Effect of Macroeconomic Factors on the Price of Gold in India

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Abstract

The prices of gold have been rising at a very fast pace. This study focuses and observes the effect of different macroeconomic factor which include the foreign exchange rate, crude oil prices and the rate of inflation which may have a significant effect on the price of gold in the context of the Indian economy. For this purpose, in the study the data of foreign exchange rates and crude oil prices have been collected for a period of 10 years. The tools of correlation and regression analysis have been used primarily to evaluate the relationship between each of the independent variables along with the dependent variable. It can observed from the results that the price of gold has a minimal relationship with the price of crude oil and a significant relationship with the foreign exchange rate. The results of this study can be useful to policy makers, analysts and investors which can help them understand various determinants of the price of gold and the help them make more informed decisions.

Keywords- price of gold, foreign exchange rate, crude oil prices, inflation rate, correlation and regression analysis

1. Introduction

As a metal gold is considered to be one of the most dense, conductive, non-destructive and brilliant metals which has a very high utility compared to any other metal. It is also an important factor in the economic growth and development of the country. The primary usage of gold is for the purpose of making jewellery in the Indian context. It is considered as the pride and most importantly a symbol of culture in many nations, especially India. Gold is considered to be one of the appealing option of investment among the different avenues and options available. It is used as a tool to hedge against inflation and compared to other investment options involves lesser risk and is comparatively a safe investment option. Apart from jewellery gold is also used as a tool which backs currency in form of gold bars widely known as gold bullion.

Although growth and development at a stable pace is difficult in low income countries or developing countries, gold has a sentimental value attached in a country like India which will ensure its demand over the years collectively.

The growth of an economy can be administered by the reserves of gold held by the country and when we look at the several economic factors and the like inflation and the dollar exchange rate, these factors can have a considerable impact on the price movements of gold in the long run and the short run. Over centuries, gold has maintained its purchasing power as an important saving and investment instrument. In the ancient times, gold formed the basis of the monetary system (Aylin Erdoğdu 2017).

1.1 Indian Culture and Gold

In a developing country like India the purchase of gold is considered as one of the most important investment avenues. It is a process where individuals maximise their assets. Gold in the form of a metal and an ornament is identified as the very essence of the Indian culture and India is one of the largest consumer of gold in the form of both bullion and ornaments. In the Indian economy there are several factors people consider while purchasing gold.

Irrespective of the level of income of the individuals, gold is something which is purchased and held by most of the individuals in the smallest to the largest of quantities as a mode of investment expecting a rise in price of its future value. The most important attribute is the value of money and the future expectations with respect to the rise in the price of gold.

2. Review of Literature

Tripathi et.al (2014) in the study explains the relationship between gold price in India and several macroeconomic factors like the US dollar, Crude oil and other global factors which impact the price of gold and are the major reasons of its fluctuations. Sindhu (2013) in her study constituted a significant relationship between all the macroeconomic factors and the price of gold. The article also suggests how gold is different from all currencies as it doesn't lose its purchasing power or is rather more stable than paper currency. Sukri et.al (2015) considers gold as a good investment which is neither a short term or a long term investment in Malaysia. In the article it has been identified as a hedging tool to offset losses.

The article establishes a significant relationship between gold and several macroeconomic factors in Malaysia, however states that the rate of inflation does not affect the price of gold in Malaysia.

Hashim et.al (2017) studied the economic factors affecting the price of gold by dividing them into dependent and independent variables, the price of gold being dependent on the independent macroeconomic factors. A correlation model was mainly employed to indicate the positive relationship between gold and the macro economic variables considered like interest rates, inflation etc. Nadim et.al (2014) in the present study explains a sharp rise in the prices of gold in Pakistan. Different tools were employed to study the impact of macroeconomic factors like descriptive statistics which explain that the international god price have a direct impact on the price of gold along with a high inflation rate which impact the price of gold.

Erdoğdu (2017) has displayed the impact of different macroeconomic factors on the price of gold by employing the model of correlation between the macroeconomic variables. The ARCH (autoregressive conditionally heteroscedastic) model which is a variance of time series used to identify the volatility of the price of gold. The

result identified is that there is no ARCH effect but the price of crude oil and the USD rate can influence the volatility of gold whereas the Consumer Price index and DJIA do not affect the price of gold. However the growth of economy leads to a decrease in the volatility of the price of gold.

