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COVID-19 and Oil Market Crash: Revisiting the Safe Haven Property of Gold and Bitcoin

Abstract

The global crude oil market has experienced a significant downturn following the novel coronavirus outbreak (COVID-19) in December 2019. Thereafter, all the major oil markets have become extremely volatile, and investments in these markets could lead to substantial losses. This paper empirically investigates the time-varying correlations between gold and oil markets to examine whether gold is a safe haven asset for the international crude oil markets during the COVID-19 period. For the purpose of comparison, the safe haven property of Bitcoin is tested as well. The results of the time-varying correlations obtained through the DCC-GARCH model suggest that gold is a safe haven asset for global crude oil markets. Bitcoin, on the other hand, acts only as a diversifier for crude oil. The results further show that the portfolio risk is minimized when investors include oil and gold in their portfolio rather than holding assets in oil and Bitcoin markets. Given that financial downturn, terrorist attacks, pandemics and similar global events often play a crucial role in portfolio risk analysis, our results could be of interest to those who invest in oil, gold and Bitcoin markets.

Keywords: COVID-19; Crude oil; Gold; Bitcoin; Safe haven.

JEL classification: G15; G18

1. Introduction

The global crude oil market has experienced a significant downturn following the novel coronavirus outbreak (COVID-19). On 11th March 2020, the World Health Organization (WHO) announces COVID-19 to be a pandemic. Since then, a substantial fall has been observed in international crude oil markets. Figure 1 demonstrates global oil price movements over the period 2000-2020. Per barrel price of the Brent crude slipped to $22.58 at the end of March 2020. This price is the minimum since November 2002. In the interim, the US West Texas Intermediate (WTI) price reached less than $20 per barrel, dropping to the lowest level for 18 years. The crude oil volatility index (OVX), shown in Figure 2, further illustrates that the crude oil asset has become extremely volatile over the last couple of months and accordingly, investments in this market could involve substantial losses.

---INSERT FIGURE 1 HERE---

---INSERT FIGURE 2 HERE---

Such dwindling oil prices in the midst of the COVID-19 outbreak have induced higher probabilities of tail-risks in the oil-derived assets. Therefore, it is essential to identify an alternative investment instrument to counteract the risks of exposure to oil. To this end, this paper intends to revisit the resilience of gold as a safe haven asset during the 'Black Swan' event of COVID-19.

Numerous studies investigate whether gold is a safe haven asset during the turmoil periods (Baur and Lucey, 2010; Baur and McDermott, 2010; Ciner et al., 2013; Reboredo, 2013). Baur and Lucey (2010) mention an asset as a safe haven if it is negatively correlated or uncorrelated with another asset during the crisis periods. They show that gold is a safe haven asset for stock markets, albeit the safe haven property is short-lived. Baur and McDermott (2010) portray gold as a safe haven asset for the US and European equity markets. Ciner et al. (2013) and Reboredo (2013) observe similar findings. Another strand of recent literature has concentrated on examining the safe haven property of Bitcoin. It is found to be a safe haven for the Asian stock markets, but not for gold, oil, and bond markets (Bouri et al. 2017a). Bitcoin serves only as a hedge for the global uncertainty indexes (Bouri et al.

2017b). Recently, Das et al. (2019) conclude that Bitcoin is not a superior asset for hedging over gold and the US dollar, although it possesses some safe haven and hedging properties.

We empirically examine the safe haven property of gold for the international crude oil markets during this current pandemic period. Also, the associations between crude oil and Bitcoin are explored to test the safe haven property of digital currency. In our analysis, two major crude oil markets, including WTI and Brent, are considered. The time-varying correlations of oil-gold and oil-Bitcoin pairs are studied by employing the DCC-GARCH process. Our findings suggest that gold is a safe haven asset for both Brent crude oil ad WTI markets. Bitcoin, on the other hand, acts only as a diversifier for the energy markets.

To the best of our knowledge, we are the first to analyze the aforementioned association, given this current pandemic situation. Since the financial downturn, terrorist attacks, contagion diseases, and alike often play a crucial role in portfolio risk analysis, our results could be of interest to those who invest in the commodity and digital currency markets. The rest of the paper is structured as follows: Section 2 describes the data and discusses the methodology. Section 3 reports the empirical findings and Section 4 concludes.

