

Trzy powody dlaczego kryptowaluty nie mogą być bezpieczną przystanią dla inwestycji na rynkach kapitałowych

Krzysztof Echaust

Uniwersytet Ekonomiczny w Poznaniu, Katedra Badań Operacyjnych i Ekonomii Matematycznej

Małgorzata Just

Uniwersytet Przyrodniczy w Poznaniu, Katedra Finansów i Rachunkowości

Diversifier, hedge and safe haven

[Baur and Lucey \(2010\)](#) were the first to define definitions of a diversifier, hedge and safe haven. The definitions are as follows:

A **diversifier** is defined as an asset that is positively (but not perfectly correlated) with another asset or portfolio on average.

A **hedge** is an asset that is uncorrelated or negatively correlated with another asset or portfolio on average.

A **safe haven** is defined as an asset that is uncorrelated or negatively correlated with another asset or portfolio in times of market stress or turmoil.

[Baur and McDermott \(2010\)](#) expanded on these definitions in an important way, making them even more precise by differentiating between weak and strong form.

A **strong (weak) hedge** is defined as an asset that is negatively correlated (uncorrelated) with another asset or portfolio on average.

A **strong (weak) safe haven** is defined as an asset that is negatively correlated (uncorrelated) with another asset or portfolio in certain periods only, e.g. in times of falling stock markets.

It is important to note that a hedge holds on average, while a safe haven only needs to hold in specific periods.

Literature review

Authors	Time period	Cryptocurrencies	Stock market	Method	Result
Dyhrberg (2016)	2010-2015	Bitcoin	FTSE	Theshold GARCH	Bitcoin is a hedge.
Będowska-Sójka and Kliber (2020)	2015-2020	Bitcoin, Ether	FTSE250, DAX, STOXX600 and S&P500	DCC-MSV	Ether is often a weak safe-haven for DAX or S&P500, while Bitcoin for FTSE250, STOXX600 and S&P500.
Kliber et al. (2019)	2014-2017	Local trades in Bitcoin	Nikkei 225, Shanghai Composite, OMXS 30 and OMX Tallin, IBVC (Venezuela).	DCC-MSV	Bitcoin is a weak hedge in all markets (investment in US dollars) Bitcoin is a safe haven in Venezuela (in bolivars).
Bouri et al. (2017)	2011-2012	Bitcoin	MSCI indices of the world, Europe and Pacific, S&P 500, FTSE 100, DAX 30, Nikkei 225 and Shanghai A-share	Hedge and safe haven regression	Bitcoin is an effective diversifier for most of cases.
Stensås et al. (2019)	2011-2018	Bitcoin	S&P 500, FTSE 100, Nikkei 225, FTSE MIB, Dax 30, CAC 40, S&PTSX 60, IBRX, MICEX 10, NIFTY 50, Shanghai A-Share, KOSPI and MSCI Zimbabwe	Hedge and safe haven regression	Bitcoin is a strong hedge for most of the developing markets, but only an effective diversifier for the developed markets.
Shahzad et al. (2020)	2010-2018	Bitcoin	MSCI indices of the G7 countries	Hedge and safe haven regression	Bitcoin is a safe haven and a hedge for only Canada.
Bouri et al. (2020a)	2015-2018	Bitcoin, Ethereum, Ripple, Litecoin and Stellar	MSCI indices of USA, Europe, Asia-Pacific excluding Japan, and Japan	Hedge and safe haven regression	Bitcoin, Ethereum and Litecoin are hedges, especially in the Asia Pacific and Japan.
Shahzad et al. (2019)	2010-2018	Bitcoin	MSCI indices of the world, developed, emerging markets, China, and US	The cross-quantilogram	Bitcoin is a weak safe haven in some cases.
Bouri et al. (2020b)	2015-2018	Bitcoin, Ethereum, Ripple, Litecoin, Stellar, Dash, Nem, and Monero	S&P500 index and its 10 sector indices	The cross-quantilogram	Bitcoin, Ripple and Stellar are safe havens for all US equity indices. Litecoin and Monero are safe havens for the US market-wide equity index. Ethereum, Dashand Nem are hedges for few equity sectors.
Bouri et al. (2017)	2011-2015	Bitcoin	S&P500, FTSE100, DAX, Nikkei225, Shanghai A-share, MSCI world, Europe, and Pacific	DCC with Ratner and Chiu (2013) regression	Bitcoin is a only a diversifier for daily data. Bitcoin is a strong safe haven against weekly extreme down movements in Asian stocks.
Pengfei et al. (2019)	2013-2018	973 forms of cryptocurrency	Top 30 international indices ranked in Yahoo	DCC with Ratner and Chiu (2013) regression	Cryptocurrency is not a hedge for most of the international indices, but is a safe haven for some international indices in certain periods.
Jiang et al. (2021)	2015-2020	Bitcoin, Ethereum, Ripple, Litecoin, Monero and Stellar	MSCI stock indices of the world, developed and emerging markets, as well as S&P 500, Shanghai Composite index and Nikkei 225.	Quantile coherency approach	Ethereum is the most effective diversifier in the short term, whereas all of the cryptocurrencies act as diversifiers over longer time scales.
Shahzad et al. (2021)	2010-2020	Bitcoin	BRICS stock markets	The cross-quantilogram	Bitcoin is a weak hedge.
MDiniz-Maganini et al. (2021)	March 11, 2020-July 10, 2020, high frequency data	Bitcoin	MSCI World index	Cross-correlations	Bitcoin is a safe-haven.
Mariana et al. (2021)	Covid-19, 2019-2020	Bitcoin and Ethereum	S&P 500	DCC with Baur et al. (2018) regression	Bitcoin and Ethereum are short-term safe-havens. Ethereum is a better safe-haven than Bitcoin during a short extreme stock market downturn.
Bauri et al. (2020)	2010-2018	Bitcoin	MSCI indices	Wavelet coherence analysis	Bitcoin is a safe-haven (the superiority of Bitcoin over both gold and commodities in terms of diversification benefits).

