



## **A LONG RUN RELATIONSHIP BETWEEN GOLD PRICE AND INFLATION- EVIDENCE FROM THE INDIAN EXPERIENCE**

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### **Abstract:**

*The study examines the long run relationship between gold price and inflation from the Indian experience. The main objective of the study is to identify whether there is long run relationship between the gold price and inflation. For the investigation three year monthly data from July 2011 to June 2014. The study is conducted by Augmented Dickey Fuller Unit Root Test, Johansen Co-integration Test and Granger Causality Test and finally came to the conclusion that there is no long run relationship between gold price and inflation.*

### **Keywords:**

*Gold price, inflation, unit root, granger causality, co-integration*

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## **1. INTRODUCTION**

Gold is the world's most precious metal and oldest medium of exchange. India is the world's largest consumer market in gold. The gold standard is a monetary system that is most common basis for monetary policies throughout human history. It is considered as precious metal with wide uses, a store of wealth for a long time, the measure of economic power of nations and the cornerstone of international monetary regimes. In the world Indian household hold the largest stock of gold both in the form of jeweler and investment. Two third of the Indian demand in gold comes from the rural area of the country. It is viewed as a secure, liquid investment, a capital and value preserver and is the second preferred investment after bank deposit.

India's domestic production of gold is very limited and the rising demand has to be sourced from outside the country. Gold as a commodity on its own does not add much to the productive capacity of the economy. Indian gold price are normally expressed in rupees per 10 gram at 995 purity or per 10 tola at 999 purity. As per world gold council India is a major importer of gold and global trend in pricing directly on the domestic price. The Indian gold demand in 2012 -13 was the golden day for the gold as it broke all previous record. In India Gold price show a upward trend in every year since 1971 to till now.



Inflation is a sustained increase in the general price level of goods and service in an economy over a period. Gold is widely considered an inflationary hedge. Inflation is a worldwide macroeconomic problem owing to its adverse implications for economic expansion and income redistribution. Gold price is attracted more considerable attention for their potential effect on inflation. It serves as a good store of value that is expressed to affect the inflation rate positively. The problem of the study is the relationship between the gold and inflation in the Indian market.

The object of the study is whether there is long run relationship between the gold price and inflation from the Indian experience.

The paper is structured as follows: In section 2 reviews of literature on relating with the study and methodology. In section 3, the data and methodology used for the study is stated. In the section 4, the empirical analysis and result of the data for the study is included. In the final section, the conclusion of the study is presented.

## 2. LITERATURE REVIEW

The study relating on the relationship between gold and inflation and on the basis of research methodology are:

**Ghosh et al (2002)** <sup>(1)</sup> In their study about the gold as an inflation hedge made an attempt to reconcile an apparent contradiction between short-run and long-run movements in the price of gold. A theoretical model is developed that suggests a set of conditions that would have to be satisfied for the price of gold to rise over time at the general rate of inflation and hence be an effective long-run hedge against inflation. The finding show that movements in the nominal price of gold appear to be dominated by these short run influences and consequently the long-run relationship is of much less importance.

**Wainwright (2005)** <sup>(2)</sup> In their new research, indicates that gold is a superior predictor of inflation when compared with other measures such as the Consumer Price Index (CPI) and oil. The research provides strong support for gold's long assumed role as a hedge against extreme events and economic shocks, including inflationary shocks. The two pieces of research "Inflation Protection: Why Gold Works Better Than "Linkers" and "Why Gold, Not Oil, Is the Superior Predictor of Inflation" indicate that Gold is an effective way to gauge and combat the ravages of inflation on a portfolio, Gold consistently moves earlier than official measures of inflation - using the Consumer Price Index to formulate a sound strategy for protecting investments against inflation bound to fail and Oil is a relatively poor performer as a leading indicator of inflation. Because gold is an asset that goes up with inflation and actually increases at several times the rate of inflation. It is an excellent choice to be used alongside inflation indexed bonds.



**Worthington and Pahlavani (2006)**<sup>(3)</sup> In their research attempted to test the presence of a stable long-run relationship between the monthly price of gold and inflation in the United States from 1945 to 2006 and from 1973 to 2006. The inflation hedging quality of gold depends on the presence of a stable long-term relationship between the price of gold and the rate of inflation. The results suggest the most significant structural breaks in both markets correspond to the gold market moving to purely open market operations and the acceleration of inflation in the 1970s. A modified co-integration method incorporating these breaks indicates that a strong co-integrating relationship exists between gold and inflation, suggesting that gold is a useful inflation hedge in the post-war and post-1970s period.

