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BITCOIN'S LAGGED EFFECT ON ALTCOINS: A SHORT-TERM RESEARCH

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ABSTRACT

Purpose- As of October 2021, more than 13,000 cryptocurrencies are traded on 424 exchanges in the crypto money market, which exceeds 2.5 trillion dollars. Cryptocurrency initially emerged as a value exchange tool and to develop projects that make life easier. It is now also used by individuals as a benefit for speculation. Cryptocurrencies are influenced by many economic indicators, as well as interacting with each other. Recently, there is a belief in the crypto money market that Bitcoin is the pioneer of altcoins, supported some literatures. In this study, I investigated how bitcoin, the first and largest of the crypto money market, affects other leading altcoins (alternative cryptocurrencies) (ETH, BNB, ADA, XRP) in the short term as a lag period and interaction direction. Also, I examined the effect of DXY on Bitcoin.
Methodology- In February 2018, the cryptocurrency market exceeded $1 trillion. As of October 2021, it was $2.6 trillion. During this time, I calculated the returns on the daily high price data. With the help of VAR models, I researched the impact of short-term lags of BTC on ETH, BNB, ADA, XRP. Also, I've looked at Granger causality relationships.
Findings- The daily lagged values of BTC have a positive significant interaction with ETH, ADA and BNB, but there is no such relationship in XRP. I found that DXY's lags have significant positive and negative effects on BTC. In the causality analysis, I saw that BTC has bidirectional Granger causality with DXY and other altcoins except XRP.
Conclusion- It is seen that BTC, which dominates 45 percent of the market as of October 2021, is decisive for its movement for many altcoins. The shocks to BTC are then reflected similarly to altcoins. I understood from both the literature and the results that DXY has no reasonable effect on BTC. In future studies, the volatility and return contagion effect of BTC on other altcoins can be examined.

Keywords: Bitcoin, altcoin, vector autoregressive, DXY, causality.
JEL Codes: G00, G10, G11

1.INTRODUCTION

ryptocurrencies emerged as a replacement for traditional money, claiming to be an exchange of value, as well as a tool for speculation, portfolio diversification and passive investment. The development of the cryptocurrency market in its recent past is dazzling, and it is obvious that it has attracted intense interest from investors and speculators. While 50 cryptocurrencies were on the market in August 2013, it increased to 500 in October 2014, 1500 in February 2018, and 2670 in June 2020 (Ballis and Drakos, 2021). As of October 2021, more than 13,000 cryptocurrencies are traded on 424 exchanges in the crypto money market, which exceeds 2.5 trillion dollars (CoinMarketCap). In the digital currency market, they are risky investment instruments (Mariana et al., 2021), (Conlon and McGee, 2020) because their price fluctuations are very high, but they are the focus of attention of investors due to their advantages such as high earnings. For this reason, those who invest in the digital market follow not only Bitcoin, but also altcoins (alternative coins). In addition, speculators closely follow the relations between Bitcoin and leading Altcoins. Pirgaip et al. (2019) stated that there is a causality relationship between BTC and Gold, ETH, XRP and LTC in the short run; Adedokun (2019) stated that there is a causal relationship between BTC and almost all altcoins in 2017 and 2018; Demir et al. (2021) found the existence of an asymmetrical relationship between BTC and altcoins. Bouri et al. (2018) mentioned a significant positive relationship between DXY and BTC.

In this study, I investigated how bitcoin, the first and largest of the crypto money market, affects other leading altcoins (alternative cryptocurrencies) (ETH, BNB, ADA, XRP) in the short term as a lag period and interaction direction. Also, I examined the effect of DXY on Bitcoin. The results of the study were in parallel with the literature. In the findings, the number of delays in the returns of the Bitcoin affects the altcoins. BTC, which dominates 45 percent of the market as of October 2021, is an pre-indicator for the movement of leading altcoins. It is understood that DXY does not have much effect on BTC.

2.LITERATURE REVIEW

Nakamato (2008) explained the mechanics of bitcoin in his study in which he introduced the decentralized money system. Essentially, this revolutionary software is a system that solves the double-spending problem without being connected to a central authority, mediates the exchange of values, keeps the recorded transactions encrypted on many computers and shows the clients as witnesses. There is studies that investigates short-term and long-term relationship between bitcoin and altcoins.g(Aysan, 2021) (Adedokun, 2019) (Pirgaip et al., 2019) (Aysan et.al 2021)(Ciaian,2018). In long term, conflicted results were occurred amoung different periods. This may be explained that cryptocurreny's market is young and hot.

