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Can altcoins act as hedges or safe-havens for Bitcoin?

Yi Li [a], Brian Lucey [b,c,d,e], Andrew Urquhart [f,*]

[a] School of Management and Economics, Beijing Institute of Technology, No. 5 Zhongguancun South Street, Beijing 100081, China
[b] Trinity Business School, Trinity College Dublin, Dublin 2, Ireland
[c] Distinguished Research Fellow, Institute of Business Research, University of Economics Ho Chi Minh City, 59C Nguyen Dinh Chieu, Ward 6, District 3, Ho Chi Minh City, Viet Nam
[d] Institute for Industrial Economics, Jiangxi University of Economics and Finance, 169, East Shuanggang Road, Xialuo, Changbei District 330013 Nanchang, Jiangxi, China
[e] Distinguished visiting Research Professor, University of Abu Dhabi, Zayed City, Abu Dhabi, United Arab Emirates
[f] ICMA Centre, Henley Business School, University of Reading, Reading, UK

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ABSTRACT

Bitcoin remains the most popular cryptocurrency and has attracted significant research attention, especially in the hedging and safe-haven literature. As many investors in bitcoin are concentrated heavily in cryptocurrencies as opposed to other assets, a question arises whether alternative cryptocurrencies (altcoins) can used as safe-havens and hedges against Bitcoin? We find that only *meme* coins offer hedging benefits but a wider range – Defi, meme coins, smart contracts, metaverse and privacy cryptocurrencies – can all act as safe-havens against bitcoin. We further show that their ability to act as hedges and safe-havens varies depending on whether the market is in a bubble or non-bubble period.

1. Introduction

Cryptocurrencies, launched by Bitcoin, despite being relatively new as an asset class, has attracted very significant volumes of research. Bitcoin remains the largest capitalized and most commented asset. It is generally taken as a bellwether for the area. Some of the main findings so far are the inefficiency of Bitcoin (Urquhart, 2016; Bariviera, 2017; Tiwari et al., 2018), the high volatility (Katsiampa, 2017; Katsiampa et al., 2019; Shen et al., 2020) and the potential trading benefits of Bitcoin (Grobys and Sapkota, 2019; Grobys et al., 2020; Hudson and Urquhart, 2021).[1]

Another area that has attracted interest is the benefits of including Bitcoin in *well-diversified* portfolios (for instance Kajtazi and Moro, 2019; Platanakis and Urquhart, 2020; Petukhina et al., 2021), suggesting that Bitcoin is not highly correlated with traditional assets. Consequently, there have been a number of papers denoting the hedging benefits of Bitcoin to other asset classes, as well as the safe-haven properties it may possess. In this line, Bouri et al. (2017) shows that Bitcoin can act as a hedge against uncertainty while Baur et al. (2018) shows that Bitcoin can be a hedge against other assets. Urquhart and Zhang (2019) finds that Bitcoin can be used as a hedge and safe haven for certain intraday foreign exchange markets whereas Smales (2019) argues that Bitcoin should not be considered a safe haven in reality, given its lack of liquidity, high volatility and high transaction fees. Wang et al. (2019) conduct a large-scale, cross-country study and show that cryptocurrencies can be safe havens but not a hedge for most international indices whereas Conlon and McGee (2020) showed that Bitcoin is not found to be safe haven during Covid-19. Huang et al. (2021) use a

* Corresponding author.
E-mail addresses: yili@bit.edu.cn (Y. Li), blucey@tcd.ie (B. Lucey), a.j.urquhart@icmacentre.ac.uk (A. Urquhart).

[1] See Corbet et al. (2019) for reviews of the literature in this area.

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Bayesian PVAR model and showed that Bitcoin offers diversification benefits and risk reductions but again there is contradictory evidence, as Baur et al. (2022) shows that Bitcoin does not reduce the risk of a portfolio in times of extreme volatility.

