



Safe havens for Bitcoin

Martin Nedved^a, Ladislav Kristoufek^{a,b,*}

^a Institute of Economic Studies, Faculty of Social Sciences, Charles University, Prague, Czech Republic

^b The Czech Academy of Sciences, Institute of Information Theory and Automation, Prague, Czech Republic

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ABSTRACT

We examine whether gold, crude oil, and stock markets could serve as safe havens for Bitcoin. As an investor into cryptoassets faces high risk when holding for longer periods and might be interested in diversifying and hedging outside of cryptoassets, these traditional assets might be of interest. We find that Bitcoin moves together with the stock markets but oil and gold can serve as safe havens. Specifically gold is identified as a strong safe haven for Bitcoin. In addition, we describe the evolution of the stocks–Bitcoin nexus which unveils in the safe haven discussion. Our results aim to lay foundations for further discussions into the topic of safe havens for cryptoassets as these are becoming increasingly standard part of investors' portfolios, being it institutional or retail, and thus protection against their extreme movements and diversifications of their risk will play an important role in the investors' decision making.

1. Introduction

Bitcoin (Nakamoto, 2008) as a potential safe haven for traditional financial assets is one of the most frequently examined topics in the cryptoassets literature (Kristoufek, 2015; Dyhrberg, 2016a,b; Bouri et al., 2017; Baur et al., 2018; Smales, 2019; Guesmi et al., 2019; Shahzad et al., 2019; Kristoufek, 2020; Conlon and McGee, 2020; Dimitriou et al., 2020; Bouri et al., 2020; Papadamou et al., 2021; Chemkha et al., 2021; Wen et al., 2022) and partially builds on the narrative of Bitcoin being “digital gold”, albeit its inherent amplified bubble-bust dynamics has often overshadowed the fundamental structures of its pricing and connectedness within the traditional financial system (Chaim and Laurini, 2019; Geuder et al., 2019; Wheatley et al., 2019). The idea is built on a hypothesized detachment of Bitcoin, and cryptoassets in general, from the traditional financial markets. However, the Covid-19 induced turbulences in 2020 and onwards have strongly undermined this narrative as the cryptomarkets mostly followed the stock markets and depreciated in the early stages of the pandemic to follow with an appreciation rally following the new wave of quantitative easing unseen even for the global financial crisis and its aftermath in early 2010s (Kristoufek, 2020; Conlon and McGee, 2020; Chemkha et al., 2021; Wen et al., 2022). Currently, the reaction to skyrocketing global inflation and interest rates hikes as a response in order to restrict and limit monetary bases has mostly been contractive even for the cryptomarkets. And even though Bitcoin as the leader has still prevailed as a rather good investment in the retrospect, with the March 2020 Covid-19 minimum of around \$5k, rallying above \$60k in 2021, to the current correction to the \$20k levels, thus still delivering staggering 300% gains, investors into cryptoassets faced the question of how to defend and hedge their positions. Even though Baumöhl (2019) studies possible safe havens within the crypto-markets and Baur and Hoang (2021) examine stablecoins as potential candidates, an analysis into safe havens for Bitcoin outside of the cryptoassets is missing.

Here, we follow the standard procedure of Baur and Lucey (2010) and examine whether gold, crude oil, and stock markets could serve as safe havens for Bitcoin. Even though such notion might sound counter-intuitive at first, an investor into cryptoassets faces

* Corresponding author at: Institute of Economic Studies, Faculty of Social Sciences, Charles University, Prague, Czech Republic.

E-mail addresses: 80119387@fsv.cuni.cz (M. Nedved), LK@fsv.cuni.cz (L. Kristoufek).

high risk when holding for longer periods and might be interested in diversifying outside of cryptoassets as they tend to move together considerably during the extreme events and swings in both directions. Identifying a safe haven asset that would not move with Bitcoin during its downturns is thus a reasonable approach to preserve the risky profits. We find that Bitcoin moves together with the stock markets but oil and gold can serve as safe havens. Specifically gold is identified as a strong safe haven for Bitcoin and at least a weak safe haven during all studied subperiods. The paper follows with a succinct methodology description in Section 2. Section 3 provides the dataset description with data sources. The main results are summarized and discussed in Section 4. Section 5 concludes.

2. Methods

Baur and Lucey (2010) provide a clear separation between three sometimes mistaken terms – a safe haven, a hedge, and a diversifier. A safe haven asset is uncorrelated or negatively correlated with another asset when the latter one undergoes negative market conditions. A hedge is uncorrelated or negatively correlated with another asset, and a diversifier is positively but not perfectly correlated with another asset. We follow Baur and Lucey (2010) and Baur and McDermott (2010) by looking at the relationship between two assets when one of them experienced an extreme negative price movement. Specifically, we look at the following relationship:

$$r_{i,t} = a + b_1 r_{BTC,t} + u_t$$

$$b_1 = c_0 + c_1 D_{BTC,0.05} + c_2 D_{BTC,0.025} + c_3 D_{BTC,0.01} \quad (1)$$

$r_{i,t}$ is the return of asset i at period t , $r_{BTC,t}$ is the return of Bitcoin at time t , and $D_{BTC,0.05}$, $D_{BTC,0.025}$, and $D_{BTC,0.01}$ are dummy variables equal to 1 if Bitcoin return is in the lower 5%, 2.5%, and 1% quantile, respectively.

