Фінанси, банківська справа, страхування та фондовий ринок

UDC 336.74:336.76:339.7

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GENERATING TRADER FORECASTS BASED ON THE DYNAMICS OF THE MINIMUM BITCOIN PRICE AND THE MACD HISTOGRAM
ФОРМУВАННЯ ПРОГНОЗІВ ТРЕЙДЕРА НА ОСНОВІ ДИНАМІКИ МІНІМАЛЬНОЇ ЦІНИ БІТКОЇНА І ГІСТОГРАМИ MACD

Summary. *Introduction. The bitcoin market remains one of the most dynamic and attractive sectors in the world of modern finance. In recent years, bitcoin has repeatedly experienced significant price fluctuations, which has encouraged investors and traders to constantly monitor, analyze and forecast its price. Forecasting is a critical tool for successful operations in the bitcoin market, and its importance for a trader is driven by the need to make informed*

decisions, reduce risks, identify market trends, optimize portfolios, and conduct strategic planning. In this context, one of the key aspects for traders is to analyze the dynamics of the minimum bitcoin price, and the use of technical indicators (such as the MACD histogram) allows traders to assess crypto market trends and potential entry or exit points. Accordingly, there is a need to consider a practical mechanism for generating trader forecasts based on a comprehensive analysis of the dynamics of the minimum bitcoin price and the MACD histogram, which will help traders increase the efficiency and accuracy of market decisions.

Purpose. The purpose of the study is to analyze the relationship between the dynamics of the minimum price of bitcoin on the weekly timeframe and the MACD histogram as a prerequisite for the formation of traders' forecasts and their behavior in the cryptocurrency market.

Materials and methods. In the process of writing the article, the following methods of general theoretical and empirical research based on a systematic approach were used: abstract-logical method (for systematization of scientific publications on the problems of analysis of the cryptocurrency market and the price of bitcoin); graphical method (for construction of the MACD histogram and dynamics of the minimum price of bitcoin); analysis method (for analysis of the dynamics of the minimum price of bitcoin on a weekly timeframe and the MACD histogram); the method of comparisons (in the process of comparing the dynamics of the minimum price of bitcoin and the MACD histogram, establishing the relationship between them); the method of coefficients (to determine the average and maximum length of the series of the minimum price of bitcoin, the length of the series of price repetition of the MACD movement direction); the method of formalization (to establish the relationship between the minimum price of bitcoin and the MACD histogram from week to week; to establish the relationship between price changes in the current and next weeks), the method of synthesis (to demonstrate how the joint use of two technical

analysis indicators - MACD and the minimum price of bitcoin - can help traders make more effective and balanced trading and investment decisions); the method of generalization (to formulate the conclusions of the study).

Results. The research focused on establishing the degree of correlation between the MACD histogram and the minimum price of bitcoin on the weekly timeframe as one of the prerequisites for making traders' forecasts in technical analysis. The main objectives of the study were to determine whether the minimum price of bitcoin increased or decreased compared to the previous week with a similar change in the MACD; to determine the average and maximum series for the minimum weekly price. The study demonstrates how the combined use of these two technical analysis indicators can help traders make more efficient and informed trading and investment decisions.

The study found that in 61.26% of cases, a trader can expect an increase in the minimum price of bitcoin this week if the MACD histogram showed an increase in the previous week; or a decrease in the minimum price of bitcoin this week if the MACD histogram showed a decrease in the previous week. With the MACD falling from the "Below zone" and rising from the "Above zone" in the first week, this probability is significantly higher: 83.33% and 82.35% respectively. A trader can expect that the low price of bitcoin will continue its direction of movement in the second week in 49.08% of cases. A trader can expect that if the minimum price falls, this fall will stop after the 3rd week with a probability of 92.59%; and the growth of the minimum price will stop after the 5th week with a probability of 91.46%.

Discussion. In further research, in order to gain a deep and comprehensive understanding of bitcoin pricing, a comprehensive study is envisaged, including an analysis of the change in the MACD for the current week in relation to the closing price for the following week. According to the authors, the study of the relationship between the closing price and the MACD is particularly important as it will provide traders with important information

about the strength of the trend and market sentiment; help traders identify potential reversals or confirmations of current bitcoin trends.

Key words: Cryptocurrency, Bitcoin, MACD, MACD histogram, forecasting.

Анотація. Вступ. Ринок біткоїна залишається одним з найбільш динамічних та привабливих секторів у світі сучасних фінансів. За останні роки біткоїн неодноразово переживав значні коливання цін, що стимулювало інвесторів та трейдерів до постійного моніторингу, аналізу і прогнозування його ціни. Прогнозування є критичним інструментом для успішної діяльності на ринку біткоїна, а його важливість для трейдера обумовлена необхідністю прийняття обґрунтованих рішень, зниженням ризиків, виявлення трендів ринку, оптимізації портфеля та стратегічного планування. В даному контексті одним із ключових аспектів для трейдерів є аналіз динаміки мінімальної ціни біткоїна, а використання технічних індикаторів (таких як гістограма MACD) дозволяє трейдерам оцінювати тенденції крипто ринку та потенційні точки входу чи виходу з нього. Відповідно, постає необхідність розгляду практичного механізму формування прогнозів трейдера на основі комплексного аналізу динаміки мінімальної ціни біткоїна та гістограми MACD, що допоможе трейдерам підвищити ефективність та точність ринкових рішень.

Мета. Метою дослідження є аналіз взаємозв'язку між динамікою мінімальної ціни біткоїна на тижневому тайм-фреймі та гістограмою MACD як передумови для формування прогнозів трейдерів та їх поведінки на крипто валютному ринку.

Матеріали і методи. У процесі написання статті були використані такі методи загальнотеоретичних та емпіричних досліджень, що базуються на системному підході: абстрактно-логічний метод (для систематизації наукових публікацій з проблем аналізу ринку крипто

валют та ціни біткоїна); графічний метод (для побудови гістограми MACD та динаміки мінімальної ціни біткоїна); метод аналізу (для аналізу динаміки мінімальної ціни біткоїна на тижневому тайм-фреймі та гістограми MACD); метод порівнянь (у процесі порівняння динаміки мінімальної ціни біткоїна та гістограми MACD, встановлення взаємозв'язку між ними); метод коефіцієнтів (для визначення середньої та максимальної довжини серій мінімуму ціни біткоїна, довжини серії повторення ціною напрямку руху MACD); метод формалізації (для встановлення взаємозв'язку між мінімальною ціною біткоїна та гістограмою MACD тиждень у тиждень; встановлення взаємозв'язку між змінами ціни на поточному та наступному тижнях), метод синтезу (для демонстрації як спільне застосування двох індикаторів технічного аналізу – MACD та мінімальної ціни біткоїна – може допомогти