



## A STUDY ON RELATIONSHIP BETWEEN BSE 30 AND SELECTED MACRO-ECONOMIC VARIABLES

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### **Abstract**

Stock market is generally considered one of the major yardsticks of the development of any nation. The performance of stock market depends on economic, social and political factors. Bombay Stock Exchange (BSE) is one of the oldest and important stock market in Asia. This paper aims to find out the nature of relationship between BSE 30 and selected macro-economic variables. For this I have considered only two macro-economic variables - Index of Industrial Production (IIP) and Wholesale Price Index (WPI). Pearson's correlation was applied to understand the impact of macroeconomics Variables on capital market movements and t-statistic were used to measure the significance of relationship between economics variables and BSE 30 index. The empirical result showed that IIP has a significant positive impact in short-run and WPI has a significant positive association and impact on BSE 30 index.

**Key Words:** Stock Market, Bombay Stock Exchange, Index of Industrial Production, Wholesale Price Index.

### **I. Introduction**

The stock market is one of the major indicators of a nation's growth and development. Stock market performance is used as a barometer to measure the country's economic development. An economy will be efficient if it has a sound banking system and efficient stock market with exhibiting upward trend. An efficient stock market drives the economic growth by stabilizing the financial sector. Earlier only GDP (gross domestic product) and per capita income were considered yard-stick of a country's economy. But, of late it has been recognised that stock market has a greater influence on national economy. However, unlike mature stock markets of advanced economies, the stock markets of emerging economies like India are characterised as the most volatile stock markets.

A **Stock Market** or stock exchange is a market where securities are bought and sold. In this market the shares of public as well as private companies are traded through exchanges or the OTC (over the counter) markets.

**Bombay Stock Exchange (BSE)** is one of the oldest stock market in Asia. Its origin dates back to 18th century when East India Company use to transact loan securities. Since the year 1991, when the government adopted LPG (liberalization, privatization, globalization), stock market of India has undergone tremendous change. This resulted in remarkable improvement in Indian stock market in terms of its size and depth.

**The Index of Industrial Production (IIP)** is an index which shows the growth rates in different industry groups of the economy such as mining, electricity and manufacturing in a stipulated period of time. The IIP index is computed and published by the Central Statistical Organisation (CSO) on a monthly basis. It is being considered as an effective tool to measure the trend of current industrial activities and growth in the industrial production.

**Wholesale Price Index (WPI)** represents the price of goods at a wholesale stage i.e. goods that are sold in bulk and traded between organizations instead of consumers. WPI is used as a measure of inflation in some economies. It is used as an important measure of inflation in India. Fiscal and monetary policy changes are greatly influenced by changes in WPI.

### **II. Importance of the Study**

Stock market performance is influenced by many macroeconomic factors like Index of Industrial Production (IIP), Wholesale Price Index (WPI), Money Supply (M3), Interest Rates (IR), Trade Deficit (TD), Foreign Institutional Investment (FII), Exchange rate (ER), Crude Oil Price (CP) Gold Price (GP) etc. Any change in these factors lead to volatility in stock market. In the recent past (2008 – 2015) there is an increase in volatility in Indian Stock Market due to global recession in 2007 – 2008 and increased participants from Foreign Institutional Investors (FIIs) as India has become more attractive investment country for it. These factors contribute a significance level of changes in stock market, it is necessary to understand the relationship as well as the degree of this relationship between those factors with stock market indices.

### **III. Literature Review**

**Darat and Mukherjee (1987)** conducted a study using a Vector Auto Regression (VAR) model and found that a significant causal relationship exists between stock returns and selected macroeconomic variables (oil price, exchange rate, moving average lags values) of China, India, Brazil and Russia which are emerging economies of the world. The results were



insignificant which propose inefficiency in market. Finally they concluded that in emerging economies the domestic factors influence more than external factors, i.e., exchange rate and oil prices.

**Bahmani and Sohrabian (1992)** found the causal relationship between U.S. stock market (S&P 500 index) and effective exchange rate of dollar in the short period of time. However, co-integration analysis failed to identify any long run relationship between the two variables.

**Bhattacharya and Mukherjee (2002)** conducted a study to investigate the nature of the causal relationship between BSE Sensitive Index and the five macroeconomic aggregates in India (i.e., IIP, money supply, national income, interest rate and inflation rate) using monthly data for the period 1992- 93 to 2000. Their major findings suggested that there was no causal linkage between stock prices and money supply, national income and interest rate while IIP lead the stock price, and there was two- way causation between stock price and inflation rate.

**Gan, et al (2006)** tried to examine stock market interaction with the macroeconomics variables of New Zealand stock market taking a set of seven macroeconomic factors. They used co-integration tests, johansen maximum likelihood and granger-causality tests.

