

MACROECONOMIC DETERMINANTS OF STOCK MARKET PERFORMANCE OF INDIA – AN EMPIRICAL STUDY

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Abstract

The purpose of this study is to identify and analyse the macroeconomic determinants of stock market performance of India. The study uses secondary data for the period 2001 to 2017. The yearly data has been collected for the macroeconomic variables like, inflation, Foreign Direct Investment, Gross Capital Formation, Lending rate, Money Supply and Foreign Exchange rate. The stock market performance was measured using yearly stock index price of Bombay Stock Exchange. Using correlation and regression, it was found that there exists high positive correlation between stock index price and Gross Capital Formation, Stock index Price and Money supply, and Gross Capital formation and Money supply. The result also revealed that only Gross Capital Formation has significant influence over stock index price, whereas all the independent variables can jointly influence the dependent variable i.e., stock index price.

Key Words: Indian stock market, Gross Capital Formation, Regression, Money Supply, Foreign Direct Investment.

Introduction

The financial sector is very broad and its growth cannot be measured using a single indicator, so many economists have focused on the nature of relationship between one sub-sector of financial markets and the growth in real economy. One such sub-sector that has attracted a lot of interests is the stock market. The stock market is considered to be one of the most important components of any modern economy, which provides the access to the capital of public and makes it available for use by business entities. So, the companies have access to a permanent channel to raise capital quickly and efficiently. The raised capital can now be directed to profitable projects and thereby drive economic growth. The role of stock market development is becoming a significant aspect of the financial and economic growth of developing countries (Ntim, Opong, Danbolt and Dewotor, 2011). There is a big strand of literature looking at the relationship between the stock market and the real sector of economy. Economic performance can be categorized into two groups; domestic economic variables such as inflation, exchange rate and money supply, and international factors like oil prices, and economic conditions of other countries (Samarakoon, 2000).

The development of the stock market is the outcome of many macroeconomic variables like foreign direct investment, foreign institutional investment, exchange rate and economic reforms (Gay, 2008) in developing or developed economies. As a developing country, India has a relatively active stock market compared to the other developing countries. Indian stock market has developed in terms of the number of stock exchanges, number of listed stocks, market capitalization, trading volume, turnover of the stock exchanges, investor's population and price during these years. But most ordinary Indian citizens invest in gold, real estate, and other tangible assets instead of investing in the stock market. Furthermore, the recent dramatic expansion of the digital information infrastructure throughout India has greatly increased the flow of knowledge and dissemination of information about the stock market throughout the general population of the country. It may be expected that this great increase in the availability of information about the stock market can be expected to make the stock market a better option in the future for Indian investors.

Statement of the problem

There are many factors to which the stock market reacts, factors like the economic, political and socio-cultural behavior of any country. Hence, investors carefully watch the performance of the stock markets by observing all the factors, before investing funds. The market index acts as yardstick to compare the performance of individual portfolios and also provides investors for forecasting future trends in the market. Especially the stock markets of emerging economies are likely to be sensitive to fundamental changes in macroeconomic structure and policies, which plays an important role in achieving financial stability.

Therefore, to predict the possible changes in the stock market those fundamental factors should be studied, who works as the triggers of changes and drives the market. According to Fama (1981), there is a comprehensive group of macroeconomic variables that influences the stock prices in the share market of any country. If a country's economy is performing well and expected to grow at a vigorous pace, the market is frequently anticipated to reflect the same.

So, it is necessary to arrive at a clear picture of the behavior of Indian stock market and its relationship with the macroeconomic variables.

Review of Literature

Ray et.al., (2004) attempted to unravel the relationship between the real economic variables and the capital market in Indian context. They considered the monthly data of several economic variables like the national output, fiscal deficit, interest rate, inflation, exchange rate, money supply, foreign institutional investment in Indian markets between 1994 and 2003, and tried to reveal the relative influence of these variables on the sensitive index of the Bombay stock exchange.

