Coronavirus Pandemic Impact on the Nexus Between Gold and Bitcoin Prices

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Abstract

This study aims to explore the Coronavirus disease (COVID-19) effects on gold and bitcoin prices variabilities and on the relationship between each of them, both prices are denominated in USD.

The study period is divided into two groups, first group included 120 workdays before 30 January 2020 when WHO first declared COIVD-19 outbreak as a public health emergency of international concern, and the second group included 120 observations post that date. The period as a total extends from June. 24, 2019 to 22 of May 2020.

To this end, the study used the appropriate statistical tools including stationery and unit root test, Levene's test for the equality of variances, correlation, least squares regression, and pairwise Granger causality test.

The results of testing the equality of variances and homogeneity between each of the study groups before and after COVID 19 revealed a strong rejection of the null hypothesis of equal variances for gold but not bitcoin which was accepted. The results also indicate a significant relationship between gold and bitcoin before and after COVID-19, but the sign changed from negative to positive respectively.

Finally, the study concludes that there were significant effects of COIVD-19 on gold but not bitcoin prices. These results are consistent with gold's traditional role as a safe-haven in crises, and bitcoin as a 'virtual gold' which has some similarities, and likely to be complementary rather than in a competion with gold.

Keywords: gold, bitcoin, COVID-19, hedging

1. Introduction

Coronavirus disease (COVID-19) has plunged the world into a "crisis like no other". The IMF described the global downturn as the worst since the great depression of the 1930s and expected that the global economy will shrink by 3% this year.

In similar circumstances, the demand is increased for a 'safe-haven' asset, (which is defined as an asset that is negatively correlated or uncorrelated with other asset classes in times of market uncertainties or turbulence (Baur & Lucey, 2010).

Traditionally, the gold characteristics such as its intrinsic value and low correlation with financial asset classes, especially in times of crisis or uncertainty, enabled it to be considered as a 'safe-haven' asset (Baur and McDermott (2010) and accepted globally as the most representative safe haven or hedge against volatility in another asset (Kyriazis, (2020).

Recently, Bitcoin (BTC) as a new asset class has been dubbed as 'virtual gold' and the gold for millennial (Burniske & White, 2016), it gained more ground and value during the Greek and European sovereign debt crisis, (Bouri, 2017a; Luther and Salter, 2017), Surprisingly, its price exceeded the price of one ounce of gold in April 2017. Dyhrberg (2016) also argued that BTC has hedging abilities as gold.

In this sense, this study aims to explore the effects of COVID-19 on the price variance of BTC & GD by testing the homogeneity between BTC before COVID-19 (BTC_b) and after COVID-19 (BTC_a) and also between gold price variance before COVID (GD_b) and after it (GD_a) and its effects on the relationship between them before and after COVID-19 by using the appropriate statistical tools.

This is one of the first studies to explore this relationship and its results are expected to contribute to the hedging literature and to provide essential information that might be beneficial to investors as well as researchers. Our results are also useful for investment decision-making.

The remainder of this paper is organized as follows: Section 2 Literature Review and previous studies. Section 3 describes the methodology. Section 4 presents the results. Section 5 provides a discussion and the overall conclusion.

2. Literature Review and Previous Studies

2.1 Corona Virus Disease (COVID-19)

Coronavirus disease (COVID-19) is an infectious disease caused by a newly discovered coronavirus, SARS-CoV-2. World health organization WHO director-general declared that the outbreak constitutes a public health emergency of international concern (PHEIC) on 30 January 2020 and a pandemic on 11th March 2020 (https://www.who.int/). The COVID-19 outbreak, which was first detected in China, had infected people in 219 countries. In 1st June 2020, WHO statistics indicated that the confirmed cases were (5 939 234) case and the confirmed deaths were (367255).

COVID-19 dived the world into a "crisis like no other", affecting all sectors all over the world. The IMF described the global downturn as the worst since the great depression of the 1930s and expected that global economy to shrink by 3% this year (Jones, 2020) and predicts that the UK economy will shrink by 6.5% in 2020, and the US economy by 5.9% this year, representing the biggest annual decline since 1946 (Ping, S. (2020). The Dow and the FTSE saw their biggest quarterly drops in the first three months of the year since 1987 (Jones, 2020). Investors fear that governments' actions may not be enough to stop such decline.

