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ECONOMETRIC MODEL ON THE EVOLUTION OF BITCOIN TRANSACTIONS

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Abstract
In recent years, an increasing number of people are investing in the cryptocurrency market. The evolution of cryptocurrencies has been rapid and tumultuous. Since the emergence of Bitcoin in 2009, a multitude of cryptocurrencies have been created, each with unique features and functionality. These digital currencies operate on blockchain technology, which ensures secure, transparent and decentralised transactions. The evolution of cryptocurrencies in digital asset transactions is a complex and ever-changing topic that requires detailed and up-to-date analysis. In the research, different aspects and factors that may influence the evolution of cryptocurrencies in transactions are considered, the objective of our analysis is to examine the price level and volume of Bitcoin transactions over time to determine whether these variables show significant fluctuations. This analysis studies the trend for the year 2023, intru cat, Bitcoin, represents a popular cryptocurrency that has gained considerable attention in recent years, and its price and trading volume have been subject to dramatic changes.

Keywords: *cryptocurrency market, Bitcoin; digital asset transactions; Blockchain-based technologies; FTX-trading platform.*

JEL Classification: *G12, M10, O16.*

I. INTRODUCTION

Cryptocurrencies have evolved from being seen as technological curiosities to viable financial assets and potentially profitable investments. Cryptocurrencies are generated through the process of mining data. Using computers and graphics cards, as well as complex mathematical algorithms, a certain value expressed in cryptocurrencies is created. In every currency system, a certain set of rules must be established to control a level of supply and to impose safeguards to protect fraud within the system. Similarly, the (traditional) paper money supply is regulated by central banks; the supply of cryptocurrencies is controlled by the set of safeguards imposed within the system. The only difference is that cryptocurrencies do not use the authority of central banks and are not backed by natural assets. Cryptocurrency units called "coins" are used to store and transfer value between users of the network. "Coins" serve the same function as paper money and are used to buy other cryptocurrencies, goods and services. They can also be used to transfer money to other people. The value of the coins is stored in the "online wallet", which is the software wallet stored in the computer or mobile device (Antonopoulos, 2014).

Cryptocurrencies and blockchain-based technologies are gaining more and more ground, gaining more and more relevance over the last years as a solution for online payments and investments. More and more people are starting to use cryptocurrency transactions, with bitcoin having a steady number of transactions of around 250,000 every day from 2017-2018, peaking in early January 2021, with around 400,000 daily transactions (de Best R., 2022), while another major player in cryptocurrency transactions is Ethereum, which has a number of over one million transactions in July 2021 (de Best R., 2022). Bitcoin and other cryptocurrencies represent a possible future of money, with an emerging consensus that they will radically change the global financial system.There are nearly 2 billion potential consumers, worldwide, who are unbanked. Cryptocurrencies could enable each of them to participate in the world's financial life. What they do and say with this opportunity will change us all forever.

By analysing price fluctuations, we can better understand the behaviour and trends of the Bitcoin market. Bitcoin's price is influenced by a number of factors such as supply and demand, mass adoption, government regulations, market sentiment and geopolitical events. Thus, examining the price level over time can give us insight into the volatility and trends of the Bitcoin market. Transaction volume also represents the total amount of bitcoin traded in a given time frame. Transaction volume can reflect the interest and activity of investors and traders in

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the Bitcoin market. Analysis of transaction volume can help us identify significant fluctuations as well as times of increasing or decreasing activity in the Bitcoin market.

We also appreciate that the paper is topical and valuable material for all those interested in this problematic area of cryptocurrencies, especially as the probusiness of the largest cryptocurrency exchange, FTX, was announced in mid-November 2022 (Mihalciuc et al., 2022).

II. LITERATURE REVIEW

The idea for cryptocurrency first emerged in 1983, when American cryptographer David Chaum published a conference paper describing an early form of anonymous cryptographic electronic currency. The concept was for a currency that could be sent without tracking and in a manner that did not require centralized entities (i.e. banks). In 1995, Chaum built on his early ideas and developed a proto-cryptocurrency called Digicash. It required user software to withdraw funds from a bank and required specific encrypted keys before those funds could be sent to a recipient (Larue, 2020). A next step in the history of cryptocurrencies is the launch of the associated Bitcoin platform, as Usman mentions in his study "A history of Bitcoin". The first to mine Bitcoin was Nakamoto himself, mining the first tranche, this tranche containing a number of 50 Bitcoins, in total Nakamoto mined about 1 million Bitcoins. Note that the first person to download the Bitcoin app is Hal Finney, he was also the first person to make a Bitcoin transaction, receiving 10 Bitcoins from Nakamoto (Chohan, 2022). We conclude, therefore, that the first and most representative currency for the cryptocurrency field is Bitcoin, while also representing a path to the beginning of this field that is living its genesis (Mihalciuc et al., 2021).

