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A study on relationship between macro-economic variables and stock market performance with reference to BSE-Sensex

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Abstract

Predicting movements in the Bombay Stock Exchange (BSE) is perhaps one of the hardest exercises in financial studies as it has many variables affecting its movement. In this paper I have taken two macro variables i.e. Gross Domestic Product & Exchange Rate and collected 12 months secondary data for the year 2014 from the website of RBI and Sebi. The data collected has been analyzed by using spss through correlation, regression and ANOVA in order to draw meaningful information. The findings show that GDP is the significant predictor and Exchange Rate is not the significant predictor of BSE Sensex.

Keywords: GDP (Gross Domestic Product), ExR (Exchange Rate), SnX (Sensex)

Introduction

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. It 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 and globalization), stock market of India has undergone tremendous change. The Indian Economy grew at an alarming pace after the adoption of LPG. That is why the stock market of India plays a very important role for aggregate economy.

The capital market of India is one of the emerging markets in the world. That is why investors in India and abroad have keen interest for investment purpose in the Indian stock market. There is the need of the hour to study and understand the key variables that influences the shareholders wealth.

The Securities and Exchange Board of India (SEBI) is the regulator for the securities market in India. It was established in the year 1988. SEBI has enjoyed success as a regulator by implementing reforms as and when needed. It introduced rolling cycle of T+2 which means settlement is done in 2 days after Trade date. Sebi has been active in setting up the regulations as required under law.

BSE

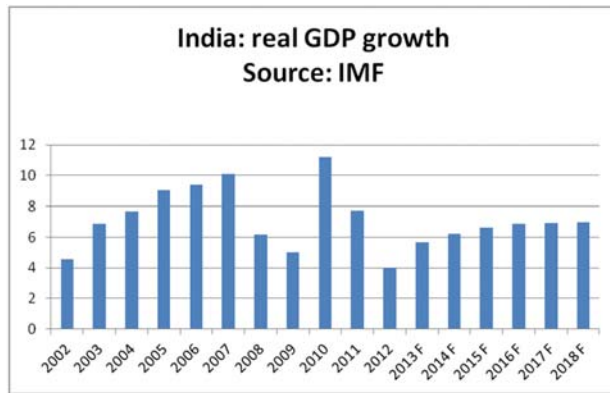
The BSE Sensex or simply the Bombay Stock Exchange is a Sensitivity Index which is also known as BSE 30 or simply the SENSEX is a free-float market weighted stock market index of 30 well-established and financially sound companies listed on Bombay Stock Exchange. These are the companies which are some of the largest and most actively traded and are representative of various industrial sectors of the Indian economy. The index is calculated based on the free float capitalization method. As per free float capitalization methodology, the index reflects value of 30 component stocks and it is determined by multiplying the price of its stock by the number of shares issued. For new companies seeking listing on the exchange and de-listed companies seeking re-listing on the exchange, the minimum post-issued equity capital requirement is Rs.10 crores.

Gross Domestic Product

GDP is a measure of the size of an economy. It is defined as the aggregate measure of production which is equal to the sum of the gross values added of all resident, institutional units engaged in production plus any taxes and minus any subsidies.

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The above graph shows how India's real GDP has grown over the years from 2002 to 2012. It can be seen that it continues to grow from 2002 till 2007 and then started decreasing. It keeps on fluctuating over the years. The International Monetary Fund (IMF) predicted that the GDP of India will rise in future.

India's growth has slowed down to a great extent after the global financial crisis. GDP growth fell to 4% in the second quarter of 2013/14 which was earlier 9.5% during 2009/10-2010/11.

The main reason behind it was the weak investment from the private sector. Fixed capital formation grew by over 15% annually before 2008 and keeps afloat to an average of 8.5 percent in 2003/04-2007/08, increased only by 1.5 percent in 2012/13. The ongoing slowdown has given rise to an intense debate in India about the role of interest rates and the role policy uncertainty and business confidence in slowing investments. The view from Economists point was that real interest rates have been low though nominal rates have risen after the year 2008/09.

In figure II.1.1 GDP growth improved marginally to 4.7 percent in 2013 from 4.5 percent in 2012-13 and keep increasing further in the second consecutive year (Chart II.1). In the absence of regulatory framework in key areas like natural resources, mining, land acquisition and so on dipped business confidence and thereby hindering investment to take place. Regaining growth would essentially come from improvement in the investment climate through better governance, transparent and other reforms. Though the agriculture sector grew in 2013-14 because of good monsoon which supported the overall growth but the industrial sector contracted whereas services sector grow remain stagnant. High inflation and domestic policy continued to show uncertainties for growth prospects.

