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## GLOBAL FACTORS & GOLD PRICE IN INDIA- A CAUSAL STUDY

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**Abstract:** *The present paper attempts to investigate the existence of causal relationship between gold prices in India and various other global factors vis-à-vis Foreign Institutional Investment (FII), Standard & Poor's 500 (S&P-500), Foreign Exchange Reserves(Forex Reserves), Exchange rate (USD) & Crude oil price. For the purpose of study monthly time series data of abovementioned variables have been studied covering the period of nine years from April, 2004 to March, 2013. In order to examine relationship among these variables Unit Root test, Co-integration test, Granger Causality test have been employed using E-Views 5 statistical software package. The results suggest long run integration between these variables further it was found that all abovementioned global factors do not Granger Cause Gold price in India however it was found that Gold price Granger Cause Exchange Rate (USD) and Crude oil price during the period under study.*

**Key words:** - Crude oil, FII, FOREX, Gold, S&P-500, USD, Unit root, Granger Causality test.

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## **INTRODUCTION:**

Gold, a metallic element has always been considered to be one of the most precious metals in the mankind's history and also one of the most liquid and widely accepted medium of exchange. Gold is measured as one of the most preferred investment avenues since its discovery. This glittering yellow metal has always fascinated all classes of investors irrespective of their gender, geographical location etc. due to the properties it offers such as liquidity, security & portfolio. One of the key features of gold is its less susceptibility to fluctuations in exchange rate and its ability to resist both internal and external changes in purchasing power of the domestic currency (Thai-Ha et al). Even in the era of industrialization the importance of gold is also evidenced from the fact that after the end of World War II, under the Bretton woods system the US Dollar remained pegged to gold at \$35 per ounce till 1971 when US, on its own suspended direct exchange of US Dollar and gold and thereby enabled switching to fiat currency system. Over the period of time various currencies dissociated with gold the last currency was Swiss Franc in 2000. Investors consider gold to be a safe haven especially during the period of economic downturn and/or political turmoil. Away from being a safe investment, with the changing scenario its role is also changing in the current paradigm. The Gold is now being traded and forecasted as a commodity (Greely & Currie, 2008). It is the world's oldest investment avenue used for hedging purposes. Gold has always been considered as a commodity providing cushion against declining purchasing power of money thus investment in gold is often made to thwart the impact of inflation and currency depreciation due to this ability gold has the property of preserving value. It also serves as an alternative source of investment in the event of bearish or volatile stock market. As both gold and stock are often substitutes to each other, universally there exists a reverse relationship between gold and stock prices because as the prices of gold rises the investors start investing less in gold & tend to park their holdings in stock market consequently its price falls and vice versa. There are some empirical evidence the gold could be hedge even against stocks, though only in short run (Baur and Lucey, 2010). When an economy experiences slow down with falling returns from stock market investors withdrew their holdings from stocks and park their investments in gold until the economy revives. The role of liberalized and developed gold market in the interest of consumers is being increasingly realized and the efforts are underway for



integrating the gold market with financial market (Reddy, 1997, 2002, Thorat, 1997, Bhattacharya, 2002).

The importance of this glittering yellow metal can also be recognized from the fact that it shares substantial portion of foreign exchange reserves of government and central banks all across the world. It is also evidenced from the world economic history that countries including India (in 1990s) had to park their gold holding as a security for loan to correct balance of payment disequilibrium. It has also been observed that the currencies having large backing of gold are stronger than others. It is evidenced from the historical gold and stock prices in India that whenever stock market falls or dollar weakens gold prices rises as gold becomes safe investment avenue under such circumstances (Gaur & Bansal, 2010). Similarly, gold also serves as an alternative source of investment to other financial assets such as securities, currencies, reality etc due to their volatility subjected to market conditions. Gold is now being used as an alternative for dollar since its collapse (Turk and Rubino, 2008). Another reason why gold is most preferred by an ordinary investor to other investment avenues is that it attracts no credit risk and can be easily liquidated at any time even in scenario of economic crisis, inflation and political unrest. The sharp rise in the price of gold & weakening dollar (for some time), tumbling stock market across the world aftermath of US subprime crisis, justifies its significance as an alternative to stock. The role of investment in gold has drawn more attention since this transformational economic crisis began to unfold in 2008 (Fei & Adibe, 2010).

