An Empirical Study on the Stock Market Performance and other Asset Classes in India

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ABSTRACT

There lies a strong relationship between the real economy performance and the stock market performance. This is due to the presence of asset classes in India in addition to external factors. This study analyses the Indian stock market performance and the Indian asset classes and international stock market variables. It tries to find the causal relationship between a sample of asset classes performance and the Indian stock market performance. To compute stock market performance BSE Sensex is used. For this study, daily BSE data from Jan,2008 to Dec,2018 is used. BSE Sensex is taken as the dependent variable. Data on yield on ten year G-sec Indian bonds, Gold, rupee exchange rates with US dollar, Brent oil and NASDAQ are the independent variables.
The presence of a significant linkage is found between the returns of Indian stock market BSE SENSEX and the other five independent variables including the US stock market NASDAQ. Multiple linear regression has been conducted for the study to find the significant relationship between the dependent and independent variables. Results shows that there lies a significant relationship in between the dependent and the independent variables. Stationarity test has also been conducted to test the predictability and the subsequent presence of bubble in the time series. The study suggests that the Indian stock market BSE SENSEX is driven not only by the asset classes such as exchange rate, gold prices, oil price movement, 10-year bond yield, but also by NASDAQ. Change in the US stock market drives the volatility of the Indian stock market. This impacts the other macro aspects of the economy.

Keywords: Asset classes, G-sec Yield, BSE SENSEX, Brent oil, Gold, NASDAQ.

INTRODUCTION:

Stock markets play a very important role in the growth of a country's economy (Tripathi & Seth, 2014). The movement of stock market helps in discovery of price and liquidity (Tripathi & Seth, 2014). Gross Domestic Product, Current Account Deficit, Fiscal Deficit and Consumer Price Index are considered to be few indicators for the economic growth. Crude Oil and Gold are one of the leading imported commodities of India, as India is one of the largest consumers of them (Bouri, Jain, Biswal, & Roubaud, 2017). Oil and Gold have come out to be an investment opportunity, therefore, their interactions across the stock market is of utmost importance and therefore are included in their equity portfolio to boost their risk adjusted return (Jain & Biswal, Resources Policy, 2016).
A study by (Kumari, 2011), shows that an economy is considered to be a healthy economy when its banking sector is growing along with its increasing stock market performance. A healthy stock market helps in price determination and liquidity determination. This further boosts the savings in the economy thereby leading to more investment growth. This further boost the inflow of Foreign Direct Investment. With the growing economy of India, the percentage of market capitalization to the GDP is increasing, which indicates growth in the Indian equity market. Moreover, this study also throws a light on how an economy is also dependent on external forces as the happening around the globe. Factors outside an economy also impacts the stock market

performance either directly or indirectly.

In this paper I tend to analyse the relationship between the Indian stock market which is taken as BSE SENSEX and the other asset class variables. Daily data for all the variables has been taken for study. Multiple linear regression has been conducted to get the results. This paper tries to analyse whether there lies any significant relationship between the dependent variable which is BSE SENSEX and the independent variables as – Bond return, gold return, Brent oil return, Nasdaq return and exchange rate return and Whether the time series is stationary or not.

This paper is different as no study has been done till present. This study takes into account the latest time duration as of FY 2018. Moreover, this study not only includes the macro-economic variables as Brent, Gold, Exchange rate, Bse Sensex but also the study of 10 Year G-sec and the study of US stock market NASDAQ.

The remaining article has been arranged as: there is a brief literature review in the second section. The third part consists of the objectives and rationale behind this study. The fourth part consists of data methodology and statistical technique. The fifth section comprises of the conclusions and findings.

LITERATURE REVIEW:

Over several years various studies have been done to investigate the relationship between various macroeconomic variables and the way they impact the Indian stock market volatility. As mentioned by (Pal & Mittal, 2011) ,explains the negative relationship between inflation and stock market, for countries like India where the requirement of foreign currency is huge and rupee depreciation badly hits the business. Here (Tripathi & Seth, 2014) takes three variables into consideration: Inflation, Interest rate and exchange rate and finds that there lies a significant amount of correlation amongst them. His findings also suggest that the movement in the stock market is also responsible for the changes in various macro aspect of the economy. The study also reveals that movement in stock market mostly drives the other macro variable rather than the other way.

