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Performance of gold-backed cryptocurrencies during the COVID-19 crisis

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ABSTRACT

This study is aimed at investigating the performance of Gold-backed cryptocurrencies during the COVID-19 crisis and in particular, during the bear market of 2020. Analysis is conducted on the daily returns of PAX Gold from 2 October 2019 to 28 September 2020 using the ARMA-GARCH model. The results are compared with those of Paxos Standard (PAX) and Gold during the same period. The results show the mean returns of the three financial instruments increase during crisis periods but the increase is insignificant. PAX Gold experiences increased volatility during the COVID-19 crisis and the bear market but the increase is insignificant.

1. Introduction

Efficient Market Hypothesis (EMH) states that stock prices follow a random walk and are unpredictable (Fama, 1970) but global events in the past have shown that markets react to major events (Al-Awadhi et al., 2020). Financial markets are found to become less efficient during periods of major economic events (Tran and Leirvik, 2019). Past studies have shown that news, good or bad, affects investment decisions (Akinchi and Chahrour, 2018; Cohen et al., 2018). The current health crisis, COVID-19, has received intense media coverage with economists warning of a major economic crisis as a result of the health crisis. The COVID-19 crisis is often compared to the Global Financial Crisis of 2008 by the financial press. It is therefore not surprising that financial markets around the world experienced large drops in values during the beginning phase of the crisis (Erdem, 2020; Salisu and Vo, 2020; Zhang et al., 2020). However, the global markets showed resilience and the stock price collapse of March reversed as a result of investors’ expectations of a resumption of economic growth towards the end of the year. He et al. (2020) equate the crisis to terrorist attacks and label the crisis as a Black Swan event – an event which is unpredictable and causes shock, fear and panic among investors, however according to Goodell (2020), COVID-19 is foreseeable due to the possibility of numerous past real-world epidemics and health crises having become global pandemics.

With the outbreak of COVID-19, there is renewed interest among academics in understanding the effect of health crises on financial markets around the world (Al-Awadhi et al., 2020; Bai et al., 2020; Corbet et al., 2021; Erdem, 2020; Liu et al., 2020; Salisu and Vo, 2020; Zhang et al., 2020) and the findings, in terms of the impact of the pandemic on financial market returns, are mixed. The studies that investigate the impact of the pandemic on volatility unanimously agree that stock market volatility is increased during the pandemic period, i.e. it is a source of systematic risk (Bai et al., 2020; Ali et al., 2020; Zhang et al., 2020). With equity markets in turmoil, investors become more concerned with avoiding losses than focusing on the prospective gains (Hwang and Satchell, 2010) therefore they seek out safe haven assets such as Gold and cryptocurrencies to avoid further losses.

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Prior to the COVID-19 crisis, a number of studies have investigated the safe-haven property of both Gold and cryptocurrencies. Hood and Malik (2013) and Baur and McDermott (2016) obtain mixed results in their study on Gold in various emerging and developing countries. However, Reboredo (2013) and Beckmann et al. (2015) confirm that Gold is not just an effective safe haven but also a good hedging instrument. These contrasting results regarding the safe haven property of Gold is clarified by Lucey and Li (2015) who find that the strength of Gold being a safe haven changes over time. Similarly, studies on the safe-haven property of cryptocurrencies prior to COVID-19 produce mixed results. Bouri et al. (2017), Bouri et al. (2019) and Urquhart and Zhang (2019) find evidence to support the safe-haven property of Bitcoin (a decentralized digital currency) in various markets although Klein et al. (2018) and Smale (2019) disagree with this notion. Studies focusing on the market efficiency of cryptocurrencies find that cryptocurrency characteristics are not efficient (Hu et al., 2019), with efficiency of the cryptocurrency markets being highly time-varying (Tran and Leirvik, 2020) and varying across frequencies (Aslan and Sensoy, 2020). When comparing the virtues of Gold over Bitcoin, Bouri et al. (2020) find that the Bitcoin exhibits the least dependence to the stock markets, in comparison to Gold and commodities, hence it is superior over both these assets. On the other hand, Shahzad et al. (2019b) find that the safe-haven property of Gold is “indisputable” over that of Bitcoin. Shahzad et al. (2019a) suggest that the strength of the safe-haven property of Bitcoin varies across indices and its role is time-varying.