As the financial returns are practically always heteroskedastic (Cont, 2001) and cryptoassets are not different in this characteristic (Bariviera et al., 2017; Zhang et al., 2018), we follow Baur and Lucey (2010) and correct for conditional heteroskedasticity in the series by utilizing the generalized autoregressive conditional heteroskedasticity (GARCH) models (Engle, 1982; Bollerslev, 1986), specifically the baseline GARCH(1,1) model and asymmetric specification according to Glosten et al. (1993), hence the standard GJR-GARCH(1,1) abbreviation. We test for asymmetries with the Engle and Ng (1993) regression.

The safe haven properties are tested in Eq. (1) by testing the hypothesis that the c coefficients down to the given quantile are zero, i.e., for 5%, we test the null that $(c_0 = c_1 = 0)$, and for 1%, we test the whole spectrum null $(c_0 = c_1 = c_2 = c_3 = 0)$. The standard F -test is utilized. If the sum of respective coefficients is estimated as negative and the null hypothesis for the given quantile is rejected, the asset i is a strong safe haven for Bitcoin at the given quantile. If the null hypothesis is not rejected, i.e., the effect is zero, it is a weak safe haven as it still does not move together with Bitcoin. Coefficient c_0 alone is considered a measure of hedging properties and if it is negative, the asset i is considered a hedge for Bitcoin.

3. Data

We identify possible safe havens for Bitcoin between 2 January 2014 and 16 March 2022. The Bitcoin data are obtained from Coinmetrics.¹ As reference assets, we study gold, oil, and stock market and the data is retrieved from Yahoo Finance.² Gold represents the Commodity Exchange asset, oil is the West Texas Intermediate crude oil traded on NYMEX, and stock market is represented by the Standard & Poor's 500 index. Bitcoin is traded on the 24/7 basis while the other assets are not traded over the weekends and various holidays. We restrict the dataset with respect to the non-Bitcoin assets and arrive at 2061 daily close–close logarithmic returns that form the basis of our study.

Table 1 summarizes the basic descriptive statistics of the analyzed series. We see that it is not only Bitcoin that has undergone some extreme movements as the most severe loss is reported for crude oil at –60%, but also the highest gain was experienced by crude oil at almost 32%. Gold is identified as the calmest of the assets, with very symmetric extremes approximately between –5% and 5%, the lowest standard deviation and skewness closest to symmetry. The most volatile of the assets is Bitcoin but it does not possess the highest excess kurtosis in the bunch. All four assets are stationary based on the combination of the Dickey and Fuller (1979) and Kwiatkowski et al. (1992) tests. The statistics suggest that all four assets are far from being normally distributed (mostly negatively skewed, high excess kurtosis) which is further tested for the residuals in Eq. (1) and will lead us to utilize Student- t distributed residuals in the models.

4. Results and discussion

We examine the safe haven potential of gold, oil, and stocks for Bitcoin, i.e., we are looking for a type of asset that does not react or ideally reacts inversely to extremely negative movements in Bitcoin. Estimating the baseline model in Eq. (1), homoskedasticity is rejected for all three models at any conventional level of confidence so that we directly proceed with the heteroskedasticity-corrected specifications and interpret the results. Table 2 summarizes the results for GARCH(1,1) and GJR-GARCH(1,1) models with Gaussian and Student- t distributed error terms as normality of residuals is clearly rejected for all relevant specifications (Jarque and Bera,

¹ <https://coinmetrics.io/community-network-data/>.

² <https://finance.yahoo.com/>.

Table 1

Descriptive statistics for daily returns. ADF and KPSS tests are used in their basic form with a constant and no time trend. ADF has the null hypothesis of a unit root dynamics. KPSS test has the null hypothesis of stationarity. *, **, and *** indicate significance at 10%, 5%, and 1% level, respectively, or better.

	Gold	Oil	Stocks	Bitcoin
Min (%)	−5.107	−60.168	−12.765	−47.056
Max (%)	5.778	31.963	8.968	22.405
Mean (%)	0.021	−0.0002	0.042	0.192
Standard deviation (%)	0.927	3.262	1.106	4.644
Skewness	−0.049	−2.919	−1.01	−0.549
Excess kurtosis	4.349	72.517	20.322	8.287
ADF	−12.377***	−12.694***	−12.578***	−11.161***
KPSS	0.117	0.192	0.045	0.210

Table 2

Estimated overall effects. Effects are based on Eq. (1) with various specifications of the errors process. As homoskedasticity is rejected for all specifications and assets, heteroskedasticity-consistent standard errors are reported. *, **, and *** indicate significance at 10%, 5%, and 1% level, respectively, or better.