Following which there were number of studies done on the other aspect of the economic variable. As (Dey & Sampath, 2018) examines the extent of linkages between the spot gold and equity prices of Indian financial services and IT companies. Study reveals that due to the presence of high inflation rate, the real returns on the deposits and insurance products offered by financial service companies becomes unappealing for the Indian investor, this in turn affects the stock performance. Here, gold is found as an effective hedge against the stock prices of Indian financial companies, irrespective of the currency in which the portfolio is denominated. Similar study by (Bouri, Jain, Biswal, & Roubaud, 2017) also finds the existence of cointegration relationship and a positive impact on the stock market due to oil and gold volatility. The research also shows the presence of inverse bi-directional causality in between the factors.

Further study on the impact of oil on the stock market volatility by (Singhal & Ghosh, 2016) studies the impact of returns of Brent crude to returns of stock market in India and finds that the cascade from oil market to Indian stock market is not significant. Further, (Broadstock & Filis, 2014) also explains the same result with respect to china and other developing nations that there is an indirect affect through the changes in the monetary policy.

Additionally, there are another set of researchers who combines various other macro dimension to study the impact of volatility. (Singh & Sharma, 2018) analyses the relation between Gold, Crude oil, Indian rupee, US dollar and the stock market which is known by (GODS) as abbreviation. This paper takes into account the phenomenon existing in the pre-crisis era, during the crisis and the period after the crisis in India. Because of the fact that Gold and Oil prices are quoted in dollar terms, any fluctuations in their prices affects the trade within the economy and in turn impacts the stock market. Similar results were also proven by (Nirmala & Deepthy, 2015) (Subhashini & Poornima, 2014), in their study. Further similar studies by (Baur & Lucey, 2010), (Capie, 2005), (Chua, Stick, & Woodward, 1990) again shows that as the price of oil increases, the cost increases, which in turn leads to inflationary condition in the economy.

Oil and gold being the most important variable impacting volatility, enormous amount of research in the movement of their prices have been done with respect to the stock market. (Siddiqui & Seth, 2015) reveals that there lies no cointegration in between the oil price and the stock market both in the short run and long run. The study shows that there is a negative mean return with respect to the stocks, while positive average return in respect of crude oil. (Ghosh & Kanjilal, 2014) analyses the impact of oil price on the stock market by way of how expected earnings are impacted. It also adversely impacts the profitability of the companies by increasing their cost component. (Bouri, Jain, Biswal, & Roubaud, 2017) study of volatility of Indian stock market uses implied indices of volatility and finds the existence of cointegration relationship and a positive impact on the stock market due to oil and gold volatility. The research also shows the presence of inverse bi-directional causality in between the factors. (Jain & Biswal, 2016) analyses that decrease in the price of gold and oil results

in the decrease in the value of INR as oil is traded in US dollar as well as the Sensex. Changing dynamics of demand and supply impacts the exchange rate for countries like India which imports oil. Gold then becomes an investment opportunity for many investors and Sensex enables a gain in the Gold prices.

The study reveals that a fall in the exchange rate has increased the value of SENSEX and vice versa proving that there lies a strong cross correlation between them. (Sharma, 2010) also finds that high degree of correlation existing between exchange rate and gold prices.

Other team of researcher by (Kumari & Mahakud, 2014) also reveals that there lies a strong connection in between the changes in the macroeconomic variables and the volatility in the stock market. Specifically, the yield from long term bond proves to be a significant variable proving how financial markets and the macroeconomic factors are related to each other like a thread. (Ahmed, 2008) studies study reveals one major finding. Firstly, economic activity is headed by the stock market volatility except the interest rate. Interest rate according to the study drives the stock market.

OBJECTIVE AND RATIONALE BEHIND THE STUDY:

The main objective behind this study is to empirically examine the causal relationship between the Indian stock market BSE SENSEX and the five other independent variables.

The study is done to identify the significant relationship between the dependent variable which is BSE SENSEX and the independent variables as – Bond return, gold return, Brent oil return, Nasdaq return and exchange rate return. Another is to examine whether the time series is stationary or not.