We can conclude that the evidence is mixed for bitcoin as a hedge/safe haven. We can also conclude that there is scant evidence around what assets in the crypto space might act thusly against bitcoin itself. As Bitcoin is the largest cryptocurrency, with a market dominance well over 50% since its inception,[2] it is likely that investors place a large proportion of their cryptocurrency portfolio into Bitcoin and the rest into altcoins.[3] Further, due to the ease and lack of barriers to trading cryptocurrencies,[4] there is likely to be a proportion of investors out there who solely trade with cryptocurrency trading platforms such as Coinbase, Binance and FTX and therefore cryptocurrencies may account for a significant portion of their portfolio. In support of this, a recent paper by Ferko et al. (2022) shows the nearly half of the traders who hold CME Bitcoin future positions are concentrated traders, in that Bitcoin accounts for over 80% of their total portfolio. Consequently a key concern for a cryptocurrency investor is how they can protect themselves from large drawdowns in Bitcoin and hedge their exposure to the most popular and largest cryptocurrency.

In this paper, we explore which groups of cryptocurrencies have the ability to act as hedges and/or safe-havens for Bitcoin.[5] To do this, we study which groups of cryptocurrencies are useful hedges and safe-havens for Bitcoin. There have been some studies that examine the tail linkages between bitcoin and others (see as examples Elendner et al., 2018; Caferra et al., 2022). However, to our knowledge only one paper to our knowledge studies how to hedge Bitcoin. Baur and Hoang (2021) examines whether stablecoins can act as safe havens for bitcoin by using high-frequency data and find that they can act as safe havens with Tether showing the strongest capabilities. Here we do not study stablecoins given their premise is to be stable, pegged typically to be equal to $1 and therefore should not fluctuate as much as other cryptocurrencies.[6] We employ the popular methodology of Baur and McDermott (2010), Baur and Lucey (2010) and find that meme coins can act as significant hedges against Bitcoin, while the other types of altcoins do not. We also show DeFi, Meme Coins, Smart contracts, Metaverse and Privacy cryptocurrencies can all act as safe-havens during extreme Bitcoin price movements. Therefore our findings offer important contributions to the literature on the ability of altcoins to act as hedges and safe-havens for Bitcoin and supports the idea that even investors solely trading cryptocurrencies, can hedge and diversify their risk by investing in altcoins as well as Bitcoin.

The rest of the papers is organized as follows. Section 2 presents the data and methodology of this paper while Section 3 reports the empirical results. Section 4 summarizes our findings and provides conclusions.

2. Data and methodology

We retrieve daily cryptocurrency prices from *coinmarketcap*, which is a popular aggregator of cryptocurrency data and has been used in previous studies on cryptocurrencies (for instance, see Rubbaniy et al., 2021; Shen et al., 2022). We first select five distinct and well-known groups of cryptocurrencies, namely DeFi, smart contracts, metaverse, meme coins and privacy coins based on their tags on *Coinmarketcap*. DeFi coins are much like a digital version of a fiat coin as they transfers value in the course of a financial transaction while smart contract coins are coins that use smart contracts in that they are programs stored on a blockchain that run when predetermined conditions are met. Metaverse coins are a unit of currency used to make transactions within the metaverse while meme coins are cryptocurrencies that are inspired by viral online images. Finally, privacy coins are cryptocurrencies that obscure transactions on their blockchain to maintain the anonymity of its users and their activity. We only include cryptocurrencies with at least $100 million market capitalization as of the 8th June 2022 so that we only include cryptocurrencies that are reasonably large and tradeable, which coincidentally represents the largest 250 cryptocurrencies according to market capitalization. This avoids any liquidity issues with cryptocurrencies that are hard to trade or experience extreme price movements. We collect data on the price (in US dollars), capturing the longest sample period we can up to 8th June 2022 where each cryptocurrency is included in the same once data becomes available on *coinmarketcap*. Table 1 reports the ticker, name and market capitalization of the cryptocurrencies used in this study where we use 131 different cryptocurrencies, along with Bitcoin.

We form value-weighted and equally-weighted portfolios of cryptocurrencies based on the five groups of cryptocurrencies. We employ a value-weighted procedure since investors are likely to invest more in well-known and larger cryptocurrencies, but we also report findings for equally-weighted portfolios as well to ensure our findings are not specific to the portfolio construction method. Table 2 reports the descriptive statistics of Bitcoin and the ten different portfolios. We show that the mean Bitcoin return is 0.025%, which is lower than the return of any of our portfolios. Bitcoin also has the lowest standard deviation of any of the portfolios indicating that Bitcoin is less risky than the altcoin portfolios that we have formed. The correlation matrix is reported in Table 3.

