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Gold Sparkling Delight: A Causal Study against Crude Oil, USD and NIFTY in India

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ABSTRACT

The present study investigates causal relationship of Gold price against Crude oil, USD and NIFTY in India for the period ranging from 1st April, 2014 to 31st March 2018. The study uses total 984 observations. Indian market is very volatile and unpredictable in nature. With a lot of investment options available Indian investors prefer to invest in safer options like gold, which in-turn affect Crude oil prices, USD and NIFTY, thus this study finds the impact of Gold prices over crude oil, USD and Nifty50 so that this relationship can in turn help the investors in making investment related decisions. Causal relationship is established using Augmented Dicky Fuller and Phillips Perron Test, Correlation Analysis, Regression Analysis, and Granger. The study reveals that there is a tremendous arbitraging opportunity in crude oil on the other hand Gold, Nifty50 and USD/INR does not show any massive price change and the moderate volatility is observed. The correlation suggests moderate relation of Gold with Crude oil, low relation with NIFTY50 meaning that they move in similar direction either upwards or downwards depending upon absorption of information. Results of regression analysis show that gold as dependent against Crude oil, Nifty50 and USD/INR show moderate impact collectively while independently these variables have high impact. Granger causality test shows that, Gold against USD/INR has bidirectional relations meaning that both follow reversal trends if one increases the other decreases and vice a versa. Whereas gold has unidirectional relations with crude oil and Nifty50 indicating that gold affect these variables returns to discover prices.

Keywords: Causal Relationship, Gold price, Crude oil price, USD/INR, NIFTY50, Regression, Granger Causality.

Introduction

The financial market including commodities, equities, futures and derivatives are very difficult to predict and understand as these are influenced by a number of factors. Various markets and the relationship between these instruments keep on changing. A number of investment avenues are available for various investors in India. Indian market is characterized by frequent and unpredictable changes in prices. There are a lot of investment avenues available with the individuals but the investor often prefers to invest in safer options.

A review of related literature shows that numerous studies have been carried out to study the various factors that affect the movement of market price. The studies show that various factors influence and are influenced by the movement of share market prices. Some of the major variables of these are Gold, Crude oil and US Dollar. Gold, Crude oil and US Dollar are the important financial factors to affect the stock market and Indian economy. Numerous investment avenues are available for investors but one of the most preferred avenues for investment in India is Gold. Some of the reasons for it to be preferred by the investors are that a gold response to price changes very fast and is highly liquid. Gold is also preferred as there is no credit risk associated with it; it is highly liquid and helps in maintaining a diversified portfolio. Because of the above mentioned reasons gold is frequently traded in the Indian financial market and also influences the economy to a great extent.

The NIFTY 50 is the lead index on the National Stock Exchange of India Ltd. (NSE). The Index tracks the conduct of an arrangement of blue chip organizations, the biggest and most fluid Indian securities. It incorporates 50 of the roughly 1600 organizations recorded on the NSE, catches around 65% of free float market capitalization and is a genuine impression of the Indian financial exchange. The NIFTY 50 covers real segments of the Indian economy and offers exposure to the Indian market in one effective portfolio. The Index has been exchanging since April 1996 and is appropriate for benchmarking, list assets and record based subsidiaries.

The current study attempts to investigate whether there is any relationship between Gold prices, crude oil, USD and Nifty50. It attempts to find the impact of Gold prices over crude oil, USD and Nifty50 so that this relationship can in turn help the investors in making investment related decisions.

Review of Literature

(Simakova,2011) States by the use of granger, correlation and regression model that there is a strong positive relationship between the prices of gold and crude oil. Correlation analyzed with reference to inflation, Granger causality test identifies causal link, Johausen co integration reveals long term relationship between variables and vector error model confirms it. (Parimi, 2018) The optimism is reflected in the performance of the model, and an analysis was conducted to observe the predictability of gold price in the spot market. The answer revealed that the regression equation was accurate by a close margin. (Rastogi, 2016) This study have been found to have long-term Cointegration. Gold price, crude oil and exchange rate have significant association for short-term correction but Sensex did not have significant error correction term; there are mutual long-term association among all the four variables undertaken for the study existing but the degree of association is weak.

