Relationship Between Gold Futures Open Interest and Gold Futures Returns

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Abstract

Purpose : The present study analyzed the trend in open interest and the relationship between gold futures open interest and futures returns to examine the investors' preference for gold commodity investment for asset allocation in their portfolio. Participants and investors in the commodity market strongly believe that open interest plays an essential role in determining the prices of commodity futures. To account for this, we studied the relationship between gold commodity futures open interest and gold futures returns.

Methodology : Futures returns was a dependent variable, while open interest was an independent variable in the study. E-views software 10.0 version acquired daily data on open interest in gold commodities and futures daily prices from 2012 to 2020 from the multi-commodity exchange (MCX) website.

Findings : We found no relationship between gold futures open interest and futures returns, and temporal trends like seasonal components did not impact open interest.

Practical Implications : It was advised that investors and portfolio managers use the results of the current study to help them determine their asset allocation. Our study had significant limitations, but it also leaves room for future research into the function and effectiveness of e-gold investments. The study might include additional investment classes if given a compelling structure.

Originality : In contrast to earlier studies on investment in gold commodities, the current study examined the relationship between open interest and futures prices and developed a model to comprehend investors' rising desire for gold commodities.

Keywords : **gold commodity, open interest, futures returns, relationship, investor preference**

JEL Classification Codes : G11, G13, G32

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Commodity market investments create significant interest in financial market analysts and investors, who use them as an alternative investment avenue for risk hedging purposes. Commodity prices have fluctuated significantly during the past ten years, and price swings have become increasingly regular. The spillover effect influences commodity futures and spot prices (Johen, 2022). Price volatility exists in all commodities (Syed et al., 2021). Prices of a product in a specific market are determined by its supply and demand conditions, as well as the supply and demand factors of all other associated markets (Salam et al., 2012). All commodities experience price uncertainty, which depends on the commodity's characteristics (Sonia & Narwal, 2023). The state of the market's economy is the primary factor affecting commodity pricing.

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For Tulsian and Shrivatsav (2020), portfolio diversification is advised to improve results due to price uncertainty. The buyers and sellers of the contract enter into the relationship when a futures contract is bought or sold. The buying and selling of futures contracts indicate an open position in the market. The open interest also changes when there is an increase or decrease in open positions. This open position expires when a contract is closed or reaches a mature position. The number of open positions in the market measures open interest, demonstrating the contract's universal nature (Garag & Ramesh, 2011). The open interest of the futures market is defined as the number of existing contracts that are in active position. It is inferred as the number of contracts outstanding at the end of the trading day. When a futures contract is initially registered for trade, its open interest rises from zero to zero when trading ends on the contract's maturity date. Commodity market participants and investors are convinced that open interest significantly influences commodity futures prices. This essential judgment has been tested in this study by examining how open interest in gold futures relates to futures returns. Only a small number of studies have used the variable open interest and examined the relationship between gold open interest and gold futures returns, but previous studies have used the variables trade volume, demand, supply, positions opened, analyzing the long or short position, spread, basis, etc., to measure the preference for gold commodity investment or the increase in investment. To overcome this gap, the current study focuses on the relationship between gold open interest and futures returns to quantify the rise in gold investment. The research in this field will always be valuable for investors and portfolio managers looking for asset allocation techniques for investing in gold commodities.