Being a developing country having huge demand for steel & oil for maintaining its growth pace, India is also known for its gold chase. Over the period of time, demand for gold in India has not only been consistent but it registered sharp rise irrespective of fact that a large portion of gold demand in India is met through imports. In wake of tumbling Indian Rupee in the recent years, gold has emerged to be second largest imported commodity after crude oil. Despite the sharp recent price rise in the international gold prices the demand for gold has sustained, not only as a component of safe haven but also its social and cultural importance (Mishra R and Mohan G 2012). According to ASSOCHAM's report, India accounts for one third of the global demand for gold further demand for gold in India is irrespective of the size of its GDP as compared to other countries. Indian gold demand is 37.6 percent more than that of China & consumer demand of gold for USA stood at 213.5



tonne whereas in terms of percentage share India's GDP is 27.7 percent of China and a meager 11.0 percent of USA.

During the last few years, gold prices witnessed a dramatic volatility. Aftermath economic slowdown triggered by US Subprime crisis it came to emerge as an alternative source of investment to falling stocks & then depreciating currencies. Gold, in India witnessed boost in its prices with tumbling US Dollar & stock market on the backdrop of US Subprime crisis & subsequent euro zone crisis, but in the recent past with the signs of revival of US economy coupled with slow down in emerging economies the prices of gold started losing its glitter & experienced high volatility.

### **LITERATURE REVIEW:**

Though the prices of Gold in India are largely dependent on large number of factors such as its production, demand, substitute investment avenues etc. yet there also exists influence of different global macroeconomic factors on the prices of Gold in India. Keeping in view the significance of the global economic factors on the prices of gold, number of studies has been carried out across the world thus; there is an availability of ample literature in this regard.

Kolluri (1981) found the existence of association between gold price and inflation rate which can be utilized for hedging and other activities.

Sherrman (1983) employed multiple regression to explore the important determinants of gold prices wherein he found that tension index, interest rate, the US trade weighted exchange rate, the GDP, the excess liquidity and the unanticipated inflation are significant determinants of gold price with serial autocorrelation. When he tried to overcome it some variables like tension index become insignificant while other like unanticipated inflation became insignificant.

Moore (1990) in his empirical studies found negative correlation between gold price and stock/bond markets.

McCann et al. (1994) developed a forecasting mechanism based on a simple recurrent neural network to discover turning-points in the gold price so as to determine whether to take long or short position in the gold price.

Dooley, Isard and Taylor (1995) in their several empirical studies found that gold has explanatory power in predicting movements in exchange rates in addition to the



movements in monetary fundamentals and other variables that enter standard exchange rate models.

Sajaastad and Scacciallani (1996) examined the relationship between the gold price and foreign exchange market for the period 1982-1990 wherein they found significant influence of change in European currency on the prices of gold where less influence of US dollar. They also found that among major currencies fluctuations in the real exchange rates explain almost half of the variation in the gold price

Graham (2001) found the existence of short term interaction and long term equilibrium gold prices and stock prices. Accordingly there is no long run relationship between the gold price and stock price but in short run stock price affect gold price.

Kannan et al. (2003) studied the various factors affecting demand for gold in India and concluded that gold has inverse relationship with its price and is positively related with income further they also found that financial wealth induced by medium term trends in equity prices has a positive impact on gold and real yield on government bonds have inverse relationship with gold demand.

Exploring the alternative to the US Dollar Kumar (2005) found that though Dollar plays a key role in storing wealth and a medium of exchange still if people suspect that the dollar may be vulnerable they may sell dollar and look for something more secure like other currencies or Gold.

Levin et al. (2006) covering the period of 1975-2006 proved the existence of a long run relationship between the gold price and the average price level in US. Employing co integration test to analyse the long run relationship & error correction models to test short run dynamics they found that in a short run the main determinants of gold price are US inflation, inflation volatility, credit risk, the interest rate to lease gold and the US trade weighted exchange rate. Their studies also proved that 66% of a deviation of the long run relationship will disappear within five years after the shock that caused deviation. This research was an extension & value addition to the study 'Political risk in oil producing countries' conducted by Ghosh et al. (2000)

Wang et al. (2010) examined the oil price, gold price, exchange rates of dollar in contrast with currencies and stock markets of Germany, Japan, Taiwan, China, and USA. The empirical results found co-integration and long-term stable relationship among these



variables in the mentioned countries except USA. Nevertheless, there is no co-integration and long term stable relationship among these variables in USA.

