

A Study on Dynamic Relationship between Indian Gold Price and Sensex

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Abstract:

This paper examines the dynamic relationship between Gold price, and stock market returns with particular reference to Bombay stock market index (SENSEX) by using various time series econometric models from the period of almost 20 years from January 2000 to November 2019 (4903 daily observation). The study finds that there is a unidirectional relationship exists in between gold price and Sensex returns. This study witnessed there is a long-run equilibrium relationship between both the variables and they are moving together. The stock price can be used to predict the gold price in India. Hence, investors have the opportunity to reap the benefit of the portfolio diversification by gaining knowledge from this study.

Keywords: Gold Price, SENSEX, Granger Causality, Co-integration, ADF.

1. Introduction

World economic history reveals that the Gold was the first metal which excavated by human beings, and it was used as a medium of exchange in ancient eras. From those Golden days to till today the modern era, the gold has some unique character among all other metals. From the investor's point of view, gold is one of the best attractive investment avenues and it has a notable place in the world monetary system. Most of the counties are used as security against the loan when they have had a deficit in their balance of payments. So, there is no credit risk attached to gold.

Moreover, during the financial crisis, the gold price was increased by 6 percent at that time other portfolios like equity dropped by around 40 percent and this is the only investment avenue which maintains its liquidity even at the time of financial hikes and inflations, so investors can easily convert into money at any time which they want. Few studies stated that gold price is one of

the macroeconomic variables for countries economic growth. Some of the reviews suggest that gold investment is the best investment diversification. That all caused as the Gold as the best and 'safe heaven' asset in all over the world. Especially countries like in India will believes that holding gold is a pride for their family and its traditional customs believes. The recent study mentioned that more than 1000 tons of gold consumed in Indian families, and they are trading every day. Since its frequently traded, the gold price has significantly had an impact on the stock price also its necessary to find the relationship between them. Therefore, gold has become the main focus of the research in the field of finance today. This research article aims to examine the relationship between Indian gold price and Sensex.

Review of Literature

A wide variety of studies has been done to understand the relationship between stock price and gold price. Some of them are referred to as the

reviews of the literature. (Smith, 2001) This study described the relationship between the gold price and US stock market price at the very first time in the history of stock market studies. The study found that gold price and US stock price are not cointegrated, and the results of Granger causality reveals there is unidirectional causality from US stock returns to returns on the gold price. It followed by (Capie, Forrest-Mills, Wood, & Geoffrey, 2005) Investigated the exchange rate and gold price returns, and the results show there is an inverse relationship between Yen and Dollar with the gold price. (Zhang, 2010) Examined the cointegration relationship between Oil and gold price, the result indicated that there is a significant impact price change of both the variables which affected directly.

(Wang, 2010) Explore the impact of price fluctuation in crude oil, gold and exchange rate of the US dollar with various stock markets. The study used daily time-series data, and they found there is long term relationship as well as short term relationship between crude oil price, gold price and exchange price with the primary stock market such as Germany, Japan, China. (Mishra, 2010) This study an attempt to analyse the gold price volatility and stock market return in India. The Granger causality test discloses that there is a bidirectional relationship between the gold price and stock market return

(Sujith & Rajesh Kumar, 2011) In their study examines the dynamic relationship among gold price, stock returns, exchange rate and oil price by using VAR model. As a result, shows that exchange rate is positively affected by gold price and oil price, but stock price negatively affects by the price change. (Thai-Ha, 2011) This study makes a dynamic relationship between the price of oil, gold and financial variables in japan, and it proves that there is a short-run impact with interest rate and long-run relationship with oil and gold.

(Kaliyamoorthy S, 2012) Found that there is no association with gold price and stock market price both are independent nature. It proved that the gold price doesn't have any relationship with stock market price changes. (Seuk Wai Phoong, 2013). This study investigates the oil price and gold price effect in the various stock market, and the outcome indicates that there is a relationship between the gold price and stock market return in selected Asian countries such as Malaysia, Singapore, Indonesia and few other.