The terminology of the word Bitcoin comes from the English language in which "Bit" represents a unit of binary information and "coin" means currency. Bitcoin was the first cryptocurrency to appear on the market, this was due to the creator with the pseudonym "SatoshiNakamoto". The first bitcoin appeared in 2009 with a complex cryptographic system behind it.Bitcoin (BTC) was created to provide investment protection and free business financing, without the use of financial institutions and free from all constraints and regulations. The name Bitcoin also refers to both the opensource software for the use of these coins and the peer-to-peer network that it forms (Samoil, 2017).The idea behind the creation of this cryptocurrency was a little game of imagination. Suppose we have a piece of paper with a distinct signaturewhich is worth 10 lei, if we gave this piece of paper to a person and the community trusted this piece of paper it would retain its value and could be traded. If we put more pieces of paper back on the market, but in a limited number they will have the value that the market will give them. People will buy and sell the paper at the market price. This is where the idea of cryptocurrency originated from, being a currency that has its value according to the market, the only thing that makes this currency expensive is the fact that it is limited numerically i.e. only a certain number of cryptocurrencies of the same kind, can be in the market (Narayann et al., 2017).

Bit Gold, often considered a direct precursor to Bitcoin, was designed in 1998 by Nick Szabo. It required a participant to devote computer power to solving cryptographic puzzles, and those who solved the puzzle received a reward. Combined with Chaum's work, the result is something that looks a lot like Bitcoin. But Szabo couldn't solve the infamous double-spending problem (digital data can be copied and pasted) without the use of a central authority. As such, it wasn't until a decade later that a mysterious person or group, using the pseudonym SatoshiNakamoto, set the history of Bitcoin and subsequent cryptocurrencies in motion by publishing an article called "Bitcoin - A Peer to Peer Electronic Cash System".

Bitcoin is a digital asset designed to function as a medium of exchange. Users can send and receive native tokens, "bitcoins", while validating transactions in a decentralised and transparent way. The underlying technology is based on a public ledger, or blockchain, shared among participants and a reward mechanism in terms of Bitcoins as an incentive for users to run the transaction network. It relies on cryptography to secure transactions and control the creation of additional units of the currency, hence the name "cryptocurrency". After Bitcoin emerged in 2009, around 1500 other cryptocurrencies were introduced, of which around 600 are actively traded today. All cryptocurrencies share the underlying blockchain technology and reward mechanism, but usually live in isolated transaction networks. Many of them are basically clones of Bitcoin, albeit with different parameters such as different provisioning, transaction validation times, etc. Others have emerged from more significant innovations of the underlying blockchain technology.

Cryptocurrencies are currently used both as a medium of exchange for everyday payments, the main reason Bitcoin was introduced, and for speculation (Chu et al., 2019). Other uses include payment medium for inexpensive cross-border money transfers and various non-monetary uses such as time stamping. The self-organisation of different uses both within a single cryptocurrency and as a differentiator between cryptocurrencies makes the cryptocurrency market unique and its price highly volatile. Between 2.9 and 5.8 million private as well as institutional users actively exchange tokens and run different transaction networks (Maffei et al., 2021). In May 2017, the market capitalisation of active cryptocurrencies exceeded $91 billion (Marr, 2017). Bitcoin currently dominates the market, but its leading position is being challenged by both technical concerns (Dyhrberg, 2016) and technological improvements in other cryptocurrencies (Jobes, 2018).

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Issue 2 / **June** 2023 ISSN-L 2344-102X

Despite the theoretical and economic interest in the cryptocurrency market (Larue, 2020), however, a comprehensive analysis of its dynamics is still lacking. Existing studies have either focused on Bitcoin, analysing, for example, its transaction network (Cuccuru, 2017) or its price behaviour and destiny (Bariteau, 2018), or on a small group of cryptocurrencies (usually 5 or 10) of particular interest (Grinberg, 2012).But even here, there is disagreement as to whether Bitcoin's dominance may be at risk or its future dominance as a leading cryptocurrency is not questionable (Corbet et al., 2018). In recent years, cryptocurrencies have gained increasing popularity and have become an increasingly popular way to conduct financial transactions (Kshetri, 2018). However, with this popularity comes a number of risks and vulnerabilities associated with cryptocurrencies.

