Does Capital Market Respond to Economic Fundamentals? A Study with Selected Key Macro Economic Factors in India

SMS Journal of Business Management
47 - 52

Article Guideline:
https://www.smsjbm.com/user/front/index

Deepa Paul[1] and **K. V. Eldhose** [2]

Abstract

In this study, regression analysis was used to investigate the relationship between the Indian capital market and important macroeconomic variables like the Consumer Price Index (CPI), Crude Oil (CO), Gold Price (GP), and Index of Industrial Production (IIP) of the Indian economy. The study's proxy for the Indian capital market was the BSE Sensex. Correlation matrix and Multivariate Regression Model derived using the Standard Ordinary Least Square (OLS) methods are used to determine the association. All tests are performed using monthly data, and the time frame under consideration is from 2018 to 2022. According to correlation analysis and derived regression coefficients, the price of crude oil significantly influences Indian stock prices in the positive direction.

Keywords

Macroeconomic Variables, Stock prices, ADF, OLS.

1. Introduction

Capital market plays a vital role in the growth of Indian economy. It offers various investment instruments one of which is stock. The stock market provides a historical stock price movement, the yardstick to compare the performance of individual portfolios. Stock prices fluctuate all the time. Many factors affect the rise and fall of stock prices. Due to globalization, the whole world has become a single economy and the financial markets all over the world work in sync. Today, stock markets closely follow economic trends and are aligned to the global economic and financial market performances. Stock market plays a crucial role in India's economic growth and development by channelizing capital from investors to entrepreneurs. To perform this role, it must have significant relationship with the economy. During the period 1991 to 2010 Indian capital markets have transformed into sophisticated, transparent and efficient markets on the back of economic and financial reforms in the early 1990's. Indian stock market movements are affected by many factors. Macro-economic factors, the most significant one, affect the entire economy including the capital markets. The macroeconomic variable are Wholesale Price Index (WPI), Index of Industrial Production

[1] Assistant Professor, Department of Commerce Sri. C. Achutha Menon Government College, Thrissur, Kerala
[2] Assistant Professor, Department of Commerce, Sri. C. Achutha Menon Government College, Thrissur, Kerala

Corresponding author:
Deepa Paul, Assistant Professor, Department of Commerce Sri. C. Achutha Menon Government College, Thrissur, Kerala.
deepapaul003@gmail.com

(IIP), Consumer Price Index (CPI), Trade deficit, Foreign Institutional Investors(FII), Inflation, Crude oil price, Gold price, Money supply, Exchange rate etc. These are the most notable factors, and the government is unable to create its policies, laws, or regulations without taking them into account. This study aids in establishing an empirical link between several macroeconomic factors and the Indian stock market. When macroeconomic indicators change, it helps the investor forecast changes in stock market indices and base investment decisions on it.

2. Literature Review and Research Hypotheses

Review of the past literature in similar field exposed that many researchers worked on macroeconomic variables and stock market on various aspects. Sharma and Mahendru (2010) analysed long term relationship between BSE and macroeconomic variables, vis-à-vis, change in exchange rate, foreign exchange reserve, inflation rate and gold price and there is high correlation between empirical results reveal that exchange rate and gold prices highly effect the stock prices, on the other hand the influence of foreign exchange reserves and inflation on the stock price is up to limited extend only. A co-integration between macroeconomic variables and Indian stock indices which is indicative of a long-run relationship can be explored in a study by Pal & Mittal (2011). Osamuonyi and Evbayiro-Osagie (2012) investigated the relationship between macroeconomic variables and the Nigerian capital market index. Ochieng and Oriwo (2012) studied the relationship between macro-economic variables and stock market performance in Kenya.

Kumar et al. (2012) revealed that macroeconomic variables and the stock market index are co-integrated and, hence, a long-run equilibrium relationship exists between them. It is observed that the stock prices positively relate to the money supply and industrial production but negatively relate to inflation. The exchange rate and the short-term interest rate are found to be insignificant in determining stock prices.

Kalra (2012) found forex rate, inflation rate and gold prices are the most significant variables that help in forming models for forecasting the SENSEX. The ECM shows that the rate of inflation has a significant impact on both the BSE Sensex and the S&P CNX Nifty. Interest rates on the other hand, have a significant impact on S&P CNX Nifty only.

Ouma et al. (2014) found out that money supply, exchange rates and inflation affect the stock market returns in Kenya. Money supply and inflation are found to be significant determinants of the returns at NSE. Exchange rates is however, found to have a negative impact on stock returns, while interest rates is not important in determining long rung run *returns in the NSE. Barakat et* al. (2015) indicated that 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 are co-integrated with the stock market in both countries. Verma and Bansal (2021) found that gross domestic product (GDP), FDI (Foreign Direct Investment) and FII (Foreign Institutional Investment) have a positive effect on both emerging and developed economies' stock market while gold price has a negative effect. Interest rates had a negative impact on both economies except for a few developing countries. The relationship with oil prices was positive for oil exporting countries while negative for oil importing countries. Inflation, money supply and GDP are the macroeconomic variables that have the same effect on sectoral indices as they do on broad market indices.

