IMPACT OF CRUDE OIL PRICES IN CHINA, INDIA AND USA ON THE GOLD PRICES

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ABSTRACT

The paper studies Impact of Inflation, Crude Oil prices and Exchange Rate on Gold Prices Fluctuations in India, China and USA. Applying co-integration and vector error correction models (VECM), Vector Auto Regression (VAR) and Granger Causality to data for 1996–2015 and found that Crude Oil Prices have the Short term Relationship with Gold Prices in India, China and USA and there is a bidirectional Causality in India and USA.

KEYWORDS: *Gold Prices, Oil Prices, Co-integration, VAR, VECM, Granger Causality, Co-integration*.

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Introduction

In India, oil demand for 2015, rose by 0.22 mb/d (Millions barrels per day), products like LPG, gasoline and diesel shows the gain to the Investors. Macro-economic variables also shown the support to low international oil prices but in China oil demand is fall by 0.05 mb/d because of lower growth rate and same situation arise in USA the demand is fall by 0.16 mb/d because of lower growth rate. In (Allese, 2008), (SitiNurulhuda Ibrahim, Rahul Bishnoi (2014), concluded that the relationship between the Oil Prices and Gold prices are positively correlated. (K. S. Sujit, 2011), (Bhunia, 2013) concluded that there is a long term relationship between the oil and Gold prices. So the study has been conducted to see the relevance of the literature and country India, China and USA are taken for the study.

Literature Review

Allese, 2008 studied the development of the price of Gold. The author has studied Gold market and the factors and trends from 1997 to 2007, which effect the Gold prices fluctuation. The study concluded that Oil and Gold Prices and USD positive correlated.

Sujit, 2011 thisstudy shows relationship among Gold price, stock returns, Exchange rate and Oil price. This study takes daily data from January 1998 to June 2011. Using techniques of time series they studies relationship among these variables using vector autoregressive and co integration technique. The results show that Exchange rate is highly affected by stock returns, Exchange rate and Oil price.

Bhunia, 2013 Study investigates the Co-integration relationships among Crude Oil price, domestic Gold price and selected financial variables (Exchange rates and stock price indices) in India for the period from January 2, 1991 to October 31, 2012. Johansen Co-integration test result indicates that there exists a long-term relationship among the selected variables. Granger causality test result shows that there must be either bidirectional or no causality among the variables.

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Ibrahim, 2014 this paper analyzed factors that affecting the Prices of Gold in Malaysia covering data for 10 years period which are from 2003 until 2012. The researcher used variables that affect the Prices of Gold which are Crude Oil Prices, CPI rates and Exchange rates. The empirical results have found there is negatively significant relationship between CPI rates and Exchange rates on Gold Prices, while a Crude Oil price is positively significant.

Bishnoi, 2014 This paper analyses the critical factors affecting the price of Gold using ordinary least square, white-test and weighted least squares taken yearly data from 1994 to 2013. The results show that Gold Prices, US dollar to Indian Rupee Exchange rate, and Crude Oil Prices are positively correlated albeit a negative relationship clearly emerges with the Rate of CPI, long run interest rates in the US and their Real GDP.

Dubey, 2014 Present study is based on the Gold price trends and what factors determine the Gold price in India. The paper specially focuses on increase in Gold Prices in India in the years between 2004 to 2013. According to empirical findings, highly positive correlation is found between Gold Prices and CPI rate of our country.

Jaiswal, 2015 The paper deals with various aspects attached to the paper basically uses the data available through journals, reports, articles etc. and concludes that Investing in Gold is potentially a way to maintain purchasing power. The purchasing power of Gold rises and falls as the real price of Gold rises and falls.

Shafiee, 2010 reviews that world Gold market and the historical trend of Gold Prices from January 1968 to December 2008. This is followed by an investigation into the relationship between Gold price and other variables like Oil price and Global CPI over the last 40 years. The study estimates the Gold price for the next 10 years, based on monthly historical data of nominal Gold price.

Objectives of the Study

Is to Study the Impact of Crude Oil Prices in China, India and USA on Gold Prices.

