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Is Bitcoin a Safe Haven for US Equity Market? --A Comparison with Gold and the Dollar

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Abstract: This paper examines whether Bitcoin is an excellent hedge asset by applying the GARCH model. First, the correlation test finds that bitcoin's returns against the US dollar and gold are not significantly correlated. Also, based on comparisons across events, bitcoin returns perform more neutrally, unlike traditional hedges such as gold, which exhibit a significant negative correlation between performance and hedge in an emergency. In addition, the high volatility of Bitcoin compared to other varieties suggests that investors choosing to invest in Bitcoin will expose to high-risk return volatility. Therefore, bitcoin is more of a speculative asset than a safe haven.

Keywords: Bitcoin, Gold, Safety haven, GARCH, Volatility

1. Introduction

Cryptocurrency was one of the most momentous financial innovations in the last decade. Bitcoin, as the first cryptocurrency, has turned into the most valuable and widely held among large number of cryptocurrencies since it was proposed by Nakamoto [1]. Impressive consideration from both investors and academicians has been attracted by bitcoin for many reasons, including autonomy from power control, a role as a store of value and restricted correlation with conventional assets [2-3]. Moreover, developing prominence of cryptocurrencies has motivated numerous researchers to explore their diversification benefits, hedging and safety haven properties [3-7].

A cryptocurrency mania has additionally achieved controversies as to whether bitcoin is a risk hazard or not. On the one hand, as the essential decentralized digital currency, bitcoin provides investors with some shelters in midst of crisis, such as the debt crisis of 2010-2013 in Europe and the financial crisis of 2012-2013 in Cyprus [4,8]. On the other hand, decentralization and unregulated markets add extra uncertainties to its pricing, forecasting and investment. Especially in recent years, dramatic price increases, collapses and a bubble-like price movement are noticeable. It is recommended that even a small allocation can immensely increment portfolio downside risk when held aside with S&P 500, and this portfolio downside risk growth is present in the majority of worldwide equity markets [2,9].

Compared with other traditional assets, incredibly higher volatility is one of the reasons why academics consider bitcoin risky. Harvey reports that bitcoin is too volatile to be a store of value and

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the extreme levels of volatility, roughly 8 times greater than the equity market and 20 times higher than the US dollar, are the main operation problem for Bitcoin [10]. Liew suggests that Bitcoin payoffs may suffer from hidden risk, named as "beta-in-the-tails" [10,11]. Based on this previous literature, we further compare and analyze the bitcoin's return volatility with other assets (gold and the dollar).

There is another debate regarding whether bitcoin is a currency, a hedging, or a speculative asset. [12] Yermack contends that it falls to satisfy the basic function of a currency and it is extremely hard to hedge, due to its greatly higher volatility. Bitcoin, therefore, behaves more like a speculative investment. Similarly, [6] Bouri demonstrates that with restricted hedging properties, bitcoin has safe-haven characteristics for Asian equity markets. Furthermore, [13] proposes that bitcoin mainly acts as a speculative venture. In this paper, we investigate the correlation among bitcoin, Consumer Price Index (CPI) and real interest rate and examine whether investors would speculate in bitcoin when CPI falls, and real interest rate rises.

Despite hidden risk, exceptional yields of bitcoin have also attracted research into its safety-haven properties. [14] took the lead in putting forward the concept of safety haven and defined the qualification of a safe-haven asset that its returns should be statistically uncorrelated or negatively correlated with the returns of other assets in the case of market downturns. A couple of investigations have suggested strong safe-haven property of bitcoin in stock markets. From a sample of developed and arising economics, [3] shows that gold and bitcoin can be viewed as a weak safe-haven asset by and large. Furthermore, the safe-haven roles are not steady but differing over time and vary across equity markets. Utilizing the wavelet approach, Bouri et. al uncovers that the Bitcoin has superior diversification benefits compared to gold. They additionally recommend that Bitcoin can be considered as the most reasonable safe haven followed by gold [10,15].

Nevertheless, a few ongoing findings also cast doubt on the capacity of Bitcoin to give some resilience during severe economic turbulence. [2] exhibits that drop in price of Bitcoin was in lockstep with S&P 500 as the crisis progresses. Moreover, [16] and [17] claim that Bitcoin is ineffective as both a hedge and a safe haven for mature markets. [9] has comparable finding during Covid- 19 that bitcoin did not act as a safe-haven asset. Overall, there is no consensus on the nature of bitcoin, so we will further test the hedging of Bitcoin in four sample periods and analyze its asset attributes in this paper.

