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## **INVESTMENT POTENTIAL ANALYSIS OF GOLD, BSE SENSEX AND BOND: A COMPARATIVE ANALYSIS FROM INDIA**

**Dr. Khujan Singh<sup>1</sup>,**

Haryana School of Business (Guru Jambheshwar University of Science & Technology),  
Hisar-125001, Haryana, India

**Anil Kumar<sup>2</sup>**

(Research Scholar)

Haryana School of Business (Guru Jambheshwar University of Science & Technology),  
Hisar-125001, Haryana, India

### **ABSTRACT**

This study has been conducted to find out any causality between gold return, the BSE sensex index return and government bond return with maturity period of 10 years. Monthly data of gold prices, BSE sensex index and government bond yields with maturity period of 10 years have been collected from the period April, 2003 to December, 2016. The empirical results found negative relationship between gold returns and the government bond returns and the BSE sensex index return over the period of study. Granger causality test found bidirectional relationship between gold return and the BSE sensex index return while unidirectional relationship found between bond return and BSE sensex index return or gold return and the bond returns during the study period. The Sharpe ratio suggests that BSE sensex index investment is more efficient than gold investment according to the findings based on the study period.

**Keywords:** Gold price, BSE sensex index, government bond yield, Sharpe ratio, Granger causality test and correlation analysis

### **1. Introduction**

Gold has been used for accumulation of wealth in terms of precious metal and as monetary unit since its discovery. Gold has been centre of attraction for producers, consumers, and investors across the world throughout the history. Gold plays a significant role of hedging against inflation in the long run and sometimes gold price volatilities are also significant in short run but gold always able to maintains its real purchasing power value during financial and currency crisis. Safe haven property of gold has been a topic of debate in the world and in India too among the investor's fraternity (Bhunia, 2013). Since the establishment of WTO lot of financial crisis has been recorded all over the world. These crises sometimes have negative impacts on portfolio

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management of different social classes and on investment returns. Basically, inflation, interest rates, dollar rates, debt effect, global instability, demand and supply of gold, central bank policy, future market management etc. affect the gold price considerably. Financial crisis, level of inflation rate and political instability are significant variables which have negative impact on stock market returns, then stock market influences the gold market significantly and simultaneously bond market. Then they flocked to the safe haven gold and gold price increased further. Accordingly, crude oil and gold in India have directly and indirectly significantly influence the stock market, for which Indian investors have fear to invest any sum further in the stock market (Kapusuzoglu, 2011).

## 2. Review of Literature

In this section available important studies related to equity, gold and bond market have been reviewed which are given following.

Siegel, J. J. (1992) found equity returns are significant in comparison to fixed income investments and gold during the study period that is from 1802 to 1990. The real rate of return on equity remains constant while real rate of return of fixed income assets declined over the period of study. Bhattacharya, B., & Mukherjee, J. (2002) did not find any causal relationship between BSE sensex stock prices and money supply, BSE sensex stock prices and national income and BSE sensex stock prices and interest rate. Index of industrial production leads the BSE sensex stock price, and bidirectional cause and effect relationship is found between BSE sensex stock price and inflation rate in India during 1992 to 2001 by applying unit root tests, cointegration and granger causality test.

Zhang, Y. J., & Wei, Y. M. (2010) noticed that the crude oil price and the gold price both follow same pricing pattern and have significant positive correlation in the study period from 2000 to 2008. The crude oil price change Granger causes the volatility of gold price only unidirectional.

Do, G. Q., & Sriboonchitta, S. (2010) brought into being that granger causality observed short term association from gold market to stock markets of ASEAN countries during the period July 2000 to March 2009 and Johansen cointegration test found no cointegration among the stock markets of ASEAN nations.

Le, T. H., & Chang, Y. (2011) originated that the crude oil price has influence on the gold price but the impact is non-linear and long term relationship found between crude oil price and gold price during 1986 to 2011.

Simakova, J. (2011) revealed that positive correlation exist between gold price and oil price during the period 1970 to 2010 in long run by applying Granger causality test, Johansen cointegration test and Vector Error Correction model.

Ray, S. (2012) found that stock price, oil price and gold price are significantly negatively correlated. However stock price, interest rate, foreign exchange reserve, balance of trade, gross domestic product, index of industrial production was positively correlated during 1991 to 2011. Granger causality test found unidirectional causality between stock price and inflation rate,

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foreign direct investment, gross domestic product, exchange rate and gross fixed capital formation, while bi directional cause and effect relationship exist among stock prices and foreign exchange reserve, money supply, crude oil price and whole price index.