The rationale behind this study shows that the stock market is directly impacted by the oil price, gold prices, exchange rate, bond yield and is also indirectly impacted by the broader macro variables as GDP, fiscal deficit and inflationary conditions. The stock market in India is also influenced by the NASDAQ and its movement in the stock prices.

The study has been conducted using the daily data for all the variables by applying statistical techniques. There has been no previous study done in this respect. The previous literature has laid importance to the study of Indian stock market and the macro economic variables. While this study is different as it not only captures the Indian stock market data but also analyses the impact of US market on the volatility of the Indian stock market. Moreover, this study also takes into account the impact of 10-year G-sec yield to analyse how it impacts the volatility of BSE SENSEX.

DATA DESIGN AND METHODOLOGY

Scope of the study:

The scope of the study limits to Indian stock market BSE SENSEX. The data consists of daily time series observations of the macroeconomic variable consisting of Brent oil, Gold, Exchange rate, Bond yield, US market return as the independent variable and BSE SENSEX return as the dependent variable is taken as a measure of volatility index. The data covers the period from 2008 upto 2018.

Daily time series data has been used as against the quarterly or yearly data. This helps in better prediction of volatility in the stock index due to the presence of macro-economic variables in the economy. In order to conduct a meaningful analysis log for all the variables have been taken to perform the analysis as log reduces the standard error. As log represents the return on that variable.

Secondary data is used for the study. The data regarding the BSE SENSEX and NASDAQ was collected from yahoo finance. Whereas, data regarding the other macro-economic variables were collected from investing.com.

The results are based on the following hypothesis:

H01: Returns on Brent oil prices does not significantly impact BSE Sensex
H02: Returns on Gold prices does not significantly impact BSE Sensex
H03: Exchange rate return does not significantly impact BSE Sensex
H04: Bond yield does not significantly impact BSE Sensex
H04: Nasdaq return does not significantly impact BSE Sensex
H05: Brent time series cannot predict bubble
H06: Bond time series cannot predict bubble
H07: gold time series cannot predict bubble
H08: Nasdaq time series cannot predict bubble
H09: Exchg time series cannot predict bubble

The study aims to empirically investigate the cointegration of various asset classes impacting the volatility of BSE SENSEX at different time interval.

Table 1: operational definition

Category	Variable used	Definition	Symbols used
Measurement of volatility	BSE SENSEX	free float market weighted index of 30 companies listed on BSE with base year at the data 1978-79	BSE
Macroeconomic variable and US stock return	Brent oil ($ per barrel)	Sweet light crude oil which serves as a benchmark for worldwide oil purchase.	BRENT
	Gold (USD)	Popular means of investment, mostly bought to diversify risk	GOLD
	Exchange rate (☐ PER $)	Rate at which one currency is exchanged over others. Here INR/USD	EXCHG
	10-year Bond yield	Rate of return available on an investment	BOND
	Nasdaq	American stock exchange market	NASDAQ

Table 2: Abbreviations used

Variables	Abbreviations
BSE_RETURN	Bse
BOND_RETURN	Bond
GOLD_RETURN	Gold
EXCHANGE_RETURN	Exchg
NASDAQ_RETURN	Nasdaq

Table: 3

	BSE	BRENT	GOLD	NASDAQ	EXCHG	BOND
Mean	8.80E-05	-0.000364	0.000178	0.000375	0.000264	-4.22E-05
Median	0.000268	0.000139	0.000244	0.000858	0	0
Maximum	0.1599	0.127066	0.086432	0.116998	0.036936	0.12237
Minimum	-0.12796	-0.129813	-0.098206	-0.095877	-0.035504	-0.057924
Std. Dev.	0.01426	0.02252	0.012611	0.01404	0.005235	0.008421
Skewness	-0.009451	-0.153119	-0.214754	-0.100462	0.105981	1.342041
Kurtosis	16.545	6.824958	8.17227	11.67079	8.570977	28.78374
Jarque-Bera	19210.58	1541.735	2820.513	7876.481	3254.409	70364.56
Probability	0	0	0	0	0	0
Sum	0.221114	-0.915914	0.446128	0.942053	0.664122	-0.106074
Sum Sq. Dev.	0.510823	1.274009	0.399488	0.495158	0.06885	0.178153
Observations	2513	2513	2513	2513	2513	2513