While most literature focus on safe-haven role of bitcoin and other traditional assets during 2008 global economic crisis and Covid- 19, this study chooses four periods of economic downturns: Ukraine War, Inverted yield curve in Treasury bond, the most recent Federal Quantitative Ease and US-China Trade War. We predominantly test the safe-haven capability of Bitcoin during the four sample periods. First, we compare the volatility of the payoffs of bitcoin with that of other assets (gold, US dollar and S&P 500) and analyze their difference in conditional volatility of daily returns by using GRACH (1, 1) model. Second, we propose two hypotheses to test the diversification benefit of bitcoin and regress the daily returns of bitcoin on our shock dummy variables as well as other assets. Ultimately, we show the correlation among bitcoin, CPI and real interest rate to study whether bitcoin behaves more like a speculative asset or a safe haven during the economic turmoil. Our discoveries demonstrate that bitcoin has outrageous higher unpredictability, and the standard deviation of its returns is roughly five times higher than that of S&P 500. Claiming to its insignificant correlation, bitcoin is more suitable for speculation rather than hedging.

The construction of this paper is coordinated as follows. Section 2 depicts the data. The rationales and methodology approaches utilized are introduced in Section 3. Section 4 shows the empirical results. Finally, section 5 provides our concluding remarks and future research direction.

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2. Data

Daily spot price data for Bitcoin and ounce of Gold, and S&P 500 Index, are obtained from Wind Economic Database. Dollar index is sourced from World Gold Council. We use monthly Consumer Price Index from US Department of Labour. Our observations encompass all data available from 18 December 2017 to 22 April 2022, where the starting point represents one typical peak when price of bitcoin was at about $20,000, except historical prices for weekend. All statistics of prices are conducted into logarithmic return in our empirical analysis. Additionally, monthly return of Bitcoin and Gold and monthly real interest rate are sourced from Wind Database. We provide descriptive statistics of daily return series as Table 1.

Table 1: Descriptive statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
BTCReturn	1020	.001	.05	-.268	.235
GOLDReturn	1020	0	.01	-.058	.063
USDReturn	1020	0	.004	-.019	.018

3. Methodology

Our empirical experiment will examine the safe-haven property of bitcoin in three aspects: the volatility of returns in bitcoins and the correlation between the return of bitcoins and that of risky assets. Lastly, we established the correlation between the return of bitcoin and the real interest rate to test the speculative property of bitcoins. From these three aspects, we study whether Bitcoin has safe haven properties from the definition of safe haven assets to start with, and then try to prove if Bitcoin shows similar properties with risky assets, which tests Bitcoin's safe haven properties from the opposite perspective.

The first aspect follows the logic that safe-haven assets would usually have a relatively stable return throughout the year, and shocks in the market would not largely influence their asset values [18]. In contrast, the asset would be speculative if the volatility of the asset is huge; investors could sometimes gain high returns from their asset while suffering from massive losses in their asset value in other circumstances. We compare the volatility of the daily return of bitcoins and other assets in the last five years; we also use GARCH (1, 1) model [19], to test the conditional volatility of the daily return of bitcoins and other assets. This model clearly reflects changing volatility of the returns of the assets in response to good and bad news, displaying the difference in the effects on volatility of returns when different types of news happen.

The second aspect follows the logic that if the asset can provide diversification benefits, especially when 'Black swan' incidents happen, which are events that brings extremely negative effects and at the same time are impossible to be predicted [20], the negative impact of the shock on a safety-haven asset should be small, while the return of risky assets would significantly fall during the shock. Also, the asset would have a safe-haven property if it could unhook with the risky assets during the shock. To test this, we regress the daily return of bitcoins on a series of shock dummy variables as well as the daily return of gold, S&P 500, and USD index:

BTC Return = a1* SPXReturn+b1* Inverted yield curve dummy +b2* Quantitative Easing dummy +b3*War dummy +b4*Trade war dummy + b5*Gold return +b6* USD return.