Pirgaip et al. (2019) carried out a study with Bitcoin in the center with daily data covering 2010 and the end of 2018 that includes BTC and other country currencies, stock markets, gold and altcoins. BTC has not a long-term cointegration relationship with all assets, however, it can be mentioned a short-term mutual causality relationship with Gold, ETH, XRP and LTC. Adedokun (2019) studied Bitcoin and leading altcoins, 2015 and 2018 separately. He could not see a cointegration relationship and a causal relationship in 2015 and in 2016, however he mentioned the existence of both relationships in 2017 and 2018. In recent years, he claimed that BTC has a causal relationship with almost all altcoins and especially BTC, ETH and XRP are the granger cause. Demir et al. (2021) examined the asymmetric interaction of BTC, ETH, XRP and LTC between 2015 and 2019 using the NARDL model. They have seen that BTC has an impact on altcoins in the short and long term. Falls in BTC affect altcoins more than its rise. In fact, this asymmetry is seen more frequently after 2017. Kubar and Toprak (2021) examined the causal relationships between bitcoin and altcoins between 21.08.2020 and 07.01.2021. They stated that BTC is the Granger cause of ETH, however, ADA, ETH and XRP are also the Granger cause of BTC.

Haslak (2018), in his research between 2010 and 2018, says that when there is a positive shock in DXY, there is a short-term shot in BTC and it goes out after 5 periods. However, he could not find a causal relationship between DXY and BTC. Bouri et al. (2018), in their study between 2010 and 2017, mention that there is a significant positive relationship between the USD index DXY and Bitcoin prices.

3. DATA AND METHODOLOGY

Cryptocurrencies with the highest market value in October 2021 were used in the study (Figure 1). These are Bitcoin, Etherium, Binance, Cordano, Ripple. Since the Solana data started from March 2020, it was not included in the study due to lack of its data. In addition, the relationship between USD index (DXY) and Bitcoin was also examined in the study. The total market value of cryptocurrencies exceeded 1 trillion USD at the beginning of 2018. February 2018 is taken as the starting date of the data, and the end of the data is October 2021. Return data generated from daily high price data were used in the study (Formula 1).

In order to see the relationship between the variables, Vector autoregressive (VAR) models were established (Formula 2). The appropriate lagged values of BTC are independent variables and other altcoins are dependent. Altcoins' delays is not added to the model. There may be autocorrelation in the models, but models reveal the relationship between the lagged values of bitcoin, which is the main purpose of the study, and altcoins. The relationship between Bitcoin and DXY was also examined with the VAR model (Formula 3). At the end of the study, Granger causality between all variables was tested.

$$R(t)=P(t)/P(t-1) - 1 \quad (1)$$

$$Altcoin(t) = c + BTC(t-1)+BTC(t-2)+ \dots + \epsilon \quad (2)$$

$$BTC(t) = c + DXY(t-1)+DXY(t-2)+ \dots + \epsilon \quad (3)$$

Figure 1: 2021, 29th October: Bitcoin and Market Leading Altcoins

Coin	Price	Market Value
Bitcoin BTC	$60,902.35	$1,166,465,950,106
Ethereum ETH	$4,227.15	$504,325,316,918
Binance Coin BNB	$487.59	$82,326,579,103
Cardano ADA	$1.99	$67,271,843,611
Solana SOL	$196.72	$59,933,246,779
Ripple XRP	$1.06	$50,332,406,549
Total Market Value		$2,610,379,126,471

4. FINDINGS AND DISCUSSION

Unit root tests of the return data results showed that there was no unit root in the series (Figure 2) Descriptive statistics of the data show that cryptocurrencies have positive average returns and has higher kurtosis. A spiked distribution is generally encountered in financial time series (Figure 3). The correlation matrix shows that bitcoin and altcoins are positively correlated. A weak negative correlation was seen between Bitcoin and DXY (Figure 4).

Figure 2: ADF Unit Root Test

t-stat	BTC_DH	ETH_DH	BNB_DH	ADA_DH	XRP_DH	DXY_D
C	-33.4016	-36.8055	-30.5443	-31.503	-33.1775	-34.8372
Trend	-33.4679	-36.9855	-30.5859	-31.697	-33.2185	-34.8568
**All of them significant at 0.01 prob.*						

Figure 3: Descriptive Statistics

	BTC_DH	ETH_DH	BNB_DH	ADA_DH	XRP_DH	DXY_D
Mean	0.001956	0.002163	0.004054	0.002463	0.001725	0.000045
Median	-0.000377	-0.000994	-0.000617	-0.003058	-0.003453	0.000000
Maximum	0.203951	0.796285	0.687700	0.333895	0.631161	0.016019
Minimum	-0.254496	-0.442665	-0.315663	-0.263819	-0.347581	-0.016823
Std. Dev.	0.035304	0.050561	0.052103	0.053767	0.061508	0.003014
Skewness	0.654800	2.508838	2.518768	1.066416	2.800272	0.322189
Kurtosis	9.755580	53.732270	31.303020	8.128043	25.358130	6.641720