**Blose (2010)**<sup>(4)</sup> In their paper examines how unexpected changes in the CPI affect gold prices. Two different hypotheses support to explain the relationship between expected inflation and gold prices. The expected inflation effect hypothesis argues that changes in expected inflation will cause immediate changes in gold prices. This study used unexpected changes in the CPI as a measure of changes in expected inflation. The tests show that unexpected changes in the CPI did not affect the price of gold on the day of the announcement.

**Beckmann and Czudaj (2011)**<sup>(5)</sup> In their study has analyzed whether gold provides the ability of hedging inflation for four major economies, namely the USA, the UK, the Euro Area, and Japan, by allowing for nonlinearity and discriminating between long-run and time-varying short-run dynamics. The main findings are gold is partially able to hedge future inflation in the long-run. The price for gold should be considered when aiming to appropriately forecast the inflation rate.

### 3. DATA AND METHODOLOGY

The present study examines whether there is any long run relationship between the gold price and inflation. Monthly data covering a period of three years from July 2011 to June 2014 for inflation and gold price has been used in the present study. Inflation is considered as the monthly rate in India. Gold price is measured as price per ten grams of gold. Data for the variables are collected from database of Indian economy maintained by reserve bank of India.

#### **METHODOLOGY**

Being an internationally traded commodity the domestic price of gold is greatly influenced by exchange rate fluctuations. To see whether this is the case, the present study attempts to analysis the link between fluctuations in domestic gold price and exchange rate fluctuations. Two widely used statistical tools namely granger causality test and Johnson co-integration analysis have been used in the present study. Since the use of time series data involves the problem of spurious correlation, Augmented Dickey Fuller test has been used to determine the stochastic properties of both exchange rate and the gold price. The Dickey Fuller test in the most general form is:



$$\Delta y_t = \beta_1 + \beta_2 t + \gamma y_{t-1} + \sum_{i=1}^n \alpha_i \Delta y_{t-i} + \varepsilon_t \quad (1)$$

The significant of  $\gamma$  has been determined by Dickey Fuller Statistic tabulated by Dickey and Fuller.

The Granger Causality Test involves estimating the following pair of equations:

$$EX_t = \sum_{i=1}^n \alpha_i GP_{t-i} + \sum_{j=1}^n \beta_j EX_{t-i} + \varepsilon_{it} \quad (2)$$

$$GP_t = \sum_{i=1}^n \lambda_i GP_{t-i} + \sum_{j=1}^n \delta_j EX_{t-i} + \varepsilon_{it} \quad (3)$$

Where EX is the exchange rate and GP is the price of gold. The causality between the two is determined by testing the significance of the coefficient of lagged variables in both equations by using the F statistics.

Johansen procedure involves the use of two test statistics based on the characteristics roots obtained from a  $P^{\text{th}}$  order VAR namely.

$$\lambda_{trace} = -T \sum_{i=r+1}^n l_n(1 - \hat{\lambda}_i) \quad (4)$$

$$\lambda_{max} = -T l_n(1 - \hat{\lambda}_{r+1}) \quad (5)$$

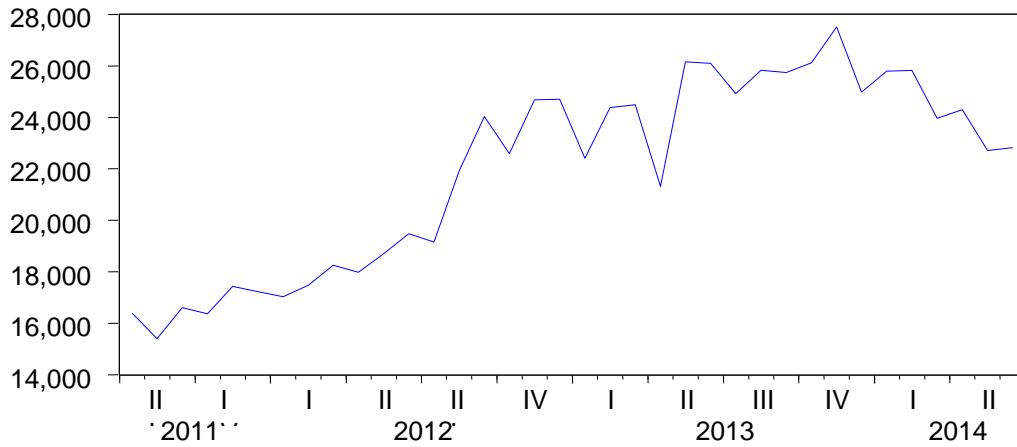
A decision regarding the existence of a long run relationship is based on the value of the test statistic obtained from sample

