Understanding Dynamic Relationship between Oil, Gold & Stock Market and its Consequences on Financial Investment

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ABSTRACT

The correlation between the prices of fuels and metals, especially oil and gold, is significant to research in the sense of commodities eclipsing financial assets. Researchers, policymakers, and businesspeople have all been drawn to the dynamic and complicated relationship between economic variables. This paper aims to see a complex relationship between gold prices, stock returns, and oil prices. Since all of these factors have changed significantly over time, it is vital to re-validate the relationship regularly.

The global hike in the prices of gold and oil impacted the financial system of countries around the world. This study is essential for an investor who desires to invest in real assets and financial assets. This study applies Descriptive statistics, correlation, trend analysis and, inferential statistics and it is concluded that data analysis results show that oil, gold and, stock market variances have a significant impact on the financial investment of an investor. This study is distinctive because it focus on current issues and uses the present research data to help investors.

Keywords: Gold prices, Oil prices, Stock market, Investment decisions.

INTRODUCTION: OIL AND GOLD PRICES – A REFLECTION

Oil and gold are considered as the world's most vital &tactical commodities. They attract more attention from economic people as the prices increase. Crude oil is the most widely traded commodities on the planet, and its value is the most unpredictable in the industry. The oil market, which is regarded as one of the most important in the world, plays a twin role with other markets, especially the foreign-exchange market. The oil markets are affected by currency movements, especially in the dollar, and can often trigger movements in the world's major

currency market. While, oil price fluctuations have a huge impact on global financial markets, they supposedly impact gold market fluctuations. It's worth noting that rising global oil prices will supposedly raise inflation, so investors need to put their money where it will have the most inflation resistance. Erstwhile and meanwhile, gold is regarded as ankey player and industry leader in the valued metals sector, as rises in its price tend to be mirrored by price fluctuations in other valued metals. Gold is often considered the best option for them because it is a known as reasonably secure reserve.

Gold price fluctuations have a major effect on global financial markets, especially the dollar. When the dollar's value rises, gold becomes more costly for consumers who use other currencies, reducing demand for gold and, as a result, lowering its value. A drop in the rate of the dollar lowers the price of gold and raises demand, and increasing demand ultimately leads to higher prices. Overall, the dollar's value and the price of gold areconsidered inversely related.It's important to remember that gold prices fluctuate throughout the year, and Thepast trend shows that the gold price trend has historically been on the rise, with the exception of a few lows between some years, giving credence to the claim that gold is a secure investment over long periods of time. W*hen we look at the past price trends of gold and the stock market. In general, it has been found that association between gold and stocks is inversely proportional.* When the stock market is at its most negative, gold has historically performed exceptionally well. This association between gold and stock markets holds true for all world economies. When the stock market is down gold coins&bars, and gold ETFs (exchange-traded funds) are in high demand. It's also been observed that when a country's GDP growth rate slows, gold demand surges.In such circumstances, people tend to invest in gold.

In such times investment options such as currency based investments are not taken into consideration.During the global financial crisis, one of the few investment options which is often left not chosen is the stock market. It has been observed evidently that gold is negatively associated with the stock market. This helps in creation of a balanced investment portfolio.As a result, the economic value of studying the connectionamong the priceof two commodities and their connection with stock market needs to be reexamined and revalidated .

REVIEW OF LITERATURE

The links between gold and oil prices, as well as stock values, have been studied by researchers. There has been a lot of research done and studies and try to figure out the relationships or connections between different economic indicators. Among the economic indicators analysed were industrial production by Mukhuti, S., 2017, interest rates by Mulyadi, M., 2012 , inflation by Narang, S., 2013 , and currency rates by Patel, S., 2013. F. Malik, 2007 was able to discover important, connections between the price of oil and the price of oil and gas stocks. There is considerable evidence that oil price risk influences stock price returns in emerging markets, according to Mollick, A., 2013.