Cryptocurrencies are known for their high volatility. Prices can fluctuate significantly over the course of a day and can fall or rise by hundreds or even thousands of dollars in a short period of time. This high level of volatility makes trading cryptocurrencies a risky business and can lead to significant financial losses (Antonopoulos, 2014).Cryptocurrencies were created out of a basic human need, namely security. Every person who trades online wants it to be a secure transaction, as fast and efficient as possible (see www.geeksforgeeks.org). Although these virtual currencies are in their infancy, this has not prevented an expansion of the field to a wide audience. For example according to Coin Market Cap, the total value of the cryptocurrency market registered a value of over $1.7 trillion at the end of February 2022 (coinmarketcap.com). To give you an idea of what this number means, the gross domestic product of a country the size of Canada in 2020 would be worth $1.65 trillion, according to the World Bank (see worldbank.org). Even though this field is just being formed, it is showing continuous and rapid expansion, with its current value being astronomical, which may suggest that this is an important field in which many people see huge potential.

Currently, the cryptocurrency market is shaken by the bankruptcy of the FTX cryptocurrency trading platform (trading platform for the main cryptocurrencies - which has a total volume of €1,612,411,073 - 130 markets and 210 parities) (see FTX, crypto.ro), and the most popular cryptocurrencies, Bitcoin and Ethereum, have fallen sharply, with confidence in the market shaken, perhaps irreversibly (see euronews.ro). Thus, after FTX's announcement, bitcoin dropped considerably to a two-year low of $15,632, trading 5.7% lower at $16,524. The bankruptcy of the FTX trading platform has had collapsing effects on the entire crypto market, even though FTX is one of several cryptocurrency exchanges (Mihalciuc et al., 2022). So, as crypto markets continue to experience the effects of the FTX crash, one of the world's leading cryptocurrency exchanges, the importance of crypto analysis is becoming increasingly apparent (see ziare.com). FTX at the time of the collapse was considered to be one of the largest cryptocurrency trading platforms, which according to Forbes at its peak FTX amassed a market value of $26.5 billion (see forbes.com). At the same time evidence has emerged showing that FTX was using coins from customer accounts to make high-risk investments through Alameda Research. This company is majority owned by FTX CEO Sam Bankman-Fried. It is believed that FTX went bankrupt because of this (see Ge Huang et al., 2022). Reuters claims in an article that Sam Bankman-Fried allegedly transferred somewhere in the region of $10 billion from FTX to Alameda Resarch, and somewhere in excess of $1 million of customer money disappeared after FTX's collapse (Berwick, 2022).

Cryptocurrencies, for their historical stage, have an extremely high value, which can only suggest that in the future, when the field matures, cryptocurrencies will be the most widely used payment method for the general public.

III. RESEARCH METHODOLOGY

The research hypotheses are related to the influence of the time variable on the Price/Vol variable, using a cubic model.

- *H0 (null hypothesis):* This hypothesis states that the Price/Vol variable is not influenced by the time variable. In other words, there is no significant relationship between these two variables.
- *H1 (alternative hypothesis):* This hypothesis states that the Price/Volume variable is influenced by the time variable using a cubic model. This suggests that there is a significant relationship between the two variables and this relationship can be approximated using a cubic model.

Time is a vital factor in many areas, including the analysis of financial markets and price behaviour. In an ever-changing world, understanding how time influences prices and trading volumes is essential for traders, investors and economists.

This part of the paper aims to explore the use of a cubic model to identify the complex relationship between time and price/volume trading.The cubic model offers an interesting approach to analysis, assuming that there is a cubic-shaped relationship between time and the variable of interest, in our case price and volume. This relationship can provide valuable information about long-term trends and the interaction between these two variables.

In order to perform this analysis, relevant price and volume trading data were collected for the period 05.01.2023 - 07.06.2023. The data provided were obtained from the platform "investing.com".

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IV. RESULTS AND DISCUSSIONS

For a more detailed analysis, Figure 1 shows the evolution of the volume of transactions as a graph. On the horizontal axis is the data and on the vertical axis is the volume of transactions expressed in units. We see that the values of the trading volume vary each day.