Source: Author's computation

The descriptive statistics shows that the kurtosis is more than 3 and is highest for Bond. This shows that it has leptokurtosis distribution. This indicates fatter tails with more outliers. The risk is more and the extreme event possibility is more. However accurately we predict it will lead to overestimation for leptokurtic. Small changes happen less frequently, while large fluctuations are more likely within the fat tails. The Jarque-Bera shows that since the values are more than 1000, the time series follows Gaussian distribution with high intensity. The difference in the mean of the 6 distinct independent variables is quite evident as shows by the f statistic value which is further reflected in the coefficient of determination indicating the level of influence of these independent variables on the dependent variables.

Table: 4

ADF Test analysis		
variables	**log level**	
	t- statistics	**p-value ***
BSE	-30.71198	0.0000
BRENT	-29.47178	0.0000
BOND	-28.46556	0.0000
GOLD	-30.938	0.0000
NASDAQ	-30.88225	0.0000
EXCHG	-29.61555	0.0000

The Augmented Dickey Fuller test shows that the independent variables taken are stationary in nature as the probability values are less than 5%. Stationary shows that the time series is elastic in nature. This means that when the information is taken out the time series come back to its original position. This elasticity shows that there lies an explosive property in the time series. This explosive property comes with a bubble formation. This bubble may explode at any point in time. Multiple regression analysis was carried on and the expected movement for Brent oil was considered to be of negatively significant to the Indian Bse Sensex.

DATA ANALYSIS:

Techniques used:
The statistical technique used was multiple linear regression using SPSS and least square method using EVIEWS.

Least Square Method:
Least Square Method is a regression analysis which helps to find a best fit for a data set, by providing a visual relationship amongst the data points. By using the least square method in the data set, it has been found that all the independent variables taken are directly impacting the volatility index taken as return of BSE SENSEX. The probability being less than 0.05 shows that all the independent variables taken are very significant in determining the causal relationship between the Indian stock market and the macro economic variables.

Augmented Dickey fuller:
This test is used to examine whether the null hypothesis is stationary or not. If the null hypothesis gets rejected which means the time series is stationary. Stationary shows elasticity. This means when the information is withdrawn, the time series comes back to the original position. Elasticity shows that the time series can be accurately predicted. This further leads to the prediction of bubble in the time series. This indicates that the time series can be exploded at any time.

Multiple linear regression:
It is a form of linear regression, wherein there is one dependent variable and more than one independent variable. This helps to identify the kind of relationship between the dependent and independent variables. Multiple linear regression assumes that their lies a linear relationship in between the dependent and the independent variables and without any high degree of correlation between the independent variables.
The regression equation shows the relationship between the dependent variable which is BSE SENSEX and the independent variable which are return of Brent oil, 10 years bond yield, Gold return, Nasdaq return and lag of Nasdaq and Exchange rate return.

The multiple regression carried on gives the following equation:

$BSE_t = \alpha + \beta1*BRENT_t - \beta2*GOLD_t - \beta3*EXCHG_t + \beta4*NASDAQ_t - \beta5*BOND_t + \varepsilon_t$

The variables taken for equation are coefficients of returns of Brent oil, gold, exchange rate, Nasdaq and 10-year G-sec as independent variables. While Bse Sensex is taken as dependent variable.

The regression equation shows that Brent return is significantly impacting BSE SENSEX, 10-year bond yield is significantly impacting the Indian stock market, Gold is significantly impacting BSE SENSEX, Exchange rate return is significantly impacting the BSE SENSEX and moreover NASDAQ is also influencing the Indian stock market. This shows that the volatility of Indian stock market is not only dependent on the macroeconomic variable but also on the change in the US market stock index.