Studies on gold prices and their reasons for change have been investigated by researchers in the last decades and remain one of the key subjects for the world's economic and financial studies. Mulyadi, M., 2012; Patel, S., 2013; Petram, L., 2011 used ARIMA & its appropriate models to model the gold prices and they were found to be more suitable for anticipating future prices. Another approach incorporates modelling gold price fluctuations as the key macroeconomic factors are categorized as multivariate variables. The gold-oil price linkages between 1970 and 2010, investigated by Rao, K., 2015 and it was established that causal ties in ganging causality tests between price levels of gold-oil and Johansen Co-integration tests showed long-term links between gold and oil. The dollar-exchange capability of gold prices for the dollar was examined by Schelkle, T., 2012 . The results show that the exchange rate for AU dollar/U.S. dollar co-integrates with appropriately signed statistically meaningful gold price coefficients. Shahzadi, C., 2016 Studied macroeconomic affect on gold pricing from 1994 to 1997. The GARCH models have shown main influence of GARCH's volatility on employment and GDP, CPI and personal incomes etc &They also stressed that volatility of gold market price has long been remembered.

The theoretical framework for evaluating gold price determinants over short and long periods was constructed by Smith, G., 2001. Their approaches of co-integration regression identify a long-term link between the gold price and US price level. Positive association between gold prices and US inflation fluctuations, volatility of US inflation and credit risk was statistically found to be significant with respect to short-term relationships. Also association between changes in gold prices and trade-weighted changes in US dollar currencies and gold lease rates was found to be statistically significant.

Another approach is to simulate macroeconomic and financial variables of the changes in gold pricing as well as movement of the gold price and financial indexes. Various models demonstrate that gold price changes may be explained by commodity price changes , US $ prices, dollar value and future inflation rate. Sujit, K., 2011 examined the macroeconomic consequences for the gold market between 1983 and 2003 and it was found that Oil which is occasionally seen as the market leader in commodity markets; the changes in oil prices affect the value of other commodities, including gold. Thus changes in the gold price may be monitored by observing movements in the oil price, through several factors.

Baur and Lucey (2010) discussed how gold can be utilised as a stock hedge. Gold's importance as an asset that is uncorrelated with stocks on average and a safe haven in a market crisis has been underappreciated. To see if gold is a hedge and/or a safe haven, Baur and Lucey looked at the constant, consistent, and dynamic correlations between stock and bond returns in countries like the US, UK, and Germany, and gold returns. They discovered that gold is a good hedge against stocks and a safe refuge during periods of high stock market volatility.

Research has been done by experts to compare the stocks of major emerging and developing countries to see if gold is a safe haven. For major European stock markets and the United States, gold serves as a hedge and a safe haven, but not for Australia, Canada, Japan, or huge growing economies such as Brazil, Russia, India, and China. When it comes to specific crisis scenarios, the research shows that gold was a reliable safe haven for most developed markets during the current financial crisis. Experts have also noted that dominant oil-exporting countries use a significant portion of their revenue from oil sales to invest in gold in order to spread market risk and maintain commodity value.

Higher oil prices (and consequently oil earnings) may have an impact on gold prices since several countries, particularly oil producers, maintain gold in their foreign reserve portfolios. This is true as long as gold comprises a significant portion of oil exporters' asset portfolios and these exporters purchase gold in reaction to higher oil income. As a result, growing oil revenues spur investment in the gold market, causing the oil and gold prices to climb in lockstep. In this scenario, an increase in oil prices leads to an increase in gold demand (and thus price).

Oil and gold prices have been denominated in US dollars since 1975, when OPEC (Organization of Petroleum Exporting Countries) agreed to sell their oil exclusively in US dollars. As a result of the dollar's volatility, global crude oil

and gold prices may move in lockstep. A key drawback of the existing literature is the occurrence of nonlinearities and asymmetries effecting both oil price shocks and gold returns, in addition to the above mentioned studies concentrating on Oil–gold price correlations. As a result, our research aims to bridge these gaps.