Mishra et al. (2010) analysed the causality relation between domestic gold prices and stock returns in India. Employing Granger Causality in Vector Error Correction Model they found that gold prices granger causes stock returns in India & stock returns also granger causes gold price in India during the sample period January 1991 to December 2009.

A. Karunagaran (2011) found that in wake of financial crisis in 2008 central banks of emerging and advanced economies started accumulating gold as a part of reserve management by either buying fresh stock of gold or by stopping selling of their existing stocks of gold.

Sujit et al. (2011) investigated dynamic relationship among gold price, stock returns, exchange rate and oil price covering the period January 1998 to June 2011. Using Vector autoregressive and Co-integration technique, they found that exchange rate is highly affected by changes in other variables whereas stock price have fewer role in affecting the exchange rate & found weak long term relationship among variables.

Mishra et al. (2012) found that both domestic and global gold prices are closely interrelated. They also examined the nature of changes in the factors affecting international gold prices during the last two decades wherein they found that short-run volatility in international gold prices used to be traditional factors such as international commodity prices, US dollar exchange rate and equity prices.

More recently, Ray et al. (2013) examined causal nexus between gold price and stock price for the period 1990-90 to 2010-11. Employing Granger causality test they confirmed the presence of uni-directional causality which runs from gold price to stock price.

The relationship between gold prices and various domestic and international economic factors is strongly supported by the above literature thus provides basis for further research in this regard.

## **RESEARCH METHODOLOGY:**

### **Objectives of the study-**

- To explore various global factors affecting gold price in India.
- To determine long run relationship between various global factors and gold price in India.



- To determine whether there exist any cause and effect relationship between different global factors and gold price in India.

### **HYPOTHESIS:**

1.  $H_0$ : There is no significant relationship between different Global Factors & Gold Price in India.
2.  $H_0$ : Various Global Factors do not Granger Cause Gold Price in India.

### **SCOPE AND LIMITATIONS OF THE STUDY:**

- The scope of the present study is confined to various macroeconomic variables namely Gold, FII, S&P-500, Foreign exchange reserves, Exchange rate and Crude oil price.
- During the period under the study there might have some effect of contemporary economic, social, political situations prevailing in India & global economy, on the variables under the study.

### **SAMPLE DESCRIPTION:**

In the present study monthly time series data has been used of Gold price, Foreign institutional investment, Standard & Poors 500, Foreign exchange reserves, Exchange rates (expressed in Indian rupee per US Dollar) and Crude oil price. The study uses the sample covering the period of April, 2004 to March, 2013. Various considerations were taken into account while selecting these variables. All these variables were subject to high volatility aftermath 9/11 subsequent US Subprime crisis and recent Euro zone crisis. In the present scenario while the advanced economies are again bouncing back to growth track while developing economies which emerged as the global growth engine after 2007-08 are experiencing slump in their growth rate, currency depreciation, high inflation, high interest rates & market volatility etc. due to global and domestic reasons.

Gold has been subjected to dramatic volatility since subprime crisis. It experienced huge appreciation after crisis due to its emergence as the major hedging cum investment asset after subprime crisis & started losing its glitter for last few months due to gradual resurgence of US & other European economies. Although in Indian context excessive import of gold coupled with unprecedented depreciating Indian Rupee has become a menace to India's Fiscal fundamentals. It is evidenced from the fact that while in 2007-08 the share of



gold import to India's total import was 16723.6 million US Dollar while in 2010-11 it has touched a mark of 33875.8 million US Dollar.

In view of the above, we try to explore the causal relationship between above mentioned global factors as independent variables and Gold price as dependent variable. For the purpose of study monthly time series data for all variables have been used. The price of Crude oil on US Dollar per barrel basis, INR/USD used as a proxy for Exchange Rate, the values for Foreign exchange reserves, Foreign Institutional Investment (Equity + Debt) have been used per troy ounce basis in terms of US Dollar. Gold price have been obtained from the Hand Book on Indian Economy published by Reserve Bank of India. Further average monthly data for exchange rates and gold has been collected from the OANDA Forex Trading and Exchange Rates Service online database & World Gold Council database respectively in terms of Gold price per troy ounce in Indian Rupee denomination. Figures for FII have been used in terms of Indian Rupee from the website of Bombay Stock Exchange (BSE).

#### EMPIRICAL TESTING PROCEDURE:

For the purpose analysis in the present study, descriptive statistics, Correlation & Regression statistics, Augmented Dickey Fuller (ADF), Philips-Perron (PP) Unit root tests, Co-integration test & Granger Causality test have been used. All these tools have been used at different stages according to requirement of the study.