Bilal, A. R. et. al. (2013) did not find any long term relationship between gold prices and Karachi Stock Exchange (KSE), but gold prices and BSE stock index significantly correlated in long run from 1st July 2005 to 30th June 2011. Granger causality test also proved that there is no causal relationship among KSE stock index, BSE stock index and gold prices.

Bhunia, A. (2013) found significant association between two commodity market indicators (i.e. world crude oil price, Indian gold price) and BSE sensx index in the long run and there is bidirectional causal relationship present between BSE sensx index and both world crude oil price and Indian gold price during 1991 to 2012.

Singh, B., & Nadda, J. B. (2013) found positive return in gold in the study period 2005 to 2013 and risk involved in gold is 1/3<sup>rd</sup> less than the risk involved in stock market and suggested that gold investors need not to understand complex market strategies and investment tools. Gold investors should buy gold ETF rather than physical gold.

Mukhuti, S., & Bhunia, A. (2013) after applying the bivariate cointegration test did not find any cointegration between gold price, BSE and Nifty but multivariate cointegration test found steady cointegration between gold price, BSE and Nifty during 1991 to 2012.

Kothari, A., & Gulati, D. (2015) found significant positive correlation between BSE and gold price, while Granger causality test revealed unidirectional causality from BSE sensx to Gold Prices during 1979 to 2013. But investment comparison analysis suggests that the investment in gold will not be beneficial in case of buy and hold strategy in long run.

### **3. Statement of the problem and Objective of the study**

On the basis of reviewed studies it can be stated that numbers of studies have been conducted to test the investment potential of different financial assets with different maturity periods. But very few studies have been carried out in which investment potential of gold, BSE sensx index and government bond return have been checked. This is very important for the institutional and individual investors. In recent times Indian government policies regarding the New Pension Schemes have been changed drastically. The return of individual saving are totally depend on the option selected by the employee i.e. balanced fund, debt fund and equity oriented fund. Therefore an attempt has been made here to examine the *“Investment Potential of Gold, BSE Sensx Index and Government Bond yield”* with maturity period of 10 years through empirical analysis and testing any causality exist between them.

### **4. Research Hypothesis**

To achieve the objective following hypothesis has been formed:

**H<sub>1</sub>**: Gold return does not Granger cause BSE Sensx return.

**H<sub>2</sub>**: BSE Sensx returns does not Granger cause Gold return.

$H_3$ : Gold return does not Granger cause Bond return.

$H_4$ : Bond return does not Granger cause Gold return.

$H_5$ : Bond return does not Granger cause BSE Sensex return

$H_6$ : BSE Sensex returns does not Granger cause Gold return

## 5. Research Methodology

This empirical research is based on secondary data for time period 2003 to 2016. For this study monthly data of BSE closing price collected from Yahoo finance website. Government bond yield data with 10 year maturity collected from Reserve Bank of India website. Monthly gold price data collected from World Gold Council website in rupee denomination. The empirical analysis is based on Correlation analysis, Augmented-Dickey Fuller unit root test, Granger-Causality test and Sharpe single index model. The first step in the analysis is to tests the stationarity of the time series. Correlation analysis is used to find any relationship among the BSE Sensex return, Gold return and bond return with maturity period of 10 year. Granger causality test is applied to test the causal relationship among the studied variables.

### Augmented Dickey-Fuller (ADF) Unit Root Test

ADF unit-root test is used to determine stationarity of the time series data. The following testing procedure is applied to the model:

$$\Delta x_t = \alpha_0 + \beta_t + \phi x_{t-1} + \sum_{m=0}^n \alpha_m \Delta x_{t-1} + \varepsilon_t \dots\dots (1)$$

Where

$x_t$  = tested time series

$\Delta$  = first difference of time series

$m$  = lag order of the autoregressive process.