2. Data and methodology

2.1. Data

We collect the information on crude oil, gold, and Bitcoin from the St. Louis FRED database. Our sample period ranges from December 2014 to March 2020, the starting point of the sample period is constrained by the availability of Bitcoin data. Table 1 provides the descriptive statistics values with Panel A for the full sample and Panel B for the pandemic period. For Panel B, we discuss how these financial markets perform during January 2020 to March 2020[1]. The results suggest that all the crude oil markets exhibit high volatility throughout the COVID-19 period, although these indexes were not that volatile when the full sample is considered. For example, the standard deviation of WTI increases from 3.1% to 9.5% during the episode of COVID-19.

---INSERT TABLE 1 HERE---

[1] On 31st December, 2019 COVID-19 cases were first reported to WHO. The Chinese authority confirms that these cases occurred between 12th and 19th December, although the coronavirus was completely unknown during that period. Based on this report, we consider the COVID-19 period from 1st January, 2020 to 31st March, 2020.

In Table 2, we present the unconditional correlations among different assets. These numbers indicate that gold has either negative or zero correlations with oil indexes. Bitcoin, on the other hand, always exhibits positive connections with oil markets. It is also worth mentioning that the magnitude of oil-gold correlation is higher during the COVID-19 period, making this precious metal an ultimate candidate to be included in the portfolio in order to hedge the risk during the turmoil periods.

---INSERT TABLE 2 HERE---

2.2. Methodological approach

We resort to the DCC-GARCH approach proposed by Engle (2002), which has received considerable attention in prior literature investigating the time-varying correlation structure among the financial markets (Bouri 2017a). In line with previous studies, we frame this model as follows:

$$r_t = L + \tau r_{t-1} + \varepsilon_t \quad (1)$$

$$\varepsilon_t = H_t^{1/2} \eta_t \quad (2)$$

where r_t is a logarithmic difference matrix for price indexes, L is a fixed parameter matrix, τ is a coefficient matrix of cross mean transmission and own-lagged, η_t is a *iid* innovation matrix, ε_t is the error, and $H_t^{1/2}$ is the conditional volatility matrix. The covariance matrix is expressed as:

$$H_t = D_t R_t D_t \quad (3)$$

where $D_t = diag(\sqrt{h_t^X}, \sqrt{h_t^Y})$ is a diagonal matrix of time-varying standard deviations on the diagonal with h_t^X and h_t^Y being the conditional volatilities of asset *X* and asset *Y*. In addition, R_t denotes the conditional correlation matrix of the standardized returns ε_t, which is expressed as:

$$R_t = diag(Q_t)^{-1/2} Q_t diag(Q_t)^{-1/2} \quad (4)$$

In Equation 4, Q_t is the time-varying conditional correlation of residuals given by:

$$Q_t = (1 - \theta_1 - \theta_2)\bar{Q} + \theta_1 \xi_{t-1}\xi'_{t-1} + \theta_2 Q_{t-1} \quad (5)$$

where θ_1 and θ_2 are non-negative scalar parameters with $\theta_1 + \theta_2 < 1$ and $\bar{Q}$ is the unconditional correlation matrix of the standardized residuals ξ_t.

Next, we consider estimating the following regression model[2] in order to explore the dynamics of the conditional correlations for the pairs oil-gold and oil-Bitcoin:

$$\hat{\rho}_{xyt} = \alpha_0 + \delta_1 COVID_t + \delta_2 Crisis_t + u_t \quad (6)$$

In the above equation, $\hat{\rho}_{xyt}$ indicates the conditional correlation between asset X (WTI/Brent) and asset Y (gold/Bitcoin) at time *t,* which is derived from the bivariate DCC-GARCH process. $COVID_t$ is a dummy variable that takes a value one during the coronavirus period (January 2020 to March 2020) and zero, otherwise. In addition, *Crisis* is also a binary variable to control for the impact of turmoil period on the DCC estimates. It is equal to one during the period of oil market downturn and zero otherwise. Following Dutta (2018), we choose this crisis period from December 2014 to March 2016. Dutta (2018) argues that such a crisis in the crude oil industry is due to oversupply, strengthening of the US dollar, and the Iran nuclear deal. Figures 1 and 2 also confirm this phase to be a stressful period.

3. Empirical findings

Figures 3 and 4 exhibit the DCC conditional correlations for the oil-gold and oil-Bitcoin pairs. It is evident from Figure 3 that during the stress periods, the commodity duo demonstrates a strong negative correlation, while positive associations are observed during the normal conditions. We thus conclude that it seems possible to minimize the risk of crude oil markets if investors hold assets in both the oil and gold sectors during the bearish period.