#### RESULTS ANALYSIS & INTERPRETATION:

Table 1: Descriptive Statistics

	GOLD	FII	SNP	FOREX	USD	CROIL
Mean	46108.9	30613.2	1244.237	236714	46.32908	77.11722
Median	39124.46	21083.94	1262.51	272119	45.59375	73.305
Maximum	95072.2	142655	1569.19	318358	56.0424	132.47
Minimum	17331.05	-45810	735.09	117592	39.3604	32.36
Std. Dev.	24323	41652.41	175.7566	69117.49	4.047149	26.24986
Skewness	0.645709	0.943153	-0.53465	-0.53941	0.614024	0.211133
Kurtosis	2.125262	3.514783	3.027414	1.638893	2.922588	1.902802
Jarque-Bera	10.94818	17.2042	5.148608	13.57406	6.813428	6.219688
Probability	0.004194	0.000184	0.076207	0.001128	0.03315	0.044608
Sum	4979761	3306226	134377.6	25565116	5003.54	8328.66
Sum Sq. Dev.	6.33E+10	1.86E+11	3305272	5.11E+11	1752.598	73728.89
Observations	108	108	108	108	108	108



The descriptive statistics for all six variables namely Gold, FII, S&P 500, Foreign Exchange Reserves, US Dollar and Crude oil are computed and presented in the Table 5 given above. Further, the standard deviation of Gold price, FII, S&P 500, Foreign Exchange Reserves & Crude oil price is very high whereas US Dollar has shown low variability during the period under study. The Skewness Coefficient in excess of unity is taken to be fairly extreme (Chou 1969). High or low Kurtosis value indicates extreme leptokurtic or extreme platykurtic (Parkinson 1987). Generally if value of Skewness of a particular distribution is zero & Kurtosis is 3, it indicates that the observed distribution is normally distributed. From the above table it is observed that frequency distribution of the above variables is not normal the same is also evidenced by the Jarque-Berra statistics with probability.

**Table 2**

CORRELATION MATRIX						
	GOLD	FII	SNP	FOREX	USD	CROIL
GOLD	1	0.215276	0.174343	0.786967	0.739138	0.766364
FII	0.215276	1	0.165388	0.302081	-0.13847	0.22447
SNP	0.174343	0.165388	1	0.090178	-0.15132	0.475695
FOREX	0.786967	0.302081	0.090178	1	0.320915	0.822808
USD	0.739138	-0.13847	-0.15132	0.320915	1	0.277299
CROIL	0.766364	0.22447	0.475695	0.822808	0.277299	1

The Correlation statistics given in the Table 6 above points out that there Foreign Exchange Reserves, Exchange Rate & Crude oil price are in a high positive correlation with Gold price whereas Foreign Institutional Investment and S&P 500 are positively correlated with Gold price at lower side. Though there exists a high correlation yet it is silent about the grounds and shocks. Thus, in order to make unambiguous delineation of the shock, Multiple Regression test have been conducted taking Gold as dependent variable & other variables as independent variable.

**Table 3**

**Regression Statistics**

**Dependent Variable: GOLD**

**Method: Least Squares**

Variable	Coefficient	Std. Error	t-Statistic	Prob.	VIF
FII	0.06907895	0.015463829	4.46713098	0.0000	1.2264
SNP	14.6398515	5.026014658	2.912815123	0.0044	2.3067
FOREX	0.13021672	0.019574494	6.652367332	0.0000	5.4110