For the past few years, researchers have been concerned about many issues in the commodities market, with a particular priority on pricing. Salam et al. (2012) investigated the magnitude of seasonal price swings and the geographical price association of important cereal crops in different Bangladeshi markets. Seasonal price indices of boro (HYV) paddy, seasonal price indices of wheat, seasonal price variation of boro paddy and wheat in Bangladesh, and trend of harvest time wholesale price of boro paddy at different district markets in Bangladesh were obtained from various Ministry of Finance, Bangladesh Bureau of Statistics, FAO Statistical report, and Department of Agricultural Marketing (DAM) publications. Data were gathered over 24 years, from 1986–1987 to 2009–2010. The Engle–Granger, Augmented Dickey–Fuller (ADF), and cointegration tests were used to examine the data. According to the study's results, selected crop prices fluctuate and are volatile throughout the year before progressively declining. Garag and Ramesh (2011) investigated the relationship between the two terms. Data such as 16 liquid stocks and Standard & Poor's CNX NIFTY were gathered from the NSE website for contracts expiring between July 2022 and June 2006. Correlation analysis, a statistical technique, was used to examine the data. The analysis found no connection between open interest and futures returns. Rout et al. (2021a) investigated price discovery, volatility, and hedging efficiency in the Indian agriculture market. Technologies such as descriptive statistics, GARCH, vector error correction, and the VAR model are used for data analysis. According to the study, there is a risk in the commodities market and the futures market, which has been affected by the spot market in times of volatility, and the futures market has to increase its hedging efficiency.

Antwi et al. (2021) investigated the numerous factors influencing commodities pricing. The study used various decomposition approaches to forecast futures commodity returns, such as empirical and variational modes. Corn, crude oil, and gold commodities have all been sampled for the study. Price variations have been analyzed using high-frequency and low-frequency trend analysis, Pearson rank correlation, and Kendall's coefficient correlation. Finally, the study's findings demonstrated that commodity prices were influenced by market economic conditions rather than product supply and demand. Rout et al. (2021b) investigated agricultural and metal commodity price discovery, short-term shocks, and hedging strategies. Contango and normal backwardation have been applied to the spot and futures returns of the commodities chosen for the study. Tools such as Johansen's cointegration test, VECM model, Granger causality tests, and OLS regression models have been applied to analyze the data. The study results have revealed that the spot market influences the futures market in the long run. John et al. (2022) investigated the impact of futures trading on pulse spot pricing. The

study considered many aspects, such as commodity pricing, trade volume, growth, and supply and demand. According to the study, there is a minor spillover effect on commodity futures returns and spot prices.

Syed et al. (2021) evaluated COVID-19's impact on the Indian commodity and financial markets. Gold and oil prices were collected from the NSE of India for three periods — 1 April 2020 to 10 April 2021, 6 June 2020 to 30 September 2020, and 2 February 2021 to 10 April 2021. The ARDL model is used to examine the impact of COVID-19 on stock and commodity markets. The study's findings revealed a long-run association between the factors. During the first wave, the COVID-19 spread negatively impacted oil prices and equities but benefitted gold prices. The second wave was contradicting in that the oil prices and stock market have a positive influence, and gold commodities have been influenced negatively. Finally, there exists uncertainty due to pandemic conditions.

Sonia and Narwal (2023) investigated the volatility spillover between several commodities traded on the MCX. The study considered data such as closing spot and futures prices of two commodities from the metal, bullion, energy, and agricultural sectors from January 2009 to March 2020. To analyze the data, descriptive statistics and the EGARCH Model are used. The study's findings found that volatility spillover exists in all of the commodities studied, and it varies depending on the nature of the commodities. Joshi (2022) investigated the optimal portfolio size and the benefits of portfolio diversification. The analysis considered statistics such as the performance of all equities indexed in the NIFTY 50 and NASDAQ 100 from 2017 to 2019. The relationship between stock returns in India and the United States is investigated using correlation and regression to determine the size of the market portfolio. The study's findings showed a weakening link between the two indices, which is suggested for global diversification strategies. Tulsian and Shrivastav (2020) investigated the Indian capital market's trend analysis. The variables studied include market segments of debt private placement offerings, rights issue offerings, preferential equity, offshore capital market offerings, repurchase offers, and further public issues. The information was gathered between January 2001 and December 2019. The data is examined using graphical analysis and models like CAGR. The study's results showed that the market has a strong growth tendency.

Objectives of the Study

- To study the trend in gold futures open interest.
- To analyze the short-run relationship between gold futures open interest and gold futures return.

Research Methodology

Sources of the Data

The data for the study consists of daily open interest in lots of gold commodities and gold futures daily price/kg for eight years, from 2012–2013 to 2019–2020. All the time series are obtained from India's MCX (Multi Commodity Exchange) website.