Figure 4: Correlation Matrices

	BTC_DH	ETH_DH	BNB_DH	ADA_DH	XRP_DH	DXY_D
BTC_DH	1.000000	0.630439	0.493807	0.554383	0.437977	-0.092524
ETH_DH	0.630439	1.000000	0.452698	0.561811	0.450782	-0.069464
BNB_DH	0.493807	0.452698	1.000000	0.450425	0.376610	-0.088319
ADA_DH	0.554383	0.561811	0.450425	1.000000	0.511438	-0.085226
XRP_DH	0.437977	0.450782	0.376610	0.511438	1.000000	-0.054108
DXY_D	-0.092524	-0.069464	-0.088319	-0.085226	-0.054108	1.000000

Similar to most literature, the relationship between bitcoin and altcoins was resulted in this study on more recent data. When the VAR Models are examined (figure 5), a positive impact in the first, third and fourth lag of Bitcoin positively affects Etherium. Again, Bitcoin's first and second lags affect Binance, and Bitcoin's first, second and fourth lags affect Cordano in the same direction. However, Bitcoin's lag do not have a significant effect on Ripple. The lag of DXY have positive and negative effects on Bitcoin's returns. It can be said that Bitcoin is the leading indicator for the altcoins. When the Granger causality relationships between the data are examined, it is stated that the Granger causality relationship between Bitcoin and all other altcoins exist, except between Bitcoin and Ripple (Figure 6).

Figure 5: VAR Models Coefficients and t-stats

	ETH_DH	BNB_DH	ADA_DH	XRP_DH
BTC_DH(-1)	0.183039	0.090105	0.067452	0.069578
	[5.62926]***	[2.50887]**	[1.87617]*	[1.59603]
BTC_DH(-2)	-0.010885	0.110008	0.07261	0.03339
	[-0.33252]	[3.05161]***	[2.01040]**	[0.76201]
BTC_DH(-3)	0.086978	0.050153	0.019426	0.064932
	[2.65819]***	[1.38987]	[0.53790]	[1.48212]
BTC_DH(-4)	0.089242	0.006779	0.083899	-0.036971
	[2.74145]***	[0.18796]	[2.34054]**	[-0.85086]
BTC_DH(-5)	--	-0.060074	--	--
		[-1.66204]*		
BTC_DH(-6)	--	-0.068117	--	--
		[-1.88594]*		
BTC_DH(-7)	--	0.002595	--	--
		[0.07235]		
BTC_DH(-8)	--	0.006496	--	--
		[0.18075]		
BTC_DH(-9)	--	-0.043053	--	--
		[-1.19919]		

	BTC_DH
DXY_D(-1)	-0.443512
	[-1.40137]
DXY_D(-2)	0.40252
	[1.27597]
DXY_D(-3)	-0.684955
	[-2.16963]**
DXY_D(-4)	0.244218
	[0.77667]
DXY_D(-5)	0.401819
	[1.27784]
DXY_D(-6)	0.545036
	[1.73425]*
DXY_D(-7)	0.548892
	[1.74297]*
DXY_D(-8)	0.244291
	[0.77633]
DXY_D(-9)	-0.61698
	[-1.95668]*

BTC_DH(-10)	--	0.014598	--	--
		[0.40946]		

*Significance probabilities, *** 0.01, ** 0.05, *0.1.*

Figure 6: Granger Causality Relationships

BTC_DH	→	ETH_DH	***	ETH_DH	→	BTC_DH	***
BTC_DH	→	BNB_DH	***	BNB_DH	→	BTC_DH	*
BTC_DH	→	ADA_DH	***	ADA_DH	→	BTC_DH	**
BTC_DH	✗	XRP_DH		XRP_DH	✗	BTC_DH	
BTC_DH	→	DXY_D	**	DXY_D	→	BTC_DH	**

*Significance probabilities, *** 0.01, ** 0.05, *0.1.*

5.CONCLUSIONS

Investors include not only Bitcoin but also altcoins in their portfolios as an investment assets. Altcoins are gaining weight in the cryptocurrency market. In this study I examined the relationship between Bitcoin and altcoins, I saw that the lagged values of bitcoin affected other altcoins. BTC, which dominates 45% of the market as of October 2021, is the leading indicator for the altcoins. It is understood that DXY does not have much effect on BTC from this research. In future studies, the impact of BTC on total altcoins can be investigated by creating an altcoin index.

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