Apiyeva (2007) intended to identify the main determinants of the stock market performance in emerging economies of Latin America and Asia Pacific. The researcher used a set of macroeconomic variables, including inflation, foreign exchange rates, market integration, the Institutional Investor's country ratings, the U.S interest rates and financial risk premiums, and their role in explaining the fluctuations in the total returns on the stock markets in six Latin American and four Asia Pacific countries. The result showed that the Institutional Investor's country ratings and financial risk premium are the best determinants of the stock market performance in Latin American and Asian Pacific countries. The researcher had used ADF, correlation and regression and found that the falling U.S. interest rates make emerging markets more attractive to the international investors and encourage capital inflows and lower U.S. interest rates make borrowing for emerging markets less expensive.

Naik and Padhi (2012) investigates the relationships between the Indian stock market index (BSE Sensex) and five macroeconomic variables, namely, industrial production index, wholesale price index, money supply, treasury bill rates and exchange rates over the period 1994:04–2011:06. The analysis revealed that there exist a long-run equilibrium relationship between macroeconomic variables and the stock market index.

Barakat et.al., (2016) tried to shed light on the relationship between the stock market and macroeconomic factors in two emerging economies namely, Egypt and Tunisia for the period from January 1998 to January 2014. And the result indicated that there is a causal relationship in Egypt between market index and consumer price index (CPI), exchange rate, money supply, and interest rate. There is a causal relationship in Egypt between market index and consumer price index (CPI), exchange rate, money supply, and interest rate. The same goes for Tunisia except for CPI, which had no causal relationship with the market index. Results also revealed that the four macroeconomic variables were cointegrated with the stock market in both the countries. There have been mixed results on the effect of macroeconomic changes on the stock markets.

Objectives of the study

- To assess the stock market returns India
- To examine the determinants of stock market performance of INDIA

Hypotheses

- There is no correlation among the determinants of stock market performance of India.
- There is no significant relationship between the macroeconomic variables and the stock index price of India.

Research Methodology

The study is analytical in nature and uses secondary data taken from Bloomberg, World Bank, Yahoo finance and Bombay stock exchange. Yearly data has been collected for the period from 2001 to 2017. Daily stock index price is taken to assess the returns of stock market of India.

Stock market Returns

The analysis is done on the daily log return series of the indices, which is computed as follows;

$$R_t = \text{Log } P_t - \text{Log } P_{t-1}$$

where, R_t is the daily return at time t , P_{t-1} and P_t are daily closing prices of the indices at two successive days $t-1$ and t respectively.

Descriptive statistics

It includes the basic statistical features like Mean, Median, Minimum and Maximum values, Standard Deviation, Kurtosis, Skewness and Jarque-Bera test. These tests are applied for the data running for the period from 2001 to 2017. Jarque-Bera test is used to find out whether the observations are normally distributed. In order to test the normality using Jarque-Bera test, Skewness and Kurtosis are needed.

Correlation

A widely known measure of dependence is the correlation coefficient, which provides information on the degree of statistical relationship between the variables of interest. The state of high correlation among the independent variables is termed as multicollinearity. Regression co-efficient remain indeterminate and their standard errors are infinite when there is multicollinearity among the chosen variables. If multicollinearity exists between the independent variables, the statistical inference made about the data may not be reliable. Subsequently the variables with high correlation should be dropped before applying any model to examine the relationship with the dependent variable.

Regression

Regression analysis is the statistical technique that identifies the relationship between two or more quantitative variables: a dependent variable, whose value is to be predicted, and an independent or explanatory variable (or variables), about which knowledge is available. The technique is used to find the equation that represents the relationship between the variables. Multiple regressions provide an equation that predicts one variable from two or more independent variables. The study adopted multiple regression guided by the following model:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

where, Y is the dependent variable, β_0 is the regression constant β_1 , β_2 , β_3 , β_4 , and β_5 are the coefficients of independent variables, X_1 is Interest rate X_2 is Inflation X_3 is Exchange rate ε is the Error Term.

Independent and Dependent variables

The set of macroeconomic variables influencing the stock market performance of India include Inflation, Gross Capital Formation, Export, Import, Lending Rate, Money Supply, and Foreign Exchange Rate. The stock market return is considered as stock market performance.

