An Econometric Analysis of Causal Relationship Between Gold, Crude Oil, U.S. Dollar Rates and S&P BSE 100 in India

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Abstract

In the present day globalized business scenario, volatility in gold prices, international crude oil prices, and U.S. Dollar exchange rate is likely to stimulate uncertainty in the stock market conditions globally. The degree of uncertainty in the stock market is high in the case of developing nations like India. Therefore, the study of causal relationship of gold, crude oil, and U.S. Dollar rates with the stock market indices (S & P BSE 100) in India is more appropriate. We analyzed these macro economic variables along with the S&P BSE 100 with the help of econometric tools - Augmented Dickey-Fuller Test for unit-root, Johansen co-integration test, pairwise Granger causality tests, vector auto regression modeling, variance decomposition test, and impulse response analysis. The econometric research software called EVIEWS 6 was used to apply all these tools successfully. The results showed that there was a high impression in the Indian stock market due to the volatility that happens in the described macro-economic factors.

Keywords : **macro economic variables, S&P BSE 100, causal relationship**

JEL Classification : G02, G12, G15

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In the globalized era, financial markets had undergone continuous and significant changes. These changes have affected rising and developed economies, especially in terms of eliminating restrictions with regard to capital movements. Further, due to technological advances, individual and institutional investors are allowed to trade worldwide on a 24 hours basis in any market. The liberalized and technically advanced markets have become more integrated over time and it is particularly true in the case of financial markets. In many developing countries like India, there has been marked change in the principles of the government towards integration of Indian economy with the world economy. When the markets experience an increase in their level of integration, shocks and events that happen in one market immediately affect the other interlinked financial markets and this impacts the benefits that investors obtain from diversifying their portfolios internationally. If this is the case, and the markets are highly integrated, these benefits will be eradicated in the long-term and investors with long horizons may not benefit from their portfolios (Morales, 2009). There will also be a direct effect on the financial stability of the financial market since the negative and positive effects will spread among the co-integrated capital markets.

On the other hand , there is a common belief that the prices of commodities tend to move in unison since they

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are influenced by common macroeconomic factors like interest rate, exchange rate, and inflation (Hammoudeh, Sari & Ewing, 2008). Among other macroeconomic factors, oil and gold are the two strategic commodities which have received close attention recently due to the surge in their prices and the increase in their economic uses. In the world, the most commonly traded commodity is crude oil and its price is the most volatile in the commodity market. Gold is considered as the leader in the precious metal market and it is also an investment asset commonly known as a 'safe heaven' to avoid increasing risk in financial markets. Investors from both developing and developed markets, often switch between oil and gold or combine them to diversify their portfolios (Soytas, Sari, Hammoudeh, & Hacihasanoglu, 2009).

In the year 2009, oil prices had risen while the dollar continued to crash down but before oil's price surge, the dollar was strong. Many economists and researchers believe that the oil and dollar exchange prices are inversely correlated since oil is driving down the value of the dollar. Prior to 2007, oil and dollar were believed to be positively correlated, oil is bought and sold in US dollars, therefore as oil price goes up, so does the global demand for dollars.

The above features describing capital market, US Dollar exchange rate, oil, and gold justify the economic importance of investigating the relationship between these. Further, their special features make these not only influenced by ordinary forces of supply and demand but also by other forces. Hence, there is a need for expanding and shedding light for a better understanding of the true nature of relationship between markets around the world, and especially with regard to the inter-linkages among these market variables.

Review of Literature

Sharma and Mahendru (2010) evaluated the long-term relationship between BSE and Macro-economic variables (exchange rates, foreign exchange reserve, inflation rate, and Gold price) from January 2008 to January 2009 using multiple regression models. The study revealed that exchange rate and Gold price influence the stock prices in India.

Le and Chang (2011) had investigated the relationships between the prices of two strategic commodities, that is, gold and oil in terms of index of US Dollar by using monthly data from January, 1986 to April, 2011 with the application of financial econometrics. Empirical results of the study showed that there is a long-run relationship existing between the prices of oil and gold and oil price can be used to predict the price of gold.