---INSERT FIGURE 3 HERE---

Looking at Figure 4, we observe a continuous swing between the positive and negative regions for the WTI-Bitcoin pair. The Brent-Bitcoin pair, however, reveals a positive connection most of the time. It is also noteworthy that the degree of negative correlation is higher for the oil-gold duo as compared to the oil-Bitcoin pair. Hence the

[2] Mellado and Escobari (2015) also employ a similar model for testing the co-movements among the Latin American stock markets.

portfolio risk is minimized more when investors include oil and gold in their portfolio rather than holding assets in oil and Bitcoin markets.

---INSERT FIGURE 4 HERE---

Next, Table 3 displays the estimates of Equation 6. Panels A and B focus on the linkage between oil and gold, while Panels C and D explore the same between oil and Bitcoin. The estimates of δ_1 indicate that during the COVID-19 period, there exists a significant negative relationship between gold and WTI markets, suggesting that gold is a safe haven asset for the US oil market. For the Brent market, the corresponding link seems to be unimportant, revealing that for the European oil industry, gold is a safe haven asset as well. Our results are in line with Baur and McDermott (2010), Ciner et al. (2013), and Reboredo (2013), in which the authors show that gold is a safe haven for currency and stock markets.

---INSERT TABLE 3 HERE---

Moving to the outcomes of Panels C and D, we find that during this pandemic period Bitcoin could act only as a diversifier since the estimates of δ_1 are found to be positive and significant in each case. Hence, Bitcoin is not a safe haven asset for the international crude oil markets. This finding is consistent with that of Bouri et al. (2017a).

Moreover, during the 2014-2016 oil market crises, the estimates of δ_2 are also negative and significant for the gold-oil pair, which further confirm the safe haven property of the gold market. For the oil-Bitcoin pair, on the other hand, we notice that Bitcoin mainly functions as a hedge or diversifier for the oil industry.

4. Conclusions

The emergence of global pandemic COVID-19 has led a slump in the crude oil markets with weaker import demands internationally. The threat of global economic contraction has induced impending downside risks in the oil markets. Consequently, investors holding the oil-derived assets are exposed to the adverse oil price movements. Thus, it is imperative to recognize an alternative instrument to hedge such risks arising out of oil exposure. Therefore, in this study, we examine the safe haven property of gold with respect to crude oil amid the COVID-19 outbreak. Moreover, we also compare the performance of gold with Bitcoin, since

a strand of recent studies advocate the prominence of Bitcoin as a safe haven asset (Demir et al. 2018; Bouri et al. 2017b).

By resorting to the DCC-GARCH model we find that gold serves as a safe haven to both WTI and Brent crude oil markets amid the COVID-19 outbreak, which reinforces the findings of the previous studies (Baur and McDermott, 2010; Ciner et al. 2013; Reboredo, 2013). Bitcoin, however, acts only as a diversifier during this phase, which is consistent with the general findings of Bouri et al. (2017a) and Das et al. (2019). Thus, the findings of this study could benefit the investors in these markets to devise effective portfolio strategy. As a future course of study, the crude oil hedging performance of gold may be compared against other precious metals.[3] Similarly, the performance of Bitcoin may be evaluated against US dollar and gold-backed cryptocurrencies.

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A. List of figures

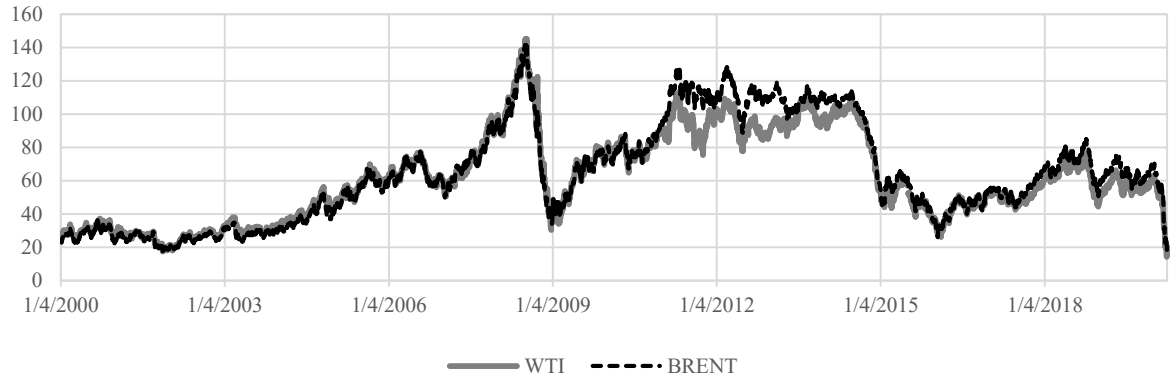

Figure 1. Crude oil price evolution over the period 2000-2020

Note: The prices are denominated in US$ per barrel.