We employ a number of methodologies in our analysis to ensure that our results are robust to the model specification. First, we employ the popular method of Baur and McDermott (2010), Baur and Lucey (2010) who define a strong (weak) safe haven as an asset that is negatively correlated (uncorrelated) with another asset or portfolio in certain periods, while a strong (weak) hedge is

[2] The market dominance has been as high as 99% but has dropped in recent years due to the explosion of altcoins.

[3] Altcoins in an abbreviation for alternative cryptocurrencies and includes everything cryptocurrency except Bitcoin.

[4] We thank the reviewer for pointing out that this is also the case of equity and foreign exchange markets too.

[5] We follow Baur and McDermott (2010), Baur and Lucey (2010) and define a strong (weak) safe haven as an asset that is negatively correlated (uncorrelated) with another asset or portfolio in certain periods, while a strong (weak) hedge is defined as an asset that is negatively correlated (uncorrelated with another asset) or portfolio on average.

[6] We acknowledge the recent collapse of a number of stablecoins.

Table 1
Cryptocurrencies used in this study.
This table presents the ticker, name and market capitalization of the cryptocurrencies used in this study. Note: The market capitalization is taken on the 8th June 2022 and is in US dollars.

Ticker	Name	Market cap	Ticker	Name	Market cap
Bitcoin			**Smart Contracts**		
BTC	Bitcoin	574 billion	ETH	Ethereum	215.40 billion
DeFI			BNB	BNB	47.02 billion
AVAX	Avalanche	6.96 billion	ADA	Cardano	21.69 billion
LINK	Chainlink	4.00 billion	AVAX	Avalanche	6.76 billion
UNI	Uniswap	3.72 billion	LINK	Chainlink	4.00 billion
XTZ	Tezos	1.83 billion	XLM	Stellar	3.50 billion
FRAX	FRAX	1.49 billion	ETC	Ethereum Classic	2.87 billion
AAVE	Aave	1.37 billion	ALGO	Algorand	2.79 billion
THETA	Theta Network	1.34 billion	VET	VeChain	1.95 billion
MKR	Maker	1.14 billion	XTZ	Tezos	1.91 billion
DFI	DeFiChain	1.03 billion	EOS	EOS	1.24 billion
GRT	The Graph	1.05 billion	FTM	Fantom	865 million
RUNE	THORChain	962 million	NEO	NEO	848 million
FTM	Fantom	885 million	WAVES	Waves	841 million
CAKE	PancakeSwap	741 million	CAKE	PancakeSwap	729 million
STX	Stacks	726 million	STX	Stacks	714 million
LRC	Loopring	705 million	ZIL	Zilliqa	633 million
BAT	Basic Attention Token	607 million	CELO	Celo	559 million
CRV	Curve DAO Token	594 million	ONE	Harmony	481 million
KAVA	Kava	540 million	XEM	NEM	451 million
GNO	Gnosis	491 million	QTUM	Qtum	408 million
CVX	Convex Finance	479 million	KDA	Kadena	357 million
1INCH	1inch Network	428 million	GLMR	Moonbeam	356 million
COMP	Compound	402 million	ICX	ICON	356 million
NXM	NXM	380 million	ROSE	Oasis	329 million
LUNC	Terra Classic	369 million	SRM	Serum	268 million
ZRX	0x	345 million	SKL	SKALE Network	248 million
ROSE	Oasis Network	338 million	LSK	Lisk	176 million
KNC	Kyber Network Crystal v2	338 million	CFX	Conflux	154 million
TFUEL	Theta Fuel	336 million	CKB	Nervos Network	145 million
LDO	LIdo DAO	319 million	CTSI	Cartesi	135 million
ANKR	Ankr	316 million	REQ	Request	120 million
BNT	Bancor	315 million	TRAC	OriginTrail	114 million
SNX	Synthetix	311 million	INJ	Injective	111 million
JST	JUST	304 million	**Metaverse**		
YFI	yearn.finance	277 million	MANA	Decentraland	1.83 billion
SRM	Serum	272 million	APE	ApeCoin	1.74 billion
SXP	SXP	265 million	SAND	Sandbox	1.61 billion
SCRT	Secret	314 million	THETA	Theta Network	1.35 billion
UMA	UMA	202 million	AXS	Axie Infinity	1.26 billion
KEEP	Keep Network	196 million	STX	Stacks	719 million
SUSHI	SushiSwap	192 million	ENJ	Enjin Coin	554 million
OCEAN	Ocean Protocol	169 million	WEMIX	WEMIX	554 million
RPL	Rocket Pool	165 million	ONT	Ontology	264 million
ACA	Acala Token	160 million	WAXP	WAX	258 million
CFX	Conflux	155 million	PLA	PlayDapp	230 million
REN	REN	155 million	SUSHI	SushiSwap	193 million
COTI	COTI	148 million	ILV	Illuvium	178 million
CKB	Nervos Network	146 million	RNDR	Render Token	177 million
VVS	VVS Finance	145 million	RACA	RadioCaca	143 million
DAO	DAO Maker	140 million	CEEK	CEEK VR	140 million
CHR	Chromia	132 million	CHR	Chromia	132 million
EPS	Ellipsis	132 million	SURE	inSure DeFi	129 million
RSR	Reserve Rights	130 million	XYO	XYO	115 million