Normal				
GARCH(1,1)	Gold	Oil	Stocks	
Hedge	0.0122**	0.0092	−0.0002	
5%	−0.0077**	0.0198	0.0278*	
2.5%	0.0023*	0.0002	0.0204*	
1%	−0.0001	0.0114	0.0314***	
AIC	−6.6051	−4.7223	−6.7869	
Normal				
GJR-GARCH(1,1)	Gold	Oil	Stocks	
Hedge	0.0127**	0.0094	−0.0003	
5%	−0.0074**	0.0209	0.0283**	
2.5%	0.0019*	0.0048	0.0245**	
1%	−0.0016	0.0144	0.0309***	
AIC	−6.6058	−4.7431	−6.8035	
Student				
GARCH(1,1)	Gold	Oil	Stocks	
Hedge	0.0118***	−0.0044	−0.0008	
5%	−0.0077**	0.0311***	0.0274**	
2.5%	0.0048*	0.0016	0.0118**	
1%	−0.0051	0.0032	0.0254***	
AIC	−6.7164	−4.8361	−6.8737	
Student				
GJR-GARCH(1,1)	Gold	Oil	Stocks	
Hedge	0.0112**	−0.0022	−0.0013	
5%	−0.0073**	0.0302	0.027**	
2.5%	0.0055*	0.001	0.0098**	
1%	−0.0048	0.0058	0.0267***	
AIC	−6.7170	−4.8406	−6.9118	

1981). AIC is reported for comparison of the models and according to the information criterion, the GJR-GARCH(1,1)- t specification delivers the best fit. Either way, all reported specifications tell a very similar story.

Starting with the most evident, the stock market is clearly not a safe haven for Bitcoin as we find positive and significant effects for all analyzed quantiles and all model specifications. Stocks and Bitcoin thus move together during the extreme periods of Bitcoin. However, the c_0 parameter is not significant or positive, so stocks might serve as a hedge in the calm periods. For crude oil, we find all but one insignificant parameters, hinting at oil being a weak safe have for Bitcoin as they do not tend to move together during the extreme movements of the cryptoasset. For gold, all model specifications identify the precious metal as a strong safe haven for Bitcoin at the 5% quantile. Even though it is mixed for the 2.5% quantile, we still find a weak safe haven signs for the most extreme movements (as the tests do not reject the null hypothesis). Interestingly, gold and Bitcoin move together during the calm Bitcoin periods, reflected in the positive and significant estimate for c_0 (“Hedge” in the table). The results for the whole period thus show a rather straightforward story — if an investor in Bitcoin wants to protect against abrupt movements in Bitcoin (or expects some in the coming period), they should diversify into gold or oil but certainly not into stocks. Gold does not seem to be ideal to spread the risk into during the calm cryptomarkets periods as they tend together but Bitcoin has much higher expected return, almost ten times higher.

To see whether the results hold even for specific cryptomarket phases, we examine the connections in three separate periods — between January 2014 and December 2017 (up to Bitcoin’s first \$200b market capitalization and the end of the 2017 Bitcoin

Table 3

Results for subperiods – GJR-GARCH(1,1)- t . As the results are best for the GJR-GARCH(1,1)- t specification based on AIC, we present results only for this specification. Other notation holds from Table 2.

	Gold	Oil	Stocks
2014–2017			
Hedge	0.0093	−0.0229	−0.0068*
5%	0.0087	0.0602	0.0147
2.5%	0.0055	−0.0136	0.0002
1%	−0.0243	−0.0323	0.0279**
AIC	−6.6989	−4.9441	−7.2628
2018–2020			
Hedge	0.012**	0.0128	0.0076
5%	0.0084	0.0507	0.0424***
2.5%	−0.0064	0.0064	0.0143***
1%	0.01	0.0582	0.0172***
AIC	−6.7275	−4.7807	−6.5939
2020–2021			
Hedge	0.014	0.0285	0.0184**
5%	0.0206	0.0404	0.0485**
2.5%	0.0042	−0.0154	0.0397**
1%	−0.028	0.0383	0.0672***
AIC	−6.2261	−4.4433	−6.3235