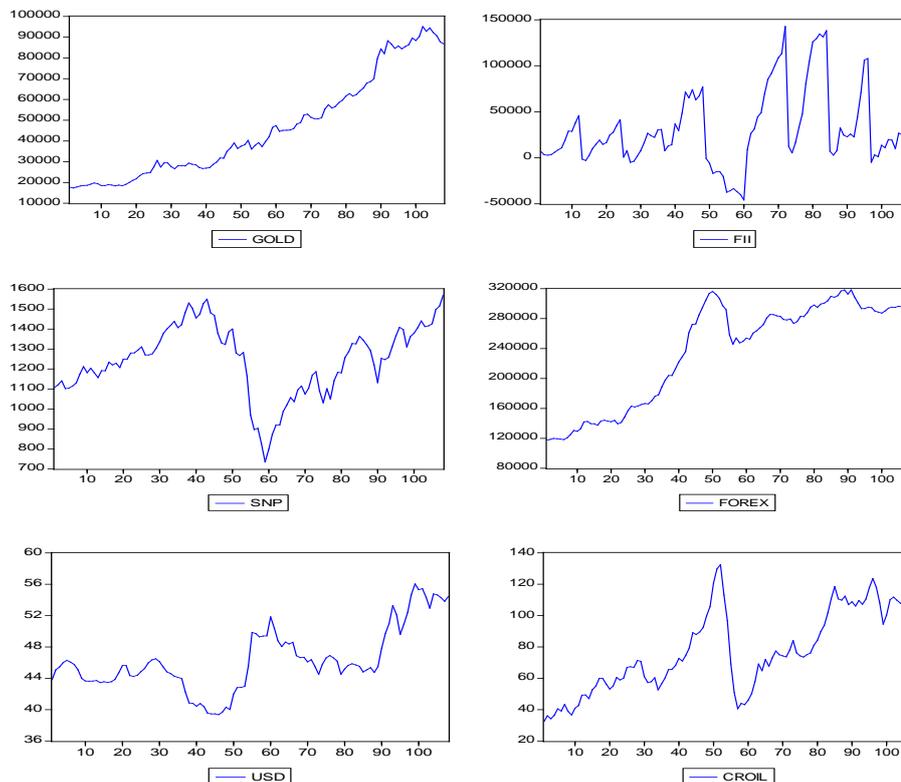
<b>USD</b>	3554.82715	162.2038405	21.91580136	0.0000	1.2739
<b>CROIL</b>	204.780403	57.65115378	3.552060797	0.0006	6.7700
<b>C</b>	-185529.35	10206.58676	-18.17741358	0.0000	
R-squared	0.94167626		Mean dependent var		46108.9
Adjusted R-squared	0.93881725		S.D. dependent var		24323
S.E. of regression	6016.32917		Akaike info criterion		20.29629
Sum squared resid	3692014103		Schwarz criterion		20.4453
Log likelihood	-1089.9999		F-statistic		329.3718
Durbin-Watson stat	0.39037985		Prob(F-statistic)		0.0000

Sample: 1 108

Included observations: 108

The Table 7 given above gives an idea about Multiple Regression test which is conducted on Non-Stationary data & residuals. All the global factors taken under the study as independent variable positively determine Gold price in India. The values of Coefficient of Determination is 0.9388 it means that 93.88% of the total variation in the Gold price is explained by our model however, these alone cannot said to be conclusive one as Durbin Watson statistics also indicates existence of autocorrelation between variables & thereby spurious regression. Further, VIF values above 5 indicate multi co-linearity between independent variables though in Social Science researches VIF Values up to 10 are also acceptable.

#### DATASET GRAPH:





Graphical representation of all variables given above also gives an idea about the stationary of data time series taken under the study. It depicts that all variable time series under the study are non-stationary except FII which is showing signs of stationary. The same is also validated by the statistics of Unit root test discussed below.

#### Unit Root Test Results:

Before applying Granger Causality test to establish whether there is any underlying impact of different global factors on Gold price in India or vice versa it is imperative that a data series are stationary so as to draw some meaningful conclusions there from. Thus, for the purpose of checking stationary, the Augmented Dickey Fuller (ADF) test & Phillip-Perron (PP) test have been performed. Augmented Dickey Fuller test discloses that errors have constant variance and are statistically independent. ADF test has been performed at two different levels i.e. at level data & at 1<sup>st</sup> difference setting a Null Hypothesis that the variable series is non stationary. The results show that all the variables are integrated of order of one & stationary upon differencing (see Table 1). When test was applied on level data, it was found that p-values of all variables except for FII are more than our assumed level of significance i.e. .05. Thus, are not significant. Therefore ADF Unit root test was applied at 1<sup>st</sup> level differencing (see Table 2). The results so obtained show that p-values of all the variables close to zero. Hence it indicates the absence of unit root in the present data series & the data were found fully stationary.

