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A Safe-haven Property of Cryptocurrencies: Evidence in Vietnam Stock Market During Pandemic Crisis

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Abstract

The study investigates the dynamic correlation of cryptocurrencies and equity in Vietnam and tests the safe-haven property of them from the perspective of the stock market in Vietnam during the pandemic crisis by applying the dynamic conditional correlation (DCC) GARCH model and regression with a dummy variable, respectively. This study employs time series data on the daily dataset from September 2014 to September 2021 with the focus on the two most popular cryptocurrencies - Bitcoin and Litecoin. The results show that the dynamic conditional correlations between cryptocurrencies and equity in Vietnam increased during the pandemic, however, in most periods, positive dynamic correlations often dominate. Besides, the regression results also indicate that Bitcoin and Litecoin act as weak safe-haven investments for stocks in Vietnam during the COVID-19 turmoil. They are more suitable for diversification purposes although the dynamic correlations between them and the stock index in Vietnam vary stronger during the pandemic crisis than before. The findings of this study suggest that in the period of pandemic crisis, cryptocurrencies are not concerned as effective safe-haven assets for stock in Vietnam. Instead, cryptocurrencies are only playing a potential role in diversification benefit in this economy.

Keywords: Cryptocurrency, Dynamic Conditional Correlation, Pandemic Crisis, Safe-Haven

JEL Classification Code: G11, G15, G18

1. Introduction

The development of technology and the financial market created a digital asset called cryptocurrency. Cryptocurrency is a term that refers to a newly generated currency that uses Blockchain technology. A wide spectrum of cryptocurrencies, such as Bitcoin, Ethereum, Litecoin, Dash, and others, have developed in recent years. Since their inception in 2009, the value and volume of cryptocurrency trade have expanded dramatically. Bitcoin is one of the most well-known cryptocurrencies, with the biggest value and market capitalization. Its price rose from zero to about

19,000 USD in December 2017 (see Figure 1), with a volume trading of around 18,000 million USD at the time. Cryptocurrencies have gotten a lot of attention from investors, the media, and regulatory agencies (Böhme et al., 2015). Since 2008, interest in cryptocurrencies has surged, posing a new problem and opportunity for policymakers, economists, and especially investors. Despite the fact that cryptocurrencies have grown in popularity in recent years, the proliferation of these and Blockchain technology poses a significant risk. Therefore, understanding and analyzing cryptocurrencies has been a subject of concern in recent years, especially when the movement of some cryptocurrencies, such as Bitcoin, changes quite dramatically and unexpectedly.

The safe-haven features of cryptocurrencies for other assets in the financial market are still a source of debate. Many research showed varying empirical outcomes about this feature of cryptocurrencies in various markets and regions before and after the financial crisis (Bouri et al., 2017b; Conlon et al., 2020; Dyhrberg, 2016b; Mariana et al., 2021). The outcomes vary depending on the market and asset type, as well as the market stress period. The pandemic problem that is fast spreading across the globe

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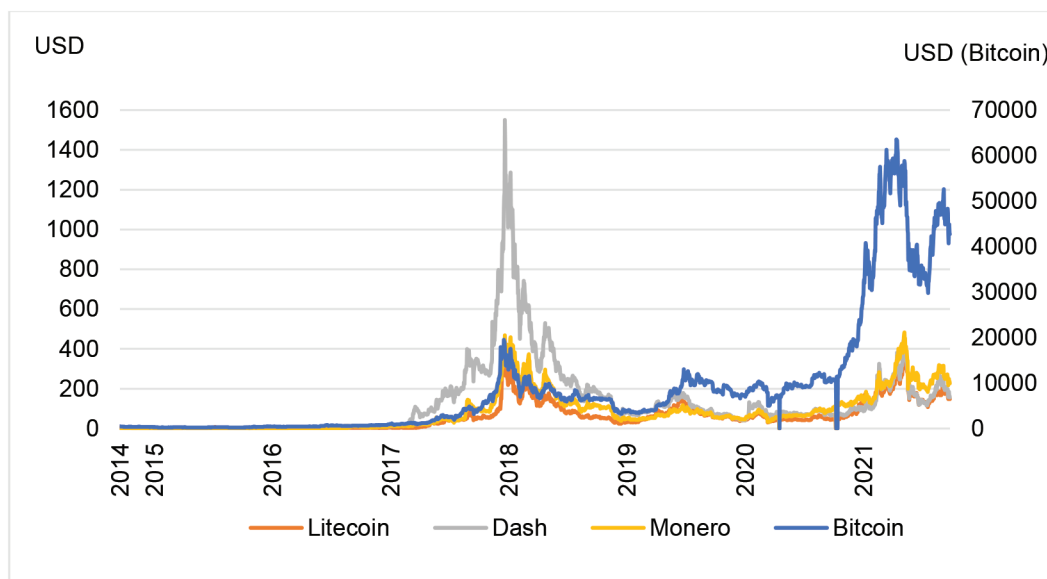


