



A study of Indian Stock Market BSE Sensex and Gold Prices for the period of Jan 2000 to Sep 2016

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ABSTRACT

The primary objective of the current study is to investigate the relationship of independent variable Gold Price on Indian stock market BSE SENSEX. Independent macroeconomic variables influence return of the organizations in turns strongly affects the stock prices and support the relationship between dependent and independent variables. The present study uses the monthly closing data for the period starting from Jan 2000 to Sep 2016 collected from secondary sources like Bombay stock exchange and YCharts.com. The methodology is designed with the application of statistical and financial econometrics model like descriptive statistics, correlation and regression model. Results: The empirical results reveal that BSE SENSEX reactions to shocks on Gold Prices is positive

KEY WORDS: Macroeconomic Variables, BSE SENSEX, Indian stock market, Gold Price, Correlation and Regression

1. INTRODUCTION

There have lot of changes made in India economy primarily driven by liberalization and globalization since 1991. These changes have impacted positively or negatively almost all the sectors of our economy along with India Capital market. Multiple factors play its role in the growth of economy such as macroeconomic variables, performance of industry and investment climate, political stability etc. In this study we pertain to perform comparative analysis between Indian Stock Market and macroeconomic variable Gold Price (GP). The objective of the study is to investigate the relationship between Indian Stock market and Gold Price (GP)

The rest of the paper is structured as follows: Section 2 briefly represents and reviews of existing related literature on the linkages between stock price and macroeconomic variables. Section 3 describes the data methodology. Section 4 analyses and data interpretation using methodology defined and lastly, Section 5 presents the conclusion of the study.

2. BRIEF REVIEW OF EXISTING LITERATURE

The section outlines the review of the related literature.

Sireesha (2013) examined the impact of macroeconomic factors and the variations introduced in Indian Stock Market via them. Linear regression technique was the key fundamental behind her research methodology and she performed analysis on Nifty, Silver and Gold returns via same. Gold and silver are considered primarily for analysis as these have been lucrative to the Indian investors and hence are studied in parallel with the stock returns. Internal variables and their performance revealed interdependence between these variable with returns on stock, gold and silver. GDP and Inflation has significant influence on Stock Return whereas Money supply had the same on Gold Returns.

Venkatraja, B. (2014) spent time analyzing the existence and extent of relationship between the performance of Indian Stock Market with context to the various macroeconomic variables. These variables include price of gold, index of industrial production, inputs from foreign institutions in terms of investment, wholesale price index and the effective exchange rate. Analysis was conducted on grounds of monthly data collected starting April 2010 and spanning until June 2014. Technique involved behind the research was regression methodology. As an outcome of the research it was discovered BSE Sensex was positively influenced by all the macroeconomic variables listed above except the gold price, in fact gold price had an inverse relation with Stock market variations for BSE Sensex. In addition, it was discovered that coefficients of all the variables were statistically noticeable except for the index of industrial production.

Luthra and Mahajan (2014) in their study aimed to analyze the impact which certain macroeconomic factors had on BSE Bankex. The fundamental variables covered for the analysis

include growth rate of GDP, inflation rate, exchange rate and the price of gold. Shedding details on the BSE Bankex, it is basically an index launched by BSE that includes the banks (both public and private sector) listed on the Bombay Stock Exchange. Index of BSE BANKEX has online visibility and display across the nation on the BOLT trading terminals. As an outcome of the study it was evident and conclusive that BSE Bankex was influenced positively by the exchange rate, rate of inflation and GDP, however was inversely impacted by Gold Price. Further it was concluded that stock prices for banks were not at all influenced by any of these variables.

3. METHODOLOGY AND DATA COLLECTION

The research methodology starts with collecting secondary data on macroeconomic variable Gold Price and Indian stock exchange (BSE - SENSEX) on the basis of objective defined.. It is followed by quantitative analysis of the data using both descriptive and inferential statistics technique.