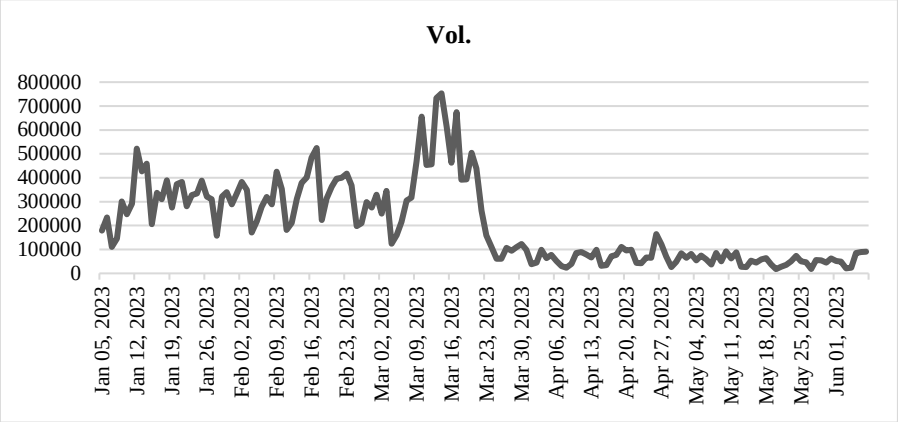

Figure 1. Evolution of transaction volume
Source: own processing after: https://www.investing.com

In order to analyze the price evolution in the given table, we need to focus on the "Price" column. It indicates the value of the share price each day, and is shown on the diagram, in Figure 2.

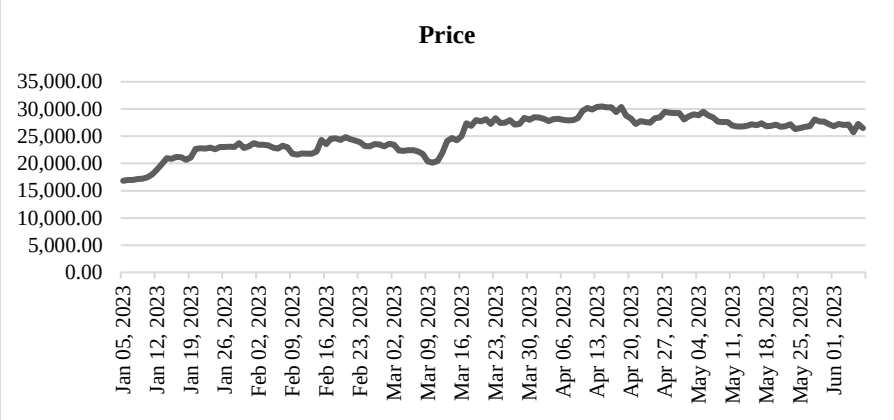

Figure 2. Price evolution
Source: own processing after: https://www.investing.com

The analysis uses cubic regression to estimate the relationship between the independent variable (the sequence of cases) and the dependent variable (the stock price or trading volume). The estimated cubic regression equation, fitted to the variables under analysis, has the general form (1).

$$PRICE/VOL = \alpha + \beta \times t + \gamma \times t^2 + \mu \times t^3 + \varepsilon \qquad (1)$$

Where:

α= constant,
β = sequence of cases ,
ϒ=sequence of cases**2,
μ=sequence of cases**3,
t is the time variable, i.e. the period rank.

According to Table 1, the MOD_1 model is constructed using the cubic equation (Equation 1), which means that the dependent variable (Price and Volume) is estimated as a cubic function of the independent variable (the sequence of cases). Thus, we want to understand how price and volume evolve as a function of the sequence of cases or their sequential order over time.

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Table 1. Model description

Model Name		MOD_1
Dependent Variable	1	Price
	2	Vol
Equation	1	Cubic
Independent Variable		Case sequence
Constant		Included
Variable Whose Values Label Observations in Plots		Unspecified
Tolerance for Entering Terms in Equations		.0001

Source: own processing used IBM SPSS Statistics, version 26

In our model, we have two dependent variables: Price and Volume. These represent values that we try to predict or explain using the independent variable - the sequence of cases. We also add a constant term to the equation, which represents the intercept or initial value of the dependent variables in the absence of the influence of the independent variable.

- Model name: MOD_1 - This is the name of the model under analysis.
- Dependent variable: The model has two dependent variables: 'Price' and 'Vol'. These are the variables we are trying to predict or explain based on the independent variables.
- Equation: The model uses a cubic equation. In this case, the dependent variable is estimated as a cubic function of the independent variables.
- Independent variable: The independent variable in this model is the 'sequence of cases'. This represents a sequential order of cases and is used to analyze the evolution of the dependent variables (Price and Volume) over time.
- Constant: The model includes a constant term. This means that there is an intercept term (α) in the regression equation that does not depend on the independent variable.
- Variable whose values label the observations in the plots: This component specifies that there is a variable used to label the observations in the plots, but the specific variable is not specified in the description provided.
- Tolerance for inclusion of terms in equations: The tolerance value of 0.0001 indicates the threshold for inclusion of terms in the regression equation. Terms with contributions below this value can be omitted from the model.