Exchange Rate of India

In the presence scenario the share of global trade in world output tripled. The global economy experienced not just a rapid expansion in international trade but also the growing of emerging economies on a global platform. Emerging economies have steadily given rise to emerging markets and become important trading centers. Despite steady growth in global there were concerns of the impact of exchange rate movements on trade in country's export and import activities. The exchange rate effected trade to a large extent in the global financial crisis in 2008. It is very important to understand the effects of exchange rate changes on the trade balance that calls for an analysis of how exchange fluctuations affect the decisions. Indian exchange rate was more or less fixed till 1991 but when the country adopted

LPG and implemented liberalized measures, India adopted a more market oriented exchange rate regime.

Review of Literature

(Kaur, 2010)^[1] in his paper examines the effect of stock split on return and liquidity of BSE Sensex. After empirically testing of data results suggests that stock splits are giving positive abnormal return on the day of stock split. The market registers an increased activity in the stock when it is associated with liquidity. (Pal & Mittal, 2011)^[2] examined the long-run relationship between the Indian capital markets and key macroeconomic variables such as interest rates, inflation rate, exchange rates and gross domestic savings (GDS) of Indian economy. The unit root test, the co-integration test and error correction mechanism (ECM) have been applied to derive the long run and short-term statistical dynamics. He findings of the study establish that there is co-integration between macroeconomic variables and Indian stock indices which is indicative of a long-run relationship. The ECM shows that the rate of inflation has a significant impact on both the BSE Sensex and the S&P CNX Nifty. (Damele & Karmarkar, 2004)^[3] analysed the market integration based on the stock market, foreign exchange market and the bullion market. The study shows that there exist an inverse relationship BSE Sensex and exchange rate has and hence an increase in BSE Sensex decreases the exchange rate. In most other indicator, the short run impact is less and insignificant. From this the conclusion was drawn that these indicators take some time to adjust with the change in other indicators. (Sinha & Kohli, 2015)^[4] studies the effect of exchange rate on three market indices; BSE Sensex index, BSE IT sector index and BSE Oil & Gas sector index for the period January 2006 to March 2012. No significant interactions were found between foreign exchange rate [USD/INR] and stock returns. Economic variables like inflation differential, lending interest rates and current account deficit (as a percentage of GDP) are found to significantly affect the exchange rate [USD/INR]. This study also analyzes how the real GDP of India is currently behaving with respect to the exchange rate. It is found that they share a negative relationship which is highly statistically significant. Statistical results also show that there is a significant negative relationship between the real GDP of India and exchange rate [USD/INR] for the period 2000-2011. (Singh, 2015)^[5] investigates the relationships between exchange rate and stock price over the period January 2007 to March 2014. Index National Stock Exchange, namely, NIFTY is used as indicator of stock price. Johansen's co-integration and Granger causality test have been applied to explore the long-run and short-run equilibrium relationship between exchange rate and stock price. The analysis reveals that exchange rate and stock price are co-integrated and, hence, a long-run equilibrium relationship exists between them. It is observed that the exchange rate and NIFTY as indicators of stock price are positively related to each other. The exchange rate is found to be significant in determining stock price and stock price significantly affects exchange rate. In the Granger-causality sense, exchange rate Granger-causes stock price and stock price Granger-causes exchange rate, or there is bi-directional causality between exchange rate and stock price in both long run and short run. (Mohanty & Bhanumurthy 2014)^[6] in his paper used a monetary model of Inflation and investigates the impact of the 'empirically-claimed' de facto stable exchange rate regime on inflation in

India during different sub-periods of exchange rate stability. The result shows that the impact of exchange rate regime on inflation is not visible in the Indian case, which could be because of the offsetting sterilization policy undertaken by the Reserve Bank of India (RBI) during expansionary money supply growth resulting from its large-scale intervention to even out exchange rate volatility. (Tiwari, Dar & Bhanja, 2013) [7] in their paper explore linear and nonlinear Granger causalities between oil price and the real effective exchange rate of the Indian currency, known as 'rupee'. They uncover linear and nonlinear causal relationships between the oil price and the real effective exchange rate of Indian rupee at higher time scales (lower frequency). Although they do not find causal relationship at the lower time scales, there is evidence of causality at higher time scales only. (Ghosh, 2011) [9] in his research paper tries to investigate and predict optimal condition of the primary factors responsible for affecting Bombay Stock Exchange (BSE) in India. The dependent variables were Oil prices, Gold price, Cash Reserve Ratio, Food Price Inflation, Call Money Rate, Dollar Price, F D I, Foreign Portfolio Investment and Foreign Exchange Reserve (Forex). He has also taken into consideration the Multicollinearity problem among different macro-economic variables and attempted to eliminate it. (Jyoti & Mahakud, 2012) [10] Conducted a study in order to find out the relationship between stock prices, exchange rate and demand for money in India during the period of post liberalization. They use Johansen and Juselius Co-integration test to test the hypothesis and Granger Causality test. The findings show that stock prices have negative and significant effect on the money demand and exchange rate found to have negative effect on M1.