Hosseini, Ahmad, and Lai (2011) examined the relationships between stock market indices and four macroeconomics variables, namely crude Oil price, money supply, industrial production, and inflation rate in China and India using yearly data between January 1999 and January 2009. The study points out that there are both long and short run linkages between macroeconomic variable and stock market index in each of these two countries.

Dasgupta (2012)had examined the long-run and short-run relationships between BSE SENSEX and four key macroeconomic variables (wholesale price index, index of industrial production, exchange rate, and call money rate) of Indian economy by using monthly data from April, 2007 to March, 2012 with the application of financial econometrics. Empirical results of the study showed that there are no short-run causal relationships between SENSEX and four macro-economic variables but confirmed long-run relationships between BSE SENSEX with index of industrial production and call money rate.

Samanta and Zadeh (2012) examined the co-movements of selected macro-variables (gold price, stock price, real exchange rate, and crude oil price) based on 21 years data using econometric models for the period January 1989 to September 2009. The study exposed that there is a co-integration relationship between the variables.

Kaliyamoorthy and Parithi (2012) had made a study to examine the relationship between gold price and stock market from June 2009 to June 2010. They proved that there is no relationship with the stock market and gold price and stock market is not a ground for rising gold price.

In a study, Basci and Karaca (2013) examined the relationship between ISE 100 Index and a set of four macroeconomic variables using Vector Autoregressive (VAR) model. Variables we used in our model are exchange, gold, import, export, and ISE 100 Index. ISE 100 Index is a dependent variable and the others are independent variables. In this study we used 190 observations for the sample period from January, 1996 to October, 2011. All variables have seasonal movements. After seasonal adjustments, all series have had stationarity in their first difference. After determining optimal lag order, it was given one standard deviation shock for each series and their responses. Variance decomposition was carried out subsequently. It has been determined that especially the second default of exchange is explained 31% by share indices.

The Bombay Stock Exchange launched the BSE Bankex index in the year 2003 and this index consists of major public and private sector banks listed in BSE. Luthra and Mahajan (2014) studied the impact of macro factors on BSE Bankex. Further, they selected four macro economic factors namely inflation rate, exchange rate, GDP, and Gold price. They studied the intensity of relationship between these macro factors and BSE Bankex using 10 years monthly average index. The researcher used SPSS for develop a multiple regression model which showed the regression co-efficient between the share prices and various factors affecting the same. Regression 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.

Bhunia and Pakira (2014) had investigated the affiliation between three financial variables of gold price, exchange rates, and Sensex between 1991 and 2013. For the purpose they used econometrics models namely unit root test, granger causality test and Johansen co integration test. They found that Johansen co-integration test result indicated that there exists a long-term relationship among the selected variables. The Granger causality test result showed that there must be either bidirectional or no causality among the variables.

Sood, Bapna, Totala, and Saluja (2014) examined the effects on gold returns by the important and highly traded financial assets - gold Exchange Trade Funds (Gold ETFs [1]), gold futures, BSE SENSEX, and S&P CNX NIFTY. The research also explored their correlation and their impact on each other individually and collectively with respect to volatility clustering by using GARCH (1, 1) Model. The study showed that while inefficiency is present in the gold price, gold ETFS, gold futures, BSE SENSEX returns, and S&P CNX NIFTY returns together affect the volatility of gold returns for the period 2011-2013.

Karunanithy and Ramachandran (2014) examined in a study that a causal link exists between BSE Sensex (SENSEX) and gold price (GOLD). Time series data (monthly) of BSE Sensex and gold price for the period January 2004 to December 2013 were used. To provide evidence on the existence of causal relationship between the variables, Granger Causality test was employed. Johansen cointegration results show that there is co-integration between the two variables chosen, which leads to prove the existence of causal relationship between them. The study found that there is a existence of a causal relationship, which is running from SENSEX to GOLD, however, there is no such relationship from GOLD to SENSEX, and therefore, the study concludes that there is a unidirectional relationship between stock price and gold price.

Tiwari and Gupta (2015) examined the causal relationship between gold prices and stock market returns in India. The researcher had used nine years monthly average BSE index and gold price data for this purpose and they used ADF unit root test and granger causality test. For the purpose of analysis, linear deterministic trend and lags interval in first differences have used. The study found that the time series are not stationary at levels and selected time series are stationary at first difference. Granger Causality test indicated that no causal relationship exists between gold price and BSE sensex.

