The Interrelation between Prices of Gold and Crude Oil

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Abstract

The paper analyzes the relation between the prices of crude oil and gold prices. The purpose of the paper is to establish the determinants, co-movement, and the character existing between the two prices. The paper looks through the crude oil and gold prices traded in different regions for the past twenty years. The relation existing between the price levels of gold and oil is analyzed using the gold to oil ratio, which is calculated as part of the price of gold to the price level of crude oil during the same period of time. Further, a correlation analysis test is adopted to establish the strength of the gold and crude price relationship.

Keywords : Price Relationship, Crude Oil, Gold

Introduction

Interconnectivity trend is prevalent in the commodity market with crude oil and gold playing a crucial role. Gold is the oldest and precious metal that is known to man, which is valued as a global currency, object of beauty, investment, and a commodity. Besides, crude oil is considered the mother of all other commodities because it is essential in the manufacture of extensive materials. The interconnection between the two commodities started in 1933, as the crude oil producers from the Middle East were demanding gold in exchange for crude oil (Fratzscher, Schneider, & Robays, 2014). Both crude oil and gold are quoted in US dollars. A quantitative and theoretical analysis present an overview of the relation between the prices of crude oil and gold. The primary characteristics of the products in diverse scenarios alongside the factors influencing the products in the markets are presented in the paper. The correlation analysis test and the gold to oil ratio are employed to establish the relation between the prices of crude oil and the prices of gold.

Objective

An analysis of the relation between the prices of crude oil and the prices of gold

Overview of Crude oil and Gold Trade

Gold is the oldest international currency in the world, which has been an essential element of the international monetary reserve. India is the world largest market for jewelry and a major driver of global demand for gold. Households in India possess more gold than other households across the globe. Two-thirds of demanding gold is obtained from rural areas in which jewelry is considered a traditional store wealth among people with limited access to the

systems of conventional banking. In light of this, Sovereign Gold Bonds Scheme was approved alongside Gold Monetization Scheme in the Union (Sumner, Johnson, & Soenen, 2010).

Schemes were created to ensure the monetization of the gold that was idle in the economy as well as satisfy the increased demand for gold without the need for retaining the physical gold. The decision of the government to launch the schemes is useful for translating the gold savings into economic investments alongside making the precious metal a crucial part of the financial system.

Throughout the history, gold has been a major monetary standard. States and empires have been rising and falling with a single fiat currency that has been in a position to sponsor governments. Gold was the standard by which currencies obtained a judgment, as it was considered the only real money. Based on its high value, gold is highly sought after internationally. However, gold is scarce in the nature that makes its supply challenging.

Crude oil is a mixture of various hydrocarbons, which are found in upper parts of the crust. Typically, crude oil is referred to as the father of nations as it is essential for making diverse commodities. Crude oil is essential for producing fuel used for trains, airplanes, buses, and cars. Besides, it is utilized for making products such as plastic for toys, asphalt for roads, bottles, and lubricants. Presently, India is among the leading importers of crude oil alongside China and the United States. For instance, in 2015, oil imports were valued at the price of US $7357.47 (Wang, Wang, & Huang, 2010). Almost every product consumed across the globe is transported using oil-powered airplanes, ships, trucks, and trains. Thus, in the absence of oil, most of the commodities utilized internationally would be unavailable, making it difficult to sustain global trade.

Characteristics of Crude Oil and Gold

Compared to other assets the evaluation of gold is very difficult. Gold is similar to currencies such as Euro and US dollar because it is portable, durable, widely accepted and uniform across the globe. Different from other currencies, the support for gold is realized from companies and infrastructure. Moreover, gold is considered to be similar to maize or even oil because it is obtained from the ground and has different characteristics.

Figure 1: Gold prices in 2012 - 2020
Source: (Macrotrends, 2020)

In addition, different from other commodities, the pricing level for gold normally fluctuates without being affected by levels of supply and demand. Over 10% of the world's gold is utilized by industries, especially in electronics based on its anticorrosive and conductivity. Apart from this, gold is used for jewelry and investments.