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4. Results

4.1 Volatility of return

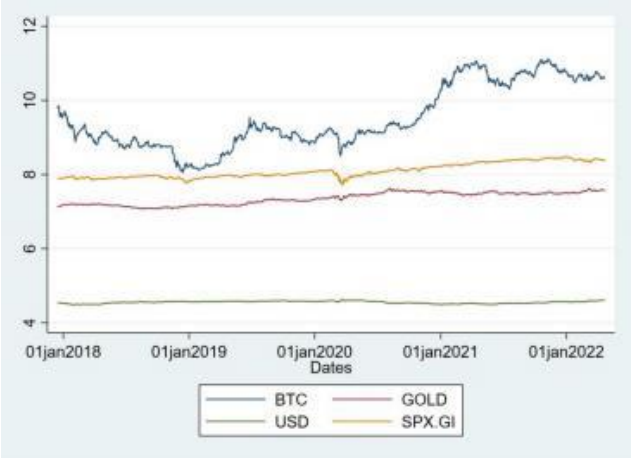

Figure 1: Time series plot of log asset prices.

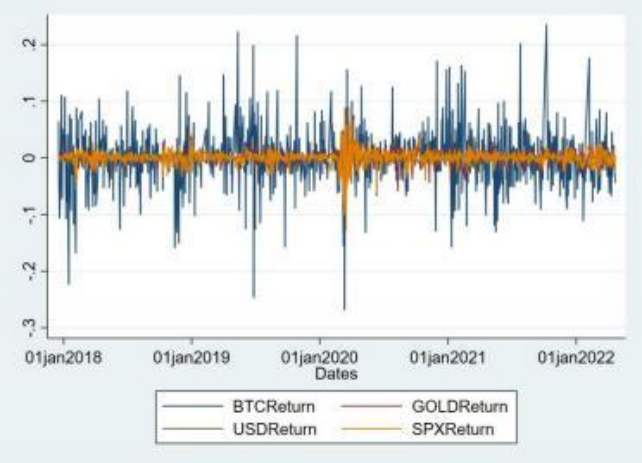

Figure 2: Return of assets.

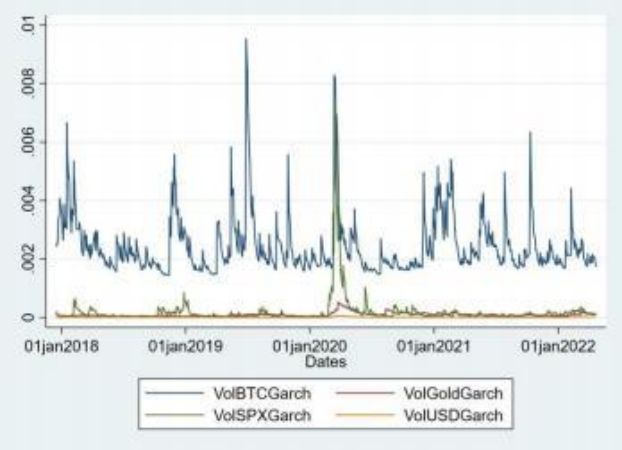

Figure 3: Generalized Autoregressive Conditional Heteroskedasticity.

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As seen in Fig. 1, the lines representing other assets are generally stable with little or no turbulations, but the line for Bitcoin price is largely unstable, having many sharp falls and rises. This clear non-stationarity indicates that the volatility of Bitcoin's price is much larger than other assets. In order to analyze the volatility of return, the first difference in log price will be taken as the continuous daily return. In Fig. 1, it can be noticed that the return of bitcoins is very volatile in contrast with that of gold, S&P 500 and US dollar. From table 1, the standard deviation of bitcoin's return is 5%, which is five times larger than the volatility of S&P500. The large volatility is also evident in the minimum and maximum data, where these data of Bitcoin returns are at -0.268 and 0.235, which is over ten times more than that of USD returns, and around 5 times of that of gold returns, taking into consideration that the three variables concerned have almost the same mean value at 0.

The return in Fig. 1 represents unconditional volatility. However, the volatility of financial assets would often have clustering phenomenon, where large changes in price in the same period [21]. Thus, conditional volatility would be a better description of financial assets' volatility. We use GARCH(1, 1) model to analyze the conditional volatility of all the assets, using lagged variance to predict future variance. The conditional volatility of Bitcoin using GARCH(1, 1) model is still higher than other assets. We can see that bitcoin is a much riskier assets in the aspect of volatility compared to other traditional financial assets.

Descriptive statistics of bitcoin and other three assets are illustrated in Fig. 2. We compare the return series of four assets and clarify the differences in their levels of volatility. Plots of daily return series indicate that returns of bitcoin are much more volatile than returns of other assets. The corresponding band of the return plot is [-0.3, 0.2], and a small number of bitcoin returns exceeds the limits.