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[1] Gold ETFs (Exchange Trade Funds) are units representing physical gold, which may be in paper or dematerialized form. These units are traded on the exchange like a single stock of any company.

Statement of the Problem

As world economy is not steady due to various businesses, political, social, and more importantly globalized economic environments, Indian economy also faces the same kind of problem, which in recent times has resulted in the decline in GDP growth and increasing inflation rate. There has been a marked change in the principles of the government towards integration of Indian economy with the world economy in many developing countries like India. Volatility in gold price, international crude oil price, and US Dollar exchange rate is likely to stimulate uncertainty in stock market condition. In this regard, the study of relationship between Indian stock market indices and gold, oil, and exchange rates shall help the investors in making adjustments in the organization and management of their portfolios with a view to achieve optimum levels of return. Such a study at macro level shall help policy makers to evolve macro level policies to redress various problems encountered by the Indian stock market and investors. Hence, the present study was undertaken in order to address these problems in India.

Methodology

This study investigated the relationship between the selected indexes in the long run as well short run. The researchers also studied the linkages between the stock index and other important economic variables. In line with this objective, the researchers had used both quantitative and qualitative methodology. For the qualitative analysis, the researchers had used empirical evidences from literature review regarding macroeconomic factors affecting the stock market. The preliminary variables identified for the basic model are variables that have been derived from previous studies and theories. Theories and previous studies suggest that macroeconomic variables such as exchange rates, oil price, and gold price influence each other. The exchange rate considered was the RBI reference rate of daily nominal spot rate, that is, rupee per U.S. dollar price available for each foreign exchange market day during the study period. For oil prices, OPEC countries prices were taken into consideration.

Gold price taken into consideration is the monthly average price obtained from the World Gold Council. S&P BSE 100 index is considered as the benchmark index since this index is comprehensive and data are available for analysis and was used to measure market price movements of Indian securities. The main objective of this study was to perform an in-depth research that leads to the outcome of adding relevant empirical evidence to the analysis of relevance of macroeconomic factors for the Indian Stock Market. Therefore, the initial hypothesis of this research postulates a lack of integration between financial markets and selected macroeconomic variable in emerging economies.

This research approach differs in a number of aspects from previous studies in the existing literature. First, the data used for the study covers a longer period and further up to recent years (1990 to 2015) than existing studies in the area. Second, the research focuses on studying the inter-relationship and inter-dependence between equity, dollar, gold, and oil markets in a combined manner which is a clear distinctive feature of this research work. Third, the relationship between these economic variables will be analyzed with a particular emphasis on the emerging market i.e. India.

Since the present study relied on economic variables that required secondary data, this data had been collected from various sources such as websites, journals, books, and theses. Monthly average closing value had been taken for representing the series of S&P BSE 100 index and the same had been collected from the BSE website. The monthly average gold price as well as the monthly average of US Dollar exchange rate against Indian rupees had been collected from Reserve Bank of India (RBI) website. The monthly average Brent oil price had been collected from the U.S. Energy Information Administration website.

To satisfy the objectives of the study, various time series econometrics models were used. The econometric analysis had been carried out with the help of the software called EVIEWS 6. Augmented Dickey-Fuller test for unit-root, Johansen co-integration test, pairwise granger causality tests, vector auto regression modeling, variance decomposition test, and impulse responses analysis were for the analysis.

Table 1. Descriptive Analysis

	BSE_100	DOLLAR	GOLD_PRICE	OILPRICE
Mean	2804.215	42.04407	10277.01	47.94413
Median	1513.46	43.9519	5293.6	28.645
Maximum	8994.46	63.8937	31672.83	133.9
Minimum	361.36	17.295	3284.8	9.8
Std. Dev.	2258.261	10.09708	8755.51	35.41168
Skewness	0.753037	-0.323525	1.32593	0.823104
Kurtosis	2.26895	3.118707	3.228627	2.222032
Jarque-Bera	35.0337	5.409559	88.55793	41.44046
Probability	0	0.066885	0	0
Sum	841264.4	12613.22	3083104	14383.24
Sum Sq. Dev.	1.52E+09	30483.34	2.29E+10	374942.2
Observations	300	300	300	300