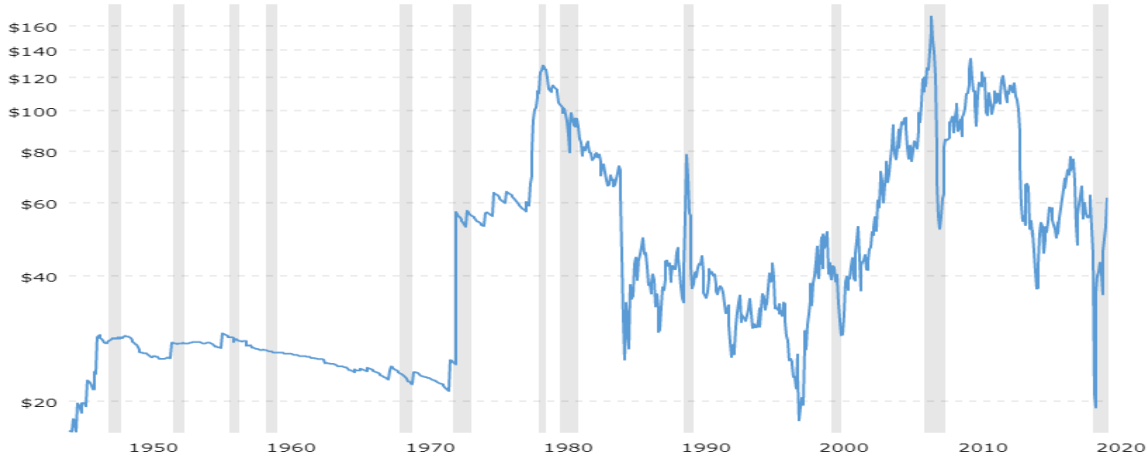

Figure 2: Oil prices in 1950 - 2020
Source: (Macrotrends, 2020)

There are various types of crude oil produced across the globe. These types vary based on their quality and their characteristics. The crude oil types primarily utilized are Brent and West Texas Intermediate. The Petroleum and crude oil are international commodities that make their prices dependent on the factors of supply and demand. The pricing level of crude oil is a vital factor that influences the pricing levels of all the petroleum products of which the most important currency is USD, and most oil trading is conducted through USD. There is an indirect correlation between dollar and oil prices. As a result, the costs of transportation increases which in return raises the costs of manufacturing as well as distribution. Thus, the final price level of the product is affected, and that its turn adds up to inflationary pressure. The forces of supply and demand influence the price levels of crude oil across the globe. The decision for the supply of crude oil lies in the hands of the OPEC nations, which makes the supply of oil limited. Figure 2 shows the oil price collapse in 1988, oil prices have fallen since the end of November 1987 lower as $18 per barrel. Oxford Institute for Energy Studies (1998) said the reason for this fallen price fluctuation crisis is the over production in 1997 and early 1998 destroyed the balance of supply demand fundamentals. Also in 2002 there was apparent instability during the period of earthquake and hurricanes when the production capabilities were limited.

The Link between Gold and Oil Markets

The prices of gold and crude oil develop in a similar path. If the valuation of the US dollar drops, the price levels of gold remain intact all over the world, but in the US market, more money is paid for gold purchased. Differently, if the same dollar falls, the price level of oil in the United States rises oddly, but it falls in other nations, based on the fact that crude oil trading's currency is the US dollar. Moreover, oil is utilized for excavating as well as refining gold; hence, increased prices on oil correspond to increased prices of gold (Narayan, Narayan, & Zheng, 2010). Besides, the recent increase in oil prices has made it impossible for the movement of crude oil and gold to be in tandem.

Further, when the participants and the hedgers make demands using Euros, then the fall becomes pronounced as the impact of price on the valuable metal increases. This can be linked to the situation of excess cash flow being placed on limited goods. Other than that, the lag between the price of gold and the movement of the dollar in the short run does not affect the relation between the two in the long run. In the case where the price of oil increases and there is a diversification in demand for the dollar, then more dollar on oil is used on gold.

Nevertheless, the gold to oil ratio is utilized for expressing the relationship between the two commodities that are crucial for forming the foundation of the entire economy. The gold to oil ratio is considered valuable as it shows the expression of the complicated relationship between crucial global commodities (Mollick & Assefa, 2013). The ratio makes it possible to notice when the prices of gold or oil are high and bring in the possibility of reversion. The prices of gold and crude oil fall and rise depending on each other as the purchases of oil were performed using gold. Besides, in the current market, the revenue accumulated from oil is used to make investments in gold. On that account, as the prices of oil increase, more revenue to be invested in gold is obtained. High prices attached to crude oil increase inflation pressure, which is essential for boosting the appeal for gold. This indicates that crude oil and gold prices obtaining a positive correlation.