Since there is a multiple of opinion as to whether gold price had an impact on the stock market return are not its very debatable issue, and it should be addressed in the research. Hence it needs to be investigated empirically in nature whether it has any impact or not; this study carried to examine the dynamic relationship between the gold price and Sensex in India and will help to policymakers.

Objectives of the Study

- ✓ To investigate the stationarity of the gold price and stock market returns data series.
- ✓ To analyse the short and long-run relationship between the gold price and Sensex returns
- ✓ To determine the direction of the causal relationship between the variables.

Research Methodology

This study is wholly based on secondary data and its empirical study. All the data used for this study was acquired from the official website of Bombay Stock Exchange (Sensex) and World Gold Council a few other information from yahoo finance. The daily market data were collected for the period between January 2000 to November 2019 (4903 daily observation). The daily gold prices are in the international price of rupee value unit per troy ounce. Hence, both variables are different. So, the data were converted into returns, the logarithmic difference has calculated it as per the following equation

$$R_t = (P_t) - (P_{t-1}) / (P_{t-1})$$

Where R_t is the daily market index at time t . P_t denotes the market index at time period t , and P_{t-1} denotes the market index in the selected market at time period $t-1$. For analysis, the data “Eviews 10” statistical software package was used to perform econometric analysis such as the Jarque-Bera test is a goodness-of-fit measure of departure from normality, based on the sample kurtosis and skewness. Augmented Dickey-Fuller (ADF) test (Stationarity), correlation test (short-term relationship), Granger causality (cause and effect relationship), cointegration test (long-run relationship)

Analysis and Interpretation

Table -1 presents the descriptive statistics of the gold and stock market return.

Table - 1

Statistics	Gold Return	Stock Return
Mean	6.6880	16.3259
Std. Dev	212.19	602.47
Skewness	0.1215	-0.3572
Kurtosis	9.9206	15.7674
Jarque-Bera	9638.7	32867.2
Probability	0.0000	0.0000

Source: Author’s Calculation.

As per the table, it is observed that the average mean returns of the stock market are higher than gold return and Standard deviation of market return is very high, which denotes the market is more volatile, and it's highly risky too. The skewness for the returns for gold is positive (non-asymmetric) and the stock market is negative, which means it is asymmetric. The kurtosis value is higher than 3, indicating that the data is leptokurtic. The Jarque-Bera test for normality portrays a significance level of 5%, showing much higher than the critical value. Hence, the rejection of the null hypothesis that

means the time series data are not normally distributed

Augmented Dickey-Fuller Unit Root Test

Before examining the relationship between gold price returns and stock market returns, it is essential to check the univariate properties of the data series are non-stationary, or they contain a unit root. For that, the ADF unit root test was calculated as per the following equation

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^m \alpha_i \Delta Y_{t-i} + \varepsilon_t$$

Where δY_{t-1} is the first difference operation, $\beta_1, \beta_2 t$ are coefficient to be estimated. $\delta = 0, \varepsilon_t$ Is white noise error term, if the estimated slope of coefficient n_t in this regression δ (hypothesis) is zero or not. if it is zero, then Y_t Is nonstationary. The ADF null hypothesis is there as unit root in the time series, whereas, the alternative is - there is no unit root, and it is stationary. It observed and presented in table 2

Table - 2

ADF Levels	Coefficient (Gold)	Probability	Coefficient (Sensex)	Probability
At level	-0.2832	0.9250	0.5243	0.9876
1 st Difference	73.356	0.0001	-63.941	0.0001

Source: Author’s Calculation.

On observing the table 2, it shows that at level gold price and Sensex data series, critical values are more than the 5% confidence level, it’s called non-stationary data. While taking into first level difference, the critical values both the data series are less than the 5% confidence level. So, the null hypothesis has rejected the data found to be stationary. Hence, the data should be taken into the first level for further calculations. Graphical representations of the ADF test are following in figure 1.

