



Dynamics between strategic commodities and financial variables: Evidence from Japan



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ABSTRACT

This study applies the bounds testing approach to cointegration to the daily data from 01-December-1997 to 15-July-2016, in order to investigate the relationships between the prices of two strategic commodities (oil and gold) and the macro-financial variables (interest rate, exchange rate and stock price) in Japan, a major oil-consuming-and-importing as well as gold-holding-and-exporting country. The results suggest that oil prices seem to have limited information for the Japanese policy-makers in the long run. In the short run, however, oil and gold prices seem to have more useful information to presage fluctuations in the Japanese macro-financial variables including stock price and interest rate.

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1. Introduction

Oil and gold are the strategic commodities of the world and have irreplaceable roles in the global economy (Hammoudeh et al., 2009; Sari et al., 2010; Bhar and Hammoudeh, 2011; Ciner et al., 2013; Sadorsky, 2014). The special features of oil and gold would lead one to expect fluctuations in the prices of the two commodities to have implications for movements in financial variables. From the perspective of monetary authorities, the seeming causation or correlation between strategic commodities and financial variables provides a rationale for analyzing the relationship between these commodity prices and performance of critical financial indicators in an economy.

Results obtained by studies in this area would have implications for risk management and thus might also be of interest to commodity-consuming and trading nations, portfolio managers, traders and investors. Particularly, our study focuses on oil and gold, which are the most traded commodities in world markets. These commodities are widely traded, spanning different areas of activity within an economy and have different characteristics in terms of industrial use, investment appeal and hedging strategies (Bhar and Hammoudeh, 2011). The findings thus would be useful for market participants keen on switching between commodities and stocks, and for portfolio managers

interested in whether to use commodities to diversify stock market risk in their portfolios.

Most of the studies on commodities, however, focus on the co-movements of commodities among themselves or with macro-economic variables. That does not necessarily address the concerns with the high-frequency co-movements between commodities and commodity-sensitive macro-financial variables. It would be particularly interesting and informative to relate changes in financial variables to selected individual commodity price co-movements, instead of changes in an aggregated commodity index (such as the CRB indexes).

As such, this study examines the dynamic relationships between the prices of oil and gold, which are two strategic and mostly traded commodities in the world, and the critical macro-financial variables, using Japan as the case study. To this end, we apply an advanced econometric method, the bounds test to cointegration, by Pesaran et al. (2001) to the daily data series from 1997 to 2016. The selected financial variables include stock price, exchange rate and short-term interest rate, all of which are of strong interest to many monetary authorities, investors, traders and exporters.

This study finds that in the long run, rising stock and gold prices are found to impact negatively the short-run interest rate of Japan. Furthermore, gold price and interest rate are shown to have negative impacts on the aggregate stock price index in Japan. Surprisingly, the oil price shock does not have a significant and stable impact on any of Japanese financial variables in the long run, but it seems to have more useful information for the policy-

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makers in the short run. Investors, traders and portfolio managers may monitor movements in gold and oil prices to predict fluctuations in the Japanese macro-financial variables.

The rest of this paper is organized as follows. The next section reviews the related literature. Section 3 discusses the relationships between oil, gold and the Japanese economy. Section 4 presents the data and methodology. Section 5 presents results and implications. Section 6 concludes.

2. Literature review

Literature seems to suggest a strong correlation between the prices of oil and gold (e.g. Zhang and Wei, 2010). This could be explained as follows. Firstly, high oil prices driven by supply concerns are often thought to be bad for an economy, which adversely affects growth and hence pushes down share prices (Kilian, 2009). Consequently, investors look for gold as an alternative asset. Secondly, the impact of oil prices on gold prices could be established through the export revenue channel (Melvin and Sultan, 1990). In order to disperse market risk and maintain commodity value, dominant oil exporting countries use high revenues from selling oil to invest in gold, leads to a rise in demand and hence the price of gold. Thirdly, inflation channel seems to be the best and most common way to explain the linkage between oil and gold markets (e.g. Hooker, 2002; Hunt, 2006; Beckmann and Czudaj, 2013).

Others, however, argue that prices of oil and gold move in tandem because they are correlated with the movement of their long-term driving factors such as volatility in US dollars and the turmoil of the international political situation (e.g. Le and Chang, 2012; Bampinas and Panagiotidis, 2015).