4.2 Correlation between Bitcoin and the Risky Asset

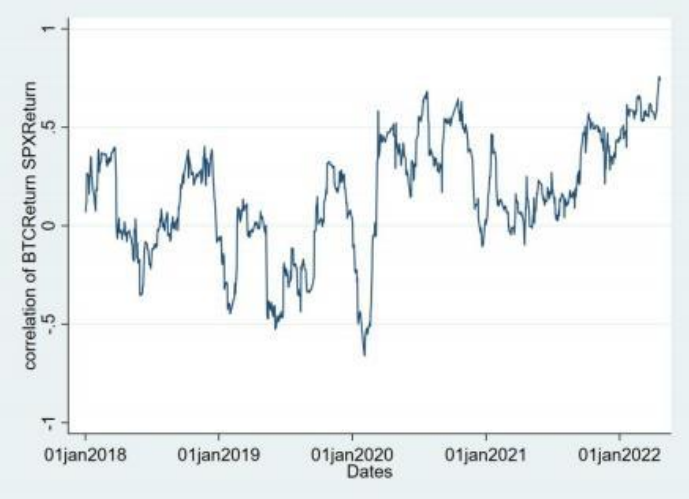

Figure 4: Rolling correlation between returns of bitcoin and S&P 500 (window 30).

S&P 500 is set as the risk asset, due to its large volatility during negative events, for example, its volatility increases sharply during the first season in 2020 due to the pandemic, shown in Fig.3. As shown in Fig.4, the correlation between bitcoin and S&P 500 is not stable in the last five years. Suppose bitcoin was negatively correlated with S&P 500 during the 'Black swan' incidents period, then, it would imply that bitcoin can provide diversification benefits when shocks happen.

We would conduct the hypothesis testing to the diversification benefit of bitcoins. We propose two hypotheses:

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H0 : Bitcoin cannot provide any diversification benefits when 'Black swan' incidents happen H1 : Bitcoin can provide diversification benefits when 'Black swan' incidents happen.

Four different 'Black swan' incidents are identified:

1. Ukraine war; date: 2022/03 to 2022/04
2. Inverted yield curve in Treasury bond; date: 2022/01 to 2022/04
3. Federal Quantitative Ease; date: 2020/03-2020/ 12
4. Trade War between China and US; date: 2018/03-2018/ 12

The prices of bitcoin experienced anomalous rise or fall during those periods. It seems that bitcoin is extremely sensitive to certain hits. In 2018, to respond to the IRS regulations that trade of cryptocurrencies should be reported and taxed as other kinds of property, the BTC price sharply dropped from about $20,000 to $3,000. Additionally, political instability because of trade war and negative comments from Wall Street accelerated the downside. In 2020, bitcoin was shaken from price stupor by multiple rounds of unchecked stimulus spending by central banks during the economic shutdown and low interest rates. Its price has skyrocketed by more than 200% since the beginning of this year. In 2022, bitcoin price starts falling, as it is affected by high inflation and Ukraine War, accompanied with sharp rises on commodity prices.

Table 2: Regression Result.

BTCReturn	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
SPXReturn	.646	.111	5.800		.427	.864	***
USDReturn	-.737	.429	-1.72	.086	-1.58	.105	*
GOLDReturn	.397	.166	2.39	.017	.071	.724	**
Inverted yield curve	-.003	.009	-0.39	.698	-.021	.014	
QuantitativeEase	.003	.004	0.67	.503	-.005	.01	
wardummy	.002	.012	0.19	.85	-.021	.025	
TradeWar	-.006	.004	-1.40	.161	-.015	.002	
Constant	.001	.003	0.25	.802	-.005	.007	
Mean dependent var		0.001	SD dependent var			0.050	
R-squared		0.054	Number of obs			1020	
F-test		8.265	Prob > F			0.000	
Akaike crit. (AIC)		-3277.753	Bayesian crit. (BIC)			-3238.333	

The regression result in table 2 shows that the return of bitcoin is positively correlated with the return of S&P500 and the return of gold, both estimates are statistically significant at 5% significance level. The return of bitcoin is negatively correlated with the return of US dollars with an estimated coefficient of -0.737, and it is statistically significant at 10% significance level. The coefficient of the inverted yield curve dummy and the trade war dummy is negative, while the coefficient of the

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quantitative easing dummy and the war dummy is positive. However, the coefficients of dummy variables are small, and all estimates has no statistical significance to the return of bitcoin even at 10% significance level. As the results are both statistically and economically insignificant, we deduce that during the black swan event period, bitcoin does not demonstrate a positive correlation between our dummy variables. As a result, bitcoin does not provide any diversification benefits during shocks.