Figure 1: Value of Cryptocurrencies

has transformed investor perceptions of financial market safety tools, and cryptocurrencies are one of the assets that are being seriously studied. During the COVID-19 market slump, a small number of research investigating the safe-haven properties of cryptocurrencies have raised the subject of whether cryptocurrencies may be used as a safe-haven for stocks and other assets in a certain region.

Using the DCC-GARCH model, this research will look into the safe-haven properties of cryptocurrency in the Vietnam stock market during a pandemic crisis. We chose Vietnam to study this aspect of cryptocurrencies since practically all cryptocurrency trading takes place in Asia, and it also has the biggest volume and value of cryptocurrency trade. By the end of November 2017, Japan, South Korea, and Vietnam accounted for nearly 80% of global Bitcoin trading activity, while the total amount of Bitcoin trading in the United States was just around a fifth of that. Unlike Japan and South Korea, Vietnam is a developing country and one of the most attractive economies for foreign investors. Moreover, Vietnam is one of the countries that ban cryptocurrencies despite the wider potential market. Therefore, it is urgent to understand the safe-haven characteristic of cryptocurrencies in the Vietnam stock market. This is important for investors and authorities as cryptocurrencies are traded for more and more value in this market. This research focuses on Bitcoin and Litecoin which have the most popular in the crypto market with a considerable amount of volume trading.

We find that Bitcoin and Litecoin are only weak safe-haven for stocks in Vietnam during the COVID-19 market turmoil, they are more suitable for diversification purposes.

Our findings are consistent with Conlon et al. (2020) who considered a range of international equity indices with cryptocurrencies and even with Bouri et al. (2017) who mentioned the safe-haven properties of Bitcoin for the Asia Pacific stock market during the pandemic crisis.

The rest of the paper is organized as follows: Section 2 outlines the literature review, the methodological approach and data are described in Section 3. Section 4 presents the empirical findings while section 5 concludes.

2. Literature Review

In financial contexts, the volatility of cryptocurrencies is evaluated from many perspectives and methods. They mainly concentrate on two areas: (i) predict cryptocurrency determinants and (ii) diversification benefits.

There are several studies analyzing the determinant of cryptocurrency volatility (Aalborg et al., 2019; Balcilar et al., 2017; Ciaian et al., 2016). Balcilar et al. (2017) demonstrated that Bitcoin trading volume can be used to explain return but not volatility; specifically, they suggested that while many studies found that traded volume played an important role in predicting stock returns and volatility, it could not help forecasting volatility, and a large number of papers also indicated the role of this factor in analyzing Bitcoin return and volatility (Aalborg et al., 2019; Bouoiyour et al., 2015; Liu & Lee, 2020). Bouri et al. (2019) extended the investigation on seven large cryptocurrencies but they found that trading volume is only used for predicting the volatility of three of them (Litecoin, NEM, and Dash). Exchange rates and the oil price had a significant effect on the value of the Bitcoin in

long-run, while the stock exchange indices played a significant role in driving Bitcoin value both in the short and long run. Besides, S&P 500 and the Baltic dry index are the formation of long-term Bitcoin volatility (Conrad et al., 2018).