hype), then up to January 2020 (when the CDC announced the first Covid-19 case in the USA), and the period after February 2020 (the Covid-19 period). Table 3 summarizes the results for the subperiods for the GJR-GARCH(1,1)- t specification which is the best one according to AIC for oil and stocks, and practically identical for gold where the standard GARCH(1,1)- t is the best model (as there are no signs of asymmetry for the Bitcoin-gold equation in general). We present the asymmetric representation for readers' convenience. The split into three separate periods tells a fuller story. Again starting with the stock market, we see that its connection with Bitcoin has changed over time considerably. In the Bitcoin early days, they actually moved in the opposite direction and there were diversification opportunities between them as is suggested by the negative estimate of c_0 , albeit significant at only 90% confidence level. Still, stocks could serve as a weak safe haven for Bitcoin in these early days, at least for 5% and 2.5% quantile shocks. Then in two clear steps, stocks moved to not being a hedge and not being a safe haven during the 2018–2020 period which is even more pronounced for the Covid-19 period when the estimates moved upwards markedly. Crude oil serves as a weak safe haven during all three subperiods and demonstrates stability in that matter over the whole period. Similar story holds for gold which holds as a weak safe haven for all three subperiods.

Our results on safe havens for Bitcoin complement the results on Bitcoin as a safe haven for various assets, but mostly stocks, to provide a clearer picture of its risk profile. As reported in the early phases of the Covid-19-induced stock markets and crypto markets dynamics (Kristoufek, 2020; Conlon and McGee, 2020) as well as the later studies (Chemkha et al., 2021; Wen et al., 2022), it was the first opportunity for Bitcoin to shine as a safe haven for standard assets as there had been no actual extreme downward movements in the stock markets or general traditional financial assets beforehand that would coincide with actual existence and investibility of Bitcoin. But the results suggested otherwise, Bitcoin actually moved together with the stock markets, reacting to unprecedented quantitative easing. By itself, this is not problematic; but Bitcoin reacted in parallel also during extreme negative movements of the stock market. The large corrections in Bitcoin after bombastic price rallies urge to look into the opposite relationship. Adding to Baur and Hoang (2021) who show that stablecoins might serve as a safe haven, our analysis suggests to add gold and likely also crude oil into consideration when a crypto investor wants to hedge against extreme market movements in Bitcoin. Looking for reasonable safe havens for Bitcoin outside of the cryptoassets and even outside of stablecoins showed its importance during the 2022 TerraUSD (UST) fiasco when a supposed stablecoin ignited one of the biggest cryptomarkets breakdowns and liquidations cascade in the whole cryptoassets history. Even though UST was an algorithmic stablecoin and thus inherently riskier than the fiat-backed (USDT, USDC) and over-collateralized (DAI) stablecoins, its collapse and implosion highlighted the need to look outside of the cryptoassets as well. The apparent cyclical booms and busts dynamics of Bitcoin and the whole cryptoassets market urge to look for safe havens elsewhere. Even though this might seem in vain with the current 2022 experience when seemingly everything busts with rising inflation, anchored inflation expectations, and quantitative tightening, one must remember that the amplitudes in the cryptomarkets are still unprecedented with respect to the traditional financial markets so that “harboring” the profits of the crypto-boom into the safer assets (such as gold and partially also crude oil, based on the current results) will still be worthy as the corrections in the more traditional markets are of different magnitudes compared to the cryptomarkets.

The current results open various avenues for future research. First, cryptomarkets are not only Bitcoin and investors will be interested in safe havens even for other highly capitalized cryptoassets. Second, stock markets as a whole might not be safe havens for Bitcoin but one might be interested in specific sectors and their hedging potential. Third, the role of stablecoins within the system should be inspected in more detail, specifically with respect to their type (fiat-backed, over-collateralized, algorithmic, and hybrid) and how they can play various roles in crypto-portfolios. And fourth, as the connection and role of various types of assets

with respect to Bitcoin evidently changes in time, other methodologies, e.g. time-varying parameters types, can be used to inspect the phenomenon of safe havens.

5. Conclusions

We have analyzed the safe haven properties of gold, crude oil, and stock markets with respect to Bitcoin, i.e., we have looked for assets that go against or at least do not move together with Bitcoin during its extreme negative movements. Between 2014 and 2022, there are several important findings. First, the relationship between stocks and Bitcoin has changed markedly in time. Stocks starting as a hedge in the early days, the two have started and continued moving together more in time, making the stock market index a bad candidate for hedging against extreme movements in Bitcoin. Second, gold is clearly the best candidate as a safe haven for Bitcoin. And third, crude oil can be considered a weak safe haven for Bitcoin. These results should lay foundations for further discussions into the topic of safe havens for cryptoassets as these are becoming increasingly standard part of investors' portfolios, being it institutional or retail, and thus protection against their extreme movements and diversifications of their risk will play an important role in the investors' decision making.

CRedit authorship contribution statement

Martin Nedved: Investigation, Methodology, Formal analysis, Writing – original draft, Writing – review & editing. **Ladislav Kristoufek:** Conceptualization, Supervision, Writing – original draft, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

All used data are freely available. All sources are cited in the manuscript.

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