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STUDY ON DYNAMIC RELATIONSHIP AMONG GOLD PRICE, S&P DOLLEX-30, AND BSE SENSEX

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Abstract: Gold has always been a hedge instrument and the dynamic relationship of this yellow metal with other macro economic variables have always kept researches on their toes. In this regard the study attempts to unveil the dynamic relationship between Gold Price, Dollar Index and BSE Sensex using Granger Causality Test. The study has taken into account daily closing data from January 2018 to December 2021.The data series is being tested for skewness, Kurtosis, stationarity and Granger Causality. The data is found to follow normal distribution and the Granger Causality test reveals that Gold Price influences Sensex and S&P Dollex in the Short run.

Key Words - Gold Price, Sensex, Dollar, Augmented Dickey Fuller(ADF), Granger Causality.

I. INTRODUCTION

Gold has always been an appealing investment avenue in India, and due to its strong performance in recent years, it mostly reinforced the validity of the view, of it being a safe heaven for investors. When markets are turbulent, investors prefer to exit risky assets like stocks and invest in assets like gold. Gold, like most other commodities, is traded in a dollar-dominated economy. As a result, there will be frequent outflow of currencies from the developing market during times of crises. This makes it undoubtedly the most appealing investment for investors during turbulent times.

Since LPG, many studies have focused on the analysis of a country's financial market in connection to macroeconomic and other financial variables. In general, the stock market is influenced by economic, social, and political factors. There are many studies trying to understand the complex nature of the stock marks and its inter-dependency with other macroeconomic variables, namely the crude oil price, gold price, exchange rate, and inflation rate (Abbas Alavi Rad, 2011).With this backdrop the study aims to understand the relationship between gold price, dollar exchange and the stock market.

II. LITERATURE REVIEW

Considerable study has been conducted in the area of financial markets to understand the linkages between various economic indicators. Gold and Oil have been studied in terms of their interconnections with stock market by researchers. According to Laughlin (1997), whether commodities decline in comparison to gold or gold increases with respect to commodities, the value of gold has advanced in either instance. Larry et al. (1996) conducted a study that confirms the theory of market efficiency for the global gold market from 1991 to 2004. The analysis also discovers that actual appreciation or depreciation of the euro and yen against the US dollar has a significant impact on the price of gold in most other currencies.

Ashraf (2005) in his study, opines that the bottom gold-oil ratio corresponds with falling (or negative) yield spreads, a dropping dollar, and finally declining growth. Zang et al. (2010) investigate the cointegration and causality between gold and crude oil prices in their study. The analysis of the sample data reveals consistent variations in the crude oil price and gold price, with a substantial positive association. According to the study, the volatility of the gold price is caused by the long-term equilibrium between the two markets and the crude oil price.

Mu Lan et al. (2010) used daily data and the time series method to investigate the effects of fluctuations in crude oil price, gold price, and US dollar exchange rates vs. various currencies on stock price indices in the United States, Germany, Japan, Taiwan, and China, as well as the long and short-term correlations among these variables. The findings reveal that there are cointegrations between changes in the price of oil, gold, and exchange rates of the US dollar vs foreign currencies, as well as stock markets in Germany, Japan, Taiwan, and China. Wang et al. (2010) investigated the effects of variations and long and short-term connections

in crude oil price, gold price, and exchange rates of the US dollar vs. various currencies on stock price indices using daily data and time series approach.

Thai-Ha Le and Youngho Chang (2011) found that the price of gold, among other things, can generate expectations of rising inflation over time. Only the price of gold has a short-term influence on Japan's interest rate. The asymmetric long-run relationship between crude oil and gold futures was investigated by Yen-Hsien Lee, Ya-Ling Huang, and Hao-Jang Yang (2012). The momentum threshold error-correction model with generalized autoregressive conditional heteroskedasticity (GARCH) is used to analyze asymmetric cointegration and causal links between WTI Crude Oil and gold prices in the futures market. According to the findings, there is an uneven long-run adjustment between gold and oil.

Ewing and Malik (2013) used univariate and bivariate GARCH models to investigate the volatility of gold and oil futures with structural breakdowns. The study gives clear evidence of considerable volatility transmission between gold and oil returns in the presence of structural failures. Biakowski et al. (2015) estimated Gold Price using numerous econometric models and Augmented Dickey–Fuller (ADF) test to detect explosive behaviour. Their research shows that inflation and gold ETF demand have the capacity to explain price movements. Using a wavelet technique, Barunk et al. (2016) performed a time-frequency study of dynamic correlations between assets such as gold, oil, and stocks from 1987 to 2012. Their findings indicate that heterogeneity is a major element in correlations between assets across various investment horizons during economic downturn and financial turmoil.

Gil-Alana et al. (2017) used time series approaches to investigate the link between oil and gold prices, which are based on the principles of partial integration and cointegration. Their research reveals a long run partial cointegration between the two variables. Bilgin et al. (2018) employed a nonlinear Autoregressive-distributed Lag (ARDL) model to examine the asymmetric influence of four uncertainty measures on gold prices (specifically, the volatility, skewness, global economic policy, and partisan conflict index. The findings suggest that increased economic policy uncertainty correlates with rallying gold price. Gold prices, on the other hand, are less likely to decline when economic policy improves.

III. RESEARCH OBJECTIVES

The purpose of this study is to look into the dynamic relationship across Gold Price, S&P Dollex 30 and Sensex. The sub objectives of the study are listed below:

- To test if the fluctuation in Gold Price, S&P Dollex 30 and Sensex are symmetrical or asymmetrical in nature.
- To test the stationarity of Gold Price, S&P Dollex 30 and Sensex data series for the study period.
- To explain the existence of short run relationship among the variables under study.