Vast studies in the emerging markets show a relationship between macroeconomic variables and stock market performance. These include Naik (2013) who investigated the relationships

between the Indian stock market index and industrial production index, wholesale price index, money supply, treasury bills rates and exchange rates. Above review reveals that only a few studies conducted recently to analyse the impact of macroeconomic variables on Indian stock market. Thus, more in depth studies are needed to understand the macroeconomic variables that might influence the stock market in an emerging economy like India since it is one among the fastest growing economies. In this regard, how does and to what extent the Indian stock market responds to the changes in macroeconomic factors needs to be explored. Understanding the macroeconomic variables that could impact the stock market index, with the recent data can be useful for investors, traders as well as the policy makers. It is believed that the findings of this study would extend the existing literature by providing some meaningful insight to the policy makers and the practitioners as far as the developing country like India is concerned.

The BSE Index known as Sensex, indicate the concert of the most popular, profitable and largest 30 companies. It is the Asia's oldest large stock exchange with listing of 5000 corporations holds third, tenth places in national and universal stock world. Hence, the study selects BSE SENSEX as proxy for Indian stock market.

Important macroeconomic variables such as Consumer Price Index, Crude Oil, Index of Industrial Production, Gold price are identified in this study as independent variables. The goal of the present study is to investigate whether the changes of the selected macroeconomic factors explain the stock prices in aggregate.

The following research hypothesis is set for the study.

H1: The Indian capital market is influenced by (a) Consumer Price Index, (b) Crude Oil, (c) Index of Industrial Production and (d) Gold price.

3. Methodology

This study is intended to be descriptive in nature. The entire study is based on secondary data. The relationship between macroeconomic variables and stock market return is examined in this study using monthly data from January 2018 through December 2022. The SENSEX is used as a stand-in for the capital market while macroeconomic indicators such the Consumer Price Index (CPI), Index of Industrial Production (IIP), Gold price, and crude oil price are considered as independent variables.

The information for macroeconomic measures, such as the Consumer Price Index and the Index of Industrial Production, is obtained from the Ministry of Finance's official website. The Index Mundi website is intended to obtain information on the price of crude oil. The Bombay Stock Exchange website is where the information for stock market return is gathered. The World Gold Council's official website is where the gold price is found.

The panel data is subjected to preliminary analysis in order to get crucial knowledge about the behaviour of the data. In order to illustrate a description of variable behaviour and express certain potential elements of dataset distribution, descriptive statistics are generated in relation to the variables utilised in the study. In this study, correlation matrix analysis is also used to examine the strength of relationships between particular macroeconomic variables. A high or strong correlation indicates a significant association between two or more variables, whereas a low or weak correlation indicates a weak relationship between the variables.

To determine if the dataset is stationary or not, the Augmented Dickey Fuller (ADF) test is run. The OLS (Ordinary Least Square) is used to verify the hypothesis. In order to estimate the unknown parameters in a linear regression model, one can use this specific sort of linear least square method.

4. Data Analysis and Discussion

Preliminary analysis is done on the panel data collected to absorb vital information regarding the behavior of the data. A summary of the

descriptive statistics for all variables is shown in Table 1. The average price of the Sensex in the group of 60 observations is 0.011, while the highest and lowest prices are 0.144 and -0.231 respectively. The CPI has a mean of 0.045, a median of 0.044, and an SD of 0.015. The CPI ranges from 0.015 to 0.076 as a maximum. The IIP median is 0.018, mean is 0.005, and SD is 0.067. IIP can have a maximum value of 0.084 and a minimum value of -0.347. The mean, median, and standard deviation of crude oil are 0.013, 0.027, and 0.124, respectively. Crude oil has a maximum value of 0.444 and a minimum value of -0.396.-0.060. The median value for gold is 0.009, the mean is 0.011, and the standard deviation is 0.033. Crude oil has a maximum value of 0.108 and a lowest value of -0.060. We discovered that CPI and Gold are positively skewed or skewed to the right based on the skewness measure. Crude oil, IIP, and Sensex are all negatively skewed. Since the gold value equals 3, it is mesokurtic according to the kurtosis measure. CPI value is below 3, indicating platykurtic behaviour or a flat distribution. IIP, Sensex, and Crude Oil values are all larger than 3, indicating that they have a leptokurtic or flat-tailed distribution.

Table 1. *Descriptive Statistics*

Descriptive Statistics	CPI	IIP	SENSEX	CRUDE OIL	GOLD
Mean	0.045	0.005	0.011	0.013	0.011
Median	0.043	0.017	0.012	0.027	0.009
Maximum	0.076	0.084	0.144	0.444	0.108
Minimum	0.015	-0.347	-0.231	-0.396	-0.060
Standard Deviation	0.015	0.067	0.055	0.124	0.033
Skewness	0.241	-2.991	-1.163	-0.193	0.626
Kurtosis	2.209	14.917	8.167	6.765	3.640
Observations	60	60	60	60	60

4.1 *Correlation Matrix*

To determine the strength and direction of the relationship between the SENSEX and the macroeconomic variables included in the study, a correlation matrix analysis is conducted here. According to the results of the correlation matrix analysis, crude oil's price, which has a correlation of 0.603 with the SENSEX, is the sole variable that has a substantial positive association with the index. It is discovered that correlation with other variables is negligible. There is a -0.211 negative correlation between the price of gold and the SENSEX. However, the bond is insignificant since it is too weak. As can be seen in Table 2, the independent variables chosen for the study have no meaningful connection, and the dataset is devoid of multicollinearity issues.

Table 2 *Correlation Matrix Analysis*

Variables	CPI	IIP	Sensex	Crude oil	Gold price
CPI	1				
IIP	-0.296	1			
SENSEX	0.027	0.113	1		
CRUDE OIL	0.056	-0.265	0.603	1	
GOLD	0.158	-0.115	-0.211	-0.203	1

4.2 *Unit Root Test (Augmented Dickey-Fuller Test)*

For the purpose of determining whether the time series are stationary or not, the Augmented Dickey Fuller (ADF) test is run. If the mean and variance of a stochastic process remain constant throughout time, it is said to be stationary, and the value of the covariance between two time periods solely depends on the interval, lag, or gap between the two time periods rather than the actual time at which the covariance is computed. A time series must be stationary in order for us to analyze its behavior beyond the time period under examination, hence this requirement is crucial. Since it cannot be applied to other eras, it cannot be generalized. Consequently, such (non-stationary) time is used for predicting in this situation.

The ADF is constrained by how many delays it has. Because more lags require the estimate of more parameters and a reduction in flexibility, the test's ability to reject the null of a unit root is reduced. The regression coefficient yt-1 is subjected to a test for a unit root. The idea that y includes a unit root is disproved if the coefficient differs significantly from zero (smaller than zero). Rejecting the null hypothesis indicates series stationary.

Null and alternative hypothesis are as follows:

H_0: p=0 [variable is not stationary]
Ha: p<0 [variable is stationary]

Table 3. *ADF Unit Root Test result*

Variables	Coefficient	Std. Error	t-statistic	P-value
SENSEX	-1.0926	0.1324	-8.2491	0.001
Crude oil	-0.9726	0.1527	-6.3655	0.007
Gold Price	-0.79556	0.1298	-6.1277	0.000
IIP	-0.3045	0.1255	-2.4262	0.139
CPI	-0.1423	0.0511	-2.7833	0.067

Test critical value at 5% level of significance is -2.9126.

Table 4. *Result of ADF test*

Null hypothesis	P-value	Decision	Result
SENSEX is not stationary	0.001**	Reject	Variable is stationary
Crude oil is not stationary	0.007**	Reject	Variable is stationary
Gold price is not stationary	0.000**	Reject	Variable is stationary
IIP is not stationary	0.139	Accept	Variable is not stationary
CPI is not stationary	0.067	Accept	Variable is not stationary

**Significant @5% level*

The ADF test's findings demonstrate that the Sensex, crude oil, and gold have reached stationarity because their P values are below the crucial P values (0.05). So, it is acknowledged that the alternative hypothesis that the variable is stationary. IIP and CPI, however, have not reached stationarity because their P values are higher than the threshold P value of 0.05. Therefore, in the case of IIP and CPI, the null hypothesis that the variables are not stationary is accepted. Now, it's crucial to make these variables stationary in order to do analysis. So, the first differences of IIP and CPI is computed. Below are the ADF test results for variables with first differencing.

Table 5 *ADF1 stlevel difference*

Null hypothesis	P value	Decision	Result
IIP is not stationary	0.019**	Reject	Variable is stationary
CPI is not stationary	0.007**	Reject	Variable is stationary

**Significant @5% level*

The test's outcome demonstrates that IIP and CPI have reached stationary because its P value is below the threshold (0.05). As a result, it is determined that the variable is not stationary.

4.3 *Ordinary Least Squares (OLS)*

OLS is a type of linear least squares method for estimating the unknown parameters in a linear regression model. OLS chooses the parameters of a linear function of a set of explanatory variables by the principle of least squares minimizing the sum of the squares of the differences between the observed dependent variable and (values of the variable being observed)in the given data set and those predicted by the linear function of the independent variable.

Table 6 *OLS Regression Model (Dependent Variable: SENSEX)*

Variable	Coefficient	Standard Error	t-Statistics	Prob.
C	-0.003	0.022	-0.136	0.892
CPI	0.329	0.469	0.701	0.486
IIP	0.161	0.112	1.433	0.157
COP	0.122	0.059	2.063	0.044**
GP	-0.241	0.217	-1.109	0.272
R-squared	0.128		F-statistic	2.019
Adjusted squared	R-0.065		Prob(F-statistic)	0.004**

***Significant @5% level*

Hence, the relationship between the dependent variable SENSEX (capital market), and the independent variables CPI (Consumer Price Index), IIP (Index of Industrial Production), COP (Crude Oil Price) and GP (Gold Price) of the macro-economic factors in India can be modelled as follows (F-statistic 2.019; p value 0.004).

SENSEX = -0.003+0.329*CPI+0.161*IIP+0.122*COP-0.241*GP-0.061

The hypothesis of the study (H1), the Indian capital market is influenced by (a) Consumer Price Index, (b) Crude Oil, (c) Index of Industrial Production and (d) Gold price is rejected as the p value of the regression coefficients of Consumer Price Index, Index of Industrial Production and

Gold Price is > 0.05. However, the Indian Capital Market is influenced by the Crude Oil Price (H1).The test result suggests that Crude oil is the sole macroeconomic factor that significantly affects the Indian Stock Market. Other factors like CPI, IIP, and gold have little effect on the Indian stock market.

5. Conclusion

In this paper, the relationship and impact of the chosen macroeconomic indicators on the Indian capital market are briefly discussed. The study concluded that only the crude oil price was shown to have a substantial positive link with the capital market among the macroeconomic factors chosen for the study, which also included the Consumer Price Index (CPI), Index of Industrial Production (IIP), Gold price, and crude oil price. Although there is a relationship between the other three variables, it is negligible. It gives a realistic picture of how Indian stock market indexes react to variations in the magnitudes of macroeconomic variables.

The study highlights the crucial link between crude oil prices and Indian stock market implying that the changes in former can exert considerable effects on the latter. Investors should be vigilant of fluctuations in crude oil prices and consider these dynamics while formulating investment strategies. Moreover, the study's results can be vital for policymakers, as they underscore the need for proactive measures to mitigate potential risks posed by volatile crude oil prices on the Indian capital market. In the light of the study results, policymakers ought to be concerned regarding the variation in crude oil prices in order to be consistent with stock market performance. They may consider implementing strategies to diversify the economy's reliance on oil or create mechanisms to buffer the impact of oil price fluctuations on the stock market.

References

Barakat, M.R., Elgazzar,S.H., & Hanafy, K.M. (2016). Impact of Macroeconomic Variables on Stock Market of Malaysia, International Journal of Economics and Finance; 8(1), ISSN 1916-971.

Kalra, R. (2012). Impact of macro economic variables in Indian stock market, IUP Journal of Financial Risk Management,9(1),43-54.

Naik, P. K. (2013). Does Stock Market Respond to Economic Fundamentals? Time Series Analysis from Indian Data. Journal of Applied Economic and Business Research, Vol 3(No 1), 34-50.

Ochieng, D. E., & Oriwo, E. A. (2012). The relationship Between Macro Economic Variables and Stock Market Performance in Kenya. DBA Africa Economic Review, Vol 3(No 1), 38-49.

Ologunde, A. O., Elumilade, D. O., & Asaolu, T. O. (2006). Stock Market Capitalization and Interest Rate in Nigeria: A Time Series Analysis. International Research Journal of Finance and Economics(No. 4), 154-16

Osamuonyi, I. O., & Evbayiro-Osagie, I. (2012). The Relationship between Macroeconomic Variables and Stock Market Index in Nigeria. Journal of Economics, Vol. 3(No. 1), pp. 55-63.

Ouma, W.N.,&Muriu,P.(2014). The impact of macroeconomic variables on stock market returns in Kenya, *International Journal of Business and Commerce*, 3(11),2225-2436.

Pal, K., & Mittal,R. (2011). Impact of macroeconomic indicators on Indian capital markets, Journal of Risk Finance,ISSN: 1526-5943.

Pramod Kumar, Naik and Puja, Padhi (2012): *The impact of Macroeconomic Fundamentals on Stock Prices revisited: An Evidence from Indian Data.*

Sharma,G.D.,& Mahendru,M.(2010). Impact of Macro-Economic Variables on Stock Prices in India, *Global Journal of Management and Business Research,* 10(7).

Verma, R.K. & Bansal, S. (2021). Impact of macroeconomic variables on the performance of stock exchange: a systematic review, International Journal of Emerging Markets; 16(7),1291-1329.