	Null Hypothesis	Alternative Hypothesis
Gold Price Per Ounce on INR	There is no significant relation between Gold Price (GP) and Indian Stock Market	There is a significant relation between Gold Price (GP) and Indian Stock Market

3.1. VARIABLE – GOLD PRICE

Gold has been used in the market since 1971 as a commodity. The importance of gold has been increased in the present world due to the financial crisis in the present economic world. The investors are investing in the Gold. In the recent decade the gold prices and oil prices rise day by day. Gold is treated as an alternative investment avenue. It is often stated that gold is the best preserving purchasing power in the long run. Gold also provides high liquidity; it can be exchanged for money anytime the holders want. Gold investment can also be used as a hedge against inflation and currency depreciation. From an economic and financial point of view, movements in the price of gold are both interesting and important. It is often argued that investment in gold is historically associated with fears about rising inflation and/ or political risk. However, financial markets do not currently show the classic symptoms associated with such fears. Gold is a financial instrument that owns the characteristics of both a commodity and currency. In the past it was used as money and as a medium of exchange. Nowadays, it acts as a store of wealth and it is a known instrument for investment uses. It has been highly demanded for many reasons such as scarcity, highly mobile, liquidity and uniformity. The price of gold depends on the supply and demand for the commodity and government auction policy. Since gold is also used to hedge the risks, investors tend to replace their shares with gold, which results in a lower demand for shares and volatility on stock markets. Therefore, getting a better understanding of this linkage will help investors and firms to diversify their portfolios and reduce their risks.

3.2. RESEARCH DESIGN

To achieve the defined objective of current study, different methods have been used. To start with, to fulfill the research objectives, descriptive statistics like standard deviation, coefficient of determination, mean, etc. are supported to show the nature and basic characteristics of the variables used in the analysis. Correlation and Regression model is the next step to move towards the objectives of this study and finding any relation between the stock market and macroeconomic variables

3.2.1. DESCRIPTIVE STATISTICS TECHNIQUE

Descriptive statistical analysis is conducted to define the effect of changing values on measures of central tendency, variation and shape. The descriptive statistical tools calculated for measurement of macroeconomic variables and Indian stock index SENSEX. The descriptive statistics of the secondary data also helps in understand the hidden patterns of the macroeconomic time series.

3.2.2. CORRELATION AND REGRESSION

Correlation is a term that refers to the strength of a relationship between two variables. Correlation matrixes of all variables including their transformation are determined. The correlation coefficients thus calculated, indicate strength of relationships between these variables. Correlation coefficients can range from -1.00 to +1.00. The value of -1.00 represents a perfect negative correlation while a value of +1.00 represents a perfect positive correlation. A value of zero means that there is no relationship between two variables.

Linear Regression is a statistical analysis which uses an independent variable to assess the outcome of the dependent variable Y. Simple linear regression relates two variables (X and Y) with a straight line (Crawley, 2012a). The regression analysis is used to find the connection between one dependent variable and at least one independent factor. It is also used for either expectation or anticipating, and can be then used to fit a prescient model to an independent and dependent informational index.

3.3. DATA COLLECTION

In this study, data was collected for variables BSE-SENSEX and Gold Prices for the duration starting from Jan 2000 to Sep 2016.

BSE SENSEX DATA

A stock index is a tool used by shareholders, investors and financial experts to illustrate the market and also to compare the return on specific investments. Market indexes are intended to represent an entire stock market and thus track the changes in the market over time. The Table

3.1 below contains the monthly closing data of BSE-SEXSEX for the last 67 quarters with 201 observations for the period starting from Jan, 2000 to Sep, 2016.