Cluster Table 2 provides relevant information on the analysis carried out. It includes data on the statistical model used and the variables involved in the analysis, as well as some important characteristics of the case processing process. There were no cases excluded from the analysis due to missing values in any of the variables considered.

Table 2. Summary of case processing

	N
Total Cases	154
Excluded Cases[a]	0
Forecasted Cases	0
Newly Created Cases	0
a. Cases with a missing value in any variable are excluded from the analysis.	

Source: own processing used IBM SPSS Statistics, version 26

In this analysis, all 154 available cases were considered, with no excluded cases, predicted cases or newly created cases. The exclusion of cases with missing values ensures the consistency and relevance of the analysis performed. The variable processing summary provides essential information about the values recorded in the dataset and helps us to better understand the characteristics of these variables. This information is presented in Tabel 3.

Table 3. Summary of variable processing

		Variables	
		Dependent	
		Price	Vol.
Number of PositiveValues		154	154
Number of Zeros		0	0
Number of Negative Values		0	0
Number of MissingValues	User-Missing	0	0
	System-Missing	0	0

Source: own processing used IBM SPSS Statistics, version 26

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Volume 11 / 2023 ISSN 2344-102X
Issue 2 / **June** 2023 ISSN-L 2344-102X

A total of 154 cases were examined in the review. Of these, no cases were excluded due to lack of data for the variables analysed. Thus, all 154 cases were included in the analysis, which gives us a complete coverage of the available data.For the variable "Price", 154 positive values were recorded, with no zeros or negative values. This suggests that the prices analysed are strictly positive and there are no cases where there are zero or negative prices.Similarly, for the variable "Vol" (volume of transactions), 154 positive values were also recorded, with no zeros or negative values. This tells us that the volume of transactions recorded in each case is strictly positive and there are no cases of zero or negative volume.There were also no missingvalues for either variable. This means that all cases include valid and complete values for the variables "Price" and "Vol", and no removal or filling of missing data is required.

In conclusion, this summary of variable processing gives us confidence in the quality of the data analysed. They are complete, with no missing values and cover the full set of cases. This table is a solid basis for further analysis of relationships and trends in prices and trading volumes.The model summary provides correlation and determination indicators related to the model analysed. These indicators are presented in Table 4 and provide us with essential information about the quality and fit of the model to the observed data.

Table 4. Model summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.885	*.784*	*.780*	*1556.345*

Source: own processing used IBM SPSS Statistics, version 26

The first indicator presented is the correlation coefficient (R). The value of this coefficient is 0.885, which suggests a strong correlation between the analyzed variables. The closer the value of the coefficient is to 1, the stronger the correlation between the variables. The next indicator is the coefficient of determination (R Square). This is a measure of the proportion of the variation in the dependent variable (Price) that can be explained by the independent variable (Vol). The value of the coefficient of determination is 0.784, which means that about 78.4% of the price variation can be explained by the variation in the volume of transactions. Adjusted R Square (adjusted R Square) is an indicator that adjusts the coefficient of determination for the number of independent variables and the size data set. This helps to assess model adequacy and control overwatering. In the case of the analyzed model, the adjusted R Square value is 0.780. The last indicator presented is the standard error of the estimate (Std. Error of the Estimate). It measures the dispersion of the residuals (the difference between the observed values and the values predicted by the model) and provides an estimate of the model's accuracy. The value of the standard error of the estimate is 1556.345. In conclusion, the values presented in the "Model Summary" table provide us with essential information about the fit of the model to the observed data. This information helps us assess the quality of the model and understand the extent to which price variability can be explained by trading volume variability.

The ANOVA table is a statistical analysis used to evaluate the significance of the regression model applied to the data. This table provides important information about the variation explained by the regression model and the unexplained variation, called residual error. In our case, the results are shown in Table 5.

Table 5. ANOVA (Analysis of Variance) for „Price”

	Sum of Squares	df	Mean Square	F	Sig.
Regression	1317504566.727	3	439168188.909	181.309	<.001
Residual	363331239.438	150	2422208.263		
Total	1680835806.165	153			

Source: own processing used IBM SPSS Statistics, version 26

From The variation explained by the regression model, represented by the sum of squares for the regression, is 1317504566.727. This indicates that the regression model contributes significantly to explaining the variation in the analyzed data. The F-statistic, with a value of 181,309, tells us that the difference between the variation explained by the regression model and the residual error is statistically significant. The associated significance level, <.001, suggests that this difference is not the result of chance, but reflects a significant correlation between the analyzed variables. In conclusion, the ANOVA table provides us with important information about the significance and validity of the applied regression model, helping us to understand how well it fits the data and how much it contributes to explaining the variation in the dependent variable. A significance level lower than 0.001 indicates that the parabolic relationship of the 3rd degree between the two analyzed variables is statistically significant. This means that there is a significant correlation between the variables and that the applied regression model is able to explain a significant part of the variation in the dependent variable based on the independent variables. In other words, there is a significant and strong association between the variables, and the model used is valid and useful in predicting the values of the dependent variable based on the values of the independent variables.

