Resources Policy xxx (xxxx) xxx–xxx

Contents lists available at ScienceDirect

Resources Policy

journal homepage: www.elsevier.com/locate/resourpol

Precious metal returns and oil shocks: A time varying connectedness approach

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ARTICLE INFO

JEL classifications:
C51
E44
L61

Keywords:
Oil shocks
Precious metals
SVAR

ABSTRACT

This paper examines the impact of oil shocks on precious metal returns using structural vector autoregression (SVAR) model proposed by Kilian and Park (2009). We capture variability in the effects through rolling window impulse response functions and by extending the dynamic connectedness approach of Diebold and Yilmaz (2014) using structural forecast error variance decomposition. We report time varying effect of disintegrated structural oil shocks on precious metal returns with a significant increase during the global financial crisis period of 2008–09. Our results also indicate that the aggregate demand shocks have most significant spillover effect on the precious metals except gold. We also report that oil specific demand shocks have highest impact on gold during the financial crisis and palladium having possible hedging opportunities against oil price movement. These findings have important investment implications for individual and institutional investors.

1. Introduction

Awareness for precious metals as an investment vehicle has increased especially after the financial crisis of 2008–09 as a result of increased financialization in commodity market following a 'flight to safety' concept. Among these commodity markets, gold along with other precious metals has historically been used as safe assets and store of value. However, other precious metals like silver, copper, platinum, palladium etc. are now also considered as safe investment opportunities because of increased financialization and acceptability by the investment community (see e.g., Vigne et al., 2017). Lately, investment opportunities in commodity markets increased from the usage of exchange traded funds (ETF).[1] With an increase in general trend for investment in commodity market, focus of researchers in now shifted more towards the co-movements among commodities, especially in oil markets.

Oil presents itself as a main input for production of goods and energy with a daily consumption level around 93 million barrels/day in 2015.[2] Crude oil production is centralized with OPEC as the major world organization with its members controlling about 73% of its total production. Current literature documents the importance of global demand and supply of oil and their substantial impact on the real economy as it affects the emergent price formation and inflation (Kilian, 2009). This presents implication for investors, since any shocks to the crude oil market tend to spillover towards financial markets. Any changes in the prices of crude oil therefore, can lead to price changes in the traditional asset markets including other commodity markets i.e. precious metals. Ahmadi et al. (2016) highlight several important factors for information spillover from oil to precious metals' market transmission. Among other factors, an overall increased activity in the economy simultaneously affect both demand for oil and the precious metals. Another factor about which the authors argue is an inflation channel, where increased oil prices not only infer higher cost in energy and production but also leads towards an interest rate hike. The interest rate could then affect the commodities through return and volatility. On a similar note, Kanjilal and Ghosh (2017) presents linkages between oil and gold in two different ways, either through an inflation channel for oil importing countries or through a revenue channel for oil exporters. These relationships have ramifications for the diversification benefits between crude oil and precious metal markets.

Although precious metals have historically been used sparsely in industries however, recently many metals like copper and platinum catalysts are now used in crude oil production. Furthermore, platinum

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[1] "Recently however, white precious metals have received increased attention from investors due to the introduction of new Exchange Traded Funds (ETFs)" p. 316 Lau et al. (2017).
[2] Source: https://www.eia.gov/energyexplained/index.cfm?page=oil_use.

https://doi.org/10.1016/j.resourpol.2018.03.014
Received 1 December 2017; Received in revised form 13 February 2018; Accepted 23 March 2018

and palladium are also used for low voltage connection in the automobile industry, which is sensitive to the business cycle.[3] Therefore, sensitivity of precious metal returns to oil shock is important in determining diversification benefits and for hedging of one's portfolio based on the inclusion of these precious metals in a portfolio alone or combined with some traditional assets. Moreover, if oil shocks are time dependent, this could affect the connectedness between oil and metal commodities. This affect could be caused by real economic activity where increased activity would lead to increased demand for goods, and implicitly towards increased demand for inputs as well such as oil and precious metals. The global financial crisis of 2008–09 also appeared as one such shocks that immediately and abruptly changed the prices and return series of various asset classes thereby changing the relationship among several markets. In general, the investors have heterogeneous expectations because the financial markets are comprised of hedgers and speculators and those market participants also have different investment objectives in terms of time horizons. Furthermore, asymmetric transaction costs (bid vs. ask spreads), information frictions, may also result in nonlinearities in asset pricing and commodity markets are no exception. Thus, the impact of oil shocks on precious metals returns might also be nonlinear.