In the financial sector, one of the most frequently asked questions is what characteristics of cryptocurrencies can be used in various contexts, and for what types of asset classes. Several studies have discovered conflicting evidence about the diversification benefits of cryptocurrency. Some studies looked into their hedging potential (Dyhrberg, 2016a), and some concluded that cryptocurrencies are a good way to diversify one's portfolio (Gil-Alana et al., 2020; Karim et al., 2021). The majority of studies found similar conclusions when it came to the relationship between bitcoin and some financial assets, particularly equities indices, where they looked at the extremely weak correlation between them (Baur et al., 2018; Bouri et al., 2017a; Ji et al., 2018). This relationship, however, changes with time and is not stable because it is dependent on the frequency of data (Corbet et al., 2018) and whether it is considered during market downturns or upturns.

Other research has focused on cryptocurrency's safety feature: while most assets in the financial market are losing value, safe-haven assets keep or gain value. During times of market stress, a safe-haven asset is described as an asset that maintains or even increases in value. The concept of safe-haven is defined directly in the research of Baur and Lucey (2010, p.5) as followed: "A safe-haven asset is an asset that is uncorrelated or negatively correlated with another asset or portfolio in times of market stress or turmoil". Accordingly, it is also necessary to distinguish this term from a hedge or diversifier assets. Following Baur and Lucey (2010, p.5): "A hedge is defined as an asset that is uncorrelated or negatively correlated with another asset or portfolio on an average. And, a diversifier is defined as an asset that is positively (but not perfectly correlated) with another asset or portfolio on average". The important feature that distinguishes a safe haven from a hedge is the length of the effect (Baur & McDermott, 2010), investors do not use hedge assets to cut losses during times of distress but a safe-haven asset does. Besides, a hedge asset holds its value on average while a safe-haven asset only holds its value in specific periods.

A few empirical research have looked into the safe-haven property of traditional cryptocurrency assets. A substantial number of publications focused on this characteristic for the equities sector (Bouri et al., 2020), while others focused on currency analysis or energy commodities like oil (Bouri et al., 2017a; Selmi et al., 2018). Furthermore, Selmi et al. (2018) compared Bitcoin's safe-haven characteristics to gold and commodities for stock indices. When they looked at the outcomes over a longer period of time and across markets, they discovered that the results were

quite different. These findings highlight the safe-haven properties of cryptocurrencies, particularly Bitcoin, but it only appeared in a few periods, and its function varies over time. Furthermore, the results vary by market. Primarily a few studies have looked at these characteristics for other forms of cryptocurrencies; however, they have only focused on Bitcoin, which is the most prominent in the cryptocurrency market.

Investigating the volatility of cryptocurrency is usually based on a comparison of Generalized Autoregressive Conditional Heteroskedasticity (GARCH) models. Baur et al. (2018), Bouri et al. (2017a), and Dyhrberg (2016a) used different GARCH-family models to account for the volatility of Bitcoin and other cryptocurrencies. However, to explore whether cryptocurrencies can be a safe haven for other asset classes, many empirical studies applied different approaches such as the cross-quantilogram (Bouri et al., 2020), the asymmetric dynamic conditional correlation (ADCC) model (Bouri et al., 2017a), the conditional Value-at-Risk (CoVaR) (Selmi et al., 2018; Corbet et al., 2018;) and the dynamic conditional correlation (DCC-GARCH) model (Bouri et al., 2017b). Although there are many methods to explore these properties of cryptocurrency, DCC-GARCH proposed by Engle (2002) has emerged as the most useful method for analyzing the correlation between the return series of cryptocurrencies and other assets.

In summary, the safe-haven properties of cryptocurrencies have not been clarified yet, especially during the pandemic crisis in one of the markets with the largest number of Bitcoin trading transactions, Vietnam. Besides, most of the papers only concentrated on Bitcoin instead of investigating other cryptocurrencies. Thus, DCC-GARCH is one of the effective methods to address this objective with the series of returns of different assets observed.

3. Methodologies and Data

According to Dyhrberg (2016a) "The GARCH framework can give an indication of what elements of the world economy bitcoin is sensitive to". Therefore, the GARCH model is one of the best models used mainly for forecasting and analyzing the volatility of time series that vary over time. Moreover, a multivariate GARCH (MGARCH) approach should be employed to extend the analysis. The MGARCH model has the advantage of allowing you to see if the volatility of one variable is leading to the volatility of another (Bauwens et al., 2006).