Framework of Analysis

The study is descriptive and employs the Purposive sampling technique. Statistical and econometric tools such as descriptive statistics, the OLS regression model with trend and seasonal components, the ARMA model, and the Granger causality tests are used to examine the short-run relationship between gold futures open interest and gold futures return using the e-views software 10 version.

Analysis and Results

The descriptive data of Gold's futures open interest are shown in Table 1.

Table 1. ***Descriptive Statistics***

Particulars	Gold Futures Open Interest
Mean	13666.89
Median	12514.5
Maximum	32108
Minimum	4439
Standard Deviation	5317.105
Skewness	0.794046
Kurtosis	3.084944
Jarque–Bera	232.4802
Probability	0.0000

Table 1 displays the findings of descriptive statistics of projected open interest in gold from 2012–2013 to 2019–2020. The result shows that during the study period, the average and the maximum number of contracts opened are 13666.89 and 32108, respectively. The standard deviation is 5317.105. The skewness value is 0.794046, and it is also skewed positive. The kurtosis seems leptokurtic; its value is 3.084944, more than its fixed criterion of the value 3. The *p*-value of Jarque–bera is less than 0.05. It reveals that the time series data are not distributed normally and suggests that open interest in the commodity market has shown an increasing trend, and sometimes the decreasing trend has also been spotted.

Regression Analysis

Regression analysis is used to measure or evaluate the relationship between the dependent variable and the independent variable.

The following null hypothesis is constructed to determine if the time trend significantly affects gold futures open interest.

↳ **H01 :** The time trend does not affect gold futures open interest.

Table 2 presents the results of the regression analysis.

Table 2. ***Regression Analysis of Gold Futures Open Interest***

Variable	Coefficient	Std. Error	*t*-Statistic	Probability
C	13651.61	226.3877	60.30191	0
@TREND	0.013865	0.17781	0.077979	0.9379
R-squared	0.000003	*F*-statistic		0.006081
Adjusted *R*-squared	–0.00045	Prob(*F*-statistic)		0.937852

Table 2 shows the regression analysis results of gold futures open interest from 2012–2013 to 2019–2020. The dependent variable is gold futures open interest, and the independent variable is the time trend. The parallel *t*-test

value is 0.07797, and the *p*-value is 0.9379, which is non-significant and accepts the null hypothesis. The *R*-squared is 0.000003, indicating that the model does not fit. The *p*-value for *F*-statistics is 0.937852, indicating that H01 is accepted. The conclusion is that the time trend does not affect open interest. Both are self-contained.

Auto Regression and Moving Average (ARMA) (1,1) Model

Using autoregression (AR) past values and moving average (MA) past errors, the ARMA model is used to examine the impact of historical trends on gold futures open interest. This model aids in the analysis of seasonal variations in the regression model. The influence of time on gold futures open interest has been determined by comparing the OLS regression model and the seasonal trend regression model.

The following null hypothesis is constructed to determine whether the time trend with seasonal components significantly affects open interest.

- **H02 :** The time trend with seasonal components does not affect gold futures open interest.

Table 3 shows the results of the ARMA (1,1) model.

Table 3. ***ARMA (1,1) Model***

Variable	Coefficient	Std. Error	*t*-Statistic	Probability
C	13805.73	2914.793	4.736436	0
@TREND	0.323191	2.402398	0.134528	0.893
@MONTH=1	141.5713	733.1141	0.193109	0.8469
@MONTH=2	–165.168	728.5538	–0.22671	0.8207
@MONTH=3	–325.693	724.518	–0.44953	0.6531
@MONTH=4	–484.922	719.1802	–0.67427	0.5002
@MONTH=5	–268.18	695.8916	–0.38538	0.7
@MONTH=6	–141.016	688.3509	–0.20486	0.8377
@MONTH=7	–95.017	656.8552	–0.14465	0.885
@MONTH=8	–377.952	641.8092	–0.58889	0.556
@MONTH=9	–298.488	440.5551	–0.67753	0.4981
@MONTH=10	–397.567	387.779	–1.02524	0.3054
@MONTH=11	–41.5671	362.051	–0.11481	0.9086
AR(1)	0.990791	0.002874	344.7123	0
MA(1)	0.095298	0.013269	7.18186	0
SIGMASQ	420432.4	6484.91	64.83241	0
R-squared	0.985122	*F*-statistic		9667.192
Adjusted *R*-squared	0.98502	Probability (*F*-statistic)		0