(Narang & Singh, 2012) the casual relationship has been examined between Sensex and gold price. There is a positive correlation between stock returns and gold price from 2002 to 2007 but due to economic crisis in USA in 2008 and 2011 this correlation seems to be fading and it was establishing by using correlation and Johansen's co-integration test that there is no relation between gold prices and stock returns i.e. Sensex return in the long run period. (Satyanarayana & Gargesh, 2018) Crude price has a positive coefficient meaning that it shares direct relationship with the Index. Crude and Dollar are statistically significant at 0.01 level, Regression results for Nifty 50 show that independent variables (Gold and Dollar) share negative coefficient with the dependent variables meaning that they share an inverse relationship with the dependent variable. They found a bi directional relationship between Nifty 50 and Forex (Dollar), Gold. But, did not find any evidence in between Nifty 50 and Crude prices. (Christner & Dicle, 2011) shows that there is a causal relationship between equities and dollar, feedback and negative correlation. (Bouri, et. al., 2017) states that volatility derivatives as risk management tools, market participants can use these volatility derivatives in hedging the volatility risk in the gold, crude oil, and Indian stock markets and in equity-commodity portfolio management.

Objectives

This study aims to achieve the following objectives:

- To explore relationship among Gold, Crude oil, USD/INR and NIFTY50 in the Indian financial market.
- To investigate impact of Gold on USD/INR, Crude oil and Nifty50 in the Indian financial market.
- To study the causal relationship among Gold, USD/INR, Crude oil and Nifty50 in Indian financial market

Hypothesis

The research hypotheses are as follows:

- H_{01}: The returns of Gold, Crude Oil, Nifty50 and USD/INR are non-stationary.
- H_{02}: There is no significant relationship between returns of Gold, Crude Oil, Nifty50 and USD/INR.
- H_{03}: There is no significant impact of returns of Crude Oil, Nifty50 and USD/INR on Gold.
- H_{04}: There is no causal relation among returns of Crude Oil, Nifty50 and USD/INR and Gold.

Research Methodology

Research Questions

- Do Crude Oil, Nifty50 and USD/INR variables impact on price formation of Gold returns?
- Does there exist any interactive cause and effect relationship between Crude Oil, Nifty50, USD/INR and Gold?

Data

The study is based on secondary data obtained from various sources as databases of NSE, MCX and Y Chart namely Gold, Crude Oil, Nifty50 and USD/INR. The study considers daily data comprising the closing prices of Gold, Crude Oil, Nifty50 and USD/INR for finding their returns. For this hetroscedastic data were converted into homoscedastic data. The period span was considered as assessment year ranging from 1st April, 2014 to 31st March 2018 for all studied variables. There are total 984 observations under the study period.

Tools Used

In the course of analysis of the study, statistical tools comprising econometric tools like, Unit Root comprising of Augmented Dicky Fuller and Phillips Perron Test, Correlation Analysis, Regression Analysis, and Granger causality have been applied. Reviews 7.0 Package Program has been used for arranging the data and implementation of econometric analysis.

Results & Interpretation

Descriptive Statistics:

Table- 1: Descriptive Statistics using E-Views 7

DESCRIPTIVE STATISTICS	CRUDEOIL	GOLD	NIFTY 50	USD/INR
Mean	-96.26919	137.8905	3.451322	0.005371
Median	2967.930	351.0400	3.600000	0.000000
Maximum	557592.5	761684.7	235.2500	0.780000
Minimum	-688744.7	-732497	-490.95	-0.88
Std. Dev.	146204.9	145929.4	71.48867	0.202930
Skewness	-0.152922	0.191386	-0.563589	0.230717
Kurtosis	4.631575	6.592809	5.714187	4.261250
Jarque-Bera	112.8639	534.7025	353.7711	73.87549