(*continued on next page*)

defined as an asset that is negatively correlated (uncorrelated with another asset or portfolio on average. In our case, we examine the hedging and safe haven properties of our indices in the following way:

$$r_{CI,t} = a + b_t r_{BTC,t} + \epsilon_t \tag{1}$$

$$b_t = c_0 + C_1 D(r_{BTC} q_5) + C_2 D(r_{BTC} q_{2.5}) + C_3 D(r_{BTC} q_1) \tag{2}$$

$$h_t = \pi + \alpha e_{t-1}^2 + \beta h_{t-1} \tag{3}$$

Table 1 (*continued*).

Ticker	Name	Market cap	Ticker	Name	Market cap
SURE	InSure Defi	129 million	BSW	Biswap	113 million
MPL	Maple	124 million	UOS	Ultra	113 million
REQ	Request	120 million	PYR	Vulcan Forged	105 million
Biswap	BSW	113 million	**Privacy**		
INJ	Injective	112 million	XMR	Monero	3.36 billion
DYDX	DYDX	109 million	ZEC	ZCASH	1.33 billion
OGN	Origin Protocol	107 million	DCR	Decred	489 million
TRIBE	Tribe	104 million	ROSE	Oasis Network	332 million
REP	Augur	103 million	ZEN	Horizen	244 million
RAY	Raydium	100 million	SCRT	Secret	213 million
Meme Coins			KEEP	Keep Network	194 million
DOGE	Dogecoin	10.55 billion	SNT	Status	137 million
SHIB	Shiba Inu	5 billion	MOB	MobileCoin	144 million
ELON	Dogelon Mars	236 million	ARRR	Pirate Chain	116 million

Table 2
Descriptive statistics.
This table presents the descriptive statistics of Bitcoin and our five portfolios where we form them as value-weighted as well as equally-weighted portfolios.

	Mean	Std.	P5	P25	Median	P75	P95	Max.	Min.	Skewness	Kurtosis	Sharpe	Obs
BTC	0.0025	0.0419	−0.0611	−0.0138	0.0018	0.0189	0.0667	0.4297	−0.3717	0.2423	13.0175	1.122	3329
Value-weighted portfolios													
DeFi	0.0050	0.0573	−0.0822	−0.0206	0.0000	0.0316	0.0899	0.4068	−0.4535	−0.1188	9.6052	1.751	2074
Meme Coins	0.0061	0.1087	−0.0892	−0.0242	−0.0020	0.0205	0.1227	3.5557	−0.4407	15.0344	430.8735	1.065	3098
Smart contracts	0.0054	0.0607	−0.0812	−0.0229	0.0020	0.0293	0.1013	0.6084	−0.4169	1.1290	13.4837	1.681	2865
Metaverse	0.0073	0.0812	−0.0963	−0.0282	0.0062	0.0375	0.1111	1.3108	−0.4631	3.9166	57.3152	1.707	1716
Privacy	0.0042	0.0642	−0.0899	−0.0255	0.0017	0.0316	0.1001	0.7709	−0.3781	1.1864	16.0084	1.229	2940
Equally-weighted portfolios													
DeFi	0.0049	0.0589	−0.0844	−0.0221	0.0070	0.0339	0.0918	0.4274	−0.4654	−0.2801	9.2536	1.575	2074
Meme Coins	0.0074	0.1185	−0.0912	−0.0248	−0.0021	0.0209	0.1302	3.5557	−0.4648	13.9841	349.3968	1.197	3098
Smart contracts	0.0052	0.0578	−0.0811	−0.0224	0.0047	0.0314	0.0954	0.6084	−0.4351	0.6660	13.7330	1.710	2865
Metaverse	0.0083	0.0783	−0.0907	−0.0281	0.0068	0.0374	0.1085	1.2708	−0.4518	3.9663	58.9924	2.019	1716
Privacy	0.0035	0.0624	−0.0887	−0.0262	0.0013	0.0309	0.1019	0.5441	−0.3762	0.7266	10.3597	1.079	2940