2.2 Previous Studies

Cryptocurrencies literature, in general, is scant, and till now there are no previous studies about COVID-19 effects on BTC and gold –up to the researcher knolwedge-.

Bouoiyour, et. al., (2019) sought to address whether BTC ever matched or even replaced gold as a safe haven. They reported a positive and strong correlation between BTC and gold returns coinciding with specific political and economic events. They indicated that gold and BTC benefits from the same economic conditions. They finally concluded that gold and BTC are likely to be complementary, rather than in competition with each other.

One of the most related previous studies is that of Al-Khazali, et. al., (2018), who examined the impact of positive against negative macroeconomic news surprises originating from large developed economies on the BTC and gold returns and volatility over the period July 19, 2010 – February 7, 2017. They found an asymmetric impacts and evidence that gold is different from BTC. Specifically, gold returns and volatility did systematically react to macroeconomic news surprises in a manner that were consistent with its traditional role as a safe-haven, whereas BTC prices and volatility did not react in a similar manner. In the same line, Li and Wang (2017) argued that BTC returns are affected by changes in economic fundamentals.

Regarding the hedging capability of BTC, while, Dyhrberg (2016) and Baur & Lucey (2010) revealed that BTC and gold have similar hedging capabilities, Capie et al. (2005) suggested that BTC cannot be used as a hedge against exchange rates.

Regarding the relationship between gold and BTC, mixed results were reported by the previous empirical studies. While some of them found a positive relationship such as Patonov, (2020) and Bouoiyor, et. al., (2019), others such as; Kyriazis, (2020); Obryan (2019); and Su et.al,. (2020) pointed out that gold price is negatively related to that of BTC.

On the other hand, Kristoufek & Scalas (2015) and Yermack (2013) denied the presences of any relationship between them. Finally, Gkillas & Longin (2019) found a low extreme correlation between BTC and gold.

Through reviewing previous studies, it is clear that few studies have examined the relationship between gold and bitcoin in exceptional circumstances such as Corona, and thus this study is expected to contribute to stimulating more subsequent studies.

3. Research Methodology

3.1 Methodology

As WHO declared that the outbreak constitutes a public health emergency of international concern (PHEIC) on 30th January 2020, our empirical study considered it as (T_0) and took an equal period before and after this date, the first period started from June. 24th, 2019 to 30th January 2020 (yielding 120 observation) and the second period started

from 31 January 2020 to 22 May 2020 (yielding 120 observation), consequently, logarithms were used throughout the analysis.

3.2 Data

In our study, we considered working days (daily) closing prices (expressed in US dollars). BTC price data were obtained from coinmarketcap.com and gold spot prices/OZ from gold.org.

3.3 Study Variables

BTC price (BTC): daily BTC closing price.

Gold price (GD): spot OZ Gold price.

The logarithms of daily prices expressed in US dollars for both variables were used.

3.4 Hypotheses

From the above discussion our preliminary hypotheses will be as follows:

> H01: The variances of BTC_b & BTC_a are equal.
>
> H02: The variances of GD_b & GD_a are equal.
>
> H03: There is no significant relationship between BTC_b and GD_b.
>
> H04: There is no significant relationship between BTC_a and GD_a.

3.5 The Model

The linear model used in this study is given below:

$$BTC_i = \alpha + \beta*GD_i + e \qquad (1)$$

$$\text{Model 1: } BTC_b = \alpha + \beta*GD_b + e \qquad (2)$$

$$\text{Model 2: } BTC_a = \alpha + \beta*GD_a + e \qquad (3)$$

Where: α: the intercept, B: Coefficient, Ɛ: Error and i = b, a and All; b and a indicate the period before and after COIVD 19 respectively, and (All) for the whole period.

3.6 Statistical Methods

To achieve the study objectives, the appropriate statistical tools were used, stationary and unit root tests, Levene's test for equality of variances, correlation, least squares regression, and pairwise Granger causality tests.

4. Study Results

4.1 Descriptive Statistics

Table I represents the descriptive statistics

Table 1. Descriptive statistics

	BTC		Gold	
	BTC_b	BTC_a	GD_b	GD_a
Mean	3.978	3.902	3.168	3.204
Median	3.987	3.909	3.172	3.201
Maximum	4.114	4.014	3.189	3.243
Minimum	3.854	3.696	3.143	3.165
Range	0.260	0.320	0.050	0.080
Std. Dev.	0.065	0.072	0.012	0.022
Skewness	-0.099	-0.562	-0.553	-0.055
Kurtosis	2.095	2.880	2.207	1.915
Jarque-Bera	4.287	6.397	9.269	5.943
Probability	0.117	0.041	0.010	0.051
Observations	120	120	120	120

Source: Eviews calculations.