RESEARCH STATEMENT

To investigate and comprehend the connection between gold, crude oil, and the stock market.

RATIONALE &SIGNIFICANCE OF THE STUDY

Oil and gold are often swapped by investors in advanced and budding markets to diversify their portfolios. Examining oil price movements can then aid policymakers in predicting gold prices and implementing effective monetary policies if oil prices have an impact on gold pricing. Investigating interrelationships of oil, gold price returns and their effect on stock market may give investors insight into where they should put their money. Last but not least, as consumers, traders, policymakers, and producers are experiencing feedback relationships with oil shocks, such discussions are critical.This research paper intends to investigate the above corundum. The following points have been particulary focused at. Is there a long-term connection among the price of oil and the price of gold and stock market indicators ?Does oil price fluctuations affect gold return and are they coorelated with stock ?Is the effect negative, positive,strong,weak, symmetric, asymmetric, linear, or non-linear.

RESEARCH METHODOLOGY&DATA COLLECTION

1.1   RESEARCH DESIGN:

This is an empirical study in which the data is downloaded as monthly crude oil and gold prices, then compressed into yearly data. We took 110 data points (monthly averages) from three data series,each data series represents one asset class, such as gold, oil, or the stock market and look for correlation among them. The Paper relies on secondary data from NSE WEBSITE, which is authentic data of government website for the gold price, Crude oil prices and Stock Market Data.

1.2   SAMPLE DESIGN:

Samples are taken from NSE INDIA website and all the prices of gold, crude oil, stock markets were taken from this websites of government.

1.3   RESEARCH OBJECTIVE:

1. To contemplate the connection between the two key variables in this study, crude oil price and gold price, as well as their effect on stock prices.

2. To establish a link among oil prices and the stock market.

3. To establish a connection among gold prices and the stock market.

4. To inspect whether a casual or a casual and effect relationship exists among the Crude oil Price, gold price & its impact on stock price.

1.4   RESEARCH QUESTION:

1. Is there a connection between the two variables, crude oil price and gold price, and their effect on stock price?

2. Is there a connection between the price of gold and the price of oil and stock prices?

3. What is the relationship between gold and oil prices and stock market prices in terms of co-integration and causality?

1.5   BASIC THREE HYPOTHESIS OF THE STUDY:

1.6   Based on Correlation and Significance;

The following Hypothesis emerges;

HO1: There is no Correlation between Crude oil prices and stock Market Prices

HA1:   There is Correlation between Crude oil prices and stock Market Prices

HO2: There is no Correlation between Gold prices and stock Market Prices

HA2: There is Correlation between Gold prices and stock Market Prices

HO3: There is no Correlation between Gold prices & Crude oil prices

HA3: There is Correlation between Gold prices & Crude oil prices

1.7   TOOLS OF STATISTICAL ANALYSIS

In the present analysis mostly secondary data have been used, so the use of Tests of correlations & Causality, and Descriptive statistics are used for the present study.

1.8   1. Descriptive Statistics

It uses the mean, median, minimum,maximum, std. deviation, skewness kurtosis, and likelihood to analyses the various time series under evaluation.

2. Inferential Statistics

Examining the Significance of the Correlation Coefficient:The correlation coefficient, 'r'tell about the strong point of the linear associationamong x and y.

1.9 Granger Causality Test

This test determines if two variables (crude oil prices, gold prices, and the stock market) have a cause and effect relationship by demonstrating that they have a consistent trend.