#### Results of Augmented Dickey Fuller Unit Root Test:

Table 4

CRITICAL VALUES OF ADF TEST AT LEVEL							
INTERCEPT							
VARIABLES	LAG	ADF STATIC	PROB	1%	5%	10%	D/W
USD	1	-1.179229	0.6814	-3.493129	-2.888932	-2.581453	1.898447
SNP	1	-1.439399	0.5603	-3.493129	-2.888932	-2.581453	1.959654
GOLD	0	0.423174	0.9831	-3.492523	-2.888669	-2.581313	1.993244
FOREX	1	-1.573092	0.4928	-3.493129	-2.888932	-2.581453	2.066832
FII	0	-3.404979	0.0129	-3.492523	-2.888669	-2.581313	1.83412
CROIL	1	-2.346091	0.1597	-3.493129	-2.888932	-2.581453	2.032539



Table 5

CRITICAL VALUES OF ADF TEST AT 1 <sup>ST</sup> DIFFERENCE							
INTERCEPT							
VARIABLES	LAG	ADF STATISTIC	PROB	1%	5%	10%	D/W
USD	0	-7.622457	0.000	-3.493129	-2.888932	-2.581453	1.895326
SNP	0	-8.161357	0.000	-3.493129	-2.888932	-2.581453	1.955584
GOLD	0	-10.13619	0.000	-3.493129	-2.888932	-2.581453	1.99472
FOREX	0	-6.403838	0.000	-3.493129	-2.888932	-2.581453	2.064843
FII	0	-10.25195	0.000	-3.493129	-2.888932	-2.581453	1.99784
CROIL	0	-6.143127	0.000	-3.493129	-2.888932	-2.581453	1.983984

In order to test the soundness of the results obtained from Augmented Dickey Fuller test the Phillips-Perron (PP) has been applied. Philips-Perron test is used to ensure the stationary of time series. This test tolerates the error variance to be heterogeneously distributed and less dependent. Phillips-Perrons unit root test has also been applied at level on and at 1st difference. On applying PP test at level again only FII series found stationary remaining data series were found stationary at 1st differencing. Thus, Granger Causality test can be applied on these variables as supported by Hina Shahzadi and M.N. Chouhan (2012) and Kaliyamoorthy, S and Parithi, S (2012)

Table 6

Results of Phillips-Perron Unit Root Test at Level:

CRITICAL VALUES OF PP TEST AT LEVEL							
INTERCEPT							
VARIABLES	BANDWIDTH	PP STATIC	P VALUE	1%	5%	10%	D/W
USD	1	-0.88545	0.7895	-3.49252	-2.88867	-2.58131	1.394996
SNP	6	-1.52488	0.5173	-3.49252	-2.88867	-2.58131	1.536343
GOLD	1	0.423858	0.9831	-3.49252	-2.88867	-2.58131	1.993244
FOREX	7	-1.52623	0.5166	-3.49252	-2.88867	-2.58131	1.145739
FII	1	-3.51488	0.0094	-3.49252	-2.88867	-2.58131	1.83412
CROIL	3	-2.00554	0.2842	-3.49252	-2.88867	-2.58131	1.057177



**Table 7**

**Results of Phillips-Perron Unit Root Test at 1<sup>ST</sup> Difference:**

CRITICAL VALUES OF ADF TEST AT 1 <sup>ST</sup> DIFFERENCE							
VARIABLES	BANDWIDTH	PP STATIC	P VALUE	INTERCEPT			D/W
				1%	5%	10%	
USD	10	-7.5736	0.000	-3.49313	-2.88893	-2.58145	1.895326
SNP	5	-8.25029	0.000	-3.49313	-2.88893	-2.58145	1.955584
GOLD	2	-10.1353	0.000	-3.49313	-2.88893	-2.58145	1.99472
FOREX	6	-6.73667	0.000	-3.49313	-2.88893	-2.58145	2.064843
FII	8	-10.6023	0.000	-3.49313	-2.88893	-2.58145	1.99784
CROIL	4	-6.12504	0.000	-3.49313	-2.88893	-2.58145	1.983984

**Table 8 (a): Results of Johansen's Co-integration Test [Unrestricted Co-integration Rank Test] (Trace)**

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.392015	147.7688	95.75366	0
At most 1 *	0.327292	96.5155	69.81889	0.0001
At most 2 *	0.237372	55.68175	47.85613	0.0078

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

**Table 8 (b): Results of Johansen's Co-integration Test [Unrestricted Co-integration Rank Test] (Maximum Eigen Value)**

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.392015	51.25329	40.07757	0.0019
At most 1 *	0.327292	40.83376	33.87687	0.0063
At most 2 *	0.237372	27.9115	27.58434	0.0454

Max-eigen value test indicates 3 co-integrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

In the next step, in order to test long run co-integration between all variable the Johansen's Co-integration test and Maximum Eigen value test have been used. The Trace test indicates the existence of three co-integrating equations at 5% level of significance and the same is also confirmed by the Maximum Eigen value test. Thus, both the test confirms the existence of long-run or equilibrium relationship between them.