Descriptive statistics of stock index price and macroeconomic variables of India

The statistical properties like mean, median, standard deviation, skewness and kurtosis gives a brief background about the macroeconomic variables like GDP, Inflation, Money Supply, Lending rate, Gross Capital Formation, Foreign Direct Investment (Inflows), Foreign Exchange rate, Export and Import prices and Stock Index Price and its movement over the study period. This study also employs Jarque-Bera test, to statistically check the normality in the time series data. The hypothesis has been set as follows:

$$H_0: JB = 0 \text{ (normally distributed)}$$

$$H_1: JB \neq 0 \text{ (not normally distributed)}$$

The descriptive statistics gives a vivid picture of the movement of stock index price of India during the study period 2001-2017. The Mean, Median, Standard Deviation, Skewness, Kurtosis, Jarque-Bera values for Indian stock market return is presented in table 1.

Table 1
Descriptive Statistics for Stock market return and Macroeconomic variables of India

	Stock market	Inflation	FDI	GCF	Lending Rate	Money Supply	Exchange Rate
Mean	0.000602	6.572229	23.66828	26.78245	2.3844	4.368347	3.925809
Median	0.001046	6.145522	24.0337	27.01161	2.374906	4.454347	3.854106

Maximum	0.1599	11.9923	24.51782	27.30495	2.588703	5.403578	4.207603
Minimum	-0.118092	2.49	22.02672	25.58626	2.120266	3.169686	3.722037
Std. Dev.	0.015663	2.945983	0.895949	0.593831	0.119613	0.752754	0.157908
Skewness	-0.116389	0.482674	-0.77388	-0.953684	-0.177605	-0.155425	0.659922
Kurtosis	11.69064	1.928466	1.921041	2.481261	2.795159	1.638033	1.939328
Jarque-Bera	11097.86	1.473391	2.521465	2.767561	0.119095	1.382371	2.030803
Probability	0.00000	0.478693	0.283446	0.250629	0.942191	0.500982	0.362257
Sum	2.120693	111.7279	402.3608	455.3017	40.5348	74.2619	66.73875
Sum Sq. Dev.	0.864291	138.8611	12.84359	5.642173	0.228916	9.066213	0.398957
Observations	3524	17	17	17	17	17	17

Source: Estimates based on secondary data

It is observed from table 1 that the Indian stock markets provide a mean return of 0.000602 during the study period and the standard deviation is 0.015663. The standard deviation result indicates the volatility of stock market. All the variables except Inflation and Exchange rate are negatively skewed, so the distribution is left skewed in the study period. The kurtosis result of stock market return showed that the distribution is leptokurtic in nature as the values are greater than 3 whereas for the others it is platykurtic in nature. The probability values associated with Jarque-Bera test reveals that the data are normally distributed.

Correlation between Macroeconomic Variables and Stock Index Price

Correlation test is carried out between the macroeconomic variables and stock index price to get a preliminary insight into the existence of relationship among the time series variables. The variables with no correlation with stock index price or an independent variable which has very high correlation with other independent variable are removed for regression analysis. The correlation analysis is performed for all the macroeconomic variables and stock market return of India for the study period 2001-2017. There exists high correlation between some variables and also negative correlation between some variables chosen for the study. The table shows the result of correlation analysis.

Table 2
Correlation result for India

	SIIND	EIND	IIND	FIIND	GCIND	LIND	SIND
SIIND	1	0.57648	0.36046	0.86785	0.94924	-0.5278	0.92076
EIND	0.57648	1	-0.1394	0.46588	0.46704	-0.5379	0.76655
IIND	0.36046	-0.1394	1	0.49847	0.54065	-0.1582	0.33209
FIIND	0.86785	0.46588	0.49847	1	0.91552	-0.2994	0.87635
GCIND	0.94924	0.46704	0.54065	0.91552	1	-0.5038	0.91779
LIND	-0.5278	-0.5379	-0.1582	-0.2994	-0.5038	1	-0.5859
SIND	0.92076	0.76655	0.33209	0.87635	0.91779	-0.5859	1

Source: Estimates based on secondary data

Table shows the correlation matrix for the selected macroeconomic variables and stock index price of India. There exists high positive correlation between stock index price and Gross Capital Formation, Stock Index Price and Money supply, and Gross Capital Formation and Money supply. All the other variables are either positively or negatively correlated with one another, so all the variables are considered for regression analysis. Except lending rate all the other macroeconomic variable chosen for the study has positive correlation with stock index price.