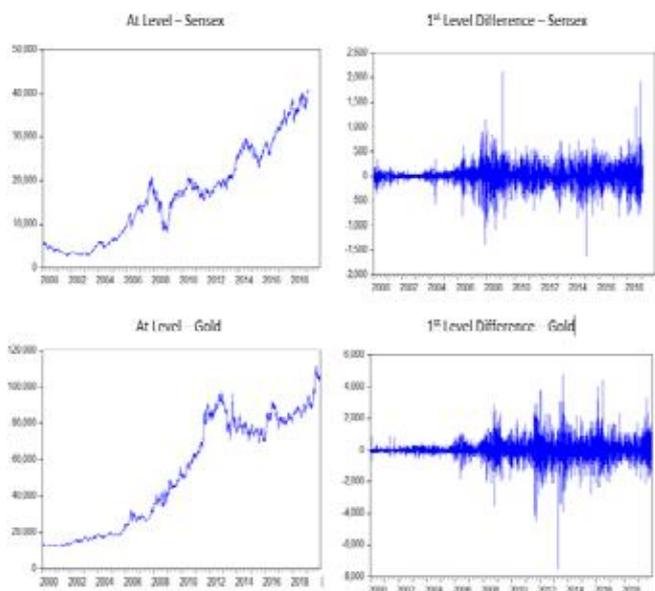


Figure - 1

Source: Author's Calculation.

From figure 1, depicts that the stationary levels of Sensex and Gold price. On the observation (from clockwise) shows the raw data of Sensex and 1st level difference of Sensex returns. 1st difference of Gold price returns and original price of gold.

Analysis of Granger Causality test

The Granger causality test is conducted to investigate the direction of causality between the Gold price return and Sensex returns. This test is applied only to stationary time series data. The test was calculated as per the following formula

$$\Delta Y_t = \sum_{i=1}^m \alpha_i Y_{t-i} + \sum_{j=1}^m \beta_j X_{t-j} + \lambda_1 t + \varepsilon_1 t$$

$$\Delta X_t = \sum_{i=1}^m \gamma_i X_{t-i} + \sum_{j=1}^m \delta_j Y_{t-j} + \lambda_2 t + \varepsilon_2 t$$

Where Δ is the difference operator, Y_{t-i} and X_{t-j} are represented as the lagged value of Y_t and X_t . ε_1 and ε_2 Are error terms assumed white noise. The lag length was picked by using the Akaike Information Criteria (AIC). The Test results are showed in Table 3

Table - 3

Null Hypothesis	F-Statistic	Probability
Gold Price Return does not Granger Cause Sensex Return	2.4286	0.0888
Sensex Return does not Granger Cause Gold Price Return	3.4061	0.0332

Source: Author's Calculation.

The above table – 3 result reveals that the returns of the gold price to Sensex do not have a significant relationship; hence the probability value is higher than 5% level so, the null hypothesis fails to reject. And in another way returns of Sensex to the gold price, the probability value is less than 5% level of significance. So as per the rule of thumb, the null hypothesis is rejected, and it proved there is a unidirectional relationship between Sensex and gold price. It indicates that, if any, changed In the Bombay stock market that will lead to an impact on the price of gold in the short run period.