Mixed findings have also been reported by studies conducted on both Gold and cryptocurrencies during the COVID-19 crisis. Demir et al. (2020) support the hedging role of cryptocurrencies during the COVID-19 crisis while Mnif et al. (2020) find that the cryptocurrency market is more efficient during the COVID-19 crisis. On the other hand, according to Lahmiri and Bekiros (2020), from the informational efficiency perspective, investment in digital assets during the COVID-19 crisis is considered riskier compared to equities. This is confirmed by Conlon et al. (2020) who find that downside risk of portfolios that consist of some allocation of Bitcoin and Ethereum (a stablecoin) is increased. Conlon and McGee (2020) find no evidence of the safe-haven and hedging properties of the Bitcoin during the crisis.

Kumar’s (2020) study of the safe-haven property of Bitcoin and Gold confirm the overall safe-haven property of both these assets but the property is partially compromised during the COVID-19 crisis. Kristoufek (2020) agrees with Gold being a better safe-haven compared to Bitcoin and that the Bitcoin’s reputation for being a safe-haven is unsubstantiated and far-fetched. Ji et al. (2020) confirm the safe-haven property of Gold. Guesmi et al. (2019) and Huynh et al. (2020) suggest that the inclusion of cryptocurrencies in a portfolio of investments which include Gold reduces the risk of the portfolio considerably. However, according to Corbet et al. (2020), Gold and cryptocurrencies are not good hedges or safe havens during times of serious financial and economic disruption, instead they may actually be contagion amplifiers.

The studies pre- and during COVID-19 suggest that either cryptocurrencies or Gold, or a portfolio consisting of investments in both these assets would be able to reduce risk. So far however, very little has been studied on another form of cryptocurrency - the Gold-backed cryptocurrency. Gold-backed cryptocurrencies have been gaining interest especially during the current COVID-19 crisis as they are digital assets whose value is tied 100% to the value of Gold hence they combine the features of Gold and stablecoins. Yet, so far Gold-backed cryptocurrencies have mainly been studied in the context of Islamic finance (Alam et al., 2019; Aloui et al., 2020). This study is therefore aimed at investigating the performance of Gold-backed cryptocurrencies, in terms of the returns and volatility during the COVID-19 crisis. Pure Gold-backed cryptocurrency. Gold-backed cryptocurrencies have been gaining interest especially during the current COVID-19 crisis as they may actually be contagion amplifiers.

In order to assess the impact of COVID-19 and the bear market on the return and volatility of Gold-backed cryptocurrencies, the one-year daily closing prices of the PAX Gold are collected from 2 October 2019 to 28 September 2020 from coinmarket.com, resulting in a total of 363 observations. The PAX Gold is a digital token which is backed by one troy ounce (t oz) of a 400 oz London Good Delivery Gold bar held in custody by Paxos Trust Company. Aside from this, the daily prices of its conventional counterpart, the PAXOS Standard, are also collected for the same period from the same website. Finally, the daily price of Gold is collected for the same period from www.investing.com. A total number of 263 observations is obtained as the Gold market is not open 7 days a week. Only the PAX Gold is considered as the Gold-backed cryptocurrency in this study due to the availability of its conventional counterpart. Although there are other Gold-backed cryptocurrencies with conventional counterparts such as the Digix Gold and Tether Gold, these are not considered in this study due to unavailability of complete data for the period under study.