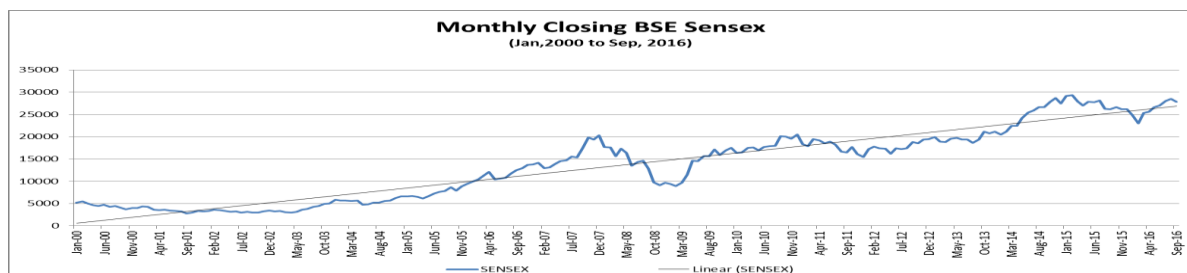
Table 3.1: Monthly closing of BSE - SENSEX (Jan, 2000 to Sep, 2016)

Year	Monthly Closing											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	5205	5447	5001	4658	4434	4749	4280	4477	4090	3711	3998	3972
2001	4327	4247	3604	3519	3632	3457	3329	3245	2812	2989	3288	3262
2002	3311	3562	3469	3338	3126	3245	2988	3181	2991	2949	3229	3377
2003	3250	3284	3049	2960	3181	3607	3793	4245	4453	4907	5045	5839
2004	5696	5668	5591	5655	4760	4795	5170	5192	5584	5672	6234	6603
2005	6556	6714	6493	6154	6715	7194	7635	7805	8634	7892	8789	9398
2006	9920	10370	11280	12043	10399	10609	10744	11699	12454	12962	13696	13787
2007	14091	12938	13072	13872	14544	14651	15551	15319	17291	19838	19363	20287
2008	17649	17579	15644	17287	16416	13462	14356	14565	12860	9788	9093	9647
2009	9424	8892	9709	11403	14625	14494	15670	15667	17127	15896	16926	17465
2010	16358	16430	17528	17559	16945	17701	17868	17971	20069	20032	19521	20509
2011	18328	17823	19445	19136	18503	18846	18197	16677	16454	17705	16123	15455
2012	17194	17753	17404	17319	16219	17430	17236	17430	18763	18505	19340	19427
2013	19895	18862	18836	19504	19760	19396	19346	18620	19380	21165	20792	21171
2014	20514	21120	22386	22418	24217	25414	25895	26638	26631	27866	28694	27499
2015	29183	29362	27957	27011	27828	27781	28115	26283	26155	26657	26146	26118
2016	24871	23002	25342	25607	26668	27000	28052	28452	27866			

Source: www.bseindia.com

The below figure 3.1 depicts the trend graph of BSE SENSEX for the last 67 quarters along with the linear trend line. Over the last 16 years market has been growing at the CAGR of approx. 11% which is more than the GDP growth rate. Sensex has grown 4 times starting Aug, 2004 to Dec 2007 and seen a sharp fall during global recession between Jan, 2008 to Mar, 2009 by 50% of what it was in Dec 2007.

Fig 3.1: Monthly closing of BSE - SENSEX data (Jan, 2000 to Sep, 2016)



GOLD PRICE (GP)

The table 3.2 below contains the monthly closing data of Gold Price (GP) for the last 67 quarters with 201 observations for the period starting from Jan, 2000 to Sep, 2016.