Table 3
Correlation matrix.
This table presents the correlation matrix between our portfolios. In each panel, the upper right (bottom left) triangle reports Spearman (Pearson) correlations.

	BTC	DeFi	Meme coins	Smart contracts	Metaverse	Privacy
Value-weighted portfolios						
BTC	1.0000	0.6061	0.5710	0.5693	0.6190	0.5735
DeFi	0.6136	1.0000	0.5527	0.8008	0.7344	0.6699
Meme Coins	0.3793	0.3239	1.0000	0.4982	0.5500	0.4419
Smart Contracts	0.5142	0.7788	0.2765	1.0000	0.7240	0.5779
Metaverse	0.5595	0.6127	0.2459	0.6053	1.0000	0.6737
Privacy	0.5341	0.6925	0.2546	0.4547	0.5848	1.0000
Equally-weighted portfolios						
BTC	1.0000	0.6122	0.5613	0.5838	0.5988	0.5665
DeFi	0.6305	1.0000	0.5519	0.8271	0.7891	0.6912
Meme Coins	0.3586	0.3028	1.0000	0.5309	0.5160	0.4391
Smart Contracts	0.5798	0.8233	0.3046	1.0000	0.7387	0.5763
Metaverse	0.5484	0.7124	0.2082	0.6245	1.0000	0.6591
Privacy	0.5445	0.6945	0.2493	0.5320	0.5795	1.0000

Where $r_{CI,t}$ is the return of each cryptocurrency index at time t, $r_{BTC,t}$ is the return of Bitcoin at time t, while $r_{BTC}q_5$, $r_{BTC}q_{2.5}$, $r_{BTC}q_1$ capture the extreme movements in Bitcoin by equalling one if the Bitcoin return exceeds the 5%, 2.5% and 1% quantile of the return distribution. If the parameters in Eq. (2) are non-positive, the cryptocurrency indices act as a weak safe haven for the market under study. If the parameters are negative and statistically different from zero, the cryptocurrency indices function as a strong safe haven. The cryptocurrency indices are a hedge for the market under study if the parameter c0 is zero (weak hedge) or negative (strong hedge) and the sum of the parameters c1 to c3 are not jointly positive exceeding the value of c0. Finally, Eq. (3) presents a GARCH(1,1) model which is used to account for heteroscedasticity in the data.

Table 4
Hedge and safe-haven regression results.
This table presents the results of the value-weighted and equally-weighted portfolios of altcoins and whether they act as hedges or safe-havens for Bitcoin. T-statistics are reported in parentheses and ***, ** and * indicates significance at the 1%, 5% and 10% levels respectively.