Research Methodology

The Period of the Study is from January 1996 to December 2015 Sample size Contains three countries India, China and USA. The study undertook the secondary data for analysis. The Monthly values of Oil prices taken from US Energy information Administration (oil prices),World Gold Council (Gold Prices) and National Bureau of Statistics of China etc. Statistical Tools and Techniques used are

Unit Root Analysis (Augmented Dickey Fuller), (Phillip Perron)

The ADF Unit root is based on null Hypothesis Ho:-Yt is Not I(0). If the calculated ADF Statistic is less than the critical value, then the null Hypothesis is rejected; otherwise accepted. ADF and Phillip Perronis used to see the stationarity between Gold Prices and Exchange rate of Rupee.

$$\Delta Yt = \alpha 0 + \alpha 1 Yt - 1 + \sum Yj \Delta Yt - j + Et$$

Vector Auto Regression

VAR Model is used to predict and analyze interrelated time series and dynamic effects that the random perturbations have on the variables system. There is no need to specify whether some variables are endogenous or exogenous. It shows the response of Exchange Rate and Gold Prices. It focuses more on the increase or decrease in trend. It is also used to detect the causal relationships among the variables.

Johansen Co-integration Test

The trace statistic can be specified as: Γ Trace

$$= -T \sum \log(1 - \lambda i)$$

Johansen Co-integration Test has been applied to check whether the long run Equilibrium relation exists between the Oil Prices and Gold Prices. It is based on two test statistic, i.e. Trace Test Statistic and the Maximum Eigen value test statistic.

Granger Causality Test

The Granger causality test is a statistical hypothesis test for determining whether one time series is useful in forecasting another.So study helps to determine whether Exchange Rate helps to determine Gold Prices. A time series Exchange Rate is said to Granger-cause Y if it can be shown, usually through a series of t-tests and F-tests on lagged values of Exchange Rate (and with lagged values of Gold Prices also included), that those Exchange Rate values provide statistically significant information about future values of Gold Prices.

$$\hat{t} = \sum_{i=1}^{m} B1Yt - 1 + \sum_{i=1}^{m} aiXt - i$$

$$X_{t=} \alpha 0 + \sum_{i-1}^{m} \alpha iXt - 1 + \sum_{i=1}^{m} \Lambda iYt - 1$$

Scope of the study

Growing variability in Gold prices in the recent years, validate the need to examine such fluctuation from January 1996 to December 2015.The data for 20 years has been taken for consideration and the three markets are considered i.e. India, China and USA for studying the determinants of Gold Prices. In reality Gold price did not solely affected by single factor. In the study, the relationship between the Crude Oil Prices, and Gold prices of the countries were being investigated.

Table 1: Descriptive Statistics of Gold Prices and Oil prices from 1996-2015

Particulars	Gold prices			Oil Prices		
	China	India	USA	USA	India	China
Mean	2.285630	2.285879	2.285838	2.3825	1.647937	0.914845
Standard Deviation	0.282718	0.282779	0.282538	0.5255	0.298477	0.314679
Skewness	0.228366	0.229379	0.2283	-1.4112	-0.204067	-0.455685
Kurtosis	1.477696	1.480270	1.4783	3.7455	1.772440	1.996587
Jarque-bera	25.26013	25.20037	25.240	85.221	16.73478	18.37432
Probability	0.0000	0.0000	0.0000	0.0000	0.0002	0.0001

Source: Authors compilation

Table 2: Unit Root Analysis of Gold Prices and Oil Prices

Unit Root	ADF		Phillip-Perron	
Null Hypothesis	T- Statistics	Prob	T- Statistics	Prob.
Gold price USA has a Unit Root	-13.01519	0.0000	-13.01519	0.0000
Gold price India has a Unit Root	-13.02951	0.0000	-13. 03678	0.0000
Gold price China has a Unit Root	-12.99907	0.0000	-12.99907	0.0000
Oil Prices of USA has a Unit Root	-10.06745	0.0000	-10.108025	0.0000
Oil Prices of India has a Unit Root	-9.765815	0.0000	-9.826013	0.0000
Oil Prices of China has a Unit Root	-20.15853	0.0000	-20.10238	0.0000