### Granger Causality Test

Engle-Granger causality test is applied to check the causality between the gold return, BSE sensex return and bond return. Suppose X is said to be Granger cause Z, if Z is estimated with greater accuracy by using previous values of X. The regression equations for Granger Causality model is written as follows:

$$x_t = \alpha_0 + \sum_{i=1}^k \alpha_i x_{t-i} + \sum_{j=1}^l \beta_j z_{t-j} + \mu_t \dots\dots (2)$$

$$z_t = \gamma_0 + \sum_{i=1}^k \gamma_i z_{t-i} + \sum_{j=1}^l \delta_j x_{t-j} + \theta_t \dots\dots (3)$$

Where,

$x_t$  and  $z_t$  are the variables

$\mu_t$  and  $\theta_t$  are white noise errors

t is the time period

i and j are the number of lags

The null hypothesis is  $\beta_j = \delta_j = 0$  for all  $j$ 's and the alternative hypothesis is  $\beta_j \neq \delta_j \neq 0$  for some  $j$ 's. Since coefficient of  $\beta_j$ 's are significant but coefficient of  $\delta_j$ 's are not significant then Z causes, while in opposite case X causes Z. If both are significant, than causality is bidirectional.

**Correlation Method**

Correlation analysis is used to identify the relationship and the direction of the relationship between two variables. The formula for the correlation analysis is as follows:

$$r = \frac{N(\sum XY) - (\sum X)(\sum Y)}{\sqrt{N \cdot \sum X^2 - (\sum X)^2} \sqrt{N \cdot \sum Y^2 - (\sum Y)^2}} \dots\dots\dots (4)$$

Where,

N = Number of pairs of variables

$\sum XY$  = sum of the products of paired variables

$\sum X$  = sum of x variable

$\sum Y$  = sum of y variable

$(\sum X)^2$  = square of the sum of x variables

$(\sum Y)^2$  = square of the sum of y variables

**Sharpe Model**

The Sharpe single-index model measures risk and the return of a security. Mathematically the Sharpe model is expressed as:

$$R_{it} - R_f = \alpha_i + \beta_i (R_{mt} - R_f) + \varepsilon_{it} \dots\dots\dots (5)$$

Where

$R_{it}$  = security return at time t

$R_f$  = risk free rate

$\alpha_i$  = security's alpha or abnormal return

$\beta_i$  = security's beta or responsiveness to market return

$\varepsilon_{it}$  = residuals return

**6. Empirical results and discussion**

Table: 1. Correlation matrix

|               | Gold return | Sensex return | Bond return |
|---------------|-------------|---------------|-------------|
| Gold return   | 1.0000      | -0.6241       | -0.5129     |
| Sensex return | -0.6241     | 1.0000        | -0.5794     |
| Bond return   | -0.5129     | -0.5794       | 1.0000      |

(Source: Author's own)

Table 1 depicts the result of correlation analysis of gold return, BSE Sensex return and government bond return with 10 year of maturity. Gold return and BSE Sensex return have significantly moderate negative association between them. If gold returns move in positive direction the return

of BSE sensex move in opposite direction. There is also significant negative correlation exist between gold return and the return on government bonds with maturity period of 10 years. Return of BSE Sensex and return of government bonds with 10 year maturity period are significantly negatively correlated.

Table: 2. Results for the ADF unit root test at the levels

| Variable      | Intercept, with no trend | Intercept, with trend |
|---------------|--------------------------|-----------------------|
| Gold return   | -17.9678                 | -0.9540*              |
| Sensex return | -0.8936                  | -0.9117*              |
| Bond return   | -0.06502                 | -0.09516              |

(Source: Author's own, \*significant at the level of 5 percent)

Table 2 depicts the results of Augmented Dickey Fuller test applied to test the stationarity of data both at levels for intercept with no trend or intercept with trend. The Augmented Dickey Fuller test is conducted for gold return, BSE Sensex return and government bond return with maturity of 10 years. After applying the Augmented Dickey Fuller test only gold return and BSE Sensex return are found stationary and significant at the confidence level of 5 percent. But government bond return with maturity of 10 years is not stationary and not significant at 5 percent level of significance. The time series data must be stationary to fulfil the precondition of Granger Causality test.

Table: 3. Results for the ADF unit root test at first order difference

| Variable      | Intercept, with no trend | Intercept, with trend |
|---------------|--------------------------|-----------------------|
| Gold return   | -17.9778                 | -17.9721*             |
| Sensex return | -7.3159                  | -7.3177*              |
| Bond return   | -2.4634                  | -2.4638*              |

(Source: Author's own, \*significant at the level of 5 percent)

Table 3 reveals the results of Augmented Dickey Fuller test at first order difference applied to test the stationarity of data for intercept with no trend or intercept with trend both. The Augmented Dickey Fuller test is conducted at the first order difference for gold return, government bond return with maturity of 10 years and BSE Sensex return time series data. Gold return, BSE Sensex return and government bond return with maturity period of 10 years all the variables are found stationary and significant at 5 percent level of confidence. Now the absolute computed value of Augmented Dickey Fuller test statistic is smaller than the critical value at 5 percent. At the first difference the gold return series, BSE Sensex return series and government bond return series with maturity period of 10 years become stationary.