The regression equation explains the causal relationship between the dependent and independent variable. Brent actually has a positive impact on the BSE SENSEX, while it was expected to be negative. Which implies with the rise in the oil prices, the Sensex reacts positively but with a very small amount. Whereas, the 10-year bond yield shows a negative relationship with the BSE SENSEX. Similarly, old return, Exchange rate return, Nasdaq return and lag of Nasdaq shows an inverse relationship with the BSE SENSEX.

Table: 5

Dependent Variable: BSE		
Variable	Coefficient	Prob.
C	0.000322	0.1941
BRENT	0.06945	0
GOLD	-0.083075	0.0001
EXCHG	-1.014067	0
NASDAQ	0.184849	0
BOND	0.16699	0.0001
Prob(F-statistic)	0	

Source: Author's computation

The least square method shows the probabilistic value as against the alpha level of significance. When the probability is less than 5%, the variable is said to be significant. In our study, all the independent variables were found to be significant with probability of 0.0000. This shows that all the independent variables taken for our study is impacting the volatility of Indian stock market.

FINDINGS:

- A regression equation was generated and it shows that Brent return is significantly impacting the BSE SENSEX, 10-year bond yield is significantly impacting Indian stock market, Gold return is significantly impacting BSE SENSEX, Exchange rate return is significantly impacting the BSE SENSEX and moreover US stock market NASDAQ is also influencing the Indian stock market. This shows that the volatility of Indian stock market is not only dependent on the macroeconomic variable but also on the change in the US market stock index.

- The regression equation explains the causal relationship between the dependent and independent variable. Brent return has a positive impact on the BSE SENSEX. Which implies with the rise in the oil prices, the Sensex reacts positively but with a very small amount. Whereas, the 10-year bond yield shows a negative relationship with the BSE SENSEX. Similarly, oil return, Exchange rate return, Nasdaq return shows an inverse relationship with the BSE SENSEX.

- The result shows that the time series of all the variables were stationary. This show that they are highly predictable but with the risk of bubble formation. Moreover, the prediction can be done with a certain level of accuracy. It shows the presence of an explosive property in the time series with triggers bubble formation.

CONCLUSION:

This paper tries to examine the causal relationship between the Indian stock market BSE SENSEX and the other asset classes as – return on gold prices, return on oil prices, exchange rate, 10-year bond yield and US stock market NASDAQ. The study comprises of a time period of 10 years starting from 2008 upto 2018. The data has been taken on a daily basis. Statistical technique was applied on the data to find whether the volatility of BSE SENSEX is

impacted by the independent variables. Multiple linear regression has been carried out to find the results.

The results show that the correlation between the independent variables taken and the stock market are very significant. Moreover, the return on oil prices shows that there lies a positive relationship with the stock market. The Indian stock market is not only impacted by the macro economic variables but also the happenings in the US market. Thus, it shows an inverse relationship with the NASDAQ return and the BSE SENSEX return.

IMPLICATIONS:

Economic Implications:

As the stock market rise, the investors confidence also increases. As buying activity enables push in price. Hence equity investors gain more wealth. This results in an increase in the consumer expenditure with increase in their buying behaviour. This enables the market to produce more goods and services thereby earning more profit.

In case of negative news, the wealth is generally eroded. As the spending decreases, the buying behaviour of non-necessary items comes down thereby impacting the profitability of the company.

Policy Implications:

More often, it is seen that business grow by raising capital. Hence, when the stock market is rising, with the presence of a greater number of investors investing their money, companies generates large capital due to increase in price. This helps the investors to make their investment strategy.

FURTHER SCOPE:

Most of the studies have taken various macro-economic factors to analyse the volatility in the Indian stock market, yet there were few research gaps. Micro-economic factors taken were narrow in nature. Broader aspect as fiscal deficit, current account deficit, gross domestic product has not been merged with these studies. Understanding of their significance in impacting the volatility is also important.

Moreover, the impact of stock market performance of other countries has also not been considered in determining the volatility of the Indian stock market. As the world has become an integrated global economy, the study of country's stock market cannot be studied in isolation.

In today's market, Behavioural aspect is also connected with the stock performance. There are concepts as Herding behaviour. Mindless following is also seen in the stock market. This mindless following behaviour also impacts the stock price movement. Buying and selling due to herding behaviour impacts the volatility in the stock market.

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