Some research has been conducted on oil price-macroeconomy relationships. Recent studies in the field are either time series data analysis for one country (Abhyankar et al., 2013; Mollick and Assefa, 2013; Wang and Chueh, 2013; Ghosh and Kanjilal, 2016) or cross-sectional or cross-national data analysis (Cunado and Perez de Gracia, 2003, 2005; Cologni and Manera, 2008; Asteriou and Bashmakova, 2013; Wang et al., 2013; Degiannakis et al., 2014; Cunado and de Gracia, 2014). In particular, investigating the relationship between oil and stock markets has been an emerging trend in the energy sector. The most recent and notable studies in this field include Basher and Sadorsky (2006), Park and Ratti (2008), Kilian and Park (2009), Broadstock and Filis (2014). Kilian and Park (2009) opine that the response of aggregate real stock returns is positive or negative, greatly depending on whether the increase in oil prices is driven by demand or by supply shocks in the crude oil market.

Wang et al. (2013) show that the effects of oil price uncertainty depend on a country's net position in the world crude oil market. Furthermore, their results reveal that the effects of aggregate demand uncertainty on stock market returns in oil-exporting countries are negative and much stronger and more persistent than in oil-importing countries. It is noticeable that several studies include short-term interest rate in the models to estimate the impact of oil price shocks on stock returns (e.g., Cong et al., 2008; Park and Ratti, 2008).

The role of the exchange rate in explaining movements in stock market returns is also well illustrated in literature (Mishra, 2004). However, most of these studies are based on a two-variable framework, which can be misleading due to the omission of oil price as an important channel through which exchange rate and stock market impact each other (Abdelaziz et al., 2008).

Compared to oil prices, research on the relationships between gold prices and macroeconomic variables in general and between gold prices and macro-financial variables in particular has been

fewer (Patel, 2013; Reboredo and Rivera-Castro, 2014; Arouri et al., 2015; Beckmann et al., 2015; Pierdzioch et al., 2015). In theory, since gold is priced in the dollar, gold price fluctuations are expected to be affected by fluctuations in the exchange rate of the dollar. When the dollar depreciates, the nominal price of gold tends to rise, thus preserving the real value of gold. As a result, gold can act as a hedge against currency exposure for investors holding dollar-denominated assets. Several studies have empirically investigated gold price-exchange rate relationships (e.g., Capie et al., 2005; Sjaastad, 2008; Reboredo and Rivera-Castro, 2014; Beckmann et al., 2015).

The relationship between the gold price and interest rates is also examined in a few studies, which seem to ascertain the critical role of interest rates in influencing the price of gold (e.g., Fortune, 1987; Cai et al., 2001). The logic is simply that during periods when nominal interest rates on short and safe financial assets are low, investors tend to respond by purchasing commodities such as gold even though it does have some storage cost. The level of interest rates also affects the real cost (if financed by credit) or the opportunity cost (if financed by own funds) of investing on the gold market. A drop in interest rates reduces the acquisition cost of gold on the spot market, and thus is capable of stimulating demand for gold.

As for the relationship between gold price and stock price, the gold market is often considered as an alternative to the stock market (Buyuksalvarci, 2010). When the price of stock goes up, investors put more money into the stock market and thus sell their gold. This drives the gold price down. Arouri et al. (2015) suggest that adding the gold asset to a well-diversified portfolio of Chinese stocks improves its risk-adjusted performance and that stock risk exposures can be effectively hedged using gold. Mishra et al. (2010), however, argues that the reason for holding gold is, to a large extent, guided by the individual sentiments.

Overall, the research examining the directional relationships between such strategic commodities and macro-financial variables in a multivariate framework is relatively scarce (see, for instance, Christiano et al., 1996; Awokuse and Yang, 2003; Sari et al., 2010; Bhunia, 2013; Chang et al., 2013; Hussin et al., 2013). The results of these findings are also mixed, which could be attributable to different country case studies, different data samples and different methodologies. However, one deficiency that could be pointed out is that the existing studies do not attempt to account explicitly for all possible commodity-relevant macro-financial variables in their models.

Using a daily macro-financial data set, our study intends to fill this gap in the literature by exploring the individual directional relationships of oil and gold with three commodity-relevant macro-financial variables: interest rates, exchange rates and stock prices. All of these macro-financial variables are explicitly included in our modelling. The modelling approach in this study is also different from most of the abovementioned studies. Methodologically, this study employs an advanced time-series technique known as the autoregressive distributed lag (ARDL) approach, developed in Pesaran and Pesaran (1997) and Pesaran et al. (2001). This approach differs from conventional cointegration methods and overcomes the pre-cointegration biases. Finally, this study focuses on Japan, an interesting case study for the subject matter. Sari et al. (2010) also apply ARDL to analyze the dynamics between different commodities and financial variables. However, their research focuses on the directional relationships between the spot prices of the major precious metals (gold, silver, platinum, and palladium), oil price, and euro-US dollar exchange rate in international markets. Furthermore, they omit the stock price and interest rate in their modelling.

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