Literature review

Authors	Time period	Cryptocurrencies	Stock market	Method	Result
Maitra et al. (2022)	Covid-19, 2019-2020	Bitcoin and Ethereum	S&P 500, FTSE 100, CAC40, DAX30, FTSE MIB, IBEX35, Nikkei 225, and SSE.	Copula, CoVaR	Cryptocurrencies are not hedge.
Conlon and McGee (2022)	2010-2020	Bitcoin	S&P 500	VaR and CVaR of portfolio	Bitcoin is not safe-haven.
Wen et al. (2022)	Covid-19, 2019-2020	Bitcoin	S&P 500	TVP-VAR	Bitcoin is not safe-haven.
Goodell & Goutte (2021)	Covid-19, 2019-2021	Bitcoin, Ethereum, Litecoin and Tether (stablecoin)	SMI, IBEX 35, DAX, CAC 40, FTSE 100, EUROSTOXX and S&P500	Wavelet coherence analysis	Bitcoin, Ethereum, Litecoin are not diversifiers of equity, Tether is a safe haven.
Conlon et al. (2021)	2010-2020 (Bitcoin) 2015-2020 (Ethereum) 2014-2020 (Tether)	Bitcoin, Ethereum and Tether	MSCI World, S&P500, FTSE100, FTSE MIB, IBEX, SCI300	Tail risk measures	Bitcoin and Ethereum are not safe havens, however they decrease downside risk of SCI300, Tether is a safe haven.
Ji et al. (2020)	Covid 2019-2020	Bitcoin	MSCI-US, MSCI-EU, MSCI-CN	Cross-quantilogram	Bitcoin is not a safe-haven
Bauri et al. (2022)	2011-2021	Bitcoin	S&P500	Optimal weight analysis	Bitcoin is not a hedge, optimal weight of Bitcoin is close to zero.
Chemkha et al. (2021)	2013-2021	Bitcoin	S&P500, Eurostoxx50, Nikkei225, FTSE100,	Asymmetric DCC with dummy variable	Bitcoin cannot provide shelter during the pandemic.
Corbet et al. (2020)	Covid 2019-2020 high frequency data	Bitcoin	Shanghai SE, Shenzhen SE and DJIA	DCC with dummy variables	Bitcoin does not act as hedges, or safe haven.
Baur et al. (2022)	2011-2021	Bitcoin	S&P500	Optimal hedge ratio	Bitcoin cannot provide shelter against stock market risk.

Optimal hedge weights

$$w^* = \frac{\sigma_S^2 - \rho\sigma_S\sigma_H}{\sigma_S^2 + \sigma_H^2 - 2\rho\sigma_S\sigma_H}$$

σ_S^2 – variance of an unhedged investment (stock market index)

σ_H^2 – variance of a hedging investment (cryptocurrency or gold)