	Value-weighted portfolios					Equally-weighted portfolios				
	Defi	Meme coins	Smart contracts	Metaverse	Privacy	Defi	Meme coins	Smart contracts	Metaverse	Privacy
C_0	0.0069***	−0.0015***	0.0096***	0.0065***	0.0066***	0.0080***	−0.0025***	0.0073***	0.0081***	0.0079***
	(6.662)	(−2.689)	(9.476)	(5.687)	(7.631)	(8.721)	(−4.512)	(8.974)	(6.089)	(8.161)
C_1	−0.0647***	0.0516***	−0.0805***	−0.1067***	−0.0706***	−0.0861***	0.0516***	−0.0678***	−0.0990***	−0.0831***
	(−11.868)	(25.123)	(−20.463)	(−19.065)	(−19.957)	(−14.628)	(29.498)	(−14.249)	(−9.111)	(−12.611)
C_2	−0.0277***	−0.1261***	−0.0217**	−0.0024	−0.0244***	−0.0338***	−0.1253***	−0.0375***	−0.0175	−0.0302*
	(−3.387)	(−19.726)	(−2.508)	(−0.200)	(−3.311)	(−2.800)	(−19.657)	(−4.583)	(−1.055)	(−1.948)
C_3	−0.0398***	−0.0402***	−0.0369***	−0.0974***	−0.0435**	−0.0550***	−0.0374***	−0.0348***	−0.0604***	−0.0376**
	(−6.034)	(−6.081)	(−5.342)	(−7.739)	(−7.334)	(−4.258)	(−5.424)	(−5.264)	(−3.352)	(−2.639)
π	0.0001***	0.0007***	0.0002***	0.0004***	0.0002***	0.0000***	0.0009***	0.0003***	0.0001***	0.0002***
	(11.643)	(38.867)	(10.532)	(10.000)	(12.133)	(4.883)	(52.285)	(14.513)	(17.173)	(10.408)
α	0.1106***	1.4530***	0.3071***	0.4429***	0.1682***	0.0988***	1.6002***	0.1987***	0.1800***	0.0755***
	(10.758)	(37.434)	(24.498)	(31.366)	(19.542)	(8.767)	(46.266)	(17.524)	(25.516)	(16.266)
β	0.8484***	0.2739***	0.7276***	0.6086***	0.7826***	0.8888***	0.2412***	0.7212***	0.8323***	0.8710***
	(66.570)	(35.524)	(58.016)	(49.424)	(80.173)	(76.076)	(34.750)	(60.143)	(152.688)	(102.595)

Table 5
Robustness results.
This table presents the results of the value-weighted portfolios of altcoins in bubble and non-bubble periods and whether they act as hedges or safe-havens for Bitcoin. Based on Phillips et al. (2015) statistics, we divide the sample into the bubble and non-bubble periods. T-statistics are reported in parentheses and ***, ** and * indicates significance at the 1%, 5% and 10% levels respectively.

	Bubble period					Non-bubble period				
	Defi	Meme coins	Smart contracts	Metaverse	Privacy	Defi	Meme coins	Smart contracts	Metaverse	Privacy
C_0	0.0189***	0.0051**	0.0208***	0.0198***	0.0190***	0.0071***	−0.0014***	0.0043***	0.0056***	0.0045***
	(7.078)	(2.382)	(8.595)	(9.406)	(7.664)	(6.223)	(−2.580)	(4.514)	(4.073)	(4.996)
C_1	−0.0574***	−0.0582***	−0.0455***	−0.1776***	−0.0588***	−0.0778***	−0.0547***	−0.0728***	−0.0997***	−0.0715***
	(−4.126)	(−4.150)	(−4.339)	(−21.438)	(−3.950)	(−11.330)	(−14.101)	(−21.584)	(−13.892)	(−11.152)
C_2	−0.0156	−0.0583**	−0.0124	0.0851*	−0.0581	−0.0380***	−0.0324***	−0.0179***	−0.0089	−0.0362**
	(−0.559)	(−2.338)	(−0.592)	(1.653)	(−1.052)	(−2.760)	(−5.779)	(−2.800)	(−0.651)	(−2.439)
C_3	−0.0430	0.0704***	−0.0952**	−0.0907	−0.0226	−0.0775***	−0.0194**	−0.0406***	−0.1143***	−0.0632***
	(−1.089)	(2.708)	(−2.544)	(−1.644)	(−0.307)	(−6.021)	(−2.569)	(−7.658)	(−9.388)	(−4.517)
π	0.0001*	0.0059	0.0008***	0.0008***	0.0002***	0.0001***	0.0001***	0.0002***	0.0003***	0.0001***
	(1.701)	(0.463)	(4.929)	(2.610)	(2.945)	(4.671)	(4.617)	(12.427)	(6.475)	(7.974)
α	0.0802***	3.8588	0.2651***	2.1788***	0.1581***	0.1145***	0.4089***	0.1712***	0.1877***	0.0732***
	(5.506)	(0.452)	(5.438)	(14.476)	(6.834)	(7.724)	(5.235)	(19.083)	(11.010)	(13.944)
β	0.9038***	0.4876***	0.5224***	0.1734***	0.7959***	0.8392***	0.7192***	0.7772***	0.7198***	0.8950***
	(46.661)	(6.708)	(7.446)	(5.257)	(26.305)	(43.262)	(32.866)	(76.131)	(27.427)	(117.242)