The dynamic conditional correlation (DCC) specification developed by Engle (2002) is used to investigate the dynamic correlation of cryptocurrency and equity in Vietnam. The DCC model permits the correlation matrix to be time-varying, allowing it to capture time-varying correlation coefficients across return series and compare variations across stable and

Table 1: Description of Variables and Source of Data

Variables	Definition	Source
btc	Bitcoin return	https://coinmarketcap.com/
ltc	Litecoin return	https://coinmarketcap.com/
vnindex	Stock market return of Vietnam	Ho Chi Minh Stock exchange (HOSE)

distressed periods. The DCC model has the advantage of being able to calculate the number of parameters regardless of the number of series. Furthermore, the DCC model estimate was separated for pairs of return series so that the correlation of cryptocurrency with each class asset's return could be seen more clearly. (Table 1).

The equation is presented as follows:

$$y_t = Cx_t + \varepsilon_t \tag{1}$$

with $\varepsilon_t = H_t^{1/2} z_t$

$$H_t = D_t \cdot R_t \cdot D_t$$

Where:

- y_t is a vector of return of Vnindex, Bitcoin, and Litecoin at time t
- C is a matrix of parameters
- X_t is a vector of independent variables
- ε_t is a vector of mean-connected return of Vnindex, Bitcoin, and Litecoin at time t . $E[\varepsilon_t] = 0$ and $cov[\varepsilon_t] = H_t$
- $H_t^{1/2}$ is the Cholesky factor of the time-varying conditional covariance matrix H_t
- H_t is a matrix of conditional variances of ε_t at time t
- Z_t is a vector of zero-mean, unit-variance i.i.d innovations
- D_t is a diagonal matrix of conditional variances. The elements in diagonal matrix D_t follow the univariate GARCH process.

$$D_t = \begin{bmatrix} \sqrt{h_{1t}} & 0 & \dots & 0 \\ 0 & \sqrt{h_{2t}} & \dots & \dots \\ \dots & \dots & \dots & 0 \\ 0 & \dots & 0 & \sqrt{h_{nt}} \end{bmatrix}$$

With $h_{it} = \omega_i + \sum_{q=1}^Q \alpha_{iq} \varepsilon_{i,t-q}^2 + \sum_{p=1}^P \beta_{ip} h_{i,t-p}$,

where ω_i is a constant term, α_i is the parameter that captures the ARCH effect, β_i represents the GARCH effect.

R_t is a conditional correlation matrix of ε_t at time t

$$R_t = \text{diag}(Q_t)^{-1/2} Q_t \text{diag}(Q_t)^{-1/2} \tag{2}$$

The DCC (1,1) equation is given by Q_t , as:

$$Q_t = (1 - a - b) \bar{Q} + a \varepsilon_{t-1} \varepsilon_{t-1}' + b Q_{t-1} \tag{3}$$

Where Q_t is a conditional variance-covariance matrix of ε_t , a and b represent the effects of previous shocks and DCCs, satisfying $a \geq 0$, $b \geq 0$ and $a + b < 1$. The correlation between assets i and j is:

$$\rho_{i,j,t} = \frac{q_{ij,t}}{\sqrt{q_{ii,t} \cdot q_{jj,t}}} \tag{4}$$

$\rho_{i,j,t}$ is the key element in this model because it represents the conditional correlation between these assets at time t .

A safe-haven property of cryptocurrencies is determined by the definition of Baur and Lucey (2010) for distinguishing three particular types of assets: safe-haven, hedge, or diversifier. Accordingly, a weak (strong) safe-haven asset is uncorrelated (negatively correlated) with another asset during market stress.

After estimating the DCC model, we extract the dynamic conditional correlations from it into separate time series relied on the method used by (Bouri et al., 2017b) and then regress with a dummy variable (COVID) that equals one if day- t is on the pandemic date, begin from the first COVID-19 announcement date (December 2019). The equation is written below:

$$DCC_t = \alpha + \beta * \text{COVID} * \text{Vnindex} + \varepsilon_t \tag{5}$$

Where DCC is the pairwise conditional correlation between Bitcoin, Litecoin, and equity in Vietnam; and ε_t is the error term. If:

- α is significantly positive, cryptocurrency is a diversifier against the equity
- α is zero, cryptocurrency is a weak hedge against equity
- α is negative, cryptocurrency is a strong hedge against equity
- β is not significantly different from zero, cryptocurrency is a weak safe-haven for equity
- β is negative, cryptocurrency is a strong safe-haven for equity

Our return study is based on daily data from September 2014 through September 2021, a span of seven years. Levels are used to express all data. The Ho Chi Minh Stock

Exchange provided the daily stock returns in Vietnam, while coinmarketcap.com provided the Bitcoin and Litecoin data.

