Cryptocurrencies as a safe tool for portfolio before and during COVID-19 pandemic: cases of Bitcoin and Ethereum

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Abstract

This research aims to analyze and explain the importance of diversification benefit of cryptocurrencies and its nature in accordance with its relation with other financial assets before and especially during the Covid-19 pandemic era. This paper will help investors to understand that how to manage a portfolio of cryptocurrencies in parallel with other financial assets and mainly cryptocurrencies since they were a safe investment option during the pandemic period due to the good defense these digital currencies activated against the covid-19 shock back in 2020. Paper used DCC-GARCH model to examine the safety of Bitcoin and Ethereum with financial market of S & P 500 and FTSE100.

Keywords: risks Cryptocurrency, COVID-19, Bitco

1.Introduction

The Covid-19 pandemic and what followed it from actions have affected the world in a serious and a negative way, especially the financial markets and the countries' economies on all sides plus it was that all the financial analysis performed then for the next five years needed to be re-studied and conducted again. Many stocks and other financial assets couldn't handle the pandemic shock and lost their value through this period with no limit and a mysterious thought about what will happen in the near future, which created a fear between investors. The problem was that people lost trust about investing and the market during that period since most of the huge investments were based on predictions and studies so when the pandemic occurred all the analysis passed away and failed due to the sudden

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shock, the thing which created a division among investors between bearish and bullish players, some of them sat back to see what will happen while others believed that during the crisis you should take risk and make more money so they found that the cryptocurrencies and some stocks was the gate for getting more rich during the pandemic. The main strategy was how your portfolio managed through trading variety of cryptocurrencies and other financial assets which were related to each other in a one way or another maybe in the same field or industry and based on what analysis this collection of investments was chosen.

There has been a lot of attention paid to the cryptocurrency phenomenon ever since Bitcoin was established in 2008 (Nakamoto, 2008). The revolutionary block chain technology that supports the phenomenon has contributed to its rise to prominence and has served to differentiate it from more traditional asset classes (Liu and Tsyvinski, 2018). Cryptocurrencies are exceedingly unregulated and decentralized since they are not backed by any physical asset or official claims (Halaburda et al., 2020). Bitcoin, Ethereum, Ripple, and Litecoin are just some of the cryptocurrencies that have seen their value and popularity increase over the last decade. As an illustration of exponential growth, consider Bitcoin's price, which increased from under one dollar in early 2013 to over nineteen thousand dollars in December 2017 (Rajput et al., 2020).

It has been shown by the ongoing pandemic of coronavirus sickness 2019 (COVID-19) that conventional financial assets such as stocks are susceptible to crises of this kind (Marobhe, 2021). Since the appearance of COVID-19 in December 2019, major market indices have been exhibiting bearish conditions, which may be characterized by negative returns. The S&P 500 Index in the United States saw a downward spiral in the early days of COVID-19, and this trend continued to deteriorate starting in February 2020 as the intensity of the sickness intensified (Curto and Serrasqueiro, 2021). On the other hand, the value of the United Kingdom's FTSE 100 Index dropped by 14.3 percent in 2020, making it the largest stock market index that has performed the worst since the 2008 financial crisis (Ozkan, 2021). In 2020, the SSE Composite Index in China had a decline of 7.2% (Chen et al., 2021). This decline serves as a further indication of the pandemic's impact on the world economy. Cryptocurrencies are a novel kind of asset that has been existing for a little over a decade, which places them in a completely distinct category from traditional financial instruments such as stocks and bonds. Other asset classes have been around longer than the Great Depression, World War II, the oil crisis, and the Global Financial Crisis combined, and each time a crisis has hit, they have shown that they can weather the storm. In the wake of the Great Financial Crisis that occurred in 2008 (Nakamoto, 2008), the cryptocurrency was initially released; COVID-19 is the first significant crisis that has arisen since then.

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The stock market is where buyers and sellers of financial securities meet and exchange or transact these securities, the stock market is a controlled and regulated market, such activities are traded over the counter which is through a broker in contrast with a controlled and centralized exchange like London Stock Exchange. As specified by Chen (2023), firms who wants to sell their shares in public for the first time have the permission from the stock market to activate it through the process of initial public offering which is offering shares of a private company to the public for the first time.

Although the stock market crashed and mostly fell down because of the pandemic, but always investors with positive thinking look at the other full half of the cup. It should be mentioned that also some stocks where a good investment during the virus spread period and as known always there are stocks which acts different than the general trend. Since all companies' stocks related to medical issues and laboratories were doing good profits and an increasing trend in sales, Asim (2022) mention that for example Abbot laboratories did a huge profit from coronavirus tests and it was a good stock to invest in during the pandemic. Also, stocks related to gaming industry and entertainment were a good choice back then to invest and generate gains.