ρ – correlation coefficient

$$w^* = \frac{1/X - \rho}{X + 1/X - 2\rho}$$

where: $X = \sigma_H/\sigma_S$

Optimal hedge weights

X\korelacja	-0.9	-0.8	-0.7	-0.6	-0.5	-0.4	-0.3	-0.2	-0.1	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0.5	0.67	0.68	0.69	0.70	0.71	0.73	0.74	0.76	0.78	0.80	0.83	0.86	0.89	0.94	1.00	1.08	1.18	1.33	1.57
0.6	0.63	0.64	0.65	0.65	0.66	0.67	0.69	0.70	0.72	0.74	0.76	0.79	0.82	0.86	0.92	1.00	1.12	1.30	1.64
0.7	0.59	0.60	0.60	0.61	0.62	0.62	0.63	0.64	0.66	0.67	0.69	0.71	0.74	0.77	0.82	0.89	1.00	1.19	1.61
0.8	0.56	0.56	0.57	0.57	0.57	0.58	0.58	0.59	0.60	0.61	0.62	0.64	0.66	0.68	0.71	0.76	0.85	1.00	1.40
0.9	0.53	0.53	0.53	0.53	0.54	0.54	0.54	0.54	0.55	0.55	0.56	0.57	0.57	0.59	0.60	0.63	0.67	0.76	1.00
1	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
2	0.33	0.32	0.31	0.30	0.29	0.27	0.26	0.24	0.22	0.20	0.17	0.14	0.11	0.06	0.00	0.00	0.00	0.00	0.00
3	0.24	0.23	0.22	0.21	0.19	0.18	0.16	0.14	0.12	0.10	0.07	0.05	0.01	0.00	0.00	0.00	0.00	0.00	0.00
4	0.19	0.18	0.17	0.16	0.14	0.13	0.11	0.10	0.08	0.06	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.16	0.15	0.14	0.13	0.11	0.10	0.09	0.07	0.06	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.13	0.12	0.11	0.10	0.09	0.08	0.07	0.06	0.04	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.12	0.11	0.10	0.09	0.08	0.07	0.06	0.05	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.10	0.10	0.09	0.08	0.07	0.06	0.05	0.04	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.09	0.09	0.08	0.07	0.06	0.05	0.04	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.08	0.08	0.07	0.06	0.05	0.05	0.04	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.08	0.07	0.06	0.06	0.05	0.04	0.03	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.07	0.06	0.06	0.05	0.04	0.04	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.07	0.06	0.05	0.05	0.04	0.03	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.06	0.06	0.05	0.04	0.04	0.03	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.06	0.05	0.05	0.04	0.04	0.03	0.02	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.05	0.05	0.04	0.04	0.03	0.03	0.02	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.05	0.05	0.04	0.04	0.03	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.05	0.04	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.05	0.04	0.04	0.03	0.03	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.04	0.04	0.03	0.03	0.03	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: Baur, Dirk G. and Hoang, Lai T. and Hossain, Md Zakir (2022). Is Bitcoin a Hedge? How Extreme Volatility Can Destroy the Hedge Property. Finance Research Letters 47, 102655.

The effectiveness of an optimal hedging

$$HE = \frac{\sigma_S - \sigma_H}{\sigma_S}$$

σ_S – standard deviation of an unhedged investment (stock market index)

σ_H – standard deviation of a hedged investment (portfolio consisting of stock market index and hedge instrument)

X\korelacja	-0.9	-0.8	-0.7	-0.6	-0.5	-0.4	-0.3	-0.2	-0.1	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0.5	0.85	0.79	0.74	0.71	0.67	0.64	0.62	0.59	0.57	0.55	0.54	0.52	0.51	0.50	0.50	0.50	0.52	0.55	0.63
0.6	0.83	0.76	0.71	0.67	0.63	0.59	0.56	0.54	0.51	0.49	0.46	0.44	0.43	0.41	0.40	0.40	0.41	0.43	0.51
0.7	0.82	0.74	0.68	0.63	0.59	0.55	0.52	0.48	0.45	0.43	0.40	0.38	0.35	0.33	0.32	0.31	0.30	0.31	0.36
0.8	0.80	0.72	0.66	0.60	0.56	0.51	0.48	0.44	0.41	0.38	0.35	0.32	0.29	0.27	0.24	0.22	0.21	0.20	0.22
0.9	0.79	0.70	0.63	0.58	0.53	0.48	0.44	0.40	0.37	0.33	0.30	0.27	0.24	0.21	0.18	0.16	0.13	0.11	0.10
1	0.78	0.68	0.61	0.55	0.50	0.45	0.41	0.37	0.33	0.29	0.26	0.23	0.19	0.16	0.13	0.11	0.08	0.05	0.03
2	0.70	0.58	0.49	0.41	0.35	0.29	0.23	0.19	0.14	0.11	0.07	0.04	0.02	0.01	0.00	0.00	0.00	0.00	0.00
3	0.67	0.53	0.43	0.35	0.28	0.22	0.17	0.12	0.08	0.05	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.65	0.50	0.40	0.31	0.24	0.18	0.13	0.09	0.06	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.63	0.49	0.38	0.29	0.22	0.16	0.11	0.07	0.04	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.62	0.47	0.36	0.28	0.21	0.15	0.10	0.06	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.61	0.46	0.35	0.27	0.20	0.14	0.09	0.06	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.61	0.46	0.35	0.26	0.19	0.13	0.09	0.05	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.60	0.45	0.34	0.25	0.18	0.13	0.08	0.05	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.60	0.45	0.33	0.25	0.18	0.12	0.08	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.60	0.44	0.33	0.24	0.17	0.12	0.07	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.59	0.44	0.33	0.24	0.17	0.12	0.07	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.59	0.44	0.32	0.24	0.17	0.11	0.07	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.59	0.43	0.32	0.23	0.17	0.11	0.07	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.59	0.43	0.32	0.23	0.16	0.11	0.07	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.59	0.43	0.32	0.23	0.16	0.11	0.07	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.59	0.43	0.31	0.23	0.16	0.11	0.06	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.58	0.43	0.31	0.23	0.16	0.10	0.06	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.58	0.42	0.31	0.23	0.16	0.10	0.06	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.58	0.42	0.31	0.22	0.16	0.10	0.06	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: own calculations