3. Empirical results

Table 4 reports the estimation results of Eq. (2) where we regress the beta of Eq. (1) on the extreme quantiles of Bitcoin. We find that coefficient c_0 is negative and statistically significant for meme coins in the value- and equally-weighted portfolios, indicating that our meme coin portfolio can act as a significant hedge for Bitcoin. However all other portfolios, namely DeFi, smart contracts, metaverse and privacy portfolios all denote positive and significant coefficients, indicating that they are positively related with Bitcoin during normal market conditions. Therefore we find that these portfolios offer little hedging benefits for Bitcoin.

For extreme returns, we find that all portfolios of altcoins generate negative coefficients and in most cases, highly significant negative coefficients indicating their ability to act as safe-havens for Bitcoin in times of market turmoil. When examining the 5% quantile, the metaverse portfolio appears the best safe-haven portfolio for value-weighted portfolios while the meme coin portfolio is deemed the best at the 2.5% quantile. When we examine the most extreme quantile, the 1%, we find the metaverse portfolio is again the strongest safe-haven portfolio. The results are consistent across our value-weighted or equally-weighted portfolios indicating that our altcoin portfolios offer significant safe-haven properties to Bitcoin.

To examine the robustness of our findings, we separate the Bitcoin's sample into the bubble and non-bubble periods based on the statistics of Phillips et al. (2015).[7] Table 5 reports the robustness results of value-weighted portfolios. In the bubble period, the

[7] The bubble periods identified are 2014.10.04–2014.10.06, 2015.01.13–2015.01.14, 2015.11.03–2015.11.04, 2016.06.06, 2016.06.11–2016.06.20, 2016.12.23–2017.01.04, 2017.03.01–2017.03.06, 2017.05.06, 2017.05.08–2017.07.14,2017.08.05–2017.09.18, 2017.09.27–2018.02.03, 2018.02.14–2018.03.06, 2018.11.24–2018.11.27, 2019.05.11, 2019.05.13–2019.05.16, 2019.05.19, 2019.05.26–2019.05.27, 2019.06.24–2019.06.29, 2020.11.20–2020.11.21, 2020.11.24, 2020.12.17–2020.12.20, 2020.12.22, 2020.12.24–2021.01.20, 2021.02.05–2021.02.24, 2021.03.01–2021.03.03, 2021.03.07–2021.03.23 and 2021.03.27–2021.04.06.

coefficient c_0 of the five portfolios are positively significant, indicating that they are not able to act as hedges for Bitcoin. In the non-bubble period, our meme coin portfolio is a significant hedge for Bitcoin and all other portfolios has positive and significant coefficient c_0. When examining the quantile 1%, we find all the portfolios provide significant safe-haven benefits for Bitcoin in the non-bubble period. Therefore the portfolios of altcoins ability to act as hedges and safe havens change whether we are in bubble or non-bubble periods.

4. Summary and conclusions

As cryptocurrencies have grown as an asset class so also has the research thereon. We fill a gap in the research by examining within the broad crypto space what can hedge or protect against movements in the market leader, bitcoin. We show that only portfolios of meme coins act as potential hedges for Bitcoin. However portfolios made up of DeFi, meme coins, smart contract, metaverse or privacy cryptocurrencies all act as safe-havens to extreme movements in the price of Bitcoin. We also show that these results are dependent on whether we are in a bubble or non-bubble period. Therefore cryptocurrency investors would do well to include altcoins in their cryptocurrency portfolios to protect themselves from sharp downturns in the price of Bitcoin.

CRediT authorship contribution statement

Yi Li: Conceptualization, Methodology, Software, Formal analysis, Writing – original draft. **Brian Lucey:** Conceptualization, Methodology, Investigation, Writing – original draft. **Andrew Urquhart:** Conceptualization, Writing – original draft, Writing – review & editing, Supervision.

Data availability

The authors do not have permission to share data.

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