Cryptocurrency is a virtual currency decentralized which is based on block-chain and not controlled by government, and that was one of the most important specifications that crypto has than other financial assets. Davis (2011) states that there are couple of ways to earn money either work to get it, steal it or as Satoshi Nakamoto did is to create it. In 2009, the first cryptocurrency was launched which is Bitcoin and nowadays there are more than five thousand digital currencies in the market. According to Yuhanitha and Robiyanto (2021), that the financing of the top cryptocurrencies attracts the investors when the market is shaky. Cryptocurrency is considered to be a safe investment during crisis and other events since its financial nature and characteristics does not depend on the economic news and situations so most of the crypto can handle the financial shocks from the market (Jeribi and Fakhfekh 2021; Shahzad et al. 2019). Unlike stocks and other financial assets which are too sensitive during any crisis and are affected in a direct way and especially during the coronavirus period.

Future market or future contracts it can be defined as agreeing to buy or sell any financial instrument at a specified future date. During the pandemic futures contracts were studied and used more than ever by investors. Since the nature of these contracts helped them by either gaining from buying before prices were rising or selling before prices were decreasing through the buy/long or sell/short features. These contracts were done

based on each investor financial studies and of course by reading plus analyzing the Japanese candles of each invested asset.

Bonds market can be defined as the worldwide exchange of debt securities which are more than one type of bonds (corporate, government, municipal and many others). Bowman (2023) state that the bond market is more complicated than the stock market since it's not traded on exchange it is usually based on dealers. During the covid-19 period investors started looking for safer investments regarding assets and there was a decrease in bond yields for some of top countries since the market was unstable, so by that trading bond was not a priority for investors back then.

Investing in a variety of assets was always a good choice to be done by investors, since putting the money in different sectors not only one will reduce risk exposure and help gaining more profits. According to Tuttle (2020), having a diversified investments portfolio help to control risk, give a push for more profits percentage and comfort the business cycle while there are some stages of recession or slow trend different sectors will have shifts in aim of searching for profits, and also sectors contain a range of traits that when combined can assist investors build an effective portfolio to help them reach their objectives.

To complete the gap, this study examines the relationship between cryptocurrencies and other assets and how beneficial is the diversity between these financial assets during the coronavirus period. First the study will define the cryptocurrencies and stock markets plus a general overview about the bond and futures market. Second, will view the nature and trend of crypto and stock market during the pandemic and each data will be analyzed and explained. Third, the importance of managing the portfolio and what steps should be followed to avoid huge loss and reduce risks. Fourth, there will be interviews conducted with investors who are experts in trading crypto and stocks for more than ten years in different markets to collect information about how professionals act in the market during any crisis and what criteria of investment they follow. At the end, after analyzing these results it will help the investors especially beginners and finance students to know how to benefit and analyze any market even if there is a crisis, focus on the idea of gaining profit no matter how the situation is and mainly how to manage a financial portfolio.

The prices of cryptocurrencies may go up or down in value much as the prices of stocks do (Chakraborty and Subramaniam, 2021). This is due to investor mood and the attention that investors pay to regular news that might have an influence on the market for cryptocurrencies. For the case of stocks, there is a plethora of empirical research that examines how the pandemic has influenced stock indexes all over the globe (Marobhe, 2021; Curto and Serrasqueiro, 2021). On the other hand, when it comes to cryptocurrencies, there are not a lot

of research that directly evaluate how COVID-19 would affect the pricing of cryptocurrencies. Among them are the research conducted by Vidal-Tomas (2021) and Demir et al. (2020), which used the wavelet coherence analysis in order to examine the influence that COVID-19 fatalities and cases have had on the values of Bitcoin, Ethereum, and Ripple. Their results reveal a negative connection in the early days of the crisis, with a positive association eventually being detected in the latter periods of time after the crisis.

2.Literature Review

In 2010, Baur and Lucey investigated the possibility that hedging, diversifying, or hoarding gold may improve the returns on stock and bond investments in the United States, the United Kingdom, and Germany. They discovered the first conclusive evidence that gold can be used as a hedge against stocks on average and as a safe haven during periods of severe market volatility. Since this was the first evidence of its kind, its finding was significant.

However, they were unable to locate any evidence of bonding in the course of their research. Hillier et al. (2006) found that valuable metals like gold, silver, and platinum may be used as a form of hedging, especially during times of severe market volatility. The research conducted by Baur and McDermott (2010), which included comparisons across countries, was based on the results acquired by Baur and Lucey (2010). The results of this research differentiated between highly developed countries and significantly undeveloped ones. After looking at the impact of safe havens on a wide range of global stock markets, they concluded that gold served as a hedge and a powerful safe haven for mature markets but not for emerging markets like those in the BRIC nations. Gold's status as an established market safe haven led them to this conclusion. They reasoned that gold may be particularly useful for developed market safe havens.

Surprisingly, the data showed that COVID-19 has a positive effect on the market efficiency of significant cryptocurrencies as Bitcoin, Ethereum, Litecoin, Binance, and Ripple. These cryptocurrencies are all traded on prominent exchanges.

To determine whether Bitcoin may be used as a protection against the effects of global uncertainty, Bouri et al. (2017b) undertook a study. They looked at Bitcoin's potential as a hedge against fluctuations in the return of a variety of other assets using wavelet-based quantile-in-quantile regressions. Based on their data, they concluded that Bitcoin might be useful as a hedge and diversifier under certain conditions. The results of their study seemed to indicate as much.