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Issue 2 / **June** 2023 ISSN-L 2344-102X

The coefficients shown in Table 6 help us understand the complex and non-linear relationship between the independent variable and the dependent variable in our model.

Tabelul 6. Coefficients for "Price"

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
Case Sequence	140.396	28.633	1.889	4.903	<.001
Case Sequence ** 2	-2.179	.428	-4.692	-5.086	<.001
Case Sequence ** 3	.006	.002	2.030	3.529	<.001
(Constant)	25878.317	514.123		50.335	<.001

Source: own processing used IBM SPSS Statistics, version 26

The unstandardized coefficients (B) indicate the estimated value of the effect of each independent variable on the dependent variable, without adjusting for the scaling of these variables. The standardized coefficients (Beta) represent the estimated value of the effect of each independent variable on the dependent variable, adjusted for the scaling of these variables . They are useful for comparing the relative importance of different independent variables in influencing the dependent variable. t-values and significance values (<.001) tell us whether the coefficients are statistically significant. If the significance value is lower than the chosen significance level (in this case, 0.001), we can conclude that the coefficients are statistically significant and have a significant effect on the dependent variable. Thus, we can see that all the coefficients, both unstandardized and standardized, have significance values below the significance level of 0.001. This indicates that all the coefficients are statistically significant and have a significant impact on the dependent variable. The equation of the cubic nonlinear model of price evolution (Price) can be written in the form:

$$Price = 25878.31 + 140.396 * t - 2.179 * t^2 + 0.006 * t^3 \quad (2)$$

From the coefficient μ=0.006>0, we can deduce that the equation of the cubic model has two inflection points. This means that the regression graph will have two points where the curve changes from a positive concavity to a negative concavity or vice versa. Interpreting the estimated equation of the model from an econometric perspective, we can say that as the independent variable (time) increases, the variable dependent (price) fluctuates. This suggests that the price has a non-linear evolution and is influenced by factors that cause changes over time. Also, the values of Sig. in column 6 shows that the t-test for the independent variable has a value less than 0.05, which indicates that there is a significant difference between the estimated coefficient and zero. Thus, we can reject the null hypothesis (H0) and accept the alternative hypothesis (H1), which means that the independent variable (time) has a significant effect on the dependent variable (price), using the cubic model. Therefore, we can conclude that the price fluctuates over time.

Based on the equation of the cubic model of the evolution of the price level, we can interpret the graph in figure 3 and observe the downward trend of the price.

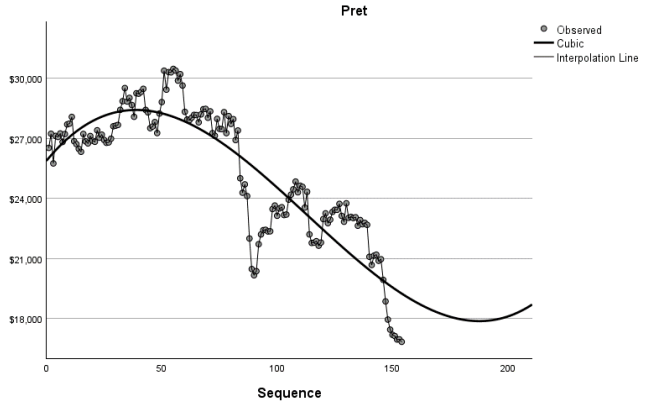

Figure 3. Estimation of the cubic regression model for Price
Source: own processing using IBM SPSS Statistics, version 26

The equation shows terms with different powers of the "Case Sequence" variable (representing time), such as t, t2, and t3. This suggests that the price does not evolve linearly, but has a more complex relationship depending on time. The terms with higher powers of the "Case Sequence" variable (t2 and t3) can contribute to the appearance of fluctuations in the graph. But the negative coefficients for these terms (-2.179 for t2 and 0.006 for t3) indicate

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that, as a whole, the price has a downward trend over time. Therefore, analyzing the graph of the evolution of the price level, we can see that it shows a downward trend, sustained of the equation of the cubic model.