1.10 DATA ANALYSIS :

Table no 1 :Descriptive Statistics:

		Crude oil, average($/bbl)	Gold ($/troy oz)	Open Price	Close Price
N	Statistic	110	110	110	110
Range	Statistic	96.7417	892.8900	10568.7901	10378.5099
Minimum	Statistic	21.0433	1075.7400	2657.3899	2813.8401
Maximum	Statistic	117.7850	1968.6300	13226.1800	13192.3500
Mean	Statistic	68.9684	1391.1284	5928.5847	6012.9978
	Std. Error	2.43629	20.99306	230.33282	236.18019
Std. Deviation	Statistic	25.5521	220.1771	2415.7510	2477.0787
Variance	Statistic	652.908	48477.961	5835852.68	6135918.78
Skewness	Statistic	0.416	0.942	0.938	0.967
	Std. Error	0.230	0.230	0.230	0.230
Kurtosis	Statistic	-1.195	-0.212	0.574	0.595
	Std. Error	0.457	0.457	0.457	0.457

From the above table, from the sample of 110 , the Average crude oil price is 68.9684 with standard deviation of 25.55 points while gold has average mean price 1391.1284 with larger standard deviation of 220 points .As the skewness liesamong the normal range of -1.96 to +1.96, data reliability is higher and proves the consistency.

Table no 2 :Correlation of Crude oil price and stocks Market Prices

Correlations		Crudeoil, average ($/bbl)	Open Price	Close Price
Crude oil, average ($/bbl)	Pearson Correlation	1	-.591[**]	-.592[**]
	Sig.(2-tailed)		0.00	0.00
	N	110	110	110
Open Price	Pearson Correlation	-.591[**]	1	.991[**]
	Sig. (2-tailed)	0.00		0.000
	N	110	110	110
Close Price	CarlPearson Correlation	-.592[**]	.991[**]	1
	Sig. (2-tailed)	0.00	0.000	
	N	110	110	110
**Correlation is significant at the 0.01 level(2-tailed).				
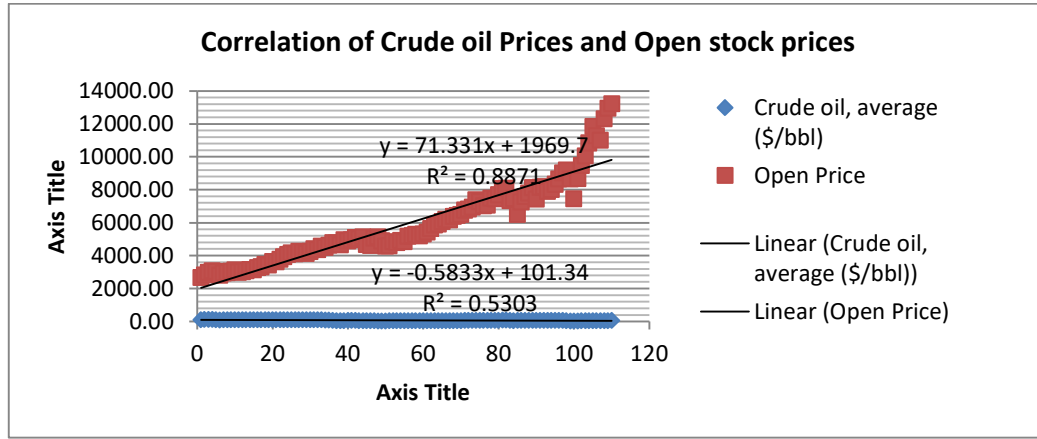
Correlation of Crude oil Prices and Open stock prices

(Source: E Views Software of Statistical analysis)

From the above table, it is seen that there is significant correlation between the crude oil prices and stock market prices as its value is – 0.591. The probability of prediction is very less .and also to test the significance of the value person's correlation t test is applied which also shows the significance because it shows values less than 0.05 at 5 % level of significance and sample size of 110.As r = 0.592, applying the t test manually,

$$ r = \left| \dfrac{1-r}{\dfrac{1-r^2}{n-2}} \right| ; \quad r = \left| \dfrac{1-0.592}{\dfrac{1-0.592^2}{110-1}} \right| $$

$r = 7.6138$ (Table value for t test at n-2 d.f. is 110-2=108 is 1.9822.)

RESULT 1:   As calculated value is greater than table value .We reject the hypothesis and conclude that our results are significant.