Source:-Authors compilation

Above Table 1 highlights the Descriptive Statistics of Oil and Gold Prices. The Data is Converted to logs Because of uniformity ,It gives information about Mean, Standard Deviation, Skewness and Kurtosis values of the India, China, USA for the period of January 1996 to December 2015.The dependent variable that is Gold Prices India has a Highest standard deviation i.e. 0.282779 and kurtosis value of 1.480270.which points out that Gold Prices of India moves around 0.0282779, Gold prices have shown an increasing trend because the Average value is increasing over the period of time . Oil price shows a highest standard deviation for USA i.e. 0.52550 Skewness shows that Oil prices are is Negatively Skewed between the three variables. Table 2 shows that the data is significant at 1% level (i.e. p value<1%) and

become stationary at First differenced so this data can be used to find the Johansen (1998) and Johansen and Juselius (1990) Co-integration for long term relationship.

Johansen Co-integration Test

To find the long term relationship by Co-integration first we have to decide the Lag length criteria by running a Normal VAR so from the VAR the length which is decided as per the Schwarz information criterion(SIC)is order(2) for Oil and Gold Prices of China, India, USA.

Table 3 Johansen Co-integration between Oil Prices and Gold Prices

Null Hypothesis Trace rank Test	Alternative Hypothesis	Eigen Value	Trace Statistic	Critical Values (0.05%)	P-values*
		India Oil and Gold Prices			
H_0: r = 0	H_1: r = 0	0.053441	13.58434	15.49471	0.0951
H_0: r = 1	H_1: r = 1	0.002393	0.567798	3.841466	0.4511
		USA Oil and Gold Prices			
H_0: r = 0	H_1: r = 0	0.042209	11.1464	15.49471	0.2027
H_0: r = 1	H_1: r = 1	0.003898	0.925514	3.841466	0.336
		China Oil and Gold Prices			
H_0: r = 0	H_1: r = 0	0.030887	8.089691	15.49471	0.4559
H_0: r = 1	H_1: r = 1	0.002756	0.653969	3.841466	0.4187
Max-Eigen Statistic	Alternative Hypothesis	Eigen Value	Max-Eigen Statistic	Critical values (0.05%)	P-values*
		India Oil and Gold Prices			
H0: r = 0	H: r > 0	0.053441	13.01654	14.2646	0.078
H_0: r ≤1	H_1: r > 1	0.002393	0.567798	3.841466	0.4511
		USA Oil and Gold Prices			
H_0: r = 0	H_1: r > 0	0.042209	10.22089	14.2646	0.1978
H_0: r ≤1	H_1: r > 1	0.003898	0.925514	3.841466	0.336
		China Oil and Gold Prices			
H_0: r = 0	H_1: r > 0	0.030887	7.435723	14.2646	0.439
H_0: r ≤1	H_1: r > 1	0.002756	0.653969	3.841466	0.4187

Source:-Authors Compilation

Table 3 shows that there is no Co-integration equation between India, USA, China Oil and Gold prices or we also find co-integrating variables when p value is less than 0.05% then there is a co-integrating variable in the equation. In above table we can see that all the p values are more than 0.05% then we conclude that there are no co-integrating variables and there is no long term relationship and we use VAR model to determine the Short term relationship between the variables.

Table 4 shows Vector Auto Regression (VAR) between Oil prices and Gold prices of China, India, and USA. It shows that in USA as the time goes Gold prices are decreasing. It means Gold prices are affected by its own past values. In China Gold prices Lag (-1) is significant at 1% level shows that today's prices are affected by its past one month prices but for Lag (-2) the today's prices are decreasing and it is accepted at 5 %level of significance.