Probability	0.000000	0.000000	0.000000	0.000000
Sum	-94632.61	135546.3	3392.650	5.280000
Sum Sq. Dev.	2.10E+13	2.09E+13	5018639.	40.43947
Observations	**983**	**983**	**983**	**983**

Source: NSE and MCX

The Descriptive insights ascertained in Table-1 above proposes that, returns of mean of Crude Oil -96.27 individually shows negative mean indicating that the costs have expanded tremendously over the period. The return of Gold, Nifty50 and USD/INR (137.89, 3.451, 0.0053) does not show any symptoms of abnormal volatility as the mean value is positive.

The skewnessis an unmistakable measurements demonstrating that, the profits are absolutely skewed, as there is a high likelihood of procuring returns. This is so because the calculated values are negative -0.153; -0.563in case of Crude Oil and Nifty 50. This is watched that the ascertained values are < Mean.

Standard Deviation it continues revealing insight into recorded estimations of unpredictability caused in studied returns of the crude oil and indices. As the figured values are positive in terms of Gold 0.191and USD/INR 0.230 returns of shows low instability is normal in returns by time inferring the low profits from the variables as it is hedge against inflating prices. The figured estimations of Kurtosis values of variables are Crude oil 4.63; Gold 6.59; Nifty50 5.71 and USD/INR 4.26> 3, indicating that the returns have fat tail and don't take off after an ordinary circulation or corrections in prices. The Jarque-Bera test measurement proposes that at 95% level of significance the p value for every single concentrated variable is 0. Thus, the null hypothesis stating that the values are not normally distributed is rejected and it is reliably estimated that the values are normally distributed and further tools like, ARCH, GARCH, Granger and Regression can be applied.

Unit-root:

Table- 2: Unit Root Test showing data Stationary using E-Views 7

UNIT ROOT TEST				
ADF Test @ Level				
	CRUDEOIL	**GOLD**	**NIFTY 50**	**USD/INR**
t-Statistics (Intercept)	-14.67552	-16.8267	-28.40403	-24.20079
1% level	-3.43687	-3.43684	-3.436789	-3.436796
5% level	-2.86431	-2.8643	-2.864272	-2.864274
10% level	-2.5683	-2.56829	-2.568277	-2.568278
p-Value	**0**	**0**	**0**	**0**
PP Test @ Level				
	CRUDEOIL	**GOLD**	**NIFTY 50**	**USD/INR**
t-Statistics (Intercept)	-76.7493	-142.7	-28.2661	-31.227
1% level	-3.43679	-3.43679	-3.43679	-3.43679
5% level	-2.86427	-2.86427	-2.86427	-2.86427
10% level	-2.56828	-2.56828	-2.56828	-2.56828
p-Value	**0**	**0**	**0**	**0**

Source: NSE and MCX

The table-2 above contemplates unit root in the arrangement tried utilizing Augmented Dickey Fuller (ADF) and Phillips Perron (PP) Tests demonstrates the nearness of heteroscedasticity. The p value estimations of ADF and PP test shows that the factors namely Crude oil, Gold, Nifty50 and USD/INR have the t statistics values negative. The calculated value of t- statistics is greater than the negative values at 1%, 5% and 10% level of significance in both ADF and PP tests. Henceforth, the consequences of both the tests affirm that the variables are stationary and reject the null hypothesis that the variables are non- stationary.