Data Analysis & Results

Table 1: Correlations

Pearson Correlation	BSE Sensex	Exchange Rate Dollar	Gross Domestic Product at constant prices
BSE Sensex	1.000		
Exchange Rate Dollar	.700	1.000	
GDP	.887	.821	1.000

Dependent variable: BSE Sensex
Independent variable: Exchange Rate Dollar & GDP

In the above correlation matrix we can see that the independent variables are positively correlated and GDP has a very high degree of positive correlation of 0.887 with BSE Sensex which means if GDP of India increases than BSE Sensex will also increase.

Table 2: Regression

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.889 ^a	.790	.743	.08173746	1.321

Dependent variable: BSE Sensex
Independent variable: Exchange Rate Dollar & GDP

In the above table the R Square value for the model is moderately high (.790) which means that the model is good fitted or 79.0% of variation in dependent variable (BSE Sensex) is caused by Independent variable (GDP & Exchange Rate). Hence it is the positive sign for the model.

Objective of Study

1. To find out the level of dependency of BSE Sensex performance on Exchange Rate.
2. To find out the level of dependency of BSE Sensex performance on GDP.

Hypothesis

1. H0: Stock performance is not dependent on Exchange Rate.
2. H1: Stock performance has significant dependence on Exchange Rate.
3. H0: Stock performance is not dependent on GDP.
4. H1: Stock performance has significant dependence on GDP.

Research Methodology

For the purpose of the study three variables have been taken i.e. BSE Sensex, Exchange Rate and GDP. Out of these Sensex has been taken as Dependent Variable (DV) while Exchange Rate and GDP as Independent Variable (IV). For evaluating the degree of dependency of Sensex on Exchange Rate and GDP; Linear Regression has been used by using SPSS. The representative variables used for the study are quarterly values from the period January 2012 to December 2014.

To prove the hypotheses, following equation is formulated.

$$SnX_t = \alpha + \beta_1 ExR + \beta_2 GDP + e \text{ (Equation)}$$

Where,

SnX = Return on Sensex

α = intercept

β_1 = slope of Exchange Rate

β_2 = Gross Domestic Product

ExR = Exchange Rate

GDP = Gross Domestic Product

e = error term

Table 3: ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.	
1	Regression	.226	2	.113	16.913	.001 ^a
	Residual	.060	9	.007		
	Total	.286	11			

Dependent variable: BSE Sensex
Independent variable: Exchange Rate Dollar & GDP

The above table shows the ANOVA value for the model. Here the significant value for the model tells about the joint significance of Independent variable towards dependent variable. The significant value or p value for the model is .001 (1%) which is less than level of significance .05(5%). Hence the null hypothesis is rejected and alternative hypothesis is accepted which means that GDP and Exchange Rate are the significant predictors of BSE Sensex.

Table 4: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-14.176	5.151		-2.752	.022
	Exchange Rate Dollar	-.196	.597	-.088	-.328	.750
	Gross Domestic Product at constant prices	2.495	.696	.959	3.584	.006

Dependent variable: BSE Sensex

Independent variable: Exchange Rate Dollar & GDP

The above table shows the coefficient value for the model. Here the significant value or p value tells the individual significance of Independent variable. The p value for Exchange Rate is .750 and GDP is .006. According to the p value the null hypothesis (H_{0b}) is rejected while H_{0a} is accepted which means that GDP is the significant predictor and Exchange Rate is not the significant predictor of BSE Sensex. The table 2 shows the joint significance for the model as significant (since p value is .001). But after looking individually GDP is significant while Exchange rate is insignificant. By looking at correlation table there is a high correlation between the independent variable. Hence it can be interpreted that model is suffering from the problem of multicollinearity.

Conclusion

In this paper, I tried to find out the relationship between BSE Sensex, GDP and Exchange Rate and got some results related to this. I have used statistical methods to do the analysis based on monthly basis database. The end result shows relationships between independent and dependent variables. Both the independent variables show positive correlation with dependent variable. GDP showed a high degree of positive correlation. While looking individually GDP is a significant predictor of BSE Sensex while Exchange rate is not the significant predictor of Sensex of BSE. By looking at correlation table there is a high correlation between the independent variable. The significant value for the model tells about the joint significance of Independent variable towards dependent variable.

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