Descriptive statistics for the daily returns of the three assets are reported in Table 1. Also provided in Table 1 are the results of the Ljung-Box test statistics for serial correlation of the return series, the ARCH-LM heteroscedasticity test statistics, the Augmented Dickey-Fuller (ADF) test statistics in two forms (the test with intercept only and test with trend and intercept) to test for stationarity and the Bai-Perron multiple break test statistics to check for stability of the returns series.

The statistics show that the mean returns of the PAXOS Standard is negative (hence, the lowest) over the entire period (-8.54E-12) compared to PAX Gold (0.000619) and Gold (0.000819) but the PAXOS Standard has the lowest standard deviation (volatility = 0.007100). Gold has the highest mean return but PAX Gold has the highest standard deviation (0.015665) during the entire period of 101958

1 https://www.paxos.com/paxGold/
study, indicating that this digital asset has the highest volatility during this period. The Jarque-Bera statistics indicate that none of the data series is normally distributed. The Ljung-Box test statistics, Q(36), for the three returns series indicate the presence of autocorrelation among the returns series while the ARCH-LM test statistics indicate the presence of heteroscedasticity (constant variance) in the return series. Augmented Dickey-Fuller (ADF) tests show that the returns series for the three returns series are stationary.

The mean return, mean volume and standard deviation (volatility) are calculated for the three return series for the pre-COVID period from 2 October 2019 to 29 January 2020, i.e. before the WHO declared COVID-19 ‘a public health emergency of international concern’. The COVID period is represented by a dummy variable, COVID, which takes on the value of 1 if the day falls within the COVID-19 period and 0 otherwise. Significance of the dummy variable suggests the presence of the effect of COVID-19 in the asset returns. The ARMA(0,1)-GARCH(1,1) model, with the Student’s t-distribution error distribution, is selected to model the returns and volatility of the three assets because it fulfills the conditions for the conditional variances to be stationary and positive for all three returns series. In addition, the residual diagnostics are fulfilled for the three returns series using this model. Estimates of the ARMA(0,1)-GARCH(1,1) model for the PAX Gold, PAX and Gold are presented in Table 3. Panel A of Table 3 reports the estimates of the mean equation and Panel B reports the estimates of the conditional variance equation modeled as a GARCH process. The goodness of fit statistics using the Akaike Information Criteria (AIC) and the Schwarz Information Criteria (SIC); and residual diagnostics, i.e. the correlogram – Q statistics and the ARCH LM test for heteroscedasticity are reported in Panel C of Table 3.

The results in Panel A show that the coefficient for the dummy variable COVID is positive but insignificant. This implies that while returns were generally higher during the COVID period, the increase is not a significant one. In terms of volatility, the dummy variable COVID is found to be positive for PAX Gold and Gold but negative for PAX. Additionally, COVID is only significant for the PAX returns series. The results therefore indicate that the volatility of PAX Gold and Gold have increased during the COVID-19 crisis but the increase in volatility is not significant. On the other hand, the volatility of the PAX is found to have significantly decreased during the COVID-19 crisis thus lending credibility to the claim that cryptocurrencies can act as safe-haven investments during crisis periods.

A further test is carried out on the three returns series to observe how they performed during the bear market of 2020. The S&P500 was in a bear market from 19 February 2020 to 23 March 2020 (Franck, 2020). Since the bear market occurred during the COVID period, the sample period for this analysis is from 30 January 2020 to 28 September 2020. The bear market is represented by a dummy variable, Bear, such that the variable will take on a value 1 if the date falls within the dates of the bear market and 0, otherwise. The ARMA-GARCH model is thus used to test the impact of the bear market on both the returns and volatility of the three assets during the COVID crisis. When the GARCH(1,1) model is used for the PAX Gold, the coefficient of the ARCH term is negative hence the GARCH(0,
1) model is used for these two series. On the other hand, when the GARCH(0,1) model is used to model the PAX returns series, the model suffers from heteroscedasticity problem. For the return series of Gold, the results of $D_{\text{Bear}}$ are the same for any of the two models above. The estimates of the ARMA(0,1)-GARCH(0,1) model for the PAX Gold and Gold, and the ARMA(0,1)-GARCH(1,1) model for the PAX are presented in Table 4 with Panel A reporting the estimates of the mean equation, Panel B reporting the estimates of the conditional variance equation modeled as a GARCH process and Panel C reporting the goodness of fit statistics using the Akaike Information Criteria (AIC) and the Schwarz Information Criteria (SIC); and residual diagnostics, i.e. the correlogram – $Q$ statistics and the ARCH LM test for heteroscedasticity.