4. Empirical Results

4.1. Descriptive Statistics

Table 2 shows the descriptive statistics for the variables. When compared to other assets, the data show that Bitcoin has the best return (0.117 percent), but Litecoin has the largest volatility (2.987 percent). Stock returns in Vietnam, on the other hand, had the lowest value and standard deviation of any asset studied. Furthermore, both Bitcoin and equity returns have negative skewness (−0.984 and −0.619, respectively), Litecoin has a positive skewness (0.503). When compared to Bitcoin and stock returns, Litecoin returns have an extremely high kurtosis of 15.02, which is over two times higher than stock returns of 8.055.

4.2. Correlations

Table 3 shows the return correlations of various assets. According to the findings, stock returns in Vietnam have a positive correlation with Bitcoin and Litecoin. Vnindex and Bitcoin (Litecoin) have a 0.063 correlation (0.061). These are the initial evidence that these cryptocurrencies are potential diversifiers against the equity in Vietnam. Furthermore, with a positive correlation of 0.664, Bitcoin and Litecoin have the highest positive connection.

4.3. Dynamic Conditional Correlation Analysis

The dynamic relationships between Bitcoin and Vnindex are shown in Figure 2A. These correlations are not always positive before a pandemic; they range from −0.09 to 0.25, with a median of 0.054. During pandemic crises, however,

the range of these correlations is broader than before the epidemic, ranging from −0.25 to 0.35, with the same median as before the pandemic (0.055). The dynamic correlation becomes more negative at the start of the pandemic and in the period after the epidemic becomes difficult to manage globally in mid-2020, then instantly turns positive and stays that way for the rest of the duration.

In Fig. 2B, the same signal appears for Vnindex and Litecoin dynamic correlation. These associations are not always positive before the pandemic, ranging from −0.15 to 0.3, with a median of 0.065. After a pandemic crisis, this range varies dramatically from −0.17 to 0.34, with a median of 0.069, however, the trend tends to be less negative after 2020. To summarise, the dynamic correlation between Bitcoin and Vnindex is more volatile and has a wider range than the dynamic correlation between Litecoin and Vnindex. During the pandemic, the correlations increase, although in most cases, positive dynamic correlations dominate. This complements the evidence of the diversifier properties of cryptocurrencies for the equity market in Vietnam.

4.4. Regression Analysis

After extracting the pairwise dynamic conditional correlations, the estimation results from Eq. 5 are provided in Table 4 according to the estimation of the DCC model. With a positive coefficient of 0.054 and statistical significance at the 1% level, the results suggest that Bitcoin operates as an effective diversifier against the equities under consideration. Similarly, the results show that when it comes to Litecoin, a significantly positive coefficient on α suggests that Litecoin is also a diversifier in Vietnam stock, with a coefficient of 0.065. Because the coefficients are not statistically significant and different from zero when it comes to the safe-haven properties of cryptocurrencies, both Bitcoin and Litecoin are weak safe-havens for equity in Vietnam. In particular, the −1.62 and −1.32 coefficients for Bitcoin and Litecoin, respectively. The study’s key findings suggest that, during a pandemic crisis, investors in the Vietnamese stock market do not regard cryptocurrencies as viable safe-haven investments. Instead, cryptocurrencies simply serve as a potential source of stock diversification in this economy. The fact that cryptocurrencies have weak safe-haven attributes in the Vietnam equities market can be explained by the fact that, first and foremost, Vietnam is not very welcoming to the idea of cryptocurrency. The State Bank of Vietnam has decided that cryptocurrency is not a legitimate form of payment and that anyone involved in the issuance, supply, or use of cryptos as a form of payment will be punished. Second, because cryptocurrencies are not issued by any central bank or government, they are difficult to regulate, which makes investors wary of investing in them. Third, there is no legal framework or mechanism in place in Vietnam for trading and investing in cryptocurrencies; however, because