The summary of the model for the "Vol" variable is presented in Table 7.

Table 7. Model summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.744	.554	.545	1145514.922

Source: own processing using IBM SPSS Statistics, version 26

The correlation coefficient, R, has a value of 0.744. This indicates an average correlation between the variables "Price" and "Vol" based on the cubic model. The correlation indicates the existence of a relationship between the two variables, but the value below 0.750 suggests that the intensity of the link is average. The value of the coefficient of determination, R^2, is 0.554. It indicates that approximately 55.4% of the variation of the variable "Vol" can be explained by the variation of the independent variable "time" based on the cubic model. In other words, the model used can explain 55.4% of the variability observed in the volume of transactions. Thus, we can conclude that the variable "time" influences the volume of transactions on average, and the existence of a relationship between the variables is supported by the correlation coefficient and the coefficient of determination. Price fluctuations may also be a contributing factor to the observed fluctuations in trading volume.

The analysis of variance (ANOVA) for the "Vol" variable is presented in Table 8.

Table 8. ANOVA (Analysis of Variance) for „Vol"

	Sum of Squares	df	Mean Square	F	Sig.
Regression	244679561825163.440	3	81559853941721.140	62.155	<.001
Residual	196830665634576.750	150	1312204437563.845		
Total	441510227459740.200	153			

Source: own processing using IBM SPSS Statistics, version 26

These results indicate that the regression is significant in explaining the variation in trading volume. The F statistic has a significant value (less than 0.001), which indicates that at least one independent variable has a significant impact on the dependent variable. Therefore, we can reject the null hypothesis that there is no relationship between the variables. It is important to note that the residuals (error) have a significant mean square value, which suggests that there is non-linear variation not explained by the model in the observed data. This may be caused by other factors or variables that were not included in the model. In conclusion, the ANOVA results show that the cubic regression model is significant in explaining the variation in transaction volume, and the existence of a relationship between the variables is statistically supported. However, non-linear variation not explained by the model must also be considered.

The values of the regression coefficients for the nonlinear cubic model for the variable "Vol" are presented in Table 9.

Table 9. Coefficients for "Vol"

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Case Sequence	-60715.076	21074.405	-1.594	-2.881	.005
Case Sequence ** 2	1612.155	315.388	6.773	5.112	<.001
Case Sequence ** 3	-7.608	1.338	-4.699	-5.687	<.001
(Constant)	932421.546	378409.595		2.464	.015

Source: own processing using IBM SPSS Statistics, version 26

These coefficients represent the contribution of each independent variable to the prediction of the dependent variable "Vol". Standardized coefficient values (Beta) indicate the relative importance of each independent variable in the model. t-values and significance values (Sig.) show how significant each coefficient is. For example, for Case Sequence ** 2, we have a t-value of 6.773 and a Sig. less than 0.001, which indicates statistical significance and a significant contribution to the regression model. The constant (Constant) represents the estimated value of the dependent variable when all independent variables are zero. Thus, the equation formula for the cubic regression model for the variable "Vol" is:

$$Vol = 932421.546 - 60715.076t + 1612.155t^2 - 7.608t^3 \quad (3)$$

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Issue 2 / **June** 2023 ISSN-L 2344-102X

These coefficients and the estimated equation allow us to make predictions on the values of the variable "Vol" according to the values of the independent variable "Case Sequence". The estimation of the cubic regression model for the variable "Vol" provides a more complex and detailed insight into the relationship between time and the volume of transactions, and is presented on the graph in figure 4.

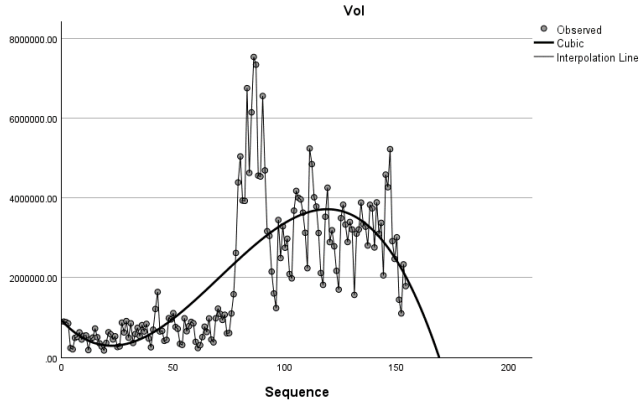

Figure 4. Estimation of the cubic regression model for Vol
Source: own processing using IBM SPSS Statistics, version 26

The evolution of transaction volume does not follow a simple linear trend, but is characterized by fluctuations and complex patterns. The maximum value of the "Vol" variable is 7530600.00, this indicates that, during the analyzed period, the transaction volume recorded a maximum value of 7530600.00. It is important to continue the analysis to interpret the results of the cubic model in more detail and to evaluate the statistical significance of the coefficients.