Studies on the Relation between the Prices of Gold and Crude Oil

Caballero, Farhi, and Gourinchas (2008) utilized the GARCH and the ARCH modes to determine the relation between gold and oil markets using the channel of export revenue. The results of their study revealed that when the price levels of oil increased the revenue resulting from the exportation of oil increased which directly affected the price levels of gold. Further et al., (2008) concluded that the price level of crude oil variations alongside the timing of making supplies vary based on the premium of gold in its future prices, which were seen to depend on its conditional variance on spot prices. The GARCH model presents a context in real life and focuses on predicting the rates and prices of various financial instruments. Moreover, it defines the conditional variance of the relationship between gold and crude oil prices as being a linear function. Lastly, GARCH and ARCH models soften the linear restriction that may be imposed on the dynamics of conditional variance.

Kang and Yoon (2013) determined the long run relation existing between oil and gold future and spot markets using different periods and the structural break cointegration test. They outlined that the rise in the prices of oil influences an increase in the rate of inflation, resulting in increased prices of gold. This means that investors utilize the gold market as the hedger of inflation, using the oil market to make predictions on the prices of gold in the market. Additionally, Masih, Peters, and De Mello (2011) established a cointegration relation between

the gold market and the crude oil market. This means that the volatility of the crude oil prices is higher than that of gold, which brings about a long-term relation in its equilibrium.

According to Chkili, Hammoudeh, and Nguyen (2014), variations in political conflicts and changes in the prices of crude oil are major determinants of the price rate assigned to gold. A bidirectional causality was identified as the long-term relation between oil and gold. In the presence of some common factors, Fratzscher (2009) indicates that future prices of all the energy commodities brings about the correlation between the prices of oil and gold. Gaur and Bansal (2010) analyzed the causality between oil and gold prices and established that a consistency in the trends of gold and oil prices as they adopted a positive correlation. The dynamics of the price of oil are linearly leading to the volatility of the gold prices. Other than that, Le and Chang (2012) analyzed the gold-oil dependence structure utilizing a copula approach between 2000 and 2011 after which they established an important and interdependent relation between gold and crude oil.

Data Sourcing and Empirical Findings

Correlation analysis

Correlation analysis represents a statistical tool, which is utilized to present the description of the degree to which one of the variables is related to other linearity (1997 - 2020). Using equation of correlation coefficient.

$$\mathbf{r} = \frac{\sum_i (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_i (x_i - \bar{x})^2}\sqrt{\sum_i (y_i - \bar{y})^2}}$$

Result Details & Calculation

Crude Oil Values

Mx: Mean of Gold Values

My: Mean of Crude Oil Values

X - Mx & Y - My: Deviation scores

$(X - Mx)^2$ & $(Y - My)^2$: Deviation Squared

(X - Mx)(Y - My): Product of Deviation Scores

X Values

$\sum$ = 20453.06

Mean = 681.769

$\sum(X - Mx)^2 = SSx = 5581944.819$

Y Values

$\sum$ = 1345.15

Mean = 44.838

$\sum(Y - My)^2 = SSy = 24873.566$

X and Y Combined

N = 30

$\sum(X - Mx)(Y - My) = 315897.77$

R Calculation

$$r = \frac{\sum((X - My)(Y - Mx))}{\sqrt{(SSx)(SSy)}}$$

$$r = \frac{315897.77}{\sqrt{(5581944.819)(24873.566)}}$$

Meta Numerics (cross-check)

r = 0.84

Table 1 Compare prices of crude oil and gold

	Price of Crude Oil WTI in USD	**Price of Gold in USD**
Price of Crude Oil	0.84	1
Price of Gold	1	0.84

Source: author's calculations

It is evident from the table that the degree of correlation is 0.8478 on positive. Hence, the statement that both crude oil and gold shows a linear relationship. This relationship can be analyzed utilizing the Gold to Oil ratio.