Table 1 reported the descriptive statistics of the study variables, the results reported that the mean and median of BTC_b are close to that of BTC_a, and also for that of GD.

The range however slightly increased from 0.26 to 0.32 and from 0.05 to 0.08 for BTC & GD respectively. The standard deviations also increased from 0.06 to 0.07 and from 0.01 to 0.02 for BTC & GD respectively.

These results indicate that prices fluctuations of BTC & GD after COVID-19 pandemic were higher than before the crisis. The Jarque-Bera statistics however indicates that BTC_a and GD_b price series don't follow a normal distribution.

4.2 Empirical Results

In this section, Unit Root testing, correlation, independent samples, and simple regression tests are conducted.

4.2.1 Stationary and Unit Root Testing

The Augmented Dickey-Fuller test (ADF) and PP were used for testing the stationarity. The results are shown in Table 2 below:

Table 2. The results of ADF & PP unit root tests

H0:	Level			1st deference	
	ADF (t. sta.)	PP (t.sta.)	ADF (t. sta.)	PP (t.sta.)	
BTC_b	-1.78 (0.39)	-1.39 (0.58)	-8.98* (0.00)	-11.74* (0.00)	
BTCa	-2.111 (0.24)	-1.98 (0.30)	-12.78* (0.00)	-12.69* (0.00)	
GD_b	-2.089 (0.25)	-1.95 (0.31)	-12.34* (0.00)	-12.49* (0.00)	
GD_a	-1.313 (0.62)	-1.64 (0.46)	-5.73* (0.00)	-11.428* (0.00)	
Test critical values:	0.01 level			-3.4870	
	0.05 level			2.8863-	
	0.10 level			-2.5800	

* reject null hypotheses at less than or equal 0.05 significant levels.

Source: Eviews calculations.

The reported results in Table 2 clearly demonstrate that the null hypothesis of each of the time series has a unit root that cannot be rejected for the levels since their ADF & PP values are less than critical values at the (5%) level of significance. Therefore, all of the variables are non-stationary in their levels. However, the results indicate that the null hypothesis is rejected for the 1st differences; all variables are stationary in their 1st differences.

Therefore, we conclude that all of the variables under investigation are individually integrated into order one I~ (1).

4.2.2 Correlation Results

Table 3 reports the correlation matrix between study variables.

Table 3. Correlation matrix

	BTC_b	BTC_a	GD_b	GD_a
BTC_b	1			
BTC_a	0.1191	1		
GD_b	-0.2678***	0.2216**	1	
GD_a	-0.638***	0.3172***	0.4376***	1

***Sig <1%, **5%, *10%

Source: Author's calculations

Table 3 shows that the significant negative correlation (-0.27) between BTC_b and GD_b had transformed into a significant positive correlation (0.32) between BTC_a and GD_a after COIVD 19.

Additionally, while there was a significant positive correlation (0.43) between GD_b and GD_a, the results indicate an absence of a significant correlation between BTC_a and BTC_b.

4.2.3 Homogeneity of Variance Test

To test the equality of variance, Levene's test represented in Table 4.

Table 4. Levene's test for equality of variances (SPSS)

H0:	Levene Statistic	Sig	Results
The variances of BTC_b & BTC_a are equal.	2.219	0.138	Accept H0
The variances of GD_b & GD_a are equal.	53.09	0.000	Reject H0

Source: SPSS calculation.

Table 4 results fails to reject the null hypothesis of equal variances for BTC at the 0.05 significance level since the value of the Levene's test statistic is 2.219. Thus, we conclude that there is ahomogeneity of BTC price variance before and after COVID 19 with insufficient evidence to claim that the variances are not equal.

On the other hand, the results showed that Levene's statistic for gold (53.091) is significant whereas the probability is 0.00. So, we rejected the null hypothesis of equal variances for gold and we conclude that there is a heterogeneity of gold price variance before and after COVID 19 with a sufficient evidence to claim that COVID has affect the gold price variances.

4.2.4 Least Squares Regression Analysis Results

Table 5 represents the third and fourth hypotheses testing results.