Table no 3 :Correlation of Gold prices and stock Market Prices

Correlations		Open Price	Close Price	Gold (Rs)
Open Price	Pearson Correlation	1	.991**	.347**
	Sig.(2-tailed)		0.00	0.00
	N	110	110	110
Close Price	KarlPearson Correlation	.991**	1	.366**
	Sig.(2-tailed)	0.00		0.00
	N	110	110	110
Gold ($/troy oz)	KarlPearson Correlation	.347**	.366**	1
	Sig.(2-tailed)	0.00	0.00	
	N	110	110	110
**Correlation is significant at the 0.01 level(2-tailed).				

(Source: E Views Software of Statistical analysis)

From the above table, it is seen that there is significant correlation between the gold prices and stalk market prices as its value is 0.347. The probability of

prediction is very less .and also to test the significance of the value person's correlation t test is applied which also show the significance because it shows values less than 0.05 at 5 % level of significance and sample size of 110.

As r = 0.347, applying the t test manually,

$$r = \left| \frac{1-r}{\frac{1-r^2}{n-2}} \right| \; ; r = \left| \frac{1-0.347}{\frac{1-0.347^2}{110-2}} \right|$$
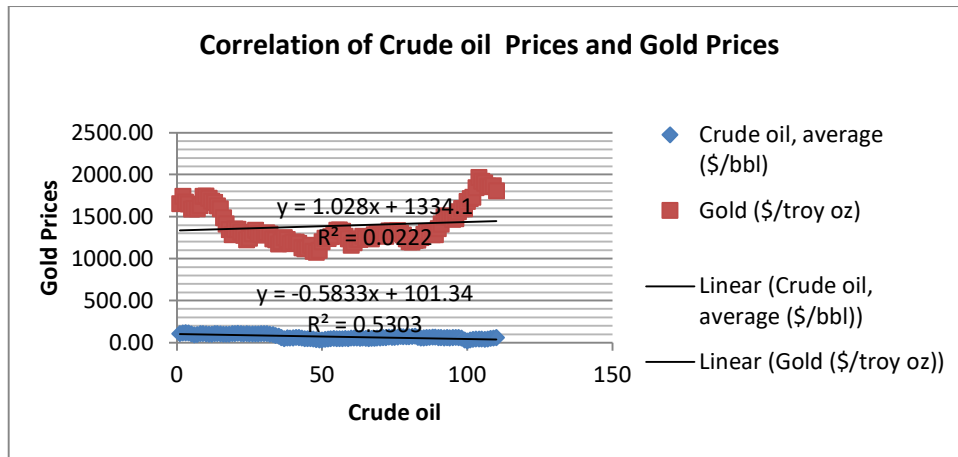
$r = 3.8450$ **(Table value for t test at n-2 d.f. is 110-2=108 is 1.9822.)**

RESULT 2: As calculated value is greater than table value .We reject the null hypothesis and conclude that our results are significant.

Table no 4: Correlation of Gold prices and Crude oil Market Prices

Correlations		Gold ($/troy oz)	Crude oil, average ($/bbl)
Gold ($/troy oz)	KarlPearson Correlation	1	0.134
	Sig.(2-tailed)		0.164
	N	110	110
Crude oil, average ($/bbl)	KarlPearson Correlation	0.134	1
	Sig.(2-tailed)	0.164	
	N	110	110

The above table shows that the relationship between gold prices and crude oil market prices is less significant, with a value of 0.134.

Correlation of Crude oil Prices and Gold Prices

y = 1.028x + 1334.1
R² = 0.0222

y = -0.5833x + 101.34
R² = 0.5303

(Source: E Views Software of Statistical analysis)

The probability of prediction is very less .and also to test the significance of the value person's correlation t test is applied which also show the significance because it shows values less than 0.05 at 5 % level of significance and sample size of 110. As r = 0.134, applying the t test manually,

$$r = \left| \frac{1 - r}{\frac{1 - r^2}{n - 2}} \right|$$

$$r = \left| \frac{1 - 0.134}{\frac{1 - 0.134^2}{110 - 2}} \right|$$

$$r = 1.4032$$

Table value for t test at n-2 d.f. is 110-2=108 is 1.9822.