Table: 4. Results of Granger causality test

| Null Hypothesis                                  | F - statistics | Probability |
|--|----------------|-------------|
| Gold return does not Granger cause Sensex return | 1.27069        | 0.0368*     |
| Sensex return does not Granger cause Gold return | 0.06337        | 0.0016*     |
| Gold return does not Granger cause Bond return   | 2.29784        | 0.1040      |
| Bond return does not Granger cause Gold return   | 1.66321        | 0.0130*     |
| Bond return does not Granger cause Sensex return | 1.46611        | 0.2341      |
| Sensex return does not Granger cause Bond return | 2.35741        | 0.0098*     |

(Source: Author's own, \*significant at the level of 5 percent)

Table 4 shows the result of Granger Causality test. Hypothesis ( $H_1$ ) gold return does not Granger cause BSE Sensex return is rejected because the probability value (0.0368) less than the critical value of significance 0.05. Therefore gold return has influence on the BSE Sensex return. Hypothesis ( $H_2$ ) BSE Sensex return does not Granger cause Gold return is also rejected because p value is (0.0016) less than significant value 0.05. Hence BSE Sensex return has a significant impact on gold return. Gold return and BSE Sensex return has bidirectional relationship between them at the significance level of 5 percent. Hypothesis ( $H_3$ ) gold return does not Granger cause Bond return (government bond return with maturity period of 10 year) is accepted because p value is 0.1040 greater than critical value of significance 0.05. But Hypothesis ( $H_4$ ) is rejected because the p value is 0.0130 which is less than the critical value 0.05 and government bond return with maturity period of 10 year does granger cause gold return. The relationship between government bond return with maturity period of 10 year and gold return is unidirectional. There is no causal relationship exist between government bond return with maturity period of 10 year and gold return. Hypothesis ( $H_5$ ) bond return with maturity period of 10 year does not Granger cause BSE Sensex return is not rejected because the probability value is 0.2341 is greater than the level of significance value 0.05. Hence bond returns with maturity period of 10 years does not have influence on the gold return. But Hypothesis ( $H_6$ ) is rejected that BSE Sensex return does not Granger cause bond return with maturity period of 10 year because the probability value 0.0098 is less than significant value 0.05. Consequently, BSE Sensex return does Granger cause bond return with maturity period of 10 year means that there is unidirectional relationship between them but there is no causal relationship found between BSE Sensex return and bond return with maturity period of 10 year.

Table: 5. Sharpe Model results

|                        | Gold   | BSE Sensex | Bond  |
|------------------------|--------|------------|-------|
| Average monthly return | 0.860  | 1.399      |       |
| Annual return          | 10.316 | 16.79      | 7.581 |
| Monthly Std. dev.      | 4.055  | 6.828      |       |
| Annual Std. dev.       | 14.048 | 23.655     |       |
| Excess return (Rm-Rf)  | 2.753  | 9.209      |       |
| Sharpe Ratio           | 0.194  | 0.389      |       |

(Source: Author's own)

Table 5 represents the Sharpe model results of absolute and risk adjusted return for gold and BSE Sensex index. The results shows that BSE Sensex index generate 16.79 percent annual rate of return with 23.65 percent standard deviation which makes BSE index a better investment vehicle than gold investment because gold has 10.32 percent annual rate of return with 14.05 percent standard deviation. The return of gold is less than BSE sensex index, on the contrary gold investment is less volatile comparatively to BSE sensex index because the standard deviation value of gold return is less than BSE sensex index. The Sharpe ratio of BSE Sensex index is 0.389 while gold investment's Sharpe ratio is 0.194 which indicates that BSE Sensex index return is more efficient investment than gold investment.

## Conclusion

The result of correlation analysis suggests that gold return has significant negative correlation with BSE sensex index return and government bond yield. But these results are not supported by the Granger causality test. The Granger causality found positive bidirectional relationship between gold return and BSE sensex index return which implies cause and effect relationship between them. The unidirectional relationship is found between bond return and gold return or BSE sensex index and bond return. The results of Sharpe ratio show that BSE sensex index return is more efficient than gold return. The findings of this study have relevant implications for the institutional investors and particularly for the salaried class person in taking investment decisions for managing their respective portfolio.

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