LINKS BETWEEN MAJOR STOCK MARKET INDEX QUOTES AND BITCOIN CURRENCY DEVELOPMENTS

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Abstract:

Virtual currencies have been characterized by extreme volatility, since the emergence in 2009 of the bitcoin currency that was followed by the launch of several thousand other virtual currencies, of which about 1600 have survived to date, with a maximum capitalization of $ 200 billion in December 2017, many factors influencing their price evolution. The study aims to analyse whether the evolutions in the capital markets influence the crypto market.

Keywords: *Virtual currency, capital market, crypto market*

JEL classification: *E30, G41, O16;*

Introduction

The current world is facing massive stability problems and financial stability seems to be a central element of these problems. Cryptocurrencies, which have emerged relatively recently, cause, with or without intention, serious problems in the global financial balance. As we can see, the principle of communicating vessels reflects rather well the links between the evolutions of the capital markets and cryptocurrencies. This issue is analyzed in this article.

Literature review

In order to discuss in detail about features and how it works cryptocurrencies we should first start from their definitions, but this isn't an easy task. First we might say that cryptocurrencies are using the cryptography technique and are secured using public and private digital keys (Houben, R. and Snyers, A., 2018, Faulkner, J., 2016).

The European Central Bank defined cryptocurrencies as a form of unregulated digital money and has classified them as a subset of virtual currencies, being accepted and used among the members of a specific virtual community (ECB, 2012). The Bank for International Settlements (BIS) in the Committee on Payments and Market Infrastructures (CPMI, 2015) has qualified cryptocurrencies as digital currency schemes which have zero intrinsic value but its value is determined by demand and supply as any other commodities, - are not operated by any specific institution or individual, - allow remote peer-to-peer exchanges of electronic value without the need for intermediaries.

Thus, beyond the definitions we can say that there are many supporters of cryptocurrency but also many opponents (e.g. Matonis, 2011; Yermack, 2014, Andreas, 2018 etc.). Thus, it is quite unclear even for international financial authorities how the cryptocurrencies will evolve and what impact will have (CPMI, 2015). Also, the most interesting opinions and studies are those which anchor the evolutions of cryptocurrency to the nominal or real economy (Ali, Barrdear, Clews and Southgate, 2014; Baumohl, 2018 etc.), but this domain is still in development. Thus, the present paper tries to bring its piece of novelty.

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Methodology and Data

This study analyses the impact of the main US stock exchange rates (DOW JONES, S&P, NASDAQ) on bitcoin rates.

It is noteworthy that during the surveyed period (December 2016 –December 2018, the most significant in terms of volume and number of transactions), the price of bitcoin cryptocurrency reflected the evolution of the main international stock exchange indices, and that the "crash" of the rates for the main stock exchange indices (S&P, NASDAQ, DOW JONES) are elements with a much stronger impact on the depreciation of the bitcoin, than the spectacular increases of the stock exchange indices. The hypothesis to be checked is that is that the evolution of the market for cryptocurrencies follows the evolution of the market for capital.

The cryptocurrencies are considered highly volatile financial assets, with high risks, and when panic strikes the capital market, this panic propagates directly to the crypto market too.

The case study focuses on the impact of the rates for the main US stock exchange indices on the bitcoin. A reverse analysis, of the evolution of the cryptocurrencies on the capital market would be equally interesting, but the lack of relevant data – volume of all transactions with cryptocurrencies only in the US, makes this case study impossible.

Our paper uses data from the international statistical databases available online, regarding the main US stock exchanges. The surveyed period reflects data availability and relevance. For the econometric analysis we monitored the period 2016-2018, daily information starting with December 8, 2016, to December 6, 2018. The daily frequency is presumed by systematization and relevance of such indices. The econometric analysis used the Excel - Data Analysis software.

Results

Starting from the importance of the minimal rates, if we monitor the evolution of bitcoin and of the main stock exchange indices rates, one may notice (Figure 1 and Table 1) a strong and positive correlation between the evolution of the bitcoin and of the stock exchange indices for the period December 2016-December 2018.