Gold to Oil Ratio

As indicated above, the gold to oil ratio represents the barrels of crude oil required to purchase around ten grams of gold. If the ratio is rising, it implies that more of the oil barrels are required to purchase ten grams of gold (Gilmore, McManus, & Sharma, 2009). In the case where the ratio is decreasing, in a relative sense, it implies that oil is becoming more expensive than gold. By coming up with a measure for the price level of oil against the price level of gold, a valuable perspective regarding the actual values of gold and crude oil against the currency in which they are priced can be used. The gold to oil ratio is calculated by dividing the price of ten grams of gold by the price level of crude oil in a single barrel. This ratio measures "how many barrels of oil one can buy with an ounce of gold" and is calculated as:

Gold-Oil Ratio = Price of Gold (per oz.) / Price of Crude Oil (per barrel)

Figure 3 the interactive chart compares the month-end LBMA fix gold price with the monthly closing price for West Texas Intermediate (WTI) crude oil since 1946.

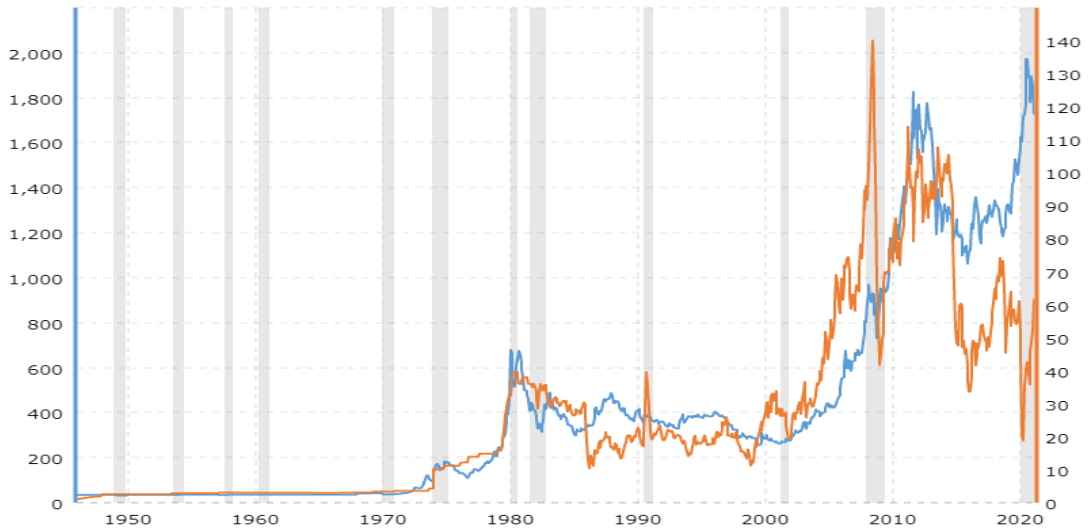

Figure 3: Compares gold price with the monthly closing price for West Texas since 1946
Source: (Macrotrends, 2020)

The chart indicates sharp falls and rises of oil prices that can be seen in black line, which are accompanied by significant changes in the price of gold in gold line. The interaction of two commodity prices shows that there is an inverse relation between the prices of gold and crude oil and the green line represents the US dollar.

Oil prices are influenced by stock markets, trade, and gold weighted USD exchange rates. Future prices of oil influence the prices of oil. On the other hand, the prices of gold are based on the variations in oil, stock markets, and the US dollar and depend on the default premium and the United States oil imports. The exchange rate of the US dollar is highly affected by the stock market, gold, and oil prices.

Nevertheless, with the financial process in the commodity markets, gold, crude oil, and stock prices, the US dollar adopts diverse properties (Ewing & Malik, 2013). A positive correlation is realized in their relationship based on the international business cycle. Thus, the price dynamics of gold and crude oil are vital indicators of the expectations in the market on the state of the world investments and the economy.

Conclusion

Based on the analysis conducted, the general thought is that the price levels of crude oil and gold have a correlation that is positive. The inter-relationship between the two is caused by the valuation of their levels in US dollars. Crude oil and gold are quoted in dollars across the global markets. In the case where Dollars should weaken against currencies such as the Rupee, then all imported items such as gold and oil end up costing more in Dollars, which indicates the inter-relation between the prices of crude oil and those of gold.

Regarding the return analysis, the conclusion is that the current return influences the previous return of gold and crude oil. Investors are supposed to be keen and make an analysis of the return and previous prices imposed on gold and crude oil for them to be in a position to determine the strategies to adopt while running investments on the future market of the two commodities. Nevertheless, there are some gaps in the relationship between the return prices of oil and that of gold. However, the volatility of the analysis of the price return indicates that the volatility of the gold price return influences the volatility of crude oil price returns. With its establishment, investors are in a position to monitor the variations of the price return of gold through being keen on the volatility of the price return of crude oil.

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