IV. METHODOLOGY

For this study secondary daily closing data has been collected BSE website with respect to S&P Dollex 30 and Sensex for a period ranging from January 2018 to December 2021. The total observation included under the study is 991 for each index. On the other hand, daily Gold Price closing data is obtained from the website of World Gold Council for the same period adding upto 1045 observations. Econometric model has been applied to analyze the data with respect to its nature, stationarity and cointegration using VAR model.

V. RESULTS AND DISCUSSION

5.1 Results of Descriptive Statistics for Gold Price, Dollex and Sensex

Table No 5.1 Showing Descriptive Statistics

	Gold Price	S&P Dollex	Sensex
Mean	112260.3	4729.33	41388.46
Median	109842.9	4503.14	38598.99
Maximum	154901.9	6751.15	61765.59
Minimum	82401.3	2805.36	25981.24
Std. Dev.	21468.7	824.5974	8012.14
Skewness	0.023225	0.756748	0.973352
Kurtosis	1.355211	2.945045	2.873686
Jarque-Bera	117.8885	94.71017	157.1401
Probability	0.000	0.000	0.000
Sum	1.17E+08	4686766	41015961
Sum Sq. Dev.	4.81E+11	6.73E+08	6.36E+10
Observations	1045	991	991

Table 5.1 shows the descriptive statistics such as mean, standard deviation, maximum minimum, skewness, Kurtosis and Jarque-Bera test and its p value for all the three variables of the under study. It is evident from the table the Gold Price (4.81) has lower standard deviation as compared to other two variables Dollar index (6.73) and Sensex (6.36). The skewness of the distribution shows that Gold Price data is symmetric with its value close to 0 (0.023) whereas Dollex an Sensex are asymmetrical or positively skewed with values 0.757 and 0.973 respectively. With regard to the Kurtosis of the distribution all the three data set follows a

normal distribution as the Kurtosis value is less than 3. All the above values of descriptive statistics are statistically significant with p-value of 0.000.

5.2 Results of Stationarity Test

Table No:5.2 Showing Augmented Dickey Fuller and Phillips-Perron Test

		Gold Price		S&P Dollex 30		Sensex	
		t-Statistic	Prob.*	t-Statistic	Prob.*	t-Statistic	Prob.*
ADF at Level							
Augmented Dickey-Fuller test statistic		-1.098663	0.7183	-0.236218	0.9313	0.022085	0.9593
Test critical values:	1% level	-3.436395		-3.436736		-3.436736	
	5% level	-2.864098		-2.864248		-2.864248	
	10% level	-2.568183		-2.568264		-2.568264	
ADF at First Difference							
Augmented Dickey-Fuller test statistic		-31.80275	0.000	-31.68568	0.000	-31.67695	0.000
Test critical values:	1% level	-3.436401		-3.436742		-3.436742	
	5% level	-2.8641		-2.864251		-2.864251	
	10% level	-2.568185		-2.568266		-2.568266	
PP at Level							
Phillips-Perron test statistic		-1.02826	0.7449	-0.276793	0.9257	0.029676	0.96
Test critical values:	1% level	-3.436395		-3.436736		-3.436736	
	5% level	-2.864098		-2.864248		-2.864248	
	10% level	-2.568183		-2.568264		-2.568264	
PP at First Difference							
Phillips-Perron test statistic		-32.20685	0.000	-31.69423	0.000	-31.67949	0.000
Test critical values:	1% level	-3.436401		-3.436742		-3.436742	
	5% level	-2.8641		-2.864251		-2.864251	
	10% level	-2.568185		-2.568266		-2.568266	

*MacKinnon (1996) one-sided p-values.

Stationarity Test is applied to see if the data series is stationary over study period. For this purpose, two tests namely Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) Test is conducted. It is observed from the above Table 5.2 that under both ADF and PP test all the three data series is non-stationary at level and stationary at their first difference which is statistically significant with p-value of 0.000.

5.3 Results of Granger Causality Test

Table No:5.3 Showing Pairwise Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.
Sensex does not Granger Cause Gold Price	989	0.68825	0.5027
Gold Price does not Granger Cause Sensex		3.01599	0.0495
S&P Dollex 30 does not Granger Cause Gold Price	989	0.97487	0.3776
Gold Price does not Granger Cause S&P Dollex 30		2.98106	0.0472
S&P Dollex 30 does not Granger Cause Sensex	989	2.00454	0.1353
Sensex does not Granger Cause S&P Dollex 30		2.23931	0.1071

The above Table No 5.3 shows the results of Granger Causality test to know about the short run relationship among Gold Price, S&P Dollex and Sensex. The results reveal that Gold Price Granger Cause Sensex and S&P Dollex 30 with p-value less than 0.05. Whereas Sensex do not Granger Cause Gold Price and S&P Dollex and S&P Dollex do not Granger Cause Gold Price and Sensex as the p-value is more than 0.05 respectively. Therefore, we can conclude that gold Price influences Sensex and S&P Dollex in the short run.

V. CONCLUSION

Gold has traditionally been viewed as a hedging tool, and the dynamic interaction of this precious metal with other macroeconomic indicators has kept researchers on their toes. The study used the Granger Causality Test to reveal the dynamic link between the Gold Price, the Dollar Index, and the BSE Sensex. The data is confirmed to be normally distributed, and the Granger Causality test demonstrated that Gold Price has significant influence on Sensex and S&P Dollex in the short run.

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