Gnanendra et.al (2018) studied the economic variables with the use of tools like correlation and regression analysis analysing the impact of crude oil prices and interest rates where the crude oil prices have no significant relationship with gold prices and do not influences the prices of gold whereas the interest rates according to the analysis display a positive relation which means that it affects the price of gold in the economy. The variable of foreign exchange displays a moderate relationship with the price of gold as displayed by the regression analysis.

Bailey et.al (1993) in his paper list down the several macroeconomic variables that affect the commodity market components and this includes gold as one of the factors listed. The forecast model being employed by him indicates the future prices and the common risk which are considered. Regression analysis thus indicates that the macroeconomic risks and how the ex-ante risks and premiums considered are directed towards making the economy rational in its decisions and attain equilibrium.

Erb (2013) indicates and highlights gold as a tool to hedge against inflation and highlights its potential in covering the risks against inflation displaying the features of gold as a metal. It also indicates the usage of gold as currency hedge and this is displayed by him graphically using several sources and macroeconomic variables. It is understood how that gold is used as a tool to maintain purchasing power directly stating its relationship with inflation. The pressure on real and nominal prices has been highlighted.

2.1. Research Gap

The summary of the review of literature focuses on the different macroeconomic factors that have an effect on the price of gold. These macroeconomic factors have been analysed using different tools. Various authors have used tools to explain the long term and the short term impact of the macroeconomic factors on the price of gold. The significant variables have been considered in the above case where they have been observed to have a significant impact on the price of gold. However the gold price being very volatile and a subject to constant fluctuations owing to different macroeconomic factors which have an impact on it.

This study thus is an extension to the existing studies with a specific focus on the Indian Economy. Apart from this, it is observed that although there is a significant study carried on with reference to the effect of macroeconomic factors on the price of gold, different models are employed to achieve different results. This study is more specific and oriented towards understanding the effect of specific macroeconomic factors on the price of gold.

3. Research Design and Methodology

For the study, data has been collected for a period of 10 years on a monthly basis and yearly basis based on the variables identifying the different trends. The period of 10 years is considered improves the accuracy of the results. The scope of the study is limited to India and thus the results of the same will be applicable only to India.

For the purpose of analysis we will use the tools of correlation and linear regression analysis which will display if the variables are related and further display the extent of their relation.

The data has been collected from secondary sources from different verified sources for a period of 10 years. Monthly prices of gold, crude oil and foreign exchange rates have been collected along with annual rate of inflation. The data has mainly been collected from investing.com.

Correlation

Correlation refers to a statistical measure which indicates the extent to which different pairs of variables are related to each other and how strongly they may be related.

Regression Tool

It refers to a statistical tool or rather a technique which help in determining the relationship between different variables which each other. In mainly analyses and displays the relationship between the dependent variable and independent variable.

Hypotheses:

H_0: The crude oil prices prevailing in the country do not have any effect on the price of gold

H_1: The crude oil prices prevailing in the country have an effect on the price of gold

H_0: The rate of inflation does not have any effect on the price of gold

H_2: The rate of inflation has an effect on the price of gold

H_0: The exchange rate fluctuations do not impact the price of gold

H_3: The exchange rate fluctuations have an impact on the price of gold

Since the study is focused on the macroeconomic variables and its effect on the price of gold we will be considering the statistical tools for the purpose of analysis in order to ensure a much more efficient and transparent outcome from the analysis. The main statistical tools to be employed in the study are correlation analysis and linear regression analysis to understand if there is any relation between the price of gold and the macroeconomic factors as stated in the study. Eviews Student version Lite and Microsoft Excel have been used for the same in order to perform the tests and functions.

4. Data Analysis

4.1. Correlation Analysis

Table 1: Showing the correlation between the price of gold and crude oil price

	Price of Gold	Crude Oil Price
Price of Gold	1	0.232543242
Crude Oil Price	0.232543242	1

Source: Own Compilation

From the first table we can observe that the price of gold and the crude oil prices have a very low correlation of 0.23 which means that the changes in the crude oil prices have a very low impact on the gold price. This means that any change in the price of crude oil can result in the changes in the price of gold although the impact of the same will be on a small scale or a very minimal change with respect to gold price.