Table 2. Unit Root Test Results at Level with Constant

Period 1990-2015	Variable	No. of Observation	ADF Test Statistic	Critical Value@ 5%	*p*- Value	Ho Accept/Reject
Level	BSE-100	299	0.393	-3.452	0.9824	Accept
Level	Exchange rate of Dollar	299	-1.470	-3.452	0.5474	Accept
Level	Gold Price	299	1.161	-3.452	0.9979	Accept
Level	Oil Price	299	-1.859	-3.452	0.3513	Accept

Table 3. Unit Root Test Results at First Differenced Form Series with Constant

Period 1990-2010	Variable	No. of Observation	ADF Test Statistic	Critical Value@ 5%	*p*- Value	Ho Accept/Reject
First Difference	BSE-100	298	-16.814	-3.452	0.0	Reject
First Difference	Exchange rate of Dollar	298	-12.906	-3.452	0.0	Reject
First Difference	Gold Price	298	-15.771	-3.452	0.0	Reject
First Difference	Oil Price	298	-11.372	-3.452	0.0	Reject

Analysis, Results, and Discussion

Table 1 presents the summary of descriptive statistics for the sample financial & commodities variable price returns during the study period. Volatility is high in the case of gold price and stock price. Skewness is negative in the case of Dollar exchange rate and the kurtosis is more than 3 for US Dollar price and gold price but for BSE 100 and oil price it is close to 3. Further, the probability value of all the variables is 0 except for US Dollar, signifying that the distribution is leptokurtic. In the case of U.S. Dollar also, the probability value is 0.067 signifying that the distribution is leptokurtic at ten percent level.

It is clear from the Table 2 that calculated value of the test statistic *'t'* is less than its critical value (3.452) in all the selected indexes and all the probability values are also greater than 0.05. Therefore, the null hypothesis is accepted, which means that for the series BSE 100, exchange rate of dollar, and oil price, unit root exists, and they are non- stationary at its levels. Even though at this level all the data has unit root, the unit root tests reject the same

Table 4. Pair-Wise Granger Causality Tests

Sample : 1991-2015

Lags : 2

Null Hypothesis	F Stat	P-Value	Hypothesis Accept/Reject	Causality
DOLLAR does not Granger Cause BSE_100	2.90621	0.0563**	Reject	Bi-Directional
BSE_100 does not Granger Cause DOLLAR	2.56593	0.0786**	Reject	
GOLD_PRICE does not Granger Cause BSE_100	1.94965	0.1442	Accept	No causality
BSE_100 does not Granger Cause GOLD_PRICE	3.4341	0.0336*	Reject	Unidirectional
OILPRICE does not Granger Cause BSE_100	0.06319	0.9388	Accept	No causality
BSE_100 does not Granger Cause OILPRICE	5.13352	0.0064*	Reject	Unidirectional
GOLD_PRICE does not Granger Cause DOLLAR	2.94532	0.0541**	Reject	Unidirectional
DOLLAR does not Granger Cause GOLD_PRICE	0.11772	0.889	Accept	No causality
OILPRICE does not Granger Cause DOLLAR	4.00455	0.0192*	Reject	Unidirectional
DOLLAR does not Granger Cause OILPRICE	2.1609	0.1171	Accept	No causality
OILPRICE does not Granger Cause GOLD_PRICE	5.09209	0.0067*	Reject	Unidirectional
GOLD_PRICE does not Granger Cause OILPRICE	1.80848	0.1657	Accept	No causality

*(**) Indicates significant causal relationship at 5 (10) significance level.