According to Greenwood-Nimmo et al. (2015), shocks to oil supply (e.g. production stop or accidents) could have large sudden impact on oil prices and can change the connectedness between oil and metal markets. Global oil market shocks also have the ability to affect spillover between different financial markets. According to Fernández et al. (2016), conditional correlation between oil market and precious metals is time varying and is connected to the crisis periods representing major structural breaks. This time varying relationship between oil market and precious metals can have important implications for international investors based on time-varying connectedness among asset returns. Our study builds on the construction of disintegrated structural oil shocks instead of taking only oil prices as generally studied in most of the previous works. We disentangle oil shocks, following Kilian and Park (2009), according to their origin i.e., supply shocks, aggregate demand shocks and oil specific demand shocks. We therefore extend the Diebold and Yilmaz (2014) by developing a structural vector autoregressive framework to identify different types of oil shocks. The Diebold and Yilmaz (2014) instead use a generalized vector autoregressive framework which is invariant to the order of variables. The structural specification, as primarily shown by Kilian and Park (2009), allows us to better understand the time-varying effects oil shocks on precious metal returns which is important given the recent financialization of commodities markers and geopolitical unrest.

Our findings show that the impact of disintegrated oil shocks on precious metals returns is time-varying and thus a full sample analysis might not be able to fully explore this dynamic relationship. The aggregate demand shocks have a significant spillover effect on all precious metals except gold. Gold (palladium) returns are more (less) sensitive to the oil specific demand shocks especially during the financial crisis and thus palladium might possibly offer hedging opportunities against oil price movement. These findings also suggest that response of precious metals to a specific type of oil shocks is not homogenous, and therefore the investment decision in precious metal markets should be based on precious metal type and not on the aggregate bases. The higher spillover during crisis periods is an indication of contagion effects. Hence, our contributions are three-fold. First, our study highlights an increase in the connectedness between oil market and precious metal returns during the global financial crisis of 2008–09 through demand, oil demand and supply shocks. This result implies that an overall low connectedness between oil and precious metal markets can increase sharply during financially distressed periods. Second, we report high effect by aggregate demand shocks on all precious metal returns except gold. This behavior of gold returns to structural shocks have ramification for institutional investors as an effective hedger and diversifier in a portfolio of stocks, keeping in view that it exhibits sensitivity to oil demand shocks. Finally, our paper has important implications for commodity returns in connection with crude oil market as this would require policymakers to integrate potential global shock and transmissions into their regulatory policy design, particularly in the presence of financial distress and crises.

Rest of the paper is structured as follows. Section 2 reviews related literature. Data and methodology are presented in Section 3. Section 4 reports estimation results with discussion and finally Section 5 concludes the paper.

2. Related literature

The current literature that investigate how oil price affect equity markets and precious metals, can be categorized into several distinct areas: volatility dependences, economic transmission, market efficiency and price co-movements. The transmission of oil price shocks to other markets has been heavily influenced by Kilian (2009) who constructed an index from freight ships goods transfer to measure the global economic activity. Then applying the SVAR method that enables separation of global economic activity shocks, from oil supply and demand shocks. Their results highlight high magnitude of demand shocks compared with the supply shock for real oil prices. However, as pointed out by Kang et al. (2016) and Rehman (2017), aggregate data could miss the intricate supply structure and therefore, underestimate its effect. They showed that if total oil supply is broken up into local and international supply in U.S. market, effect of local supply shocks becomes comparable to demand shocks, for U.S. equity and metal markets. However, it requires that the country being studied has an own supply of oil. Another related critique is discussed by Juvenal and Petrella (2015) as they argued that small VAR models, like the one used by Kilian (2009), may miss relevant factors and therefore provide misleading results.

Research on volatility dependence and co-movement between oil and precious metal markets tries to determine the diversification benefits between these two markets. Fernández et al. (2016) found that the link between the assets is not possible with a single pricing model cannot capture the domestic business cycle. In addition, they found that the business cycle is transmitted through an aggregated commodity market (e.g. metals, agriculture), and that the transmission is not caused by financialization of the oil and/or commodity market. For instance, Dutta (in press) suggest that copper react more strongly to business cycle than other precious metals. Gold, however is commonly found to act as a hedge or diversification tool against market turmoil, since it is perceived as store of value and a safe haven (see for example Balcilar et al., 2015; Hammoudeh and Yuan, 2008; Sari et al., 2010). However, Reboredo (2013) reported that gold does not act as a hedge against negative oil price changes but can be used as a diversification tool in extreme market conditions. Hence, business cycle and oil shocks affect the precious metals differently.

Lau et al. (2017), found that the spillover between precious metals and equities is largely driven by higher frequencies (daily/weekly returns). The precious metal market is characterized by short-lived persistence in the spillover for different type of metals, see for example (Soytas et al., 2009; Balcilar et al., 2015). However, the variance persistence is common between precious metals and oil market. Hammoudeh and Yuan (2008) showed that gold and silver has longer persistence to oil than copper, whereas copper is more sensitive to changes in the economic activity. Thus, different metals could have varied connectedness between different type of shocks to oil or demand. Ewing and Malik (2013) showed that the structural breaks shorten volatility persistence from 86 days to 4 days for different metals. Structural breaks tend to give indication about the non-linear relationship between oil and precious metal markets thereby implying the limitation of a linear regression model. With the implication of

[3] Source: https://minerals.usgs.gov/.