

Non-technical executive summary

An Empirical Analysis of the Relationships between Crude Oil, Gold and Stock Markets

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The crude oil and gold markets are the main representatives of the large commodity markets and seem to drive the price of other commodities. On the one hand, gold is the leader in the precious metal markets and is considered as an investment asset. Gold is a store of value, a hedge against inflation, and a safe haven to avoid an increase in financial risk; consequently, it is used as a core component of many fundamental investment strategies. On the other hand, crude oil is the main source of energy and is also used as a safe haven against the more traditional asset classes such as equities and bonds; thus, it is used as an investment asset. Therefore, investors often include one of the two commodities - gold and crude oil - or both in their investment portfolios as a diversification strategy.

Since oil and gold are used as investment assets, they are closely related to the evolution of stock market indices: any influence on decisions about gold or oil investment portfolios can affect the stock market returns. It is worth noting though that gold and crude oil prices are determined in global markets and so their dynamics are relevant indicators of collective expectations about the future state of the global economy and, consequently, about the investment decisions. Commodity traders follow the evolution of the stock and commodity markets in order to infer the trend of each market with the objective of designing substitution investment strategies. Therefore, there is no doubt over the immediate practical importance of knowing the direction of influence between the three markets (crude oil, gold and stock markets). Moreover, the study of the link between the three markets is of interest to a wider group of decision makers since the movements in the stock market have an important influence to key macroeconomic indicators. In particular, the evolution of the stock market has a relevant influence on the consumer and business confidence, which in turn affects the evolution of other macroeconomic variables.

The literature on the relationship between crude oil and stock markets seems to indicate that crude oil market gives rise to changes in the stock market, but not vice versa. However, there is no consensus in the related literature about the direction of the causality between crude oil and gold markets, neither between gold and stock markets.

Therefore, three key questions arise: i) what is actually the direction of the causality between the three markets for one of the most important economies in the world, the US?; ii) may this direction change with the sample period considered?; and iii) is it important to consider the possibility of non-linearity? This paper answers these three questions by considering linear and nonlinear causality tests and data from the Great Moderation onwards. Consequently, this paper extends significantly the existing related literature.

Regarding the first and the third key questions, this paper provides evidence of the importance of considering nonlinear relationships between the three markets, and shows that the linear tests lead to an information loss and mis-representation of the true link between markets. It is shown that a nonlinear causal link among the three markets considered (with the causality going in all directions) for the full sample is preferred under testing, and provides novel insights. The causal link found among the three markets implies that changes in the S&P's 500 index may be monitored by observing changes in the returns of the two commodity markets considered (and vice versa), which is valuable for investors given that they can design substitution investment strategies.

With respect to the sensitivity of the results obtained to the use of different sample periods (the second key question), it is observed that the direction of influence between the stock and crude oil markets does not change in general with the sample period considered. The same happens with the stock and gold markets, with the exceptions of subsamples that start the first date of any year between mid-1990s and 2001 and end in June 9, 2017 and subsamples that run from the first date of 2010 and 2011 to June 9, 2017, where the nonlinear causality from gold price changes to S&P 500 returns disappears. The main difference with respect to the full sample is the causality relationship between the two commodity markets. While the linear and nonlinear causality is similar to the full sample when the subsample goes from January 2, 1986 to the last available observation of any year beyond 1991, the lack of nonlinear causality appears for some specific subsamples that start in different years and end in June 9, 2017. Therefore, the causality between the price movements of the crude oil and gold markets seems highly dependent on the sample used, which may explain the contradictory results found in the related literature and make the mixed conclusions found in previous literature more understandable.