Table 5. Johansen's Co-integration Test

Unrestricted Co-Integration		Trace Rank Test			Max-Eigen Value test		
Hypothesized No. of CE (s)	Eigen Value	Trace	Critical value @ 5%	Prob**	Max Eigen Value	Critical Value @ 5%	Prob**
None	0.05128	37.077	47.856	0.344	15.687	27.584	0.692
At most 1	0.03631	21.390	29.797	0.334	11.023	21.132	0.645
At most 2	0.02762	10.368	15.495	0.254	8.347	14.264	0.345
At most 3	0.00676	2.0203	3.841	0.155	2.020	3.841	0.155

null hypothesis i.e. in the first differenced form of the series. At their first difference the calculated $|t|$ is more than the critical value 3.452 and all the probability values are also less than 0.05 (refer to Table 3). Hence, the null hypothesis is rejected, which indicates that in the first differenced form, all the series are stationary. Therefore, each time series data is integrated in order one, or $I(1)$.

The results of pair-wise Granger causality test between selected time series are shown in the Table 4. It has been found that causality between US Dollar exchange rate and BSE 100 is at 10% significance level. There exists unidirectional causality between BSE 100 and gold price, BSE 100 and oil price, gold price and U.S. Dollar exchange rate, oil price and US Dollar exchange rate, and oil price and gold price. From the Granger causality analysis it is concluded that there is a short run, there is interchangeable lead-lag relationship between the variables. This result is just contrary to the result of previous studies by Tiwari and Gupta (2015).

From Table 5, it is inferred that the trace statistics and Max-Eigen values are lesser than the critical value (None), which has not established a long-run co-integration relationship in the model, since the p - value is not significant at 5% level. Therefore, as per trace statistics and Ho, there is no co-integration between the variables at 5% level of significance. This implies that there is no co-integration equation (since p value is more than 0.05) between the selected time series viz., BSE 100, US Dollar exchange rate, oil, and gold price. Since the selected time series are not co-integrated, the study does not prove the presence of long-run relationship between them and hence H0, that is, there is no co-integration relationship between time series is accepted.

Table 6. Estimations Of The 'Unrestricted Series Autoregressive Vector'

	BSE_100	DOLLAR	GOLD_PRICE	OILPRICE
BSE_100(-1)	0.982034	-0.000342	-0.149845	0.00193
	-0.062	-0.00018	-0.11471	-0.00103
	[15.8387]	[-1.88234]	[-1.30629]	[1.87416]
BSE_100(-2)	0.003406	0.00026	0.178855	-0.00147
	-0.0632	-0.00019	-0.11693	-0.00105
	[0.05389]	[1.40211]	[1.52957]	[-1.40216]
DOLLAR(-1)	-10.46182	1.204923	16.88005	-0.52154
	-21.3768	-0.06268	-39.5494	-0.35503
	[-0.48940]	[19.2219]	[0.42681]	[-1.46899]
DOLLAR(-2)	14.19409	-0.218858	-18.88095	0.492642
	-21.2584	-0.06234	-39.3304	-0.35306
	[0.66769]	[-3.51084]	[-0.48006]	[1.39533]
GOLD_PRICE(-1)	0.028882	-7.64E-05	1.034181	0.000793
	-0.03264	-9.60E-05	-0.0604	-0.00054
	[0.88474]	[-0.79846]	[17.1233]	[1.46308]
GOLD_PRICE(-2)	-0.021064	8.50E-05	-0.045046	-0.00071
	-0.03245	-9.50E-05	-0.06003	-0.00054
	[-0.64917]	[0.89372]	[-0.75038]	[-1.32319]
OILPRICE(-1)	0.06143	-0.001993	12.81844	1.338652
	-3.31005	-0.00971	-6.12398	-0.05497
	[0.01856]	[-0.20531]	[2.09316]	[24.3505]
OILPRICE(-2)	-1.546978	0.008986	-9.981928	-0.39097
	-3.42429	-0.01004	-6.33532	-0.05687
	[-0.45177]	[0.89491]	[-1.57560]	[-6.87470]
C	-97.09819	0.52635	55.20017	1.679923
	-77.7196	-0.2279	-143.79	-1.29079
	[-1.24934]	[2.30952]	[0.38389]	[1.30147]
R-squared	0.987276	0.994341	0.997113	0.985762
Adj. R-squared	0.986924	0.994185	0.997033	0.985368
Sum sq. resids	19249908	165.5281	65890963	5309.781
S.E. equation	258.0866	0.75681	477.4897	4.286367
F-statistic	2803.004	6347.762	12478.58	2501.17
Log likelihood	-2073.156	-335.2387	-2256.5	-851.995
Akaike AIC	13.9742	2.310327	15.2047	5.778492
Schwarz SC	14.08586	2.421984	15.31636	5.890149
Mean dependent	2820.557	42.21008	10323.01	48.15574
S.D. dependent	2256.964	9.924218	8766.801	35.43575
Determinant resid covariance (dof adj.)	1.31E+11			
Determinant resid covariance	1.16E+11			
Log likelihood	-5487.43			
Akaike information criterion	37.07			
Schwarz criterion	37.51663			