Table 2: Descriptive Statistics

	Mean	Standard Deviation	Skewness	Kurtosis
vnindex	0.018%	0.488%	−0.984	8.055
btc	0.117%	2.043%	−0.619	12.09
ltc	0.088%	2.987%	0.503	15.02

Table 3: Correlation Matrix

	vnindex	btc	ltc
vnindex	1	0.063	0.061
btc	0.063	1	0.664
ltc	0.061	0.664	1

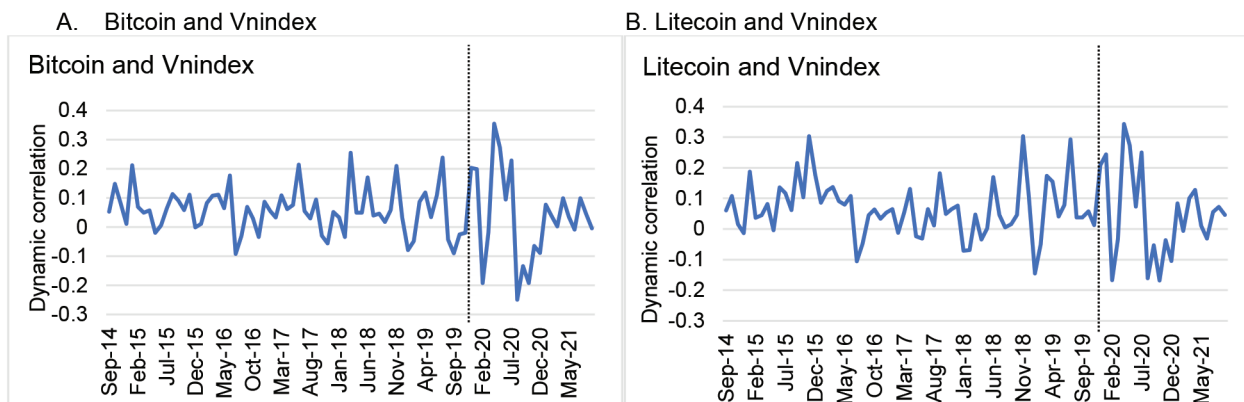


Figure 2: Daily Dynamic Conditional Correlation Based on DCC
 Note: The dashed line shows the beginning of the pandemic crisis (December 2019)

Table 4: Estimation Results on the Hedge or Diversifier or Safe-Haven Properties of Cryptocurrencies

	α Coefficient	β Coefficients
Bitcoin		
vnindex	0.054***	-1.62
Litecoin		
vnindex	0.065***	-1.32

Notes: ***indicate statistical significance at the 1% level.

the government does not prohibit Bitcoin trading or holding as an asset, trading cryptocurrencies as a diversification method continues to attract a large number of investors.

5. Conclusion

This paper applies the dynamic conditional correlation (DCC) GARCH model to investigate the safe-haven property of cryptocurrencies for stocks in Vietnam in the period of pandemic crisis with the focus on 2 types of popular cryptocurrencies, Bitcoin and Litecoin. The empirical evidence suggests the dynamic conditional correlations between cryptocurrencies and equity in Vietnam increase during the pandemic, however, in most periods, positive dynamic correlations often dominate. Besides, the regression results also indicate that Bitcoin and Litecoin act as weak safe-haven investments for stocks in Vietnam during the COVID-19 turmoil. They are more suitable for diversification purposes although the dynamic correlations between them and the stock index in Vietnam vary stronger during the pandemic crisis. The estimated results are consistent with those from the literature (Bouri et al., 2017b; Conlon et al., 2020). Despite the importance of our findings to investors, we still warn about the safety and legality of cryptocurrencies for investing,

as they are not guaranteed by any government. The liquidity of cryptocurrencies is also a serious issue. Cryptocurrencies have not been recognized as a financial asset on the Vietnamese financial system, their ability to convert into money is quite limited. Moreover, cryptocurrencies witness high volatility in a period of pandemic crisis, using them for diversification benefits may bring unexpected risks during this period.

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