Table 2: Showing the correlation between the average price of gold and inflation rate

	Avg.Price.Gold	Inflation Rate (in %)
Avg.Price.Gold	1	-0.486717503
Inflation Rate (in %)	-0.486717503	1

Source: Own Compilation

From the second table of correlation analysis we can observe that the average gold price has been considered to explain how correlation between inflation and price of gold. It has been observed that there is a negative correlation of -0.48 between the inflation rate and the price of gold which is moderate implying that they move in the opposite direction and the price of gold is not affected by the changes in the level of inflation in the country.

Table 3: Showing the correlation between the price of gold and foreign exchange rate

	Price of Gold	Forex Rate
Price of Gold	1	0.744798567
Forex Rate	0.744798567	1

Source: Own Compilation

From the third table of correlation analysis, an observation of a high positive correlation of 0.74 between the foreign exchange rate and the price of gold has been observed which explains the extent to which the price of gold is impacted by the fluctuations in the exchange rates with respect to the economic scenario of the country.

4.2. Regression Analysis

Table 4: Showing the linear regression analysis between the price of gold and foreign exchange rate

Dependent Variable: PRICE_OF_GOLD
Method: Least Squares
Date: 01/23/20   Time: 14:43
Sample: 2010M01 2019M10
Included observations: 118

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5059.458	1907.981	2.651734	0.0091
FOREX_RATE	378.9473	31.52283	12.02136	0.0000

R-squared	0.554725	Mean dependent var		27764.24
Adjusted R-squared	0.550886	S.D. dependent var		4385.282
S.E. of regression	2938.838	Akaike info criterion		18.82622
Sum squared resid	1.00E+09	Schwarz criterion		18.87318
Log likelihood	-1108.747	Hannan-Quinn criter.		18.84529
F-statistic	144.5131	Durbin-Watson stat		0.185498
Prob(F-statistic)	0.000000			

Source: Own Compilation

Table 5: Showing the linear regression analysis between the price of gold and crude oil price

Dependent Variable: PRICE_OF_GOLD
Method: Least Squares
Date: 01/23/20 Time: 14:21
Sample: 2010M01 2019M10
Included observations: 118

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	23948.89	1533.172	15.62049	0.0000
CRUDE_OIL_PRICE	0.855482	0.332205	2.575163	0.0113
R-squared	0.054076	Mean dependent var		27764.24
Adjusted R-squared	0.045922	S.D. dependent var		4385.282
S.E. of regression	4283.409	Akaike info criterion		19.57969
Sum squared resid	2.13E+09	Schwarz criterion		19.62665
Log likelihood	-1153.202	Hannan-Quinn criter.		19.59876
F-statistic	6.631463	Durbin-Watson stat		0.102868
Prob(F-statistic)	0.011276			

Source: Own Compilation

Table 6: Showing the linear regression analysis between the average price of gold and inflation rate

Dependent Variable: PRICE
Method: Least Squares
Date: 02/03/20 Time: 11:55
Sample: 2010 2019
Included observations: 10

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.51527	0.228362	46.04650	0.0000
INFLATION	-0.153677	0.116980	-1.313701	0.2254
R-squared	0.177446	Mean dependent var		10.22316
Adjusted R-squared	0.074627	S.D. dependent var		0.170963
S.E. of regression	0.164461	Akaike info criterion		-0.595436
Sum squared resid	0.216378	Schwarz criterion		-0.534919
Log likelihood	4.977181	Hannan-Quinn criter.		-0.661823
F-statistic	1.725809	Durbin-Watson stat		0.921508
Prob(F-statistic)	0.225368			

Source: Own Compilation

The linear regression analysis displaying how the dependent variable is affected by each of the independent variables in different manners the dependent variable being the price of gold. Table 4 at a significance level of 0.05 we reject the null hypothesis which means we will accept the alternative hypothesis in the first case indicating the dependent variable is affected by the changes in the independent variables.