Correlation:

Table- 3: Correlation Analysis using E-Views 7

CORRELATION	CRUDEOIL	GOLD	NIFTY 50	USD/INR
CRUDEOIL	1.000000	0.359893	0.040285	-0.032629
GOLD	0.359893	1.000000	0.076208	-0.013472
NIFTY 50	0.040285	0.076208	1.000000	-0.023552
USD/INR	-0.032629	-0.01347	-0.023552	1.000000

Source: NSE and MCX

On applying Karl Pearson Coefficient of Correlation at 5% level of significance as shown above in Table 3 conditioned that, there is a very low positive correlation between returns of Nifty50 with Gold i.e. 0.0762. This means that the price change in the Gold does not by and large follow identical trends with Nifty50, Crude oil with gold has moderate correlation they follow same pattern indicating both move in same direction in the Indian markets. These variables are moderately affected by gold returns. Finally, Gold and USD/INR have negative relations as the calculated vale is -0.0134 indicating that if gold increases the currency decreases and vice a versa. Hence the hypothesis stating that there are no significant relations among Crude Oil, Gold, Nifty50 and USD/INR is rejected. So, there exists significant relationship between returns of studied variables.

Regression:

Table- 4: Regression Analysis using E-Views 7

Dependent Variable: GOLD				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1435074	108103	-13.27506	0
CRUDEOIL	0.355177	0.028807	12.32966	0
NIFTY 50	9.189062	4.526266	2.030164	0.0426
USD/INR	23893.53	1772.337	13.48137	0

R-squared	0.333547
Adjusted R-squared	0.331507
S.E. of regression	131628.5
Sum squared resid	1.70E+13
Log likelihood	-12993.37
F-statistic	163.4907
Prob(F-statistic)	0
Mean dependent var	377027
S.D. dependent var	160991
Akaike info criterion	26.41741
Schwarz criterion	26.4373
Hannan-Quinn criter.	26.42498
Durbin-Watson stat	1.072945

Source: NSE and MCX

As shown in Table 4 above, the regression model of returns of variables namely Crude oil, Nifty50 and USD/INR as independent variable and dependent variable as Gold has yielded an R-squared value of 0.33, indicating that the volatility caused by the variables are low collectively. This infers that only 33% impact is observed among the variables. The subsequent F statistics (goodness of fit or good fit) was 163.49 and the corresponding P value was 0.00, pointing out that, the variables have significant collective impact at 95% level of significant, as P< 0.05. Further the regression test proves that all the independent variables affect the dependent variable significantly even if they are independently studied. It can be inferred because, the P value of Crude Oil is 0 Nifty50 is 0.0426 and USD/INR is 0 respectively smaller than 0.05.Hence, all these variables at 95% level has no impact on the formation of gold returns. Thus, the null hypothesis stating no significant of Crude oil, Nifty50 and USD/INR on Gold is rejected.

Granger Causality:

Table- 5: Granger Causality Test using E-Views 7

VARIABLES	LAG	P-VAUE	REMARK
Gold does not Granger Cause Crude Oil	14	0.0942	Gold has causal relations with Crude Oil
Crude Oil doesnot Granger cause Gold		0.0436	Crude Oil does not have causal relations with Gold
Nifty50 does not Granger Cause Crude Oil	40	0.3507	None of the variables have causal relations from lag 2 to 40
Crude Oil does not Granger Cause Nifty50		0.462	
USD/INR does not Granger Cause Crude Oil	20	0.243	USD/INR has causal relations with Crude Oil
Crude Oil does not Granger Cause USD/INR		0.0368	Crude Oil does not have causal relations with USD/INR
Nifty50 does not Granger Cause Gold	4	0.3253	Nifty 50 has causal relations with Gold
Gold does not Granger Cause Nifty50		0.0124	Gold does not have causal relations with Gold
USD/INR does not Granger Cause Gold	40	0.3507	None of the variables have causal relations from lag 2 to 40
Gold does not Granger Cause USD/INR		0.462	
USD/INR does not Granger Cause Nifty50	35	0.984	USD/INR has causal relations with Nifty 50
Nifty50 does not Granger Cause USD/INR		0.0252	Nifty 50 does not have causal relations with USD/INR

USD/INRSource: NSE and MCX

Results of Granger Causality Test performed based on Vector Error Correction Model with the purpose of revealing whether there is a causality relationship between variables is shown in the Table 5 above. It is observed that Gold has unidirectional causal relations with Crude oil at lag 14 and at lag 4 it has identical relations with Nifty50. Gold shows bidirectional causal relational with USD/INR meaning that both the variables complement each other. The hypothesis stating no causal relations among Gold, Crude oil, Nifty50 and USD/INR is rejected and there exist unidirectional or bidirectional relations among the variables.