Finally, Granger Causality test is performed so as to ascertain the direction of causality between the variables in the Vector Error Correction Model (VECM). The Granger Causality test (Awe, O. O, 2012 and Haldrup, G 2005) is a statistical proposition test for determining whether one time series is helpful in forecasting another. The pair wise Granger Causality test has been employed for determining causality (if any) between Gold price and different other Global factors such as FII, Global stock markets (S&P 500), Foreign Exchange Reserves, Exchange rate & Crude oil prices.

**Table 9: Pair wise Granger Causality Test**

Null Hypothesis:	Obs	F-Statistic	p-value	Decision	Nature of Causality
FII does not Granger Cause GOLD	106	0.94123	0.39354	accepted	No Causality
GOLD does not Granger Cause FII		0.23392	0.79185	accepted	No Causality
SNP does not Granger Cause GOLD	106	0.41445	0.66182	accepted	No Causality
GOLD does not Granger Cause SNP		1.25187	0.29037	accepted	No Causality
FOREX does not Granger Cause GOLD	106	2.76431	0.06779	accepted	No Causality
GOLD does not Granger Cause FOREX		0.16873	0.84497	accepted	No Causality
USD does not Granger Cause GOLD	106	2.22268	0.11359	accepted	No Causality
GOLD does not Granger Cause USD		4.16663	0.01825	rejected	Uni-directional Causality
CROIL does not Granger Cause GOLD	106	0.20589	0.81427	accepted	No Causality
GOLD does not Granger Cause CROIL		3.41566	0.0367	rejected	Uni-directional Causality
SNP does not Granger Cause FII	106	1.49898	0.22828	accepted	No Causality
FII does not Granger Cause SNP		4.50518	0.01336	rejected	Uni-directional Causality
FOREX does not Granger Cause FII	106	0.16285	0.84994	accepted	No Causality
FII does not Granger Cause FOREX		3.92726	0.02278	rejected	Uni-directional Causality
USD does not Granger Cause FII	106	0.43147	0.65074	accepted	No Causality
FII does not Granger Cause USD		4.84134	0.00982	rejected	Uni-directional Causality
CROIL does not Granger Cause FII	106	0.38565	0.681	accepted	No Causality
FII does not Granger Cause CROIL		6.89955	0.00155	rejected	Uni-directional Causality
FOREX does not Granger Cause SNP	106	0.18554	0.83094	accepted	No Causality
SNP does not Granger Cause FOREX		0.65475	0.52176	accepted	No Causality
USD does not Granger Cause SNP	106	2.6527	0.07537	accepted	No Causality



SNP does not Granger Cause USD		4.93228	0.00904	rejected	Uni-directional Causality
CROIL does not Granger Cause SNP	106	4.05716	0.02019	rejected	Bi-directional Causality
SNP does not Granger Cause CROIL		6.26481	0.00272	rejected	Bi-directional Causality
USD does not Granger Cause FOREX	106	4.02871	0.02073	rejected	Uni-directional Causality
FOREX does not Granger Cause USD		2.41801	0.09424	accepted	No Causality
CROIL does not Granger Cause FOREX	106	2.63537	0.07662	accepted	No Causality
FOREX does not Granger Cause CROIL		7.06566	0.00134	rejected	Uni-directional Causality
CROIL does not Granger Cause USD	106	6.10873	0.00313	rejected	Uni-directional Causality
USD does not Granger Cause CROIL		0.90832	0.40647	accepted	No Causality

Sample: 1 108

Lags: 2

### FINDINGS & DISCUSSIONS:

On applying Granger causality test using Vector Error Correction Model (VECM) in the Table 9 given above. The causal relationship between different variables is as following taking each of them as a benchmark.

**Gold price:** No causality is found between Gold price and Foreign Institutional Investment, Gold price and S&P 500, Gold price and Foreign Exchange Reserves however it was found that Gold price Granger causes US Dollar and Crude oil price.

**Foreign Institutional Investment:** No Causal relationship is found between FII & Gold price however Causal relationship is observed between FII and S&P 500, FII and Foreign Exchange Reserves, FII and Exchange rate, FII and Crude oil.