Bitcoin is the only asset with the potential to serve as a robust safe haven against the extreme weekly price changes seen in Asian markets. Bitcoin is also the only asset that has the ability to serve as a safe haven. It's worth noting that their findings suggested Bitcoin's hedging features shift depending on where the money is being invested and how long for. This is something to think about while figuring up your budget.

Cash, fixed income, and shares are the three primary types of financial classes that may be selected from, as stated by Dilanchiev et al. (2022), Robiyanto (2018) and Baur and Lucey (2010) respectively. When compared to bonds, shares are seen as a kind of ownership owing to the dividend payment that they get, which may change over the course of time. On the other hand, bonds are regarded as a type of debt that receive an interest payment. In addition to this, the research conducted by Corbet et al. (2018) gives the impression that Bitcoin and Ethereum are both members of the same category of (digital) assets. Both Bitcoin and Ethereum are instances of decentralized, peer-to-peer electronic money systems that do away with the need of a financial middleman in business dealings. Because of this, in contrast to other kinds of financial assets, they do not exist in any form that can be touched and they may be split up. The value of cryptocurrencies such as Bitcoin and Ethereum is based on the reliability of the algorithms that govern their operation.

According to research by Dilanchiev et al. (2022) and Bouri et al. (2020), the most widely used cryptocurrency, Bitcoin, does not function as a safe haven and instead exhibits characteristics similar to those of the S&P 500 Stock Index. This shows that Bitcoin follows a pattern similar to that of the S&P 500. They argue that this is because Bitcoin displays characteristics that are similar to the S&P 500 Stock Index. This fact could lead one to believe that Bitcoin operates similarly to a stock market index. Meanwhile, the findings of Corbet et al. (2021) showed that cryptocurrency market liquidity increased in the months after the March 2020 declaration by the World Health Organization that COVID-19 was a pandemic. Their findings lend credence to the idea that cryptocurrency investments might be seen as havens during this period of extreme market volatility. Further, Shahzad et al. (2021) argue, using a cross-quantilogram approach, that Bitcoin and gold are inferior assets for hedging COVID-19 risk in contrast to US VIX futures. They make this claim because of how much more volatile Bitcoin and gold are compared to US VIX futures. According to research by Brandvold et al., 2015, COVID-19 reduces the effectiveness of digital currency. Researchers found that COVID-19 significantly reduces the efficiency of digital currency. The researchers concluded that COVID-19 was the primary driving force behind the decline in Bitcoin and Ethereum prices.

Bouri et al. (2017a) looked at whether or not there is a connection between Bitcoin and a number of other commodities in a separate piece of study. The production of bitcoins required a significant amount of power,

which is why this line of study focused on energy commodities in general and electricity in particular. They revealed that Bitcoin exhibited traits of a hedge and a safe haven for the general commodity index and for the energy commodity index throughout the time period of 2010 to 2015, as well as during the time period prior to the crisis. This was true for both the general commodity index and the energy commodity index. However, following the market crash that took place in December of 2013, bitcoin was only used as a store of value.

According to the conclusion obtained by Baur et al. (2018), Bitcoin is not linked to any non-digital asset during the whole crisis. This was also one of the study's results. Related to this is their claim that Bitcoin is a speculative asset. However, Dyhrberg (2016a), an author who used a technique called generalized autoregressive conditional heteroskedasticity, concluded that Bitcoin has certain characteristics with gold, signifying that Bitcoin may be used as a hedge. He used GARCH modeling approaches to arrive at this conclusion.

Previous study by Robiyanto et al., 2018 have shown that gold and fixed income assets may boost portfolio performance and mitigate risk, respectively. Investment portfolios or other financial assets may be protected in part via the use of fixed income securities. The Indonesian corporate bonds were also mentioned as a potential secure investment option.

They also showed that even a little Bitcoin allocation may significantly boost the portfolio's performance after accounting for risk. Cryptocurrencies are quite different from traditional economic assets, as examined by Corbet et al. (2018), who looked at the association between cryptocurrency price changes and those of other assets.

3.Sources of Data

The pre-COVID-19 period (daily data from January, 2018 to December 31, 2019) and the COVID-19 period (hourly data from January 2, 2020 to December 31, 2022) are the two sample periods that the daily price data of Bitcoin, Ethereum, S& P 500 and FTSE100 are used for. I make use of common weekdays and daily trading across all markets for research as the weekly trading days and all daily trading differ for markets used in this research. The daily price data for all data are obtained from investing.com. All prices are in US dollars. I calculated daily returns for each of the instruments. (See Table 1 for variables used)

4.Methodology

The econometric criterion consists of two parts. A one-lag vector autoregression (VAR) model is used to model the returns. This provides the way for return correlations both across and within markets. I then use the DCC-GARCH model to simulate the time-varying covariances and variances.