As per the results found for the COVID crisis period, the results in Table 4 show that the mean returns of PAX Gold, PAX and Gold are higher during the bear market but the higher return is insignificant. Therefore, the results in Tables 3 and 4 confirm that crises do not have any significant impact on the mean returns investors earn on their investments in cryptocurrencies and Gold.

On the other hand, the bear market is found to have mixed impacts on the volatility of the three assets. The volatility of the PAX is found to be significantly (at 5% level) higher during the bear market while that of Gold is also significantly higher although the significance is weak at the 10% level. The significant reduction of the volatility of the PAX during the COVID period but significant increase of its volatility during the bear market confirms the suggestion by Shahzad et al. (2019) that the safe-haven property of cryptocurrencies is time-varying. The insignificant effect of the COVID crisis on the volatility of Gold but the significant (albeit weak) effect of the bear market on Gold confirms the finding of Hood and Malik (2013) that Gold is a weak safe haven and that of Lucey and Li (2015) that its strength as a safe haven changes over time. On the other hand, both the COVID crisis and the bear market have insignificant influences on the volatility of PAX Gold thus lends credence to the claim by Huyhn et al. (2020) that a portfolio consisting

### Table 2
Comparison of mean returns, mean volume and standard deviation.

|                | Pre-COVID | COVID     | p-value |
|----------------|-----------|-----------|---------|
| **PAX Gold**   |           |           |         |
| mean           | 0.05%     | 0.07%     | 0.58    |
| volatility     | 1.75%     | 1.47%     |         |
| mean volume    | 2,243,812.29 | 1,355,538.40 |         |
| **PAX**        |           |           |         |
| mean           | 0.00%     | 0.00%     | 0.68    |
| volatility     | 0.69%     | 0.72%     |         |
| mean volume    | 324,654,448.98 | 404,174,085.07 |         |
| **Gold**       |           |           |         |
| mean           | 0.06%     | 0.09%     | 0.53    |
| volatility     | 0.83%     | 1.47%     |         |
| mean volume    | 1,035.00  | 87,501.25 |         |

### Table 3
Estimates of the ARMA(0,1)-GARCH(1,1) model during COVID.

|                | PAX Gold | PAX Gold |
|----------------|----------|----------|
| Panel A: Mean Equation |          |          |
| $c$             | 0.00045  | -6.13E-05| 0.00048 |
| ($0.00064$)     | ($0.000101$) | ($0.00068$) |         |
| $\eta_1$ (MA(1)) | -0.25434*** | -0.83567*** | -0.09955 |
| ($0.05041$)     | ($0.02980$) | ($0.06678$) |         |
| $D_{\text{COVID}}$ | 6.31-05  | 5.33E-05 | 0.00096 |
| ($0.00083$)     | ($0.000103$) | ($0.00104$) |         |
| Panel B: Conditional Variance Equation |          |          |
| $\alpha_0$      | 4.07E-05  | 4.91E-06** | 8.15E-06 |
| ($3.03E-05$)    | ($2.50E-06$) | ($5.74E-06$) |         |
| $\alpha_1$ (ARCH) | 0.39322  | 0.18972*** | 0.13456* |
| ($0.26378$)     | ($0.03662$) | ($0.07513$) |         |
| $\beta_1$ (GARCH) | 0.58109*** | 0.74074*** | 0.77303*** |
| ($0.11950$)     | ($0.02422$) | ($0.01873$) |         |
| $D_{\text{COVID}}$ | 1.78E-05  | -4.89E-06** | 1.37E-05 |
| ($2.07E-05$)    | ($2.50E-06$) | ($1.08E-05$) |         |
| Panel C: Goodness of Fit Statistics and Residual Diagnostics |          |          |
| AIC             | -5.86677  | -5.25818 | -6.11182 |
| SIC             | -5.83265  | -6.44235 | -6.00316 |
| Q(36)           | 33.441    | 24.324   | 32.839  |
| ARCH LM test (prob) | 0.1633   | 0.8399   | 0.7041  |
| No of observations | 363       | 363      | 263      |