Source: Data processed by means of Eviews 6.0

It has been observed on applying the VAR model that the integration of the time series with others can be established if the critical value is more than 1.96. Table 6 shows that BSE-100 index at the lag of 1 had influence on the returns of BSE 100 and oil price index since value 1.87 is very closer to the table value. However, with a lag of 2, it had no influence on the returns of each of the indexes under the study. The index of U.S. Dollar exchange rate at the lag of 1 and 2 had influence on the returns of U.S. Dollar Exchange rate indexes. At the lag order 1, oil price is influenced by the gold price index and other variables not influenced, conversely while at lag order 2, none of the variables were influenced by the gold price index. The oil price at lag order 1, oil price index, and gold price index were influenced by oil price while at lag order 2, only oil prices index was influenced by oil price. The estimated integration of variables is given below in equations form :

Equation- 1: BSE_100 = 0.982034453957 * BSE_100(-1) + 0.00340614078772 * BSE_100(-2) - 10.461820861 * DOLLAR(-1) + 14.1940888407 * DOLLAR(-2) + 0.028881816779 * GOLD_PRICE(-1) -0.0210635826603 * GOLD_PRICE(-2) + 0.0614300246421 * OILPRICE(-1) - 1.54697832593 * OILPRICE(-2) - 97.0981855647.

Equation- 2: DOLLAR = - 0.000342235774477 * BSE_100(-1) + 0.00025985800017 * BSE_100(-2) + 1.20492303477 * DOLLAR(-1) - 0.218857998276 * DOLLAR(-2) - 7.64335362239e-05 * GOLD_PRICE(-1) + 8.50349304638e-05 * GOLD_PRICE(-2) - 0.00199279319082 * OILPRICE(-1) + 0.00898613098691 * OILPRICE (-2) + 0.526349705558.

Equation- 3: GOLD_PRICE = - 0.149845093375 * BSE_100(-1) + 0.178854665399 * BSE_100(-2) + 16.880050776 * DOLLAR(-1) - 18.8809496319 * DOLLAR(-2) + 1.03418072005 * GOLD_PRICE(-1) - 0.0450457473122 * GOLD_PRICE(-2) + 12.8184385994 * OILPRICE(-1) - 9.98192765419 * OILPRICE(-2) + 55.2001721472.

Equation- 4: OILPRICE = 0.0019299103744 * BSE_100(-1) - 0.00147181129018 * BSE_100(-2) - 0.521535421842 * DOLLAR(-1) + 0.492642350114 * DOLLAR(-2) + 0.000793233489474 * GOLD_PRICE(-1) - 0.000713051438544 * GOLD_PRICE(-2) + 1.33865179855 * OILPRICE(-1) - 0.390974172609 * OILPRICE(-2) + 1.67992338486

Variance decomposition analysis was done to check the percentage change in a variable on introducing a shock in the residual series. One standard deviation shock is assumed in residual series for the analysis. It can be concluded from Table 7 that when there is one standard deviation change in residual BSE 100 equation, in the short term, that is, three months, 99.73% of change happens in BSE, 0.013% change in dollar, 0.247% in gold price, and 0.009% in oil price (total being 100). Likewise, one standard deviation change in residual BSE 100, in the long run i.e. twelve months, 95.74% of change happens in BSE 100, 1.238% change in dollar, 1.030% in gold price, and 1.989% in oil price (total being 100). Further, it is clear from the table that the level of influence of long run shock in BSE 100 is increasing dollar exchange rate and oil prices as compared to short run shock in BSE 100.