Regression for Macroeconomic Variables and Stock Index Price

Regression analysis is done to identify the macroeconomic factors which influence the stock index price of India. The post estimation diagnostics test such as Breusch-Pagan-Godfrey test of Heteroskedasticity, Breusch-Godfrey test of Serial correlation, Histogram and Jarque-Bera statistic has been applied on the residuals extracted from the multiple regression analysis to find the regression model applied on data is fit to explain the association between the stock market price and the key macroeconomic variables.

The characteristics of best regression model are as follow,

- High R-square value
- No serial correlation in the residual
- No Heteroskedasticity in the residual
- Residuals are normally distributed.

In order to check the regression model, the following hypotheses were framed;

- H_0 : Residuals are not serially correlated
- H_0 : Residuals are not heteroskedastic, that is homoskedastic
- H_0 : Residuals are normally distributed.

The correlation result of India depicts the relationship among the chosen variables. A linear function has been fitted to get the regression of yearly stock index price with each of the following:

- Exchange rate
- Inflation
- FDI Inflows
- Gross Capital Formation
- Lending rates
- Money Supply

To estimate the relationship between India's stock market price and its potential determinants, the study employed Ordinary Least Squares (OLS). The result of regression is presented in table 3.

Table 3
Regression result for India

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-18.668	8.846859	-2.1102	0.061
EIND	0.79494	0.700624	1.13461	0.283
IIND	-0.0178	0.011399	-1.5614	0.1495
FIIND	0.03343	0.092095	0.36297	0.7242
GCIND	0.76684**	0.273201	2.80689	0.0186
LIND	-0.0655	0.31154	-0.2103	0.8376
SIND	-0.3156	0.33639	-0.9383	0.3702
R-squared	0.94328		Mean dependent variable	4.12961
Adjusted R-squared	0.90925		S.D. dependent variable	0.31496
S.E. of regression	0.09488		Akaike info criterion	-1.5795
Sum squared residual	0.09003		Schwarz criterion	-1.2364
Log likelihood	20.4254		Hannan-Quinn criterion	-1.5454
F-statistic	27.717		Durbin-Watson statistics	2.26805
Prob(F-statistic)	0.000011			

Source: Estimates based on secondary data

Note: ** denotes significance at 5 per cent level

The regression results shown in table revealed that the explanatory variables i.e., macroeconomic variables jointly account for 94 per cent changes in stock market price in India during the study period from 2001 to 2017. The Durbin-Watson statistics result depicts the absence of autocorrelation in the variables. From among the chosen independent variables, only Gross Capital Formation (GCF) is significant as the p-value is less than 5 per cent. The estimation result shows that GCF has a positive influence on stock market price in India, as the co-efficient value is 0.76684. This explains that 1 per cent increase in FDI lead to increase in stock index price by 0.766 per cent as indicated by co-efficient. As the probability (F-statistic) value is less than 0.05, F-statistics is also significant, which shows that all the independent variables can jointly influence the dependent variable i.e., stock index price.

The residuals are checked for serial correlation using Breusch-Godfrey Serial Correlation LM test. As the p-value is greater than 0.05 and the null hypothesis is accepted. This indicates that the residuals of this model are not serially correlated. The model is said to be best as there is no serial correlation. The

heteroskedasticity test is employed to check whether the residuals are heteroskedastic. The result showed that the residuals are not heteroskedastic rather homoskedastic as the p-value is greater than 5 per cent significance level. In order to check the residuals are normally distributed or not, histogram – normality test is done. The results showed that p-value is 0.668 which is greater than 0.05, so it said that the residuals are normally distributed.

Conclusion

The relationship between macroeconomic variables and stock prices has been the focus of both theoretical and empirical research since early nineteenth century. Since then, there has been growing effort made by researchers to empirically estimate this relationship by using sophisticated econometric methods. So, this study is carried out to examine the macroeconomic factors influencing the stock market in India. In this present study it was found that among the macroeconomic variables only Gross capital Formation has influence over the Indian stock market. On the whole it was observed that all the selected macro economic variables jointly influence the returns of Indian stock market. Very interestingly, the result showed much against the common belief that FDI and Money supply does not have any impact on volatility levels of the Indian Stock Market. It may be useful for future studies to include other economic variables that might affect each sector specifically. It is also recommended to work out research that compares results with other developed or developing countries' under similar assessment and measurement.

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