Table 4 Vector Auto Regression between Gold prices and Oil Prices

Particular	USA Oil and Gold Prices		China Oil and Gold Prices		India Oil and Gold Prices	
Independent	Dep. Gold	Dep. Oil Price	Dep. Gold Price	Dep. Oil Price	Dep.Gold	Dep. Oil Price
	Price USA	USA	China	China	Price india	India
	1.134720***	0.179626	1.155***	0.012672	1.141484*	0.025582
	(0.06594)	(0.18758)	(0.06482)	(0.01074)	(0.06641)	(0.02684)
Gold Price (-1)	[17.2072]	[0.95761]	[17.8271]	[1.17940]	[17.1891]	[0.95328]
	-0.146370**	-0.155563	-0.1556**	-0.011249	-0.151667**	-0.016433
	(0.06551)	(0.18635)	(0.06508)	(0.01079)	(0.06630)	(0.02679)
Gold Price(-2)	[-2.23419]	[-0.83479]	[-2.39148]	[-1.04285]	[-2.28773]	[-0.61338]
	0.028271	1.3710***	0.06508*	0.696681***	0.163679	1.387393***
	(0.02152)	(0.06121)	(0.38367)	(0.06359)	(0.15004)	(0.06063)
Oil price (-1)	[1.31384]	[22.4001]	[0.16963]	[10.9553]	[1.09091]	[22.8826]
	-0.020819	-0.401***	-0.223804	0.247868***	-0.126736	-0.441314***
	(0.02161)	(0.06147)	(0.38148)	(0.06323)	(0.15136)	(0.06116)
Oil Price (-2)	[-0.96335]	[-6.53469]	[-0.58667]	[3.92013]	[-0.83733]	[-7.21529]
	0.739528	6.024608	2.400885	0.159229	1.127169	0.821920
	(1.39049)	(3.95520)	(1.53082)	(0.25373)	(1.40854)	(0.56920)
Constant	[0.53185]	[1.52321]	[1.56837]	[0.62755]	[0.80024]	[1.44400]

* Indicates significance at 10% ** significance at 5% ***significance at 1%

Source:-Authors compilation

Table 5 : Granger Causality Test between Gold Prices and Oil prices

Null Hypothesis	Obs.	F-Statistics	Prob.	Decision	Nature of Causality
USA Oil prices does not Granger Cause USA Gold Prices	235	2.51144	0.0309	Rejected	Causality
USA Gold Prices does not Granger Cause USA Oil prices	235	2.28138	0.0476	Rejected	Causality
China Oil prices does not Granger Cause China Gold Prices	228	0.46382	0.9338	Accepted	No causality
China Gold Price does not Granger Cause China Oil prices	228	0.77259	0.6783	Accepted	No causality
India Gold Prices does not Granger Cause India Oil Prices	235	2.71373	0.0211	Rejected	Causality
India Oil Prices does not Granger Cause India Gold Prices	235	2.82088	0.0171	Rejected	Causality

Source:-Authors Compilation

Table 5 shows the results of Granger Causality Test between USA, India, China, Gold prices and Oil prices. The selected lags for USA is Lag (5), China (12), India (5). And If the Probability value is less than 5% then we reject the null hypothesis i.e. There is no Causality between the variables. This test shows that if past values of Oil prices Causes the Present Value of Gold prices from above table we can conclude that USA Oil Prices and Gold Prices Probability is less than 5% so we reject the null hypothesis and Relationship between the USA Gold Prices and Oil prices are bidirectional causality between the variables. So past values of USA Oil prices causes the present value of Gold Prices and vice versa. In China we can conclude that China Oil and Gold Prices doesn't affect each other. In India we can see that null hypothesis is rejected so Oil prices and Gold prices are causes each other so there is bidirectional causality between the variables. The past values of Oil prices affecting today's Gold prices.

Conclusion

In this paper we have analyzed the impact of Crude Oil Prices on Gold Prices. We have taken the time series data from January, 1996 to December, 2015 and applied Co intégration, Granger Causality

test and Vactor auto Regression to assese the impact of Crude Oil Prices on Gold Prices. In India the relationship between the Crude Oil prices and Gold prices have Insignificant short term Relationship and the variables are not co integrated but the past values of Gold Prices affect the present values of Oil prices and Vice Versa so there is a bidirectionalcausality between the variables. In USA Gold Prices and Oil Prices are not co integrated and they have insignificant Short term Relationship between the Variables and also there is a bi directional causality i.e. past values of Oil prices affect the Present values of Gold prices and vice versa. In China Gold prices and Oil prices are not co integrated and they have significant positive short term relationship and there is no causality between the variables.

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