To know how a variable responds to one standard deviation shock in residual series impulse response analysis used and the result shows that the BSE series increases over the 12 months period and becomes highest positive in the long run. Where dollar prices increase from negative value to positive value in long run, Gold price is starting at neutral value and has increased to highest positive value in fifth month and after that the value has become decreasing in trend. Oil price is increasing in trend, though negative throughout the period.

Conclusion and Implications

This study aims at investigating the relationship among the S&P BSE 100, US Dollar exchange rate, crude oil

Table 7. Variance Decomposition of BSE 100

Period	S.E.	BSE_100	DOLLAR	GOLD_PRICE	OILPRICE
1	258.087	100.000	0.000	0.000	0.000
2	362.445	99.847	0.017	0.136	0.000
3	439.990	99.732	0.013	0.247	0.009
4	502.887	99.585	0.016	0.340	0.059
5	556.090	99.363	0.047	0.424	0.167
6	602.297	99.048	0.113	0.504	0.335
7	643.170	98.645	0.217	0.583	0.555
8	679.807	98.165	0.358	0.663	0.814
9	712.974	97.621	0.534	0.747	1.099
10	743.225	97.027	0.741	0.835	1.397
11	770.979	96.398	0.977	0.929	1.696
12	796.562	95.743	1.238	1.030	1.989

Source: Data Analysis Eviews Out put

price and gold price in India. The major conclusion of the study is that the selected time series exhibits non-stationarity and, therefore, provide indication of long-term co-integration relationship. In short, selected time series variables are closely interlinked. U.S. Dollar exchange rate and oil price are essential unpredictable variables that operate as channel during which the stock prices are associated. The Granger causality test reveals that the U.S. Dollar exchange rate, gold and oil price instability has an influence on each other. However, BSE 100 does not cause other series. Further, it is clear from the result that the level of influence of long run shock in S&P BSE 100 is increasing dollar exchange rate and oil prices as compared with short run shock in BSE 100.

Hence, this study has the following implications:

(1) In general, investors are advised to take informed decisions by considering global economic and political environments for mitigating investment risks in their investment portfolio.

(2) Stakeholders and policy makers should keep informing investors about market and other profitable investment avenues by hedging their portfolios so that shocks in an index do not affect their portfolio.

(3) Legitimate risks return strategies help in controlling unpredictability, which needs to be guaranteed by policy makers. In absence of legitimate risks return strategies, informed and institutional financial specialists will move in the opposite direction of the capital markets. Regardless of the fact that they partake, they may fall back on unscrupulous methods for benefit, thereby, leading to higher instability.

(4) Numerous speculators maintain a strategic distance from securities exchanges because of data asymmetry. Controllers and policy makers of market need to make efforts for proficiently sharing data about the market. The premise of benefit valuation must be entirely bound to the financial basics so that speculators can't make strange additions.

(5) Taking into account everything and keeping in view the nature and ramifications of unpredictability, it is fitting to consistently concentrate on available data to distinguish the components that have suggestions for real market makers. The detailed arrangements will help to settle and to hold these variables under control.

(6) It is likewise fitting that macroeconomic approaches with regards to these variables ought to, at all times, take perception of the conceivable impacts that such strategies will have an impact on stock value changes and the capital markets by and large. Such an all encompassing way to deal with approach plan will help guarantee

security in the capital business sector and accordingly diminish the likelihood of crashes in share prices, which may prompt disequilibrium in the capital business.

The above discussed managerial implications have immense use for policy makers to take appropriate decision for mitigating the problems faced by investors while their investments by unpredictable shocks in the economy.

Limitations of the Study and Scope for Further Research

The present research work focuses on studying the inter relationship and inter dependence between equity, dollar, gold, and oil markets in a combined manner from the year 1990 to 2015. However, it failed to focus on other micro economic variables such as GDP. Hence, the limitations of this present research work leads to a room for future research on the following subjects:

(i) Inter-relationship between equity, dollar, gold, and oil markets in a combined manner for long run period in the Asian region.

(ii) Compare these economic variables namely stock index, U.S. Dollar rate, gold price, and oil price between two countries in the Asian region.

(iii) Causal relationship between all the micro and macroeconomic variable for the short-run period in India.

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