Model Equation

Gold Futures Open Interest Series = Constant term (1) + coefficient value (2)*@TREND + coefficient value (3)*(@MONTH=1) + coefficient value (4)*(@MONTH=2) + coefficient value (5)*(@MONTH=3) + coefficient value (6)*(@MONTH=4) + coefficient value (7)*(@MONTH=5) + coefficient value

(8)*(@MONTH=6) + coefficient value (9)*(@MONTH=7) + coefficient value (10)*(@MONTH=8) + coefficient value (11)*(@MONTH=9) + coefficient value (12)*(@MONTH=10) + coefficient value (13)*(@MONTH=11) …… (1)

Substituting the estimated model coefficients, the model equation becomes :

Gold Futures Open Interest Series = 13805.7332597 + 0.323190575873*@TREND + 141.571262604*(@MONTH=1) – 165.168373268*(@MONTH=2) – 325.693280599*(@MONTH=3) – 484.921878497*(@MONTH=4) – 268.179554956*(@MONTH=5) – 141.016002833*(@MONTH=6) – 95.0170399849*(@MONTH=7) – 377.952446247*(@MONTH=8) – 298.488426572*(@MONTH=9) – 397.566470166*(@MONTH=10) – 41.5671009926*(@MONTH=11) …… (2)

Table 3 displays the ARMA (1,1) model findings with temporal trend and seasonal components of gold futures open interest from 2012–2013 to 2019–2020. Open interest in gold futures is the dependent variable, while a temporal trend with seasonal components is the independent variable. Compared to the OLS regression model, the *R*-squared value has increased to 0.985122. The *t*-statistics value is increased to 0.134 compared to the OLS regression Model. While considering the *p*-values of entire seasonal components, all the values more than 0.05 represent the non-existence of seasonal influence on gold futures open interest, which represents H02 is accepted. The *p*-values of AR(1), *F*-statistics, and MA(1) are also lower than 0.05, which proves that the time trend affects open interest, especially MA (1) says that the model is the best fit.

Unit Root Test of Gold Futures Open Interest and Gold Futures Return Series at Level

The following null hypotheses are framed to find whether the gold futures open interest and futures return are stationary.

- **H03 :** The gold futures open interest and return series are non-stationary.
- **Ha3 :** The gold futures open interest and return series are stationary.

Table 4 presents the unit root test results of gold futures open interest and gold futures return.

Table 4. ***Unit Root Test***

Variables	Tests	Level I(0)	*t*-statistics and *p*-value
Open Interest	ADF	–2.862592	–52.69890 (0.000)*
	PP	–2.86265	–53.15144 (0.000)*
Gold Futures Return	ADF	–2.86265	–37.8296 (0.000)*
	PP	–2.86265	–37.2364 (0.000)*

Note. *p<0.05 significance.

The unit root test results for gold futures open interest and gold futures return are shown in Table 4. The ADF (–52.69890) and PP tests (–53.15144) *t*-statistics for gold futures open interest and (–37.8296) and (–37.2364) *t*-statistics for gold futures return, respectively. The *p*-values of the ADF and PP tests for both variables are less than 0.05, indicating that H03 is rejected, indicating that stationarity of gold futures open interest and gold futures return does not exist.

Granger Causality Test

The Granger causality test has been used to ascertain the short-run relationship between gold futures open interest and futures returns. The following null hypotheses are framed to determine whether a relationship exists between gold futures open interest and futures return.

- **H04 :** Open interest (OI) does not Granger cause futures return.
- **Ha4 :** Futures return does not Granger cause OI.

Table 5 shows the results of the Granger causality tests.