RESULT 3: As calculated value is less than table value .We accept the null hypothesis and conclude that our results are not significant.

Hypothesis Testing Scenario 1:

Thus Based on Simple Correlation and Significance;

The following Hypothesis emerges;

HO1: There is no Correlation between Crude oil prices and stock Market Prices

HA1: There is Correlation between Crude oil prices and stock Market Prices

Result: Null Hypothesis Rejected. (RESULT 1)

HO2: There is no Correlation between Gold prices and stock Market Prices

HA2: There is Correlation between Gold prices and stock Market Prices

Result: Null Hypothesis Rejected. (RESULT 2)

HO3: There is no Correlation between Gold prices & Crude oil prices

HA3: There is Correlation between Gold prices & Crude **oil prices**

Result: Null Hypothesis ACCEPTED. (RESULT 3)

Table No 5: Hypothesis Testing Scenario 1 Summary

TESTING HYPOTHESIS SCENARIO 1							
Null Hypothesis	**Test Used**	**Level of Significance**	**Degree of Freedom**	**Calculated Value**	**Table value**	**Decision**	**Significance**
There is no significant Correlation between crude oil and stock market prices	**T test for correlation**	5%	108	7.6138	1.9822	Reject the Hypothesis	**Significant**

There is no significant Correlation between gold prices and stock market prices	**T test for correlation**	5%	108	3.845	1.9822	Reject the Hypothesis	**Significant**
There is no significant Correlation between gold prices and crude oil market prices	**T test for correlation**	5%	108	1.4032	1.9822	Accept the hypothesis	**Insignificant**

Hypothesis Testing Scenario 2:

Based on Ganger Causality

Hypothesis 4:

HO4: There is the no relationship between gold and crude oil prices in terms of co-integration and causality

HA4:There is the relationship between gold and crude oil prices in terms of co-integration and causality

Gold-Oil Engle Granger

From the above table it is seen that , there is a very high f statistic & p value is >0.05 then reject null hypothesis and Accept the alternate hypothesis and conclude that there is cause effect relationship directly into variables at 5 % level of significance .

RESULT 4: NULL HYPOTHESIS REJECTED

Hypothesis 5:

HO5: There is no relationship between Gold and Stock Market prices in terms of co-integration and causality

HA5:There is relationship between Gold and Stock Market prices in terms of co-integration and causality

Gold-Stock Market Price Engle Granger

G Group: UNTITLED   Workfile: DATA_STOCK INDEX_GOLD_OIL::Untitled\

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Pairwise Granger Causality Tests
Date: 05/16/21 Time: 16:02
Sample: 2012M01 2021M02
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
D(GOLD__$_TROY_OZ_) does not Granger Cause D(CLOSE_PRICE)	107	0.11810	0.8887
D(CLOSE_PRICE) does not Granger Cause D(GOLD__$_TROY_OZ_)		0.88403	0.4163

From the above table it is seen that , there is a very high f statistic & p value is >0.05 then reject null hypothesis and Accept the alternate hypothesis and conclude that there is cause effect relationship directly into variables at 5 % level of significance .

RESULT 5: NULL HYPOTHESIS REJECTED

Hypothesis 6:

HO6: There is no relationship between Crude Oil and Stock Market prices in terms of co-integration and causality

HA6:There is relationship between Crude Oil and Stock Market prices in terms of co-integration and causality

Crude-Oil Stock market Price Engle Granger

G Group: UNTITLED   Workfile: DATA_STOCK INDEX_GOLD_OIL::Untitled\

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Pairwise Granger Causality Tests
Date: 05/16/21 Time: 16:03
Sample: 2012M01 2021M02
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
D(CRUDE_OIL__AVERAGE__$_BBL_) does not Granger Cause D(CLOSE_PRICE)	107	0.84217	0.4337
D(CLOSE_PRICE) does not Granger Cause D(CRUDE_OIL__AVERAGE__$_BBL_)		3.26472	0.0422

From the above table it is seen that , there is a very high f statistic & p value is >0.05 then reject null hypothesis and Accept the alternate hypothesis and

conclude that there is cause effect relationship directly into variables at 5 % level of significance .