The VAR model is used to solve the DCC-GARCH's conditional mean equation. The equation for the mean is as follows:

$Rt = \mu + \gamma \quad R\, t_{-1} + et \quad$ with $e_t = H_t^{1/2}\, \eta_t$

where $Rt = (R_t^x, R_t^y)$ is the vector of returns on asset x (Bitcoin, Ethereum) and asset y (FTSE100 and S&P500) at time t; c refers to a 2 x2 matrix of parameters measuring the impact of own lagged and cross mean transmissions between two assets; $e_t = (e_t^x , e_t^y)$ is the vector of error terms of the conditional mean equations for the two series at time *t ;* $\eta_t = (\eta_t^x , \eta_t^y)$ means a string of mistakes that were all generated at the same time and had the same probability of occurring; and $H_t^{1/2} = diag\sqrt{h_t^x} , \sqrt{h_t^y}$, where h_t^x and h_t^y presents the conditional variance of returns of assets used in the research.

Figure 1 Return of assets during COVID-19

Table 1 Descriptive statistics

During -COVID-19 Period (January 2,2020 to December 31, 2022)									
	Mean	**Max**	**Min.**	**Std. Dev.**	**Skewness**	**Kurtosis**	**Jarque-Bera**	**ARCH**	**ADF**
BITCOIN	0.003	0.19	-0.14	0.039	0.080	4.93	78.35*	0.27	-23.22*
ETHUM	0.0064	0.259	-0.27	0.053	-0.054	6.30	228.72*	14.65*	-24.12*
FTSE100	0.00011	0.090	-0.10	0.014	-0.926	14.82	2988.8*	76.19*	-7.887*
SP500	0.00087	0.093	-0.11	0.016	-0.659	16.58	3889.3*	51.55*	-6.31*
Pre-COVID-19 Period (January 2,2018 to December 31, 2019)									
BITCOIN	-0.0019	0.16	-0.16	0.0393	0.3657	5.09	103.07	0.32	-22.1*
Ethereum	0.00744	0.25	-0.445	0.0554	-0.978	14.18	2706.2	12.71*	-32.2*
FTSE100	-0.0006	0.13	-0.085	0.0166	-0.918	14.72	2957	64.21*	-8.25*
SP500	-0.0006	0.13	-0.085	0.0166	1.43	19	5763	43.84*	-7.62*

Note: * indicate statistical significance at 5%.

5. Result of Empirical Analyzing

Figure 1 shows the daily values of Bitcoin, Ethereum, the S&P 500, and the FTSE100 throughout the COVID-19 time period. The FTSE100 and the S&P 500 both dropped significantly during the start of COVID-19, but when the outbreak was eradicated, the markets began to recover. The average prices of Bitcoin and Ethereum

show a general upward trend before and after COVID-19. In addition, Bitcoin values fall before COVID-19, show an upward trend during the first half of COVID-19, fall dramatically, and then show an upward trend once again in the second half of COVID-19.