In general analysis it was found that the NZSE40 is consistently determined by the interest rate, money supply and real GDP but there is no evidence that the New Zealand Stock Index is a leading indicator for changes in macroeconomic variables.

**Ahmed (2008)** tried to know the relationships between stock prices (i.e., Nifty and Sensex) and the key seven macroeconomic variables. Using quarterly data, co-integration and Granger causality test have been applied to explore the long-run relationships while BVAR modeling and impulse response functions has been applied to examine short run relationships. The study reveals that the movement of stock prices is not only the outcome of behaviour of key macro economic variables but it is also one of the causes of movement in other macro dimension in the economy.

**Kumar (2008)** has conducted an empirical study to know the relationship of stock market with wholesale price index and exchange rates taking ten years previous data. The research established and validates the long-term relationship of stock prices with exchange rate and inflation using of co-integration between the selected macroeconomic variable.

**Ahmad et al (2010)** studied to observe the impact of interest rate and exchange rate to the Stock Return in Pakistan. The result showed that the change in interest rate has a significant negative impact and exchange rate has a significant positive impact on stock returns.

**Geetha et al. (2011)**, tried to examine the relationship between inflation and stock returns. The results confirm that there were no long term relationship between inflation and stock return.

**Akbar et al. (2012)** examined the relationship between the Karachi stock exchange index and macroeconomic variables for the period of January 1999 to June 2008. The study revealed that there was a long-run equilibrium relationship exists between the stock market index and the set of macroeconomic variables. Their results also indicated that stock prices were positively related with money supply and short-term interest rates and negatively related with inflation and foreign exchange reserve.

**Vashishtha et al. (2013)**, reviewed the impact of economic growth rates on capital market movement. The study revealed that WPI was highly correlated with S&P BSE Sensex, whereas IIP growth moderately related with S&P BSE index.

**Luthra and Mahajan (2014)** conducted a study to know the impact of macroeconomic factors on BSE Bankex. Their results indicate that Exchange rate, Inflation, GDP growth rate affect banking index positively whereas Gold prices have negative impact on BSE Bankex but none of them have significant impact on Bankex.

**Subramanian (2015)** tried to know the influence of various macroeconomic variables on BSE sensex taking quarterly data from December 2005 to June 2012. The study clearly showed that the macroeconomic variables strongly influence the stock market index.

**Ahmad and Sinha (2016)** tried to find out the relationship between BSE Sensex, GDP and Exchange Rate. The results showed both the independent variables have a positive correlation with dependent variable. But GDP is a significant predictor of BSE while taking individually. On the other hand Exchange Rate is not a significant predictor of BSE.

#### IV. Objective of the Study

The objectives of the study are

- (i) to find out the level of dependency of BSE Sensex performance on IIP
- (ii) to find out the level of dependency of BSE Sensex on WPI

#### Hypothesis

1. H0: Stock performance is not dependent on IIP
2. H1: Stock performance has significant dependence on IIP
3. H0: Stock performance is not dependent on WPI
4. H1: Stock performance has significant dependence on WPI

#### V. Research Methodology

The present study has been conducted to examine the relationship among microeconomic variables and Indian stock market. Therefore an applied cum analytical research design has been used in this study. Two explanatory variables such as IIP and WPI and BSE 30 Index as an explained variable have been purposefully selected for this study.

In this study secondary monthly data relating to WPI and IIP has been selected from the period April 2006 to March 2016. The relating to explained variable has also been taken monthly BSE 30 Index during the aforesaid study period. The data has been collected from Office of the Economic Adviser<sup>1</sup> and BSE's<sup>2</sup> website. Statistical tools such Pearson Correlation Coefficient, t-test, Linear Regression Analysis were used to achieve the objectives. The following Linear Regression has been fitted to examine the aforesaid hypotheses:

$$\text{BSE 30X}_t = \beta_1 \text{IIP} + e$$

$$\text{BSE 30X}_t = \beta_2 \text{WPI} + e$$

Where,

BSE 30X = Return on Sensex

= intercept

$\beta_1$  = Coefficients or slope of IIP

$\beta_2$  = Coefficients or Slope of WPI

IIP = Coefficients or Index of Industrial Production

WPI = Wholesale Price Index

e = error term

#### VI. Data Analysis

To analyse the collected secondary monthly data relating to BSE 30 index, IIP and WPI, I have computed Pearson's Simple Correlation Coefficient between BSE 30 index and IIP, and BSE 30 index and WPI for all years during the aforesaid study period. To examine the computed result whether statistically significant or not, I have used t-test.