Table 3.2 – Monthly closing of Gold Price (Jan, 2000 to Sep, 2016)

Year	Monthly Closing – Gold Price per Ounce											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	12360	12806	12067	12007	12135	12872	12459	12678	12597	12387	12608	12811
2001	12271	12416	12015	12323	12575	12729	12531	12869	14024	13377	13204	13332
2002	13694	14465	14702	15080	16006	15561	14818	15161	15650	15318	15413	16648
2003	17567	16561	15891	15943	16993	16078	16368	17217	17754	17504	18232	18991
2004	18106	17906	18397	17276	17849	18196	18151	18874	19161	19305	20171	18935
2005	18428	18985	18666	18966	18130	19005	18635	19101	20806	21233	22750	23090
2006	25096	24669	25936	28925	30233	28245	29449	29014	27520	27186	28928	27972
2007	28727	29407	28762	27885	26762	26493	26874	27468	29606	31045	31046	32862
2008	36352	38874	37452	35288	37604	40024	39083	36597	41540	36135	40794	42374
2009	44945	48685	46498	44193	45960	44767	45025	46652	47900	48843	54690	50606
2010	49794	51095	50080	52311	55985	57777	54247	58611	58730	59829	63481	62846
2011	60922	63898	64172	67892	69211	67299	71963	83511	79339	83852	91149	81303
2012	86232	86747	84696	87020	87493	89252	90207	91697	93675	92473	93885	90814
2013	88548	86422	86864	79142	78768	70834	79928	92151	83045	81366	78299	74504
2014	78381	82216	77146	77715	73892	79090	77786	78019	75131	71484	73395	76125
2015	78053	75031	74283	74963	76090	74569	70427	75449	74653	74646	70780	70125
2016	75466	84498	81917	85277	81556	89144	89893	87680	88052			

Source: www.YCharts.com for Gold Prices per ounce in INR

4. EMPIRICAL ANALYSIS

4.1. DESCRIPTIVE STATISTICS ANALYSIS

In this study, data was collected for variables BSE – Sensex and Gold Price per Ounce (GP) for the duration of Jan 2000 to Sep 2016. The table 4.1 below depicts the descriptive statistics analysis of 201 monthly closing of BSE Sensex and Gold Price (GP). The recorded skewness for BSE SENSEX is of 0.2 and Gold Price (GP) is of 0.3 as per Hilderand (1986) absolute values of skewness above 0.2 indicates great skewness.

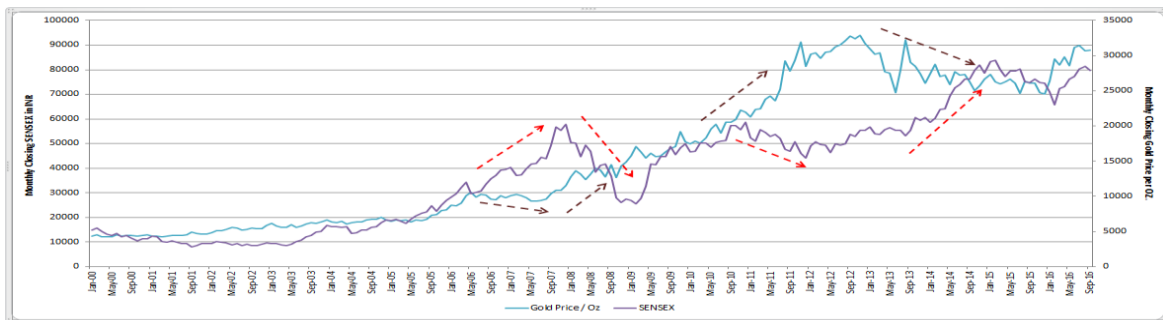
The recorded kurtosis for BSE SENSEX is -1.1 and Gold Price (GP) is -1.5 which is normal according to George, D., & Mallery, M. (2010) values for asymmetry and kurtosis between -2 and +2 are considered acceptable in order to prove normal univariate distribution.