Overall, for the period we study, bitcoin is highly and positively correlated with our equity assets and provides no diversification benefits during shocks. Thus, we cannot reject the hypothesis that Bitcoin cannot provide any diversification benefits when 'Black swan' incidents happen. It cannot be defined as a safe haven asset in the aspect of volatility, diversification or risk hedging.

4.3 The correlation between assets and the real interest rate

Table 3: Matrix of correlations.

Variables	(1)	(2)	(3)
(1) bitcoin return	1.000		
(2) CPI	-0.210	1.000	
(3) real interest rate	0.150	-0.929	1.000

The information shown in Table 3 is a matrix of correlation performance and contains three variables, namely monthly bitcoin returns yields, CPI, and real interest rates. The test results demonstrated that bitcoin return negatively correlates with CPI with a value of -0.210. Meanwhile, bitcoin shows a positive correlation with the real interest rate with a value of 0.15. However, as the value result is close to zero, the correlation between bitcoin returns and two variables is insignificant. Therefore, it concluded that the impact of bitcoin returns due to changes in CPI and real interest rates is not significant.

Furthermore, the real interest rate is calculated as the 10-year US Treasury yield minus the 5-year expected inflation rate. Real interest rates fall when inflation rises more than Treasury yields, leading to increased anti-inflationary incentives, higher prices for safe-haven assets, and higher yields. Conversely, suppose Treasury yields fall more than inflation falls. Real interest rates fall, and significant easing leads to lower earnings through interest rates, higher demand for safe-haven assets, higher prices, and higher yields. Vice versa, the price of traditional safe-haven assets is influenced by Treasury yields and inflation and is negatively correlated.

The monthly return of bitcoin is negatively correlated to the Consumer Price Index (CPI) and is positively correlated to the real interest rate [Calculated by Interest rates on 10-year Treasury bonds minus five-year inflation expectations]. This suggests that investors would still speculate in bitcoins when the real interest rate increase or CPI decreases, seeking to get a higher return from investing in bitcoins. Analysis suggests that bitcoin performs the different of traditional safe-haven asset in a hyperinflationary context. In comparison, the correlation is relatively weak. Therefore, there is no reason for investors to invest in Bitcoin based on changes in Treasury yields and inflation rates, thus serving as a safe-haven asset against inflation.

5. Conclusion

Analysis shows that bitcoin has many similarities to traditional hedge assets such as the gold, and dollar, but there is no significant correlation based on returns. Bitcoin does not respond significantly to real interest rates and the Consumer Price Index. Therefore, suggesting that it does not possess the value attributes of a liquid currency and cannot invest in a hyperinflationary context as a high-return

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hedge asset option. The high volatility range of bitcoin returns will expose investors to high-risk investment behavior and holding bitcoin as a safe-haven asset for the long term is not the right choice. However, in a diversified portfolio of investments, Bitcoin is not a hedge asset as a replacement for gold and the US dollar due to its insignificant correlation. Bitcoin is more suited to speculation than hedging. Furthermore, the pressure of national policies has severely compromised the safety and market size of Bitcoin. Therefore, it cannot be considered a liquid currency investment that can replace the US dollar.

Since Bitcoin's return impact is affected by its related events, further research in the future may explore more about Bitcoin's costs and price influences, such as mining electricity costs, graphics card fees, and platform transaction fees. As a result, Bitcoin's position in the market is independent, unlike gold and the US dollar, and is minimally affected by world emergencies and financial crises. This result suggests that Bitcoin can provide options for portfolio diversification but not a long-term allocation as a hedge against the negative impact of crisis events. Bitcoin, meanwhile, is not an excellent safe-haven asset.

6. Acknowledgement

HU JIAWEN(Claudia) is mainly accountable for literature reading and wrote section 1(introduction) and most of the list of references; / Section 2 (data), partial analysis of methods and results were done by ZHANG ZIYING(Cindy); / GAO YUBO(Louis) is responsible for almost all the data processing and wrote the first draft of methodology and results. / CHEN SHENGDUO (Sheng duo) done partial data processing and wrote the analysis of result (4.3), Abstract and Conclusion.

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