The value of p for regression analysis in the table 5 is 0.0113 which indicates that there is a significant relationship between the price of gold and crude oil prices.

Further when we look at the table 4 with the value of p 0.00, indicates that there is a very significant relationship between the dependent variable and the independent variable implying that the price of gold has a very significant relationship with the foreign exchange rate. Any change in the rate of foreign exchange will directly impact the price of gold at the given significance level of 0.05.

Finally when we look at table 6, at the given level of significance level of 0.05, the value of p stands at 0.2254 which indicates that there is no significant relationship between the price if gold and the rate of inflation. Any change in the rate of inflation will not affect the price of gold at the given level of significance.

5. Findings and Discussion

The findings of the study suggest that-

- When we look at the results analysed we can observe that there exists a significant relationship between the price of gold and crude oil prices. The price of gold (dependent variable) is dependent on the changes in price of crude oil (independent variable) considered in this study, thereby identifying that the macroeconomic variable considered has a considerable impact on the price of gold.
- There exists a very significant relationship between the price of gold and the foreign exchange rate when we observe the results where the foreign exchange rate is the independent variable considered displaying that it does have an impact on the price of gold which is the dependent variable considered and identified in the study.
- There exists no significant relationship between the rate of inflation and the price of gold and this is displayed from the results analysed, the rate of inflation being the independent variable considered in the study, and the price of gold being the dependent variable is not affected by the changes in the level of inflation in the country as analysed in the study.
- There exists a low level of correlation between the price of gold and the crude oil prices.
- There exists a high level of correlation between the price of gold and the foreign exchange rate.
- There exists a negative correlation between the price of gold and the rate of inflation.
- Therefore it can be said that the there is no effect of inflation as a macroeconomic variable on the price of gold while the other macroeconomic variables which include the foreign exchange rate and the crude oil prices do have a significant effect on the price of gold and this means that the price of gold is dependent on several macroeconomic variables.

6. Conclusion

When we look at the results by analysing the different macroeconomic variables that have an effect on the price of gold, we can draw the above mentioned results. In order to understand and ascertain the results we have used the tools of correlation and simple regression analysis. When we look at the correlation analysis of crude oil prices and the price of gold, we can understand that although there exists a very low positive correlation between the two variables considered the simple regression analysis gives a clear indication of how the price of gold is dependent on the price of crude oil.

Further when we do observe how the correlation of price of gold and the foreign exchange rate in terms of dollars have been considered, there exists a very high correlation between the variables which clearly is also indicated through the regression analysis where the price of gold is determined by the changes in the price of foreign exchange. The significant relationship between both the above mentioned variables has been observed along with another economic variable considered which refers to the level of inflation or the rate of inflation which is being considered. There exists a low level of negative correlation between the rate of inflation and the price of gold which is also observed in the regression analysis implying that there is no significant relationship between the rate of inflation and the price of gold.

However when we consider the other two macroeconomic variables, we can see how each of the other variables considered in the study have a significant relation which affect the price of gold. We in this case accept the alternate hypothesis of the impact of crude oil price changes on the price of gold and the impact or rather the effect of foreign exchange rates on the price of gold. We on the other hand accept the null hypothesis in the case of the effect of inflation rate on the price of gold since the rate of inflation does not have any significant effect on the price of gold. The policy makers, analysts and the investors can thus make more informed decisions in the economic context as they can clearly understand the extent to which each of the above mentioned factors have an effect on the price of gold in the context of the Indian economy.

Recommendations:

- The Future researchers can resort to other macroeconomic variables and financial market indicators to clearly understand the reason of unambiguity when it comes to the price of gold by adopting a much more vigorous empirical or rather descriptive analysis which could be a possible area for future research in India.

- The Researchers can also study the relation between the level of imports of gold and the demand for gold, by analysing the reasons of the price fluctuations in depth as a possible area of research.

- The Future researchers can also use different models to study both the short and long term relationship between the price of gold and the different macroeconomic variables.

- The research ahead can also use tools to forecast the price of gold using the ARIMA model and other significant models as this research sets a simple foundation with respect to factors that have an effect on the price of gold in the long run.

- The researchers in the future can also resort to considering the interest rate and the consumer demand level to understand the price changes in gold.

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