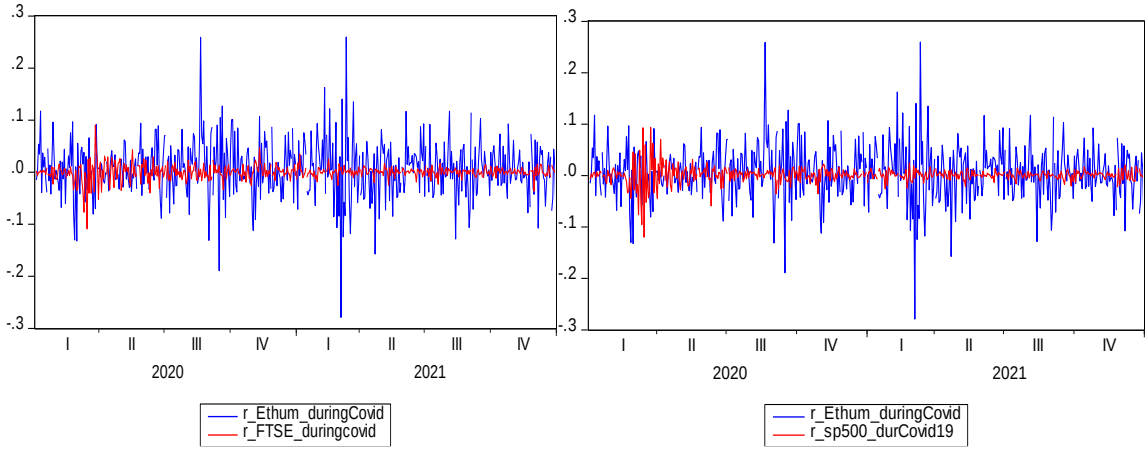

Figure 2 Return of assets during COVID-19

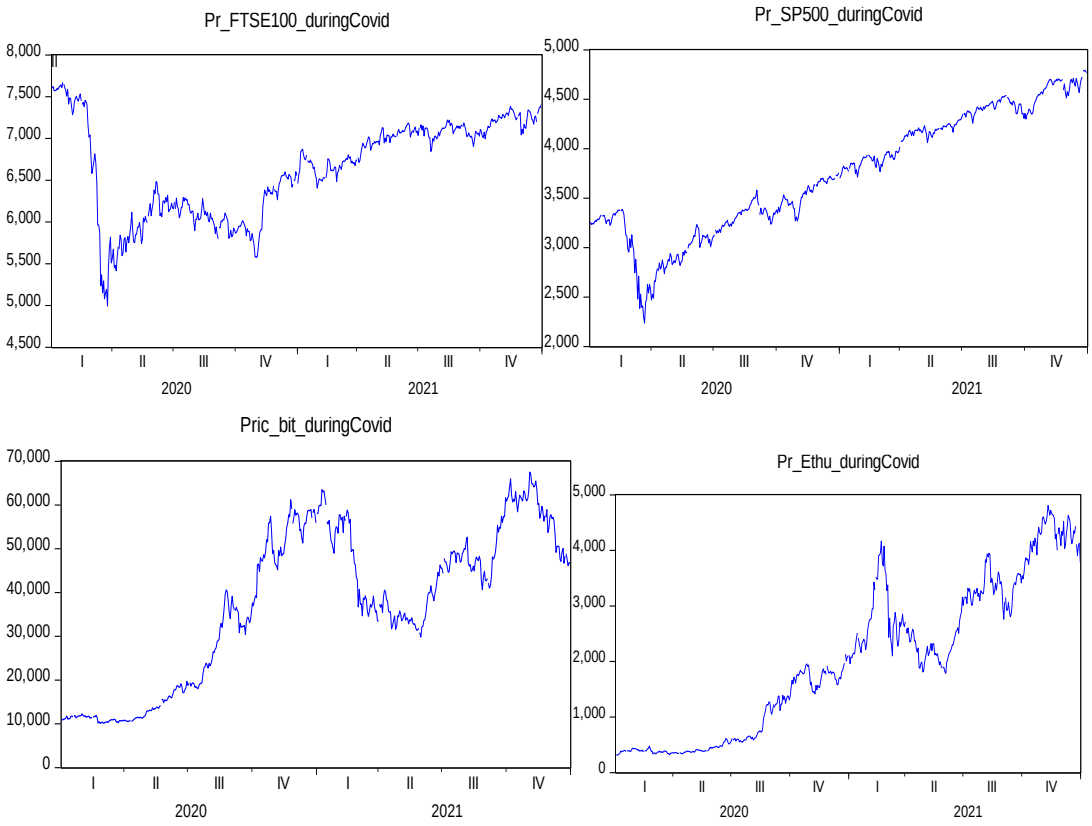

Figure 3 Daily price-during COVID-19

The first consequences of COVID-19 are unfavorable for the stock market but positive for cryptocurrencies. The correlations between the crypto markets and the FTSE100 and S&P 500 over the COVID-19-time frame are therefore a fascinating field of study. Returns on the S&P500, FTSE100, Ethereum, and Bitcoin markets show volatility clustering before COVID-19 (as shown in Figure 2), with the highest levels of volatility clustering being shown after COVID-19. Figure 2 shows the volatility clustering in the returns of the Ethereum, S&P 500, FTSE100, and bitcoin markets prior to COVID-19, with the volatility maximum in all returns occurring within the COVID-19 period. The assets' relative volatility is shown clustered together in Figure 3 of this research.

Table 2. Correlation Matrix.

Pre-COVID 19 period (January 2,2018 to December 31, 2019)				
	Ftse100	Bitcoin	SP500	Ethereum
Ftse100	1			
Bitcoin	-0.005549	1		
SP500	0.03868	0.01615	1	
Ethereum	-0.0518	-0.0217	0.3868	1
During COVID 19 period (January 2,2020 to December 31, 2022)				
	Bitcoin	Ethereum	Ftse100	SP500
Bitcoin	1			
Ethereum	0.055(0.2142)	1		
Ftse100	-0.0027(0.950)	-0.00614(0.8909)	1	
SP500	0.0377(0.398)	-0.000309(0.9945)	0.334870(0.000)	1

Note: Numbers in parentheses indicate statistical significance.

Table 1 provides series-level descriptive statistics for before - COVID-19 and during-COVID-19 eras. While the Bitcoin market's average return is negative before COVID and positive after it, Ethereum's is positive both before and after the outbreak. However, the COVID-19 period is a better time to invest in Ethereum. In contrast, Bitcoin's mean returns are positive during the COVID-19 era but negative before that time.

During the whole of the COVID-19 period, an unwarranted rise in volatility can be seen across all return series. This rise is considerable. In any time period, Ethereum is a great investment option with a high level of risk. In most cases, the kurtosis value is more than 3, which indicates that the distribution of the returns is considerably skewed to the left. Statistics developed by Jarque and Bera provide evidence against the normality theory. all the ARCH and autocorrelation effects are strongly present across all returns for all time periods.

The use of GARCH-based models is made possible by the presence of ARCH effects, which makes it possible to take into consideration the presence of heteroskedasticity in the return series. The acronym GARCH refers to the study of generalized autoregressive conditional heteroskedasticity. The results of the augmented Dickey-Fuller (ADF) test showed that the stability of all return series was maintained over both time periods.