Johansen Test of Cointegration

Cointegration test is the most widely used method in examining the long-run equilibrium relationship of the different time series or integration in the financial market. While examining the cointegration, the time series data should be non-stationary at the level, and it must be stationary at first difference. It calculated by using the following equation

$$\Delta y_t = \mu + \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-1} + \varepsilon_t$$

Where Π is the coefficient matrix, r is the number of cointegration relationships? Johansen proposed two different likelihood ratio tests of the significance of these canonical correlations and thereby the reduced rank of the Π matrix: the trace and max eigenvalue test, equation as following

$$J_{trace} = -T \sum_{i=r+1}^n 1n(1 - \hat{\lambda}_i)$$

$$J_{Max} = -T 1n (1 - \hat{\lambda}_{r+1})$$

Here T is the sample size and $\hat{\lambda}_i$ is the i^{th} most substantial canonical correlation. The trace tests the null hypothesis of r cointegrating vectors against the alternative hypothesis of n cointegrating vectors. The maximum eigenvalue test, on the other side, test the null hypothesis of r cointegrating vectors against the alternative hypothesis $r+1$ cointegrating vectors. The Test results are showed in Table 4

Table - 4

Hypothesised No of Integration	Trace Statistic	Max-Eigen Statistic	Critical Value 0.05 (5%)	Probability Value
None	3862.49	2061.66	15.4947	1.0000
At Most 1	1799.83	1799.83	3.84114	0.0000

Source: Author's Calculation.

From the above table 4, it is implied that both Trace statistics and Maximum Eigenvalues are more than the critical value of a 5% level of significance. So, it rejected the hypothesis and proved there is a long-run relationship between gold price returns and Sensex returns. Thus, information is following from the stock market to gold price and both are share common long-run information.

Findings

From this study, it is found that in the short-run period, there is a unidirectional relationship between Sensex return to gold price return. The reason being, almost all the investors are ready to invest in the stock market instead of the gold market, and they want to speculate stock in a short period. During long-run relationship between Gold Price and Stock market return were closely associated. The reason being investors are willing to invest in long term benefit-oriented

investments. In such gold and stock will satisfy the conditions; hence there is a relationship in price movement of gold and capital in a long period. Therefore, in the long run, the price of gold and stock movement depends on each other. This study will help to small retail investors to get more benefit out of it.

Conclusion

This study was intended to examine the relationship between the gold price and Bombay stock exchange price return (Sensex) by using various econometric models for the period from January 2000 to November 2019. It found that the data considered for the study was non-stationary, but while checking ADF at first level, it was stationary. The Granger Casualty test suggests that there is unidirectional causality between Sensex to the gold price. Johansen Cointegration test revealed that there is a long-run relationship between the gold price and stock market return in India. This study shows that the investors are well-informed with the information on the relationship of gold price and a stock price that enable to diversify their investment portfolios in India.

References

1. Capie, Forrest-Mills, Wood, T. C., & Geoffrey. (2005). Gold as a hedge against the Dollar. *Journal of International Financial Markets, Institutions and Money*, 343-353.
2. Gujarati, D. N. (2009). *Basic Econometrics*. Delhi: Tata McGraw-Hill Education.
3. Kaliyamoorthy S, P. S. (2012). Relationship of the Gold market and stock market: AN ANalysis. *International Journal of Business Management Tomorrow*, 1-6.

4. Mishra, P. D. (2010). Gold price volatility and stock market returns in India. American Journal of scientific research, 47-55.
5. SeukWaiPhoong, M. (2013). A Markov Switching Vector Error Correction Model on Oil Price and Gold Price effect on stock market returns. Information Management and Business Review, 331-336.
6. Smith, G. (2001). The price of gold and stock price indices for the united states. The world gold council, 1-35.
7. Sujith, K., & Rajesh Kumar, B. (2011). Study on the dynamic relationship among gold price, oil price, exchange rate and stock market returns. International Journal of Applied Business and Economic Research, 145-165.
8. Thai-Ha, Y. C. (2011). Dynamic Relationship between the price of oil, gold and financial variables in Japan: A bounds Testing Approach.
9. Wang, C.-P. T.-Y. (2010). The relationship among oil price, GOLD price, Exchange Rate and international stock markets. International Research Journal of Finance and Economics, 80-89.
10. Zhang, Y.-J. W.-M. (2010). The Crude oil market and the gold market: Evidence for co-integration, causality and price discovery. Resource Policy, 80-89.