Table 5. ***Granger Causality Tests for Gold Futures Open Interest and Gold Futures Returns***

Lags	Particulars	*F*-statistics	*p*-value	Significance Status
1	OI does not Granger cause the futures returns.	0.43094	0.65	Non Significant
	Futures returns do not Granger cause OI.	0.83494	0.434	Non Significant
2	OI does not Granger cause the futures returns.	0.41794	0.7401	Non Significant
	Futures returns do not Granger cause OI.	1.07187	0.3598	Non Significant
3	OI does not Granger cause the futures returns.	0.907	0.4589	Non Significant
	Futures returns do not Granger cause OI.	0.84686	0.4954	Non Significant
4	OI does not Granger cause the futures returns.	0.78092	0.5633	Non Significant
	Futures returns do not Granger cause OI.	0.6893	0.6316	Non Significant

The Granger causality tests of gold futures open interest and return are shown in Table 5. The *p*-values of *F*-statistics are greater than 0.05, demonstrating that H04 and Ha4 are accepted, demonstrating that gold futures open interest and gold futures return do not Granger cause each other, explaining why there is no short-run link between the two variables.

Discussion and Conclusion

Open interest is a metric to determine how many contracts were opened during the study period. In the opinion of Mr. Garag and Mr. Ramesh, open interest reveals the level of interest in a specific contract or good. More people choose that particular product or contract when the open interest rises, showing increased demand for that particular commodity. Investors favor this commodity since gold is a valuable metal. This overall viewpoint is supported by the analysis, which revealed that the minimum number of contracts opened throughout the study period is 4,439. In recent years, from 2018 to 2020, it has increased to 32,108, illustrating investors' and dealers' desire for gold as a commodity. Before 2018, it showed a varied pattern. The outcomes of the regression analysis demonstrate that not all open interest can be accounted for by the temporal trend. Whenever there is a modest increase or decrease in the number of open positions on the contract, the open interest changes, but it has no immediate effect on the market (Garag & Ramesh, 2011). The conclusion is that the time trend does not affect open interest. Both are self-contained. The Granger causality tests have once again demonstrated that changes in open interest do not affect the gold futures return. Both open interest and gold futures returns are unrelated to one another.

Managerial and Theoretical Implications

The study results reveal that the investors' preferences for gold investment increased during the study period. The overall increase in investment will create more liquidity in the market and, again, lead to market volatility. Gold is the most desired of all other metals worldwide, and investors have preferred it because of its beauty, liquidity, asset quality, etc. As a financial asset, gold continues to be valuable and functional. Although gold always retains its worth as an asset, macroeconomic variables, including changes in interest rates, currency fluctuations, and worldwide demand, may be to blame for the downward trends from 2013 to 2018.

This study can help investors and portfolio managers understand the flow of gold preferences among investors. The study's findings will give investors a higher degree of understanding to view gold as a vital asset in their portfolio. It will also help policymakers develop new investment criteria. The OLS regression model, the ARMA model, and Granger causality were used to determine the trend in open interest and the link between gold futures open interest and return in this study. However, the GARCH and T-GARCH models can also predict the volatility of gold futures returns. Overall, this study offers knowledge of investors' gold investing characteristics by analyzing the proxy variable, namely open interest, and establishing the correlation between gold futures open interest and gold futures return.

Limitations of the Study and the Directions for Future Research

The research is limited to the study period from 2012 to 2020. The raw gold investment trend after 2020 can be assessed by forecasting current research results, but forecasting methods cannot predict it. However, raw gold in commodity futures is essential for investors and portfolio managers. Still, many other gold investment opportunities, such as e-gold, are available in the market. Future research can probe into the role and efficiency of e-gold investments. The study could be outstretched to the other investment classes underneath a zestful framework.

Authors' Contribution

Dr. D. Vijayalakshmi devised the idea of a qualitative and quantitative design to conduct the empirical investigation. Dr. D. Vijayalakshmi approved the analytical procedures for the study after S. Manasha retrieved the highly regarded research papers and determined the keywords. E-Views software was used by both authors to evaluate the data. Together, both authors helped to write the manuscript.

Conflict of Interest

The authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

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