Table 5. Regression analysis results

Method: Least Squares	Model 1: $BTC_b(-1)$		Model 2: $BTC_a(-1)$	
	Coefficients	T	Coefficients	T
C	8.583	5.77***	0.669	0.7311
GD_b (-1)	-1.453	-3.1***		
GD_a (-1)			1.009	3.53***
R^2	0.09		0.10	
F-Stat.	11.125***		13.03***	

*** Sig, at 1% level.

Source: Eviews calculation.

As shown in Table 5, the results of model 1 reports that, as GD_b (-1) coefficient in the previous period of Covid-19 is negative (-1.453) and statistically significant at $\alpha < 0,01$, we reject the null hypothesis H03: There is no significant relationship between BTC_b and GD_b, and accept Ha: There is a significant relationship between BTC_b and GD_b (before COVID-19). The estimation of the regression model as follows:

$$BTC_b(-1) = 8.583 - 1.453 * GD_b (-1)$$

In addition, model 2 results showed that the (-1) coefficient in the following period of Covid-19 did transformed into being significantly positive (1.009) at $\alpha < 0,01$, this indicates that the crises did had a significant effect on BTC and GD relationship. Thus, we reject the null hypothesis H04: There is no significant relationship between BTC_a and GD_a and accept Ha: There is a significant relationship between BTC_a and GD_a.

The estimation of the regression model as follows:

$BTC_a(-1) = 0.669 + 1.009* GD_a (-1)$

The R-squared (F- statistics) for model1 and model 2 are 0.09 (11.12) and 0.10 (13.03) respectively.

4.2.5 Granger Causality Test

Table 6 represents the results of the pairwise Granger causality test.

Table 6. Results of the pairwise Granger Causality Test

Causality direction	Lag	F-Statistic (Probability)		Result
BTC_b does not Granger Cause BTC_a	2	0.074	(0.93)	
BTC_a does not Granger Cause BTC_b	2	1.18	(0.84)	
GD_b does not Granger Cause GD_a	2	0.24	(0.79)	
GD_a does not Granger Cause GD_b	2	0.04	(0.96)	
GD_b does not Granger Cause BTC_b	2	0.37	(0.69)	Accept H0
BTC_b does not Granger Cause GD_b	2	0.39	(0.68)	
GD_a does not Granger Cause BTC_a	2	1.18	(0.31)	
BTC_a does not Granger Cause GD_a	2	0.22	(0.81)	

Source: Eviews calculation.

Note: for F-statistics, probabilities are greater than 0.01 levels or 5% level null hypotheses are rejected at that level.

Table 6 shows that all F tests are insignificant at the 0.05 level of significance. These results imply that we can't reject all of the null hypotheses, and thus we conclude the absence of a short-term causality relationship between all of the study variables.

5. Discussion and Conclusion

Although there are a number of determinants, especially time, the results of this study provides benefit to investors and researchers and will hopefully motivate researchers to address the economic and financial implications of the exceptional crisis of Corona.

The results of correlation and regression tests revealed a negative and weak correlation between BTC_B and GD_B, which implies its benefit of hedging and diversification, These results are in line with several previous studies such as that of Kyriazis, (2020); Obryan (2019); and Su et.al,. (2020) who pointed out that, gold is negatively related to the price of BTC.

The results of correlation and regression analysis before and after COVID 19 were different, and the relationship between the study variables has transformed from positive to negative respectively.

These results are in line with Patonov, (2020) and Bouoiyour, et. al., (2019) and with Dyhrberg (2015), and inconsistent with Kristoufek and Scalas (2015) and Yermack (2013).

The result of testing the equality of variances strongly rejects the null hypothesis of equal variances for gold while accepting it for BTC.

These results are in line with Al-Khazali, et. al., (2018) who reported that gold is different from BTC, and with the gold traditional role as a safe-haven, whereas BTC prices and volatility do not mostly react in a similar manner.

The results contradicted that of Li and Wang (2017), who argued that BTC returns are affected by the changes in economic fundamentals. The results also contradicted Dyhrberg (2016) and Baur and Lucey (2010) who revealed that BTC and gold have similar hedging capabilities.

Finally, the study concludes that the COVID-19 impacts were stronger for gold than for BTC. These results are consistent with gold's traditional role as a safe-haven in turmoil and confirmed BTC as a new asset class that has been dubbed as 'virtual gold' which has some similarities, and likely to be complementary rather than in competition with gold.

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