From the Table 1 result showed that Pearson simple correlation coefficient between BSE 30 and IIP were highly positive and statistically significant at 5% level throughout the year of our study period except the financial year 2006-2007 and 2011-2012 during our aforesaid study period. It indicates that the IIP has a significant positive impact on BSE 30 index in short-run during the

**Table 1: Calculated Correlation value and t value of IIP and WPI for the financial year 2006-2007 to 2015-2016**

Year	Correlation with BSE 30	Correlation value	Calculated t value	Table value	
				1%	5%
2006-2007	IIP	0.54	2.02	3.17	2.23
	WPI	0.71	3.19**	3.17	2.23
2007-2008	IIP	0.60	2.39*	3.13	2.23
	WPI	0.27	0.89	3.13	2.23
2008-2009	IIP	0.87	5.59**	3.13	2.23
	WPI	0.12	0.37	3.13	2.23
2009-2010	IIP	0.65	2.70*	3.13	2.23
	WPI	0.80	4.25**	3.13	2.23

<sup>1</sup> <http://www.eaindustry.nic.in/>

<sup>2</sup> <http://www.bseindia.com/>

2010-2011	IIP	0.61	2.41*	3.13	2.23
	WPI	0.43	1.53	3.13	2.23
2011-2012	IIP	-0.55	2.09	3.13	2.23
	WPI	-0.55	2.06	3.13	2.23
2012-2013	IIP	0.67	2.89*	3.13	2.23
	WPI	0.87	5.58**	3.13	2.23
2013-2014	IIP	0.85	5.06**	3.13	2.23
	WPI	0.51	1.87	3.13	2.23
2014-2015	IIP	0.85	5.19**	3.13	2.23
	WPI	-0.44	1.57	3.13	2.23
2015-2016	IIP	0.73	3.34**	3.17	2.23
	WPI	0.70	3.11*	3.17	2.23

\*Data are significant at 5% level only; \*\*Data are significant at both 1% and 5% level

stipulated study period. Whereas the correlation between BSE 30 Index and WPI are statistically significant at 5% level in the year 2006-2007, 2009-2010, 2012-2013, 2015-2016 and insignificant at 5% level in the year 2007-2008, 2008-2009, 2010-2011, 2011-2012, 2013-2014 and 2014-2015 during our study period. It means that the WPI has no significant positive impact on BSE 30 index in short-run during the aforesaid study period.

**Table 2: Yearly Index BSE 30, PPI and WPI from 2006-2007 to 2015-2016.**

Year	BSE 30	PPI	WPI
2006-2007	12374.5	102.9503	111.35
2007-2008	16799.01	105.2797	116.625
2008-2009	12124.8	97.63921	126.0167
2009-2010	15799.06	90.01783	130.8167
2010-2011	18647.65	95.54461	143.325
2011-2012	17453.89	98.01104	156.1333
2012-2013	18271.67	100.5063	167.6167
2013-2014	20262.74	102.3937	177.6417
2014-2015	26814.47	105.5176	181.1917
2015-2016	26275.64	104.8005	176.675

#### Results of Pearson's Test of Linear Correlation for "BSE 30" vs "PPI"

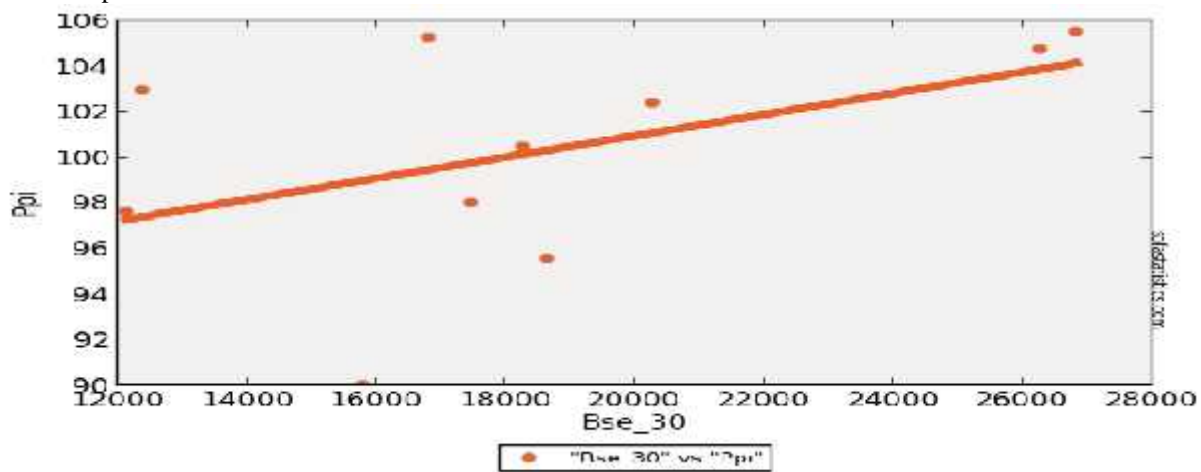
Two-tailed p value: 0.176 <sup>1</sup>

Pearson's R statistic: 0.465

Degrees of Freedom (df): 8

Linear Regression Details: <sup>2</sup>

- Slope: 0.0
- Intercept: 91.638



<sup>1</sup> If p is small, e.g. less than 0.01, or 0.001, you can assume the result is statistically significant i.e. there is a relationship.