*,**,*** indicate significance at the 10%, 5% and 1% levels, respectively. Standard errors are in parentheses. $c$ is the constant term, $\eta_1$ is the coefficient of the ARMA(0,1) model, $\alpha_0$ is the constant intercept term, $\alpha_1$ and $\beta_1$ capture the presence of heteroskedasticity in daily index return series, $D_{\text{COVID}}$ represents the COVID-19 period and takes on the value of 1 if the day falls within the COVID-19 period and 0 otherwise.

1) model is used for these two series. On the other hand, when the GARCH(0,1) model is used to model the PAX returns series, the model suffers from heteroscedasticity problem. For the return series of Gold, the results of $D_{\text{Bear}}$ are the same for any of the two models above. The estimates of the ARMA(0,1)-GARCH(0,1) model for the PAX Gold and Gold, and the ARMA(0,1)-GARCH(1,1) model for the PAX are presented in Table 4 with Panel A reporting the estimates of the mean equation, Panel B reporting the estimates of the conditional variance equation modeled as a GARCH process and Panel C reporting the goodness of fit statistics using the Akaike Information Criteria (AIC) and the Schwarz Information Criteria (SIC); and residual diagnostics, i.e. the correlogram – $Q$ statistics and the ARCH LM test for heteroscedasticity.

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of both cryptocurrency and Gold investments may act as an effective hedge against unexpected movements in the cryptocurrency market, because although Gold-backed cryptocurrencies are not portfolios of Gold and cryptocurrencies, they combine the features of both Gold and cryptocurrencies.

4. Conclusion

The aim of this study is to investigate the performance of Gold-backed cryptocurrencies, in terms of the returns and volatility, during the COVID-19 crisis and in particular, during the bear market of 2020 which occurred within the COVID-19 crisis period. The results show that mean returns and volatility are higher during the COVID and bear market period for both PAX Gold and Gold but the effect is insignificant, thus implying gold-backed cryptocurrencies can act as safe-haven investments during crisis periods. On the other hand, the volatility of PAX is found to be significantly lower during the COVID crisis but significantly higher during the bear market, confirming the findings in previous studies that the safe-haven property of cryptocurrencies is time-varying. This study is significant as it provides evidence on the safe-haven property of Gold-backed cryptocurrencies, which to the authors’ knowledge has not been adequately studied in the past.

This study however has its limitations in terms of its choice of sample and methodology. This study only considers the Pax Gold to represent Gold-backed cryptocurrencies due to the availability of its conventional counterpart and data. Additionally, unlike previous studies conducted on cryptocurrencies which focused on major cryptocurrencies such as the Bitcoin, this study considers the Paxos Standard cryptocurrency as it is the counterpart to the Pax Gold. Therefore, future studies can be focused specifically on the different Gold-backed cryptocurrencies to confirm the generalizability of the safe-haven property of these cryptocurrencies.

CRediT authorship contribution statement

Shaista Wasiuzzaman: Conceptualization, Methodology, Software, Data curation, Writing - original draft. Hajah Siti Wardah Haji Abdul Rahman: Methodology, Writing - review & editing.

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