#### 4. EMPIRICAL ANALYSIS

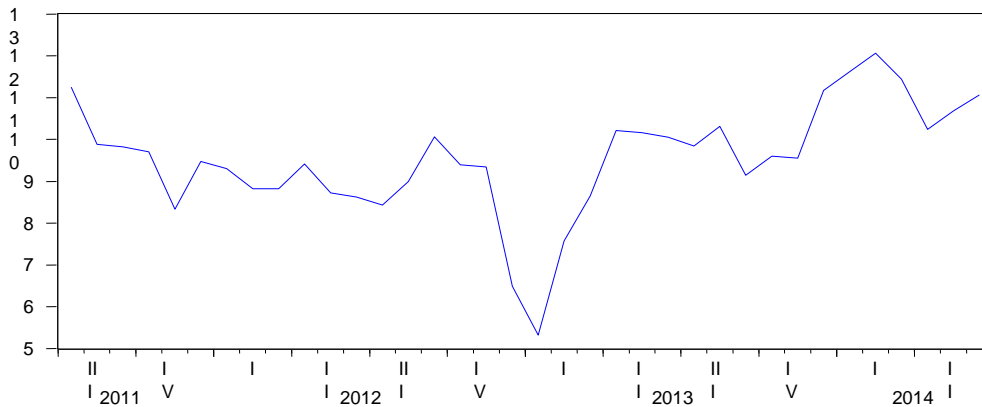
To examine the relationship between spot price of gold and inflation rate. The graph of the spot price of gold and inflation rate for the period from July 2011 to June 2014 is show in the graphs below:



### The Spot Price of Gold



### The Inflation Rate



Since we cannot use non-stationary variables for testing granger causality or for VAR modeling, the stationary of all four series is tested using Augmented Dickey Fuller test. It is clear from the data that both series are non-stationary in the level but stationary in first differences.



**Table 1:** Unit Root Test of Gold

Variable	Test statistic	P-value
Spot price	-0.480776	0.9793
$\Delta$ spot price	-7.499265	0.0000**
Inflation rate	-2.972659	0.1542
$\Delta$ inflation rate	-5.248810	0.0009**

\*\*indicates significance at 1% level

To assess whether there is any long run relation between spot price and inflation rate, we adopt the Johansen test for Cointegration. The test is based on two test statistics namely trace statistics and maximum Eigen Statistics.

**Table 2:** Johansen co-integration test

Hypothesized No of CEs	Eigen Value	$\lambda_{trace}$	$\lambda_{max}$
None	0.196305	11.62245 (0.176)	7.430223 (0.4396)

Figures in brackets are P values.

Both  $\lambda_{trace}$  and  $\lambda_{max}$  statistics indicates no cointegration between inflation rate and spot price of gold. So we conclude that there is no long-term relationship between these two variables.

## 5. RESULTS AND DISCUSSION

By analyzing the data using Augmented Dickey- Fuller Unit Root Test, Johansen cointegration test and Granger Causality test the results obtained are the following. The Augmented Dickey Fuller Unit Root test is conducted for stationary and the test has concluded that gold price and inflation are non-stationary but stationary in first difference. Granger Causality test is conducted to known the causality between the gold price and inflation. The test result suggests no causality between them. The Johansen co-integration Test also shows the absence of long run relationship. Thus we conclude that there is no co-integration between inflation and gold price.



## 6. CONCLUSION

This paper investigated the long run relationship between gold price and inflation for a period of three years of daily data from July 2011 to June 2014. The Augmented Dickey Fuller unit root test concluded that gold price and exchange rate are non stationary but stationary in first difference. Granger Causality test concluded that there is no causality between them. The Johansen cointegration test also indicates that there is no cointegration between inflation and gold price.

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