RESULT 6: NULL HYPOTHESIS REJECTED

Table No 6: Hypothesis Testing Scenario 2 Summary

TESTING HYPOTHESIS SCENARIO 2						
Null Hypothesis	**Test Used**	**Level of Significance**	**Degree of Freedom**	**P Value Greater Than 0.05**	**Decision**	**Significance**
There is the no relationship between gold and oil prices in terms of co-integration and causality	**Granger Causality Test for Causality**	5%	107	All The Cases	Reject the Hypothesis	**Significant**
There is no relationship between gold and Stock Market prices in terms of co-integration and causality	**Granger Causality Test for Causality**	5%	107	All The Cases	Reject the Hypothesis	**Significant**
There is no relationship between Crude Oil and Stock Market prices in terms of co-integration and causality	**Granger Causality Test for Causality**	5%	107	All The Cases	Reject the Hypothesis	**Significant**

FINDINGS

1. Correlation between Stock prices and Gold Price is 0.347 which clearly proves that there is poor positive correlation between both of them and if the stock price increases Gold price increase slightly and if stock prices decrease and there is a fall in gold prices . These results are Held Significant by T Test also. The Granger Test for Causality also indicates that there is significant co-integration and causality between these two asset classes.

2. Correlation between Crude Oil Prices & Gold Price is 0.134 which clearly proves that there is poor positive correlation between both of them and if the Crude Oil Prices increases Gold price increase slightly and if Crude Oil Prices decrease and there are falls in gold prices. But the correlation between them is poor. These results are Held In-Significant by T Test also. Although going by The Granger Test for Causality some amount of significant co-integration and causality between these two asset classes is found.

3. It is seen that there is significant negative correlation between the crude oil prices and stock market prices as its value is – 0.591. It clearly proves that there is proper negative positive correlation between both of them and if the stock price increases crude oil prices decrease and if stock prices decrease and there are upswings in crude oil prices. These results are Held Significant by T Test also. The Granger Test for Causality also indicates that there is significant co-integration and causality between these two asset classes.

4. It is found that Gold is positively correlated with both crude oil and stock market although more with stock market and less with crude oil. Thus investors need to be careful while investing in Gold and see the various aspects of market like how is the dollar faring with respect to rupee and international developments affecting the crude oil prices. Because as it is seen that gold largely moves in tandem with oil prices and hence the investor can see to when and how much to invest in gold assets.

5. It is clearly evident that Crude Oil and stock market act as antidote to each other and thus speculators risk managers hedge makers all can use them as complimentary bets; as safeguards to lose. That if someone is expecting loss in stock market he can invest in crude oil and vice versa.

CONCLUSION

Given their complimentary nature of Investment it can be safely understood that the stock market and Crude oil can act as hedging bets for each other and can be used to safeguard investment value of portfolios in order to preserve their value in a medium to long term forecast. Gold as an investment is advised for all investors alike. Gold has acted as a reliable "store of value" for centuries because of many resaons like being scarce yet being easily recognizable and acceptable as a form of payment and it is still considered as a weight monetary measure from traditional times to modernity. Depending on conservative or aggressive Approach in Investment gold investment can be an important game changer in

portfolio diversification. This is due to ability of Gold act as a diversifier on account of its *lowcorrelation* with stocks and bonds. Due to this reason, experts usually urge investors to keep a chunk of gold in their total assets.

Usually portfolios come invested with traditional financial assets including stocks and bonds; the inclusion of gold provides an element of security and value preservation. Diversification protects a portfolio's total value from fluctuations in the value of a single asset class, and Gold provides just that.

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