Objective

1. Verify the ability of cryptocurrencies to serve as a hedging instrument or a safe haven against stock market risk.
2. Compare cryptocurrencies and gold in the hedging/safe haven role.

Empirical study focuses on

1. The dependence between stock markets and hedging instruments.
2. Volatility and hedging effectiveness.
3. Extremal risk and hedging effectiveness.

Identifying price bubble periods

The Generalized SADF (GSADF) Test ([Phillips et al. 2015](#))

ADF regression:

$$\Delta y_t = a_{r_1, r_2} + \gamma_{r_1, r_2} y_{t-1} + \sum_{j=1}^k \psi_{r_1, r_2}^j \Delta y_{t-j} + \epsilon_t,$$

where the subscripts r_1 and r_2 on the parameters to be estimated are the fractions of the total sample size and represent the starting and ending points of a subsample period.

Hypotheses:

$$H_0: \gamma_{r_1, r_2} = 0 \text{ (unit root),}$$

$$H_1: \gamma_{r_1, r_2} > 0 \text{ (explosive behavior).}$$

GSADF statistic is defined as follows

$$GADF(r_0) = \sup_{r_2 \in [r_0, 1], r_1 \in [0, r_2 - r_0]} \hat{\gamma}_{r_1, r_2} / \text{s. e.}(\hat{\gamma}_{r_1, r_2})$$

where r_0 is minimum window size.

If the $GADF(r_0)$ statistic is greater than the right tail critical value, we reject the null in favor of the explosive alternative hypothesis. The test statistics is non-standard therefore the Monte Carlo simulations to obtain the critical values must be performed.

Data

Stock markets		Hedge (safe haven) instruments	
developed markets G7	emerging markets BRICS	cryptocurrencies	other assets benchmark
index – country SPX – US TSX – Canada UKX – UK CAC – France DAX – Germany FMIB – Italy NKX – Japan	index – country BVP – Brazil MOEX – Russia SHC – China SNX – India JTOPI – Republic of South Africa	Bitcoin USD (BTC-USD) Ethereum USD (ETH-USD) Binance USD (BNB-USD) Cardano USD (ADA-USD) XRP USD (XRP-USD)	Gold

Data

We conduct the analysis for:

- the entire period (9.11.2017-30.06.2022)
- bubble behavior in the stock prices during the COVID-19 Health Crisis

Index	COVID-19 bubble	Index	COVID-19 bubble
CAC	9.03-24.03.2020	BVP	9.03-25.03.2020
DAX	9.03-24.03.2020	JTOPI	12.03-24.03.2020
NKX	9.03-24.03.2020	MOEX	10.03-23.03.2020
UKX	27.02-24.03.2020	SHC	7.02-18.02.2020
FMIB	9.03-20.03.2020	SNX	9.03-7.04.2020
SPX	12.03-25.03.2020		
TSX	9.03-25.03.2020		

Conclusions

It is not recommended to use cryptocurrencies to hedge investment in the analyzed stock markets (G7, BRICS) since

1. They do not meet the definition of hedge/safe- haven instrument (they are positively correlated with stock market);
2. They are not effective in reduction of volatility and extreme risk;
3. Gold is much better shelter against market risk in terms of hedging effectiveness.

Gold still acts as hedge/safe- haven instrument since

1. Gold is uncorrelated or negatively correlated with most stock markets;
2. Gold effectively decreases volatility and downside risk;
3. Gold reduces extreme losses more intensively than corresponding profits.