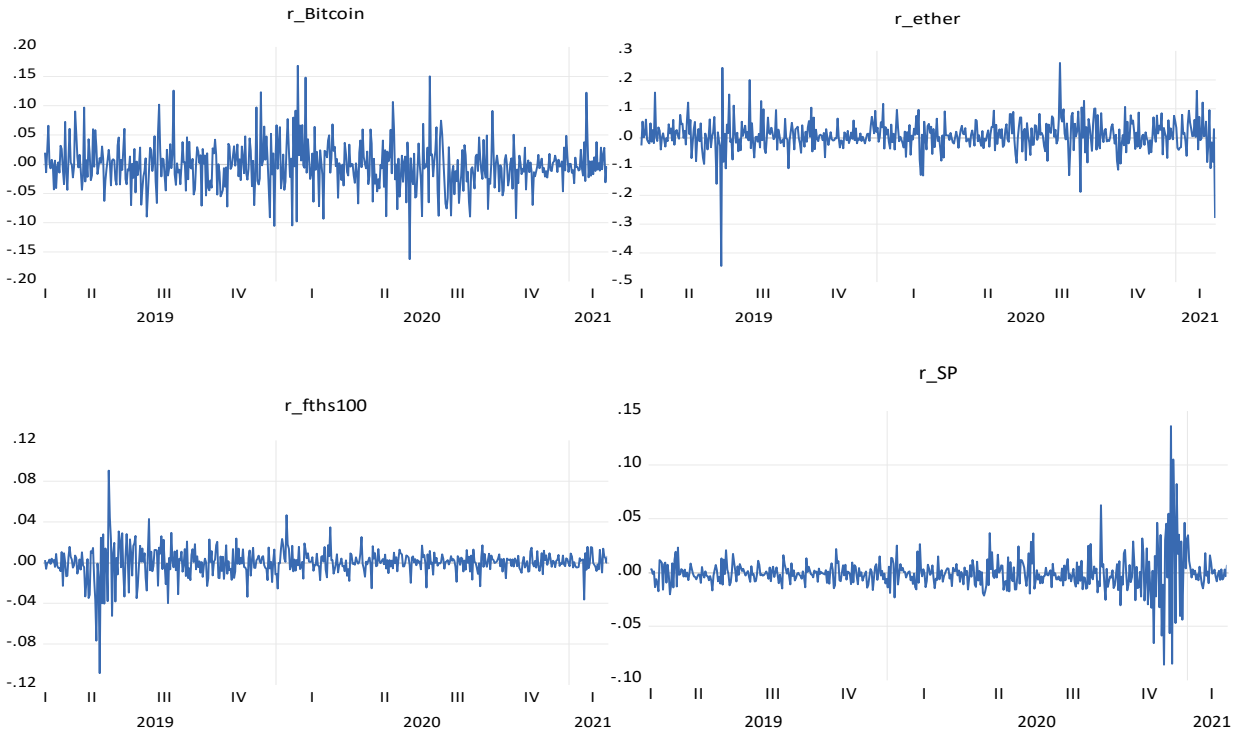

Figure 4 Daily returns, pre-COVID-19

Table 2 displays the asset correlation matrix. In both the pre- and duringCOVID-19 periods, the unconditional correlations between Bitcoin and the FTSE 100 are negative, whereas the correlation between Ethereum and the index is positive. For the COVID-19 time period, we find positive unconditional correlations for the pair FTSE100-Bitcoin but negative correlations for the pairings Ethereum-SP500 and Ethereum-FTSE100. The increasing uncertainty in the financial markets during the crisis explains the higher degree of correlation between all pairings throughout the COVID-19 timeframe. Because of the growth in uncertainty, investors tend to act similarly (herd) across markets, which increases the correlations across assets. There has been an increase in the correlation between assets throughout the COVID-19 time period.

Return and volatility spillovers between Bitcoin and the FTSE 100, Ethereum and the FTSE 100, Bitcoin and the S&P 500, and Ethereum and the S&P 500 were analyzed using the dynamic conditional correlations-generalized autoregressive conditional heteroskedasticity (DCC-GARCH) model. Due to its superior hedging efficiency score and lower Akaike information criterion (AIC) values, the DCC-GACH model was selected.

The aforementioned correlations are evaluated with the help of Eviem12. Table 3 and Table 4 detail the findings.

Table 3 Return and Volatility spill- overs for the pairs of assets in the during COVID-19 period (January 2,2020 to December 31, 2022)