Interpretation

The study interprets that gold is a dominating variable that dictate terms to the supporting variables. The gold fancies its shine over all other variables because it is a hedge against all variables and a tool to stock against inconsistencies caused by stocks, index, crude and currencies. It is also known that gold is a best hedge against inflation because in inflationary scenario when prices rise and value of currency falls gold is that best source of investment and help strengthen the portfolio. Thus, every time when gold is used against the crude, index and currency it protects the investors from all inconsistencies arising out of market and players like speculators and arbitrageurs. The regression analysis interrelates that gold prices affect crude oil, index and currency in long run. It is also confirmed that they show signals to investors when to invest in gold and when to short so that hedging against price risk can be done. Granger Causality test also facilitates the study that during trade foreign currency and gold plays a significant role meaning that more the gold reserves results in decrease of deficit and improve bilateral trade and vice versa. If the deficit increases the gold imports increases and the currency become weaker that result in loss and more foreign currency drift out of economy and negatively affect economic growth. With reduction of economic growth, the stock markets fall, increases crude oil import values and foreign investments sores and currency reserves depreciates which give signals to stock gold till the market revives. Finally, gold is a better hedge under all circumstances and help revival of economy.

Conclusion

The study concludes that Crude oil shows striking changes as mean is negative the price discovery is very fast there is a tremendous arbitraging opportunity in crude oil. Gold, Nifty50 and USD/INR does not show any massive price change and the moderate volatility is observed. All the studied variables follow bell shaped curve and they are normally distributed. It is also inferred that returns are absolutely skewed and measure of steep volatility on either side. The variables are homoscedastic in nature after conversion and non- stationary meaning that they are model fit and good for further research. It also suggests that non stationary variables are dynamic and are mark to market as their prices revise themselves on regular basis as concluded by ADF and PP test. The correlation suggests moderate relation of Gold with Crude oil, low relation with NIFTY50 meaning that they move in similar direction either upwards or downwards depending upon absorption of information. Whereas a negative relation is with USD/INR i.e. if price rise in gold is discounted the currency falls down and if gold decreases the currency improves in terms of valuation. This is because of the fact the maintenance of reserve chest in terms of gold and currency to enhance bilateral trades among trading economies. On regressing Gold as dependent against Crude oil, Niftf50 and USD/INR it is estimated that the variables show moderate impact on collectively. Independently these variables have high impact as the p value is less than 0.05 in all cases. Hence the effect is lasting and self- explanatory in terms of return in the variables. Finally, granger causality test concludes that, Gold against USD/INR has bidirectional relations meaning that both follow reversal trends if one increases the other decreases and vice a versa. Whereas gold has unidirectional relations with crude oil and Nifty50 indicating that gold affect these variables returns to discover prices.

Suggestion

The study suggests that gold is the safest hedge to create equilibrium among investment avenues it is necessary to have a proportionate investment in gold. Crude oil, Index and Currency is a highly speculative instrument hence they should not be used as leveraging tool but being a mark to market instrument it's necessary to park fund into it for short term only. Finally, gold should be used as risk hedger and long term investment can be ensured by the investors. Government may make provision to regulate the Crude oil prices so that the riskiness can be reduced and moderation can be done as it it an imported commodity. Companies depend heavily on crude and its by-products any revision in crude prices affect the profitability of companies on either side resulting in increase or decrease in prices. Hence gold is a best hedge and competencies to repay after long term holding. It is recommended that to strengthen the economy it is necessary to control and regulate the prices of Crude, Index and Currency by creating increasing reserves of Gold in order to resist shocks.

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