Descriptive statistics provide information on the distribution and variability of the data, and are presented in Table 10.

Table 10. Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
Price	154	$16,830	$30,473	$25,295.75	$3,314.492	-.611	.195
Vol	154	177200.00	7530600.00	2058598.7013	1698731.22099	.922	.195
Valid N (list wise)	154						

Source: own processing using IBM SPSS Statistics, version 26

For the variable "Price", we have the following statistics:

- Number of observations (N): 154
- Minimum value: $16,830
- Maximum value: $30,473
- Average: $25,295.75
- Standard deviation: $3,314,492
- Skewness: -0.611

These statistics indicate that the price has considerable variation, with a minimum value of $16,830 and a maximum value of $30,473. The mean price is $25,295.75 and the standard deviation shows that the data is scattered around the mean with a value of $3,314,492. The negative skewness (-0.611) indicates a slight skewness to the left in the price distribution.

For the variable "Vol" (volume of transactions), we have the following statistics:

- Number of observations (N): 154
- Minimum value: 177,200.00
- Maximum value: 7,530,600.00
- Average: 2,058,598.7013
- Standard deviation: 1,698,731.22099
- Skewness: 0.922

These statistics also indicate that there is significant variation in transaction volume. The minimum trading volume is 177,200.00 and the maximum trading volume is 7,530,600.00. The mean of the trading volume is 2,058,598.7013 and the standard deviation is 1,698,731.22099. The positive skewness (0.922) indicates a slight asymmetry to the right in the distribution of transaction volume. Between the variable "Price" and the variable

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Volume 11 / 2023 ISSN 2344-102X
Issue 2 / **June** 2023 ISSN-L 2344-102X

"Vol" there is a significant correlation, indicated by the Pearson correlation coefficient of 0.922. This suggests that there is a strong and positive relationship between price and trading volume.

The cubic regression model used to analyze the evolution of the "Price" variable indicates that the price has a downward trend over time. The estimated coefficients for the cubic model of price evolution are: α=25878.317, β=140.396, ɣ=-2.179, μ=0.006. Regarding the "Vol" variable, the cubic regression model indicates that the volume of transactions has a complex relationship with the "Case Sequence" variable as a function of time. The estimated coefficients for the cubic volume evolution model are: α=932421.546, β=-60715.076, ɣ=1612.155, μ=-7.608. The descriptive statistical analysis shows that the "Price" variable has a mean of $25,295.75, with a standard deviation of $3,314,492. The "Vol" variable has a mean of 2,058,598.7013, with a standard deviation of 1,698,731.22099. This information provides a picture of the distribution and variability of the data.

In conclusion, there is a significant correlation between price and transaction volume, and their evolution over time can be analyzed by means of cubic regression models. The "Price" and "Vol" variables show fluctuations and are influenced by the time variable in a complex way. These results can be useful for understanding and analyzing the market and for making financial or commercial decisions.

V. CONCLUSION

The rapid growth and volatility of cryptocurrencies has led to increased global interest and scrutiny by organizations, investors, regulators, governments and others. The most popular and used cryptocurrency is Bitcoin; however, there are over 1,500 cryptocurrencies in circulation. Stakeholders are concerned about the accounting and tax implications associated with cryptocurrencies. Finally, in order to reduce the risks associated with cryptocurrencies, it is important to work with specialists in the field and constantly monitor market developments. Based on the case study on the evolution of Bitcoin transactions for the year 2023, we can state that the evolution of the price of Bitcoin in the year 2023 is characterized by significant fluctuations. This indicates high volatility in the cryptocurrency market and possible trading opportunities.

The cubic regression model used to analyze the Bitcoin price evolution indicates a complex relationship between the variable time and price. The estimated coefficients for the cubic model of Bitcoin price evolution could be used to predict future trends and make investment decisions. The volume of Bitcoin transactions in the year 2023 shows a significant increase. This suggests increased investor interest and greater engagement in the cryptocurrency market. The correlation between Bitcoin price and trading volume can be used to understand market dynamics. An increase in trading volume may indicate an increase in interest and trading activity in the market.

In conclusion, the case study on the evolution of Bitcoin transactions for the year 2023 gives us an insight into the trends and fluctuations of the cryptocurrency market.

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