	Bitcoin	**Ethereum**	**FTSE100**	**S&P 500**
Panel A. Mean Equation				
Constant	0.0039[b]	0.0065[a]	-7.19E-05	0.0047
	(0.0205)	(0.0054)	(0.887)	(0.1239)
r_{t-1}^{B}	-0.0030	-0.0822	0.0183[c]	0.0090
	(0.9517)	(0.1547)	(0.0761)	(0.2549)
r_{t-1}^{E}	0.0049	-0.0521	-0.0080	-0.0046
	(0.8869)	(0.3282)	(0.3477)	(0.5347)
r_{t-1}^{F}	-0.0617	0.1525	-0.096[c]	0.0208
	(0.6717)	(0.3547)	(0.0697)	(0.6051)
r_{t-1}^{SP}	0.0757	0.0182	0.1699[a]	-9.02E-07
	(0.5349)	(0.920)	(0.0000)	(0.2594)
Panel B. Variance Equation				
Constant	3.59E-0[b]	0.0001[b]	5.96E-06[a]	9.29E-06[a]
	(0.0345)	(0.0347)	(0.0005)	(0.0000)
$(e_{t-1}^{B})^2$	0.0390[a]	0.0764[a]	0.1238 [a]	0.2799[a]
	(0.0062)	(0.0012)	(0.0000)	(0.0000)
$(e_{t-1}^{E})^2$	0.0392[a]	0.0742[a]	0.1227[a]	0.2732[a]
	(0.0059)	(0.0015)	(0.0000)	(0.000)
$(e_{t-1}^{F})^2$	0.0396[a]	0.0741[a]	0.1609[a]	0.2746[a]
	(0.0068)	(0.0015)	(0.0005)	(0.0000)
$(e_{t-1}^{SP})^2$	0.0400[a]	0.0752[a]	0.14620[a]	0.2828[a]
	(0.0058)	(0.0012)	(0.0000)	(0.0000)
h_{t-1}^{B}	0.9399[a]	0.8701[a]	0.8425[a]	0.6868[a]
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
h_{t-1}^{E}	0.9396[a]	0.8728[a]	0.8428[a]	0.6883[a]
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
h_{t-1}^{F}	0.9394[a]	0.8749[a]	0.8749[a]	0.688[a]
	(0.0000)	(0.000)	(0.0000)	(0.0000)
h_{t-1}^{SP}	0.9390[a]	0.8704[a]	0.8242[a]	0.6796[a]
	(0.0000)	(0.0000)	(0.0000)	(0.0000)

Values in parentheses are the P-values [a,b,c] indicate statistical significance at 1%, 5%, 10% respectively.

Table 4 Return and Volatility spill- overs for the pairs of assets in the pre-COVID-19 period (January 2,2018 to December 31, 2019)

	Bitcoin	**Ethereum**	**FTSE100**	**S&P 500**
Panel A. Mean Equation				
Constant	-0.002280	0.0089	7.19E-05	-0.001525
	(0.2029)	(0.0002)	(0.8878)	(0.0001)
r_{t-1}^{B}	-0.02900	-0.0112	-0.0953	0.0377
	(0.5894)	(0.700)	(0.4535)	(0.7703)
r_{t-1}^{E}	0.01356	-0.08894	0.1444	0.1967
	(0.7918)	(0.1323)	(0.3755)	(0.1804)
r_{t-1}^{F}	-0.0035	-0.0209	-0.09687	-0.00118
	(0.7863)	(0.0437)	(0.0697)	(0.9711)
r_{t-1}^{SP}	0.00777	0.000275	0.02212	-0.143198
	(0.3847)	(0.9635)	(0.3707)	(0.0044)
Panel B. Variance Equation				
Constant	2.67E-06	6.32E-03	3.57E-05	7.54E-06
	(0.0012)	(0.0052)	(0.0003)	(0.0027)
$(e_{t-1}^{B})^2$	0.05064	0.0514	0.05059	0.0515
	(0.0074)	(0.0069)	(0.0072)	(0.0071)
$(e_{t-1}^{E})^2$	0.1132	0.1077	0.1134	0.1139
	(0.000)	(0.000)	(0.000)	(0.000)
$(e_{t-1}^{F})^2$	0.1206	0.1340	0.1223	0.1203
	(0.000)	(0.000)	(0.000)	(0.000)
$(e_{t-1}^{SP})^2$	0.4065	0.4070	0.4036	0.39316
	(0.000)	(0.000)	(0.000)	(0.000)
h_{t-1}^{B}	0.9204	0.91836	0.9196	0.9188
	(0.000)	(0.000)	(0.000)	(0.000)
h_{t-1}^{E}	0.8790	0.8828	0.8792	0.8785
	(0.000)	(0.000)	(0.000)	(0.000)
h_{t-1}^{F}	0.8457	0.8308	0.8441	0.8455
	(0.000)	(0.000)	(0.000)	(0.000)
h_{t-1}^{SP}	0.6011	0.6013	0.7512	0.6116
	(0.000)	(0.000)	(0.000)	(0.000)

Values in parentheses are the P-values [a,b,c] indicate statistical significance at 1%, 5%, 10% respectively.

The findings of the spillover of return and volatility from the Bitcoin market to the Ethereum market before and during COVID-19 are shown in Tables 3 and 4, respectively. The results are tabulated below. When comparing the prior year's returns to the current returns in the Bitcoin market, Panel A of Tables 3 and 4

demonstrates that there is no significant influence. No evidence is shown that past returns in the Bitcoin and Ethereum market during the COVID-19 era and before COVID-19 can be used to forecast future returns with any degree of accuracy.