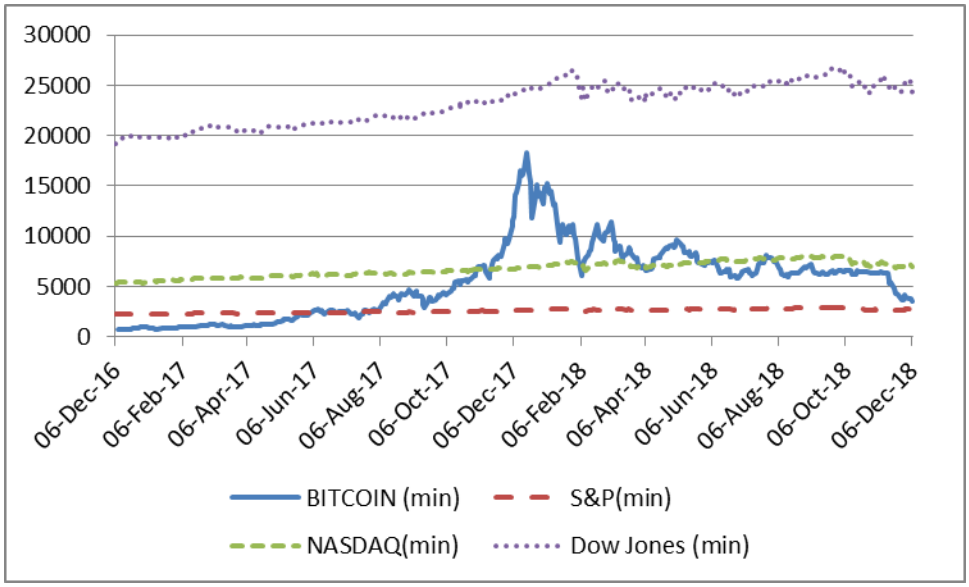

Figure 1 – Evolution of the minimal rates of the bitcoin and of the stock exchange indices – S&P, NASDAQ, Dow Jones in the interval 6.12.2016-6.12.2018

Source: http://coinpaprika.com, https://finance.yahoo.com/

Table 1

Correlation matrix between the minimal rates of the bitcoin and of the main stock exchange indices

	BITCOIN (min)	*S&P (min)*	*NASDAQ (min)*	*Dow Jones (min)*
BITCOIN (min)	1			
S&P (min)	0,731624928	1		
NASDAQ (min)	0,686546373	0,988288866	1	
Dow Jones (min)	0,783248039	0,987634021	0,963905024	1

Source: authors processing; data from http://coinpaprika.com and https://finance.yahoo.com/

If the evolution of volumes is also analyzed, the link between bitcoin and the main international stock market indices is maintained, but this reflects to a lesser extent the positive and direct correlation between the analyzed elements (see Table 2).
If we analyze the connection between bitcoin and the main international stock exchange indexes on closing quotations, we can see that the correlation is maintained (see Table 3), but to a lesser extent it reflects the positive and direct relationship between the analyzed elements.

Table 2

Correlation matrix between the trading volumes of the bitcoin and of the main stock exchange indices

	BITCOIN (volume)	*S&P (volume)*	*NASDAQ (volume)*	*Dow Jones (volume)*
BITCOIN (volume)	1			
S&P (volume)	0,072182967	1		
NASDAQ (volume)	0,182205393	0,795416843	1	
Dow Jones (volume)	0,321474883	0,780894439	0,650338107	1

Source: authors processing; data from http://coinpaprika.com and https://finance.yahoo.com/

Table 3

Correlation matrix between the closing quotation of the bitcoin and of the main stock exchange indices

	BITCOIN (closing)	*S&P (closing)*	*NASDAQ (closing)*	*Dow Jones (closing)*
BITCOIN (closing)	1			
S&P (closing)	0,713526937	1		
NASDAQ (closing)	0,664363941	0,988452842	1	
Dow Jones (closing)	0,764753257	0,988190694	0,963804029	1

Source: authors processing; data from http://coinpaprika.com and https://finance.yahoo.com/

Analysing the relation between the maximal rates of the bitcoin and the main stock exchange indices, one may notice that the strong correlation remains, but it reflects to a lesser extent the positive and direct relation between the analysed elements than the closing and minimal rates.
Thus, it is checked the hypothesis that the relation between the evolution of the maximal rate of the bitcoin and the maximal rates of the main stock exchange indices (S&P, NASDAQ and Dow Jones) is strong. However, the correlation is weaker than when the minimal rates of the bitcoin and of the selected stock exchange indices were used.

Based on the correlation matrices, we only considered the relation between the evolution of the minimal rates of the bitcoin and of the main stock exchange indices.
Thus, for the calculation of the regression equation showing the relation between these two elements, we only monitored the indicators with rather strong correlation.

Table 4

Correlation matrix between the maximal rates of the bitcoin and of the main stock exchange indices

	BITCOIN (max)	*S&P(max)*	*NASDAQ(max)*	*Dow Jones (max)*
BITCOIN (max)	1			
S&P(max)	0,705789306	1		
NASDAQ(max)	0,653548951	0,98863445	1	
Dow Jones (max)	0,755820621	0,989038584	0,964425267	1

Source: authors processing; data from http://coinpaprika.com and https://finance.yahoo.com/

Table 5

The result of the regression equation regarding the link between the minimum quotes of bitcoin and the stock market indicators (S&P, NASDAQ, Dow Jones between 8.12.2016-6.12.2018)

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,8291385
R Square	0,6874706
Adjusted R Square	0,6855879
Standard Error	2032,7711
Observations	502

