistent growth with all the variables having an upward slope with the variables having an effect on

each other's price movements, as they highly reflect each other's pattern. With the graph we can see that whenever the price of Gold increases, the returns in the SENSEX decreases and when the price of Gold decreases the SENSEX return increases. We can say that Gold and SENSEX have inverse relationship as they show the price movement in opposite directions, whereas NASDAQ has a similar pattern of SENSEX so we can say that both SENSEX and NASDAQ go hand in hand with each other as all the ups and downs are similarly related.

The limitation of the study is that there are other variables that affect the capital market of India which have not been included in this study such as behavior of the individual, news in the market, war aggression, GDP growth, etc. The study is focused only on macroeconomic factors as there is severe lack of available data on behavior of individuals, news, etc.

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