Source: The St. Louis FRED database (https://fred.stlouisfed.org/)

Figure 2. Crude oil implied volatility index (OVX) over the period 2007-2020.

Source: The St. Louis FRED database (https://fred.stlouisfed.org/)

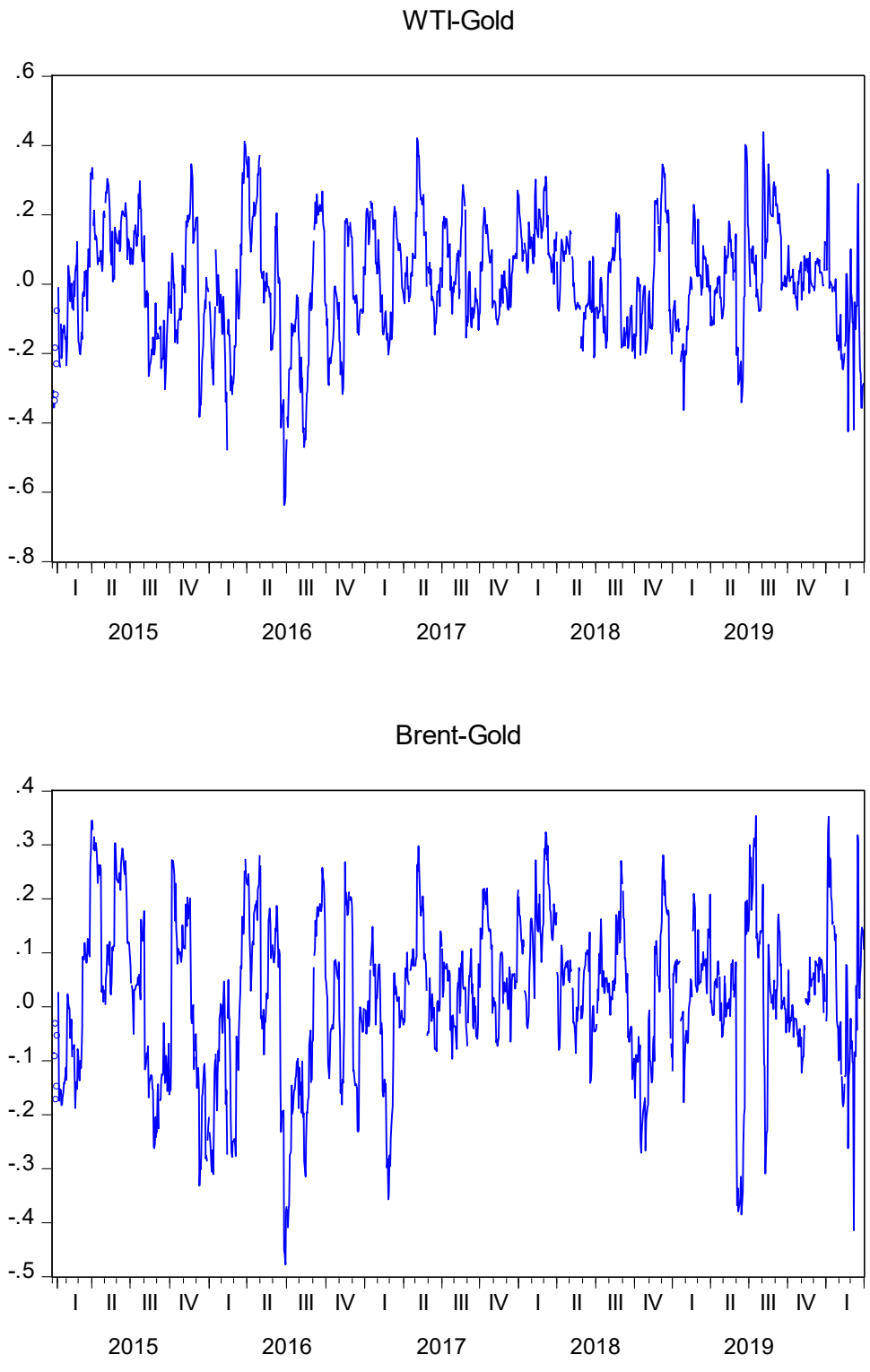

Figure 3. Dynamic conditional correlations between oil and gold markets

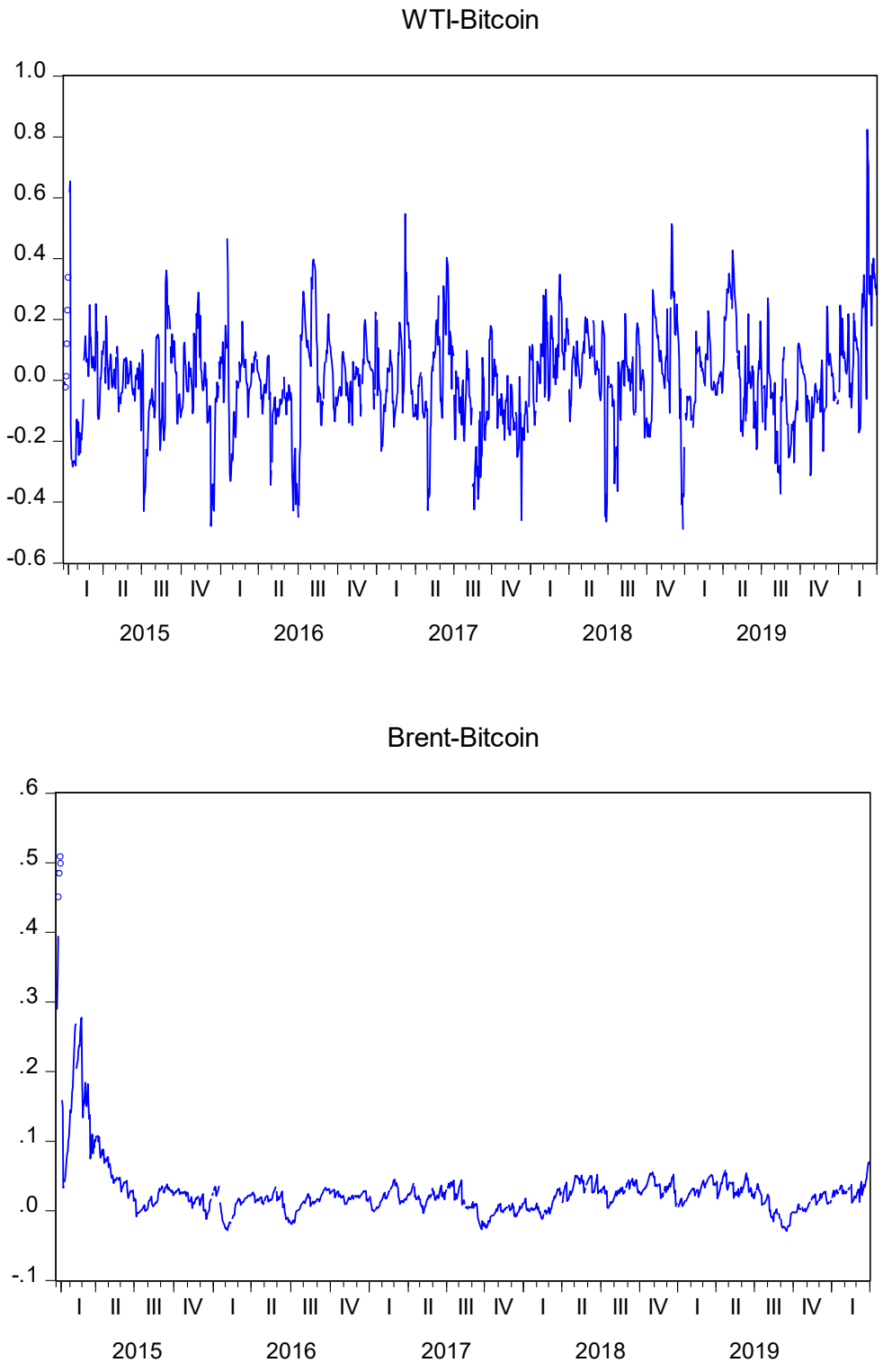

Figure 4. Dynamic conditional correlations between oil and Bitcoin markets

Table