Panel A's results from the cross return spill-overs of the mean equation reveal that return transmission did occur before and during COVID-19, but that its direction could not be determined. Yaya et al. (2016) found a unidirectional flow of return transmission from the Bitcoin market to the Ethereum market during periods when neither market was in crisis, but these results don't support their hypothesis. Thus, it is difficult to estimate the future price of Ethereum by looking at the delayed returns of Bitcoin, and vice versa, during periods without crises. Bitcoin and Ethereum markets do not show significant return spillover within the COVID-19 time period.

The variance equation (Panel B) for both time periods reveals that the conditional volatility of the Bitcoin, Ethereum, FTSE100, and S&P 500 markets is now substantially impacted by shocks that happened in the past. The conditional volatility of all markets is strongly impacted by the volatility of the market in the past. However, the coefficients for past own volatility are bigger than those for past own shocks, suggesting that previous volatility is a more important factor in predicting future volatility.

The cross-market shock transmission demonstrates that during the period before COVID-19, the shock spill-over between the Bitcoin market and the FTSE100 market and the Bitcoin market and the SP500 market is directional in the two directions. Both the cross-market shock spillover between Ethereum and the FTSE100 and the cross-market shock spillover between Ethereum and the SP500 are bidirectional in both sample periods. The results of this research have shown several conclusions that are consistent with those discovered by Husayin et al. (2019). As a result, the historical volatility of Bitcoin and Ethereum serve as crucial components for determining the potential danger of the FTSE100 and SP500 market during non-crisis and crisis situations respectively. (See tables 2 and 3 for further information). Tables 2 and 3 provide extensive information about the outcomes of the return and volatility transmissions between assets before and during the COVID-19 period, respectively.

The findings from the mean equation (Panel A) indicate that the influence of lagging returns on future returns is not substantial for either the FTSE100 market or the Bitcoin market during either time. This indicates that short-term predictions of forward returns in both markets cannot be formed using previous returns.

The results, which are based on the mean equation (Panel A) in tables 2 and 3, suggest that the effect of lagged returns on current returns is not significant for either the SP500 market or the Bitcoin market for any of the

sample periods. This conclusion is based on the fact that the influence of lagged returns on current returns is not significant. In a similar vein, the impact of lagging returns on current returns is not substantial for Ethereum and the SP500, nor is it important for Ethereum and the FTSE100. This suggests that utilizing historical returns to make short-term predictions of current returns in the FTSE100 and Bitcoin markets as well as Bitcoin and the SP500 is not achievable, regardless of the sample length.

The results of the variance equation (Panel B) indicate that the coefficient of prior own shocks was a major influence in the market for Bitcoin, the S&P 500, Ethereum, and the FTSE 100 throughout both of the sample periods.

The results of the variance equation (Panel B) indicate that the coefficient of past own shocks was a significant factor in both the FTSE100 market and the SP500 market as well as in the Ethereum market and the Bitcoin market throughout both of the sample periods. In addition, the coefficient of past own volatilities is an important component in the market for all assets over both of these time periods.

However, the coefficients of prior own volatility are bigger than the coefficients of previous own shocks in both time periods, showing that the former is a more important factor in affecting the latter. This finding is consistent throughout both time periods. There is a unidirectional shock transmission from Bitcoin to the FTSE100 market and the S & P 500 during both the pre-COVID-19 and during-COVID-19 periods. According to the findings of Panel B's investigation on the transmission of volatility across markets, Bitcoin's volatility moved gradually near those of the FTSE100 and the S&P500 up until just before the COVID-19 event. (Please refer to tables 2 and 3)

6.Conclusion

Because to the COVID-19 outbreak, there has been a detrimental effect on the lives of humans. The global stock market suffered an important decline as the COVID-19 outbreak became spread. In this work, we applied multivariate DCC-GARCH models to investigate the return and volatility transmission between the Bitcoin-FTSE100, Bitcoin-S&P500, Ethereum- FTSE100, and Ethereum- FTSE100 pairings for the purposes of diversification, hedging, and portfolio risk management. I compare these pairings to the Bitcoin-S&P500, Bitcoin-FTSE100, and Ethereum- FTSE100 pairings.

The results of our study have provided a number of surprising insights. First, the data for return spill-overs indicate substantial results at all times when comparing Bitcoin-FTSE100 and Bitcoin-S&P500 pairings before

and during COVID-19. These pairings were compared to each other. The price projections of any and all financial markets that are based on their own trailing returns are not reliable for the whole time period.

Additionally, there is not a unidirectional return transmission from Bitcoin to the FTSE100 and S&P500 during the pre-COVID-19 time period. Additionally, there is not a transmission from Bitcoin to the FTSE100 and to the S&P500 during the pre-COVID time period. Two, the results of the volatility spill-overs demonstrate that Bitcoin and Ethereum were the cause of volatility in the FTSE and s&p500 markets before and during COVID-19, but after COVID-19, Bitcoin and Ethereum were not the source of volatility in those markets. Establishing a position in the FTSE100 is one way for investors to diversify their assets. portfolios of the S&P 500, Bitcoin, and Ethereum both during and before the COVID-19 outbreak, due to the fact that the volatility spill-over influence was present in both time periods.

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