Table 4.1: Descriptive Statistics Analysis

Descriptive Analysis	SENSEX	Gold Price
Mean	13690.6	45017.3
Standard Error	566.4	1986.3
Median	14564.5	37452.0
Mode		
Standard Deviation	8029.7	28161.1
Kurtosis	-1.1	-1.5
Skewness	0.2	0.3
Range	26549.9	81878.0
Minimum	2811.6	12007.0
Maximum	29361.5	93885.0
Confidence Level (95.0%)	1116.8	3916.8
CV	58.7	45017.3

The figure 4.1 below depicts the trend analysis based on two variables one dependent variable i.e. BSE SENSEX and another one independent variable i.e. Gold Price (GP). The graph below represents on one axis monthly closing BSE SENSEX and on another axis monthly closing GP per ounce. There have been multiple instances of inverse relationship in the below 201 observations which has been represented with dotted arrows. The red dotted arrow line represents that whenever SENSEX has moved up gold per ounce have gone down and become cheaper represented with brown arrow showing downward or vice versa.

Fig 4.1: Trend Analysis of Gold Price and BSE Sensex



4.2. CORRELATION METRICS

The table 4.2 below depicts the summary of correlation analysis that shows the relevance and relationship Gold Price and BSE – Sensex two variables. In case of **gold prices**, as the Sensex rises the price of gold decreases. Increasing gold prices are a traditional indicator of a recession or a downturn in an economy (Dutta et al., 2014). From the correlation analysis between Sensex and Gold, **p=0.8719**, in this research study, the high correlation in comparison to the literature relevance and empirical reports. In an empirical study by Najaf & Najaf, (2016); it was found that there was no long run connection between securities exchange of India and gold markets. It was found that with 94% change in stock exchange the change in gold price is mere 9% indicating very low relationship between the two variables, gold and Sensex. However, in another research by

Dutta et al., (2014); found that the impact of exchange rates and gold price on Sensex in the long period. The researcher however contradicts that there is a very strong relationship between the gold price and its influence over stock exchange. Mukhuti, 2013; investigated the inter-relationship between stock market index and gold price. The researcher’s finding however is congruent to the current study as there was a steady relationship between the two stock market indices and gold price in India from the findings of Mukhuti & Bhunia, (2013). Therefore, in the long-run gold price in India is significantly influenced by Indian stock market indices and thereby Sensex is influenced. Thus, from the current correlation analysis and relevance from the literatures it is evident that there is a strong relationship between Sensex and gold prices.

Table 4.2: Summary of correlation statistics

Correlation	SENSEX	Gold Price
BSE SENSEX	1	
Gold Price (GP)	0.8719*	1

4.3. REGRESSION ANALYSIS

From the summaries for the significance value was found for Gold Price (GP) is zero. The p-value for Gold Price (GP) shows the hypothesis that the coefficient is equivalent to zero. A low p-esteem (< 0.05) shows that the invalid and can be rejected. Thus, from the analysis of p-value data in table 4.3, it can be interpreted that both the independent variable had significant values with .000, However, since the regression significance is evaluated on the basis of p-value, the alternative hypothesis is accepted while the null hypothesis is rejected.

Table 4.3: Regressions Model

Linear Regression						
Source	SS	Df	MS	Number of obs	=	201
				F(5, 195)	=	491.35
Model	11947000000.00	5	2389400000.00	Prob > F	=	0
Residual	948286503.00	195	4863007.71	R-squared	=	0.9265
				Adj R-squared	=	0.9246
Total	12895000000.00	200	64477175.80	Root MSE	=	2205.2
Summary of Regression						
Sensex	Coef.	Std. Err.	T	P>t	95% Conf	Interval
Gold Price	-0.1077265	0.018469	-5.83	0	-0.14415	-0.0713
_cons	-78915.51	3965.375	-19.9	0	-86736	-71095

5. CONCLUSION

Study has found that the microeconomic variable Gold Price had a positive impact on Sensex. Based on correlation and regression, individually it has been found that the variable Gold Price showed significance to influencing Sensex. With this the variable rejects the null hypothesis. Thus, it can be implicated that the Gold Price has a positive impact and relation to the Sensex.

	Null Hypothesis		Alternative Hypothesis	
Gold Price Per Ounce on INR	There is no significant relation between Gold Price (GP) and Indian Stock Market	False	There is a significant relation between Gold Price (GP) and Indian Stock Market	True

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