**S&P 500:** There exists no causality between S&P 500 and Gold price, S&P 500 and FII, S&P 500 and Foreign Exchange Reserves however causal relationship is found between S&P 500 and US Dollar and S&P 500 and Crude oil price.

**Foreign Exchange Reserves:** There exist no causality between Foreign Exchange Reserves and Gold price, Foreign Exchange Reserves and FII, Foreign Exchange Reserves and S&P 500, Foreign Exchange Reserves and US Dollar however it was observed that Foreign Exchange Reserves Granger Causes Crude oil price.

**Exchange Rate (USD):** No causal relationship is found between US Dollar and Gold price, US Dollar and FII, US Dollar and S&P 500 & US Dollar and Crude oil price however it was found that US Dollar Granger causes Foreign Exchange Reserves.



**Crude oil price:** There observed no causality between Crude oil and Gold price, Crude oil and FII, Crude oil and Foreign Exchange Reserves however it was found that Crude oil price Granger causes S&P 500 and US Dollar.

### **HYPOTHESIS TESTING & CONCLUSION:**

In the present study we examined dynamic relationship between different Global factors and Gold price in India. The main aim of this study is to empirically investigate the impact of different global factors on Gold price in India using time series and cross sectional data. We observed significant correlation between Gold price & Foreign Exchange Reserve, Exchange rate (USD), Crude oil price. The Johansen Co-integration test both Trace & Maximum Eigen values also validates long term Co-integration between variables. The Unit root, both ADF & PP tests also indicate that all variables are I(1) except FII which was found I(0). The empirical results obtained show significant relationship between Gold price and different global factors such as Foreign Institutional Investment, Standard & Poor's 500, Foreign Exchange Reserves, US Dollar and Crude oil price. Thus, our first null hypothesis ( $H_0$ ) that 'There is no significant relationship between different global factors and gold price in India' stands rejected.

As regards to our second null hypothesis set that 'Various global factors do not Granger cause Gold price in India', it was found that all the global factors taken under the study i.e. Foreign Institutional Investment, Standard & Poor's 500, Foreign Exchange Reserves, US Dollar and Crude oil price do not Granger Cause Gold price in India as their respective p-values are more than our assumed level of significance at which we are testing hypothesis i.e. 0.05. Thus, it can be construed that these global factors do not predict gold price in India thus our second null hypothesis is also accepted. However, it was found that Gold price Granger Cause Exchange Rate (USD) and Crude Oil price during the period under study.

### **POLICY IMPLICATIONS & SUGGESTIONS:**

Aftermath US Subprime crisis and subsequent Euro zone crisis with tumbling stock market around the globe, gold has emerged to be most sought investment in the global financial market in the recent years. According to World Gold Council's report Central banks around the globe have also substantially increased holding of gold in their reserves composition during the past decade. Increase in export and other foreign exchange inflows strengthen payment capacity of India for its import bill which consists of substantial burden of oil,



metals (including gold) and other capital goods etc. Recent measures taken by RBI to strengthen rupee and curbing import of gold yielded desired results as it enabled government to bring current account deficit under control. The inter-linkage between performance of stock markets abroad and Foreign Institutional Investment in Indian stock market also affects Foreign Exchange Reserves in India. Further volatility in the price of gold is also affected by positions taken by large players in the bullion market who take position by speculating and hedging for making profit or making their losses good through investing in Crude oil and Stock markets as an alternative to investment in gold and vice versa. Thus, the possibility of these global factors affecting gold price in India could not be denied earlier but the results obtained from the present studies suggest that price of Gold price is not affected by S&P 500, Exchange rate, FII, Foreign Exchange Reserves and Crude oil price even gold price affects Exchange Rate and Crude Oil price. Also, some of these factors explain changes in each other.

As the results suggest that these global factors are irrelevant to gold price so, the price of Gold may have some effect of domestic factors & trade practices such as inflation, interest rates hike, speculation & hedging etc. which itself is a matter of further study thus, in order to control gold price, Govt. of India may reduce duties on bullion trading, RBI may invoke more actions to prevent rupee depreciation & SEBI should take corrective measures to control possible too much speculation in the Derivative market. Further FDI & FII investment limit in different sectors may be gradually increased to encourage foreign exchange inflow and thereby appreciating rupee. While curbing import of gold to keep CAD under control government should also check back-door entry of gold & efforts for exploration of domestic sources of gold and petrochemicals also need to be promoted to reduce dependency on import and thereby, saving precious foreign exchange reserves.

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