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	4,527E+09	1508857607	365,14999	2,5007E-125
Residual	498	2,058E+09	4132158,373		
Total	501	6,584E+09			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-18764,925	4159,139	-4,511	8, 03E-06	-26936,548	-10593,301	-26936,54	-10593,30
S&P(min)	-22,142	6,227	-3,555	0,0004129	-34,377	-9,907	-34,377	-9,907
NASDAQ(min)	-1,845	0,936	-1,971	0,0492716	-3,685	-0,005	-3,685	-0,005
Dow Jones (min)	4,045	0,328	12,300	1,509E-30	3,399	4,691	3,399	4,691

Source: authors processing; data from http://coinpaprika.com and https://finance.yahoo.com/

Thus, the simple regression model proposed for the study of the evolution of the minimal rate of the BITCOIN (St), is analysed depending on the minimal rates of S&P, NASDAQ, Dow Jones (Xt) and has the following simplified formula:

$BITCOIN_{min}$= f($S\&P_{min}$, $NASDAQ_{min}$, Dow $Jones_{min}$) sau

$BITCOIN_{min}$=c(1)+c(2)*$S\&P_{min}$+c(3)*$NASDAQ_{min}$,+c(4)* Dow $Jones_{min}$+εt

Analysing the value of the determination coefficient, R^2, used to measure the intensity of the correlation between the endogenous variable and its determinants, one can notice that the value of 0.68 is good, value also maintained by the adjusted R^2, which suggests a strong correlation between the model variables.

One of the problems of any regression model is the way of determining its parameters. In this case we used the generalized least squares technique, also incorporated in Data Analysis or Excel data analysis software.

The use of this instrument allowed us to estimate the model parameters. The values of the coefficients estimated for the sample are as follows: c(1) = -18764,925, c(2) =-22,142355, c(3) = -1,8456491 and c(4) = 4,045559.

Coefficient c(1) shows the minimal bitcoin value if the value of the other variables is zero, while coefficient c(2) shows the increase of the minimal bitcoin value when the minimal rate for S&P increases by one unit. Coefficient c(3) shows the increase of the minimal bitcoin value when the minimal rate for NASDAQ increases by one unit. Coefficient c(4) shows the increase of the minimal bitcoin value when the minimal rate for Dow Jones increases by one unit.

The values of the coefficients show that their sign is positive only for the rate of Dow $Jones_{min}$, which shows that the correlation of this indicator with the evolution of $BITCOIN_{min}$ is direct, while the correlation between the rates of the other stock exchange indexes and the $BITCOIN_{min}$ is reverse.

Table 5 data show that most coefficients are significantly different from zero, have an associated probability, a p-value below 0.05, which confirms the fact that they are significant within the total statistical population and that H0 null hypothesis is rejected for these indices. We may, therefore, conclude that the model was correctly specified and evaluated and that the influence on the dependent variable ($BITCOIN_{min}$) comes from these factors.

All the results we obtained are of good credibility, as the number of observations is significant (502 records). Unfortunately, the study revealed the correlations between the daily evolutions of the indices, and we have no possible correlations for these indicators for periods other than one day.

The results of this case study can be completed by a broader study in which, along with the stock exchange rates, we might study other macroeconomic variables too.

It would be interesting to analyse the relation between the economic evolutions of the economies (savings) that allow transactions with cryptocurrencies. This aspect would also be interesting in the opposite direction, more exactly – the evolution of the bitcoin on those economies.

In order to eliminate any doubts about the existence and strength of the links between the analyzed elements, we mention that in another study of ours were we additionally confronted with problems of lags and the connection of bitcoin with major international exchange rates, the Augmented Dickey - Fuller Unit Root Test and Standard Granger Causality Test confirmed the results mentioned above.

Conclusions

The case study is an attempt to connect information on the bitcoin in relation with the main stock exchange indices, Dow Jones, S&P, NASDAQ.

The main purpose of the case study was to provide understanding on the relations between the analysed elements, with the purpose to anticipate the future evolution of the bitcoin and of other virtual coins too, as basis for the a more rigorous regulation of the cryptocurrencies.

The case study focuses on the analysis of the impact of stock exchange indices on bitcoin evolution. The evolution of the bitcoin can be shown by econometric analysis using statistical data for specific periods, e.g. daily data for the interval December 8, 2016 to December 6, 2018.

The correlations between the analysed elements and the regression equation taken into consideration support the hypothesis that the stock exchange evolutions, particularly during the period of strong depression, have a significant negative influence on the bitcoin.

The extremely favourable evolution of the stock exchange also has a strong positive influence on the bitcoin, but not as strong as the “crashes” of the capital market.

The closing rates also have strong information value for the evolution of the bitcoin, but lower than the minimal rates, particularly as the bitcoin is often traded during the days that are officially nonworking days, which the stock exchange operators observe. Thus, the bitcoin traders can “reflect” more on the closing rates of the stock exchanges and take decisions that strengthen the relations between the cryptocurrency and the stock exchange rates.

Regarding the volume of transactions, the relation between the volume of virtual coins and the volume of the stock exchange assets maintains, being in a direct correlation, but the relation is much weaker.

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