Note: a statistically significant difference may not necessarily be of any practical significance.

<sup>2</sup> Always look at the scatter plot when interpreting the linear regression line.

From the above result computed by SOFS statistical software, the Pearson's Correlation Coefficient between BSE 30 Index and IIP is 0.465 and statistically insignificant at both 1% and 5% level. The slope of the regression line is 0.0 that means if IIP increases by 1 unit the BSE will be increased by 0.0 units. As a result though there is a positive correlation between BSE 30 Index and IIP, IIP has no impact on BSE 30 index in long term.

#### Results of Pearson's Test of Linear Correlation for "BSE 30" vs "WPI"

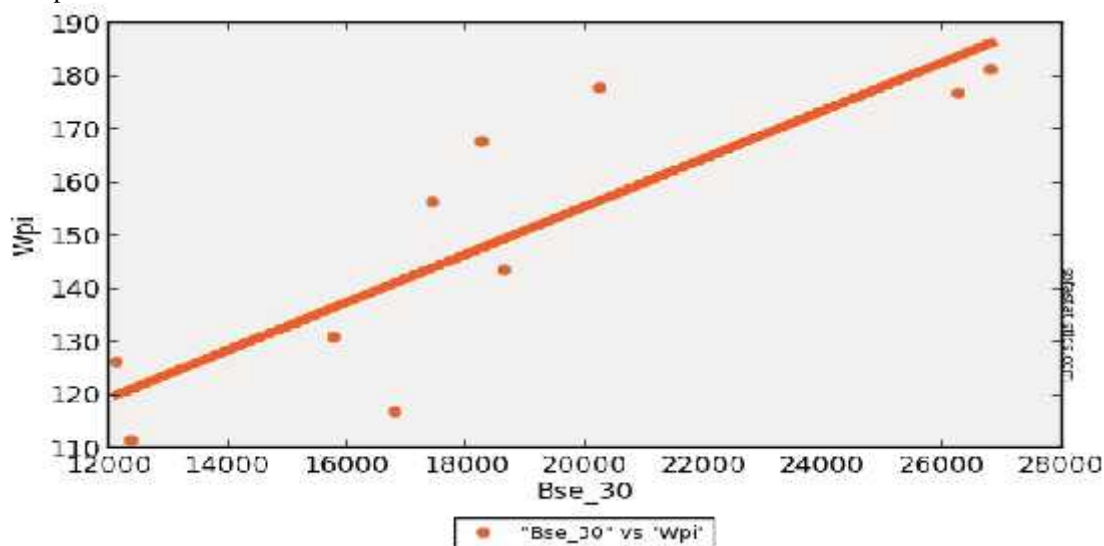
Two-tailed p value: 0.002 <sup>1</sup>

Pearson's R statistic: 0.842

Degrees of Freedom (df): 8

Linear Regression Details: <sup>2</sup>

- Slope: 0.005
- Intercept: 65.395



<sup>1</sup> If p is small, e.g. less than 0.01, or 0.001, you can assume the result is statistically significant i.e. there is a relationship.

Note: a statistically significant difference may not necessarily be of any practical significance.

<sup>2</sup> Always look at the scatter plot when interpreting the linear regression line.

From the above descriptive statistic result it was seen that the Pearson's Correlation Coefficient between BSE 30 and WPI was 0.842 which was found to be statistically significant at both 1% and 5% level. It implies that there was a very significant positive association between BSE 30 index and WPI in long-run during the aforesaid stipulated time period. The slope of the Regression line was 0.005 that means if the wholesale price index (WPI) increased by one unit, BSE 30 indexes will be increased by 0.003 units which were found to be statistically significant at 1% level. It implies that the wholesale price index does not make a notable contribution toward enhance the BSE 30 index in long run period also.

#### VII. Conclusion

From the study, it may be concluded that the Indian stock market has significant positive influence of Index of Industrial Production in the short-run but no influence in the long-run during the study period. Because in short i.e. when we taken monthly data for a particular year, there was a significant positive association found in eight years out of 10 years. But when we considered the IIP annually throughout the period it was found insignificant. Whereas Indian stock market has no significant positive influence of Wholesale Price Index in short-run period but has a significant positive association in long-run during our study period. In short-run only 4 years out of 10 years there were significant positive association. But in long-run the result showed that there was a high degree of significant positive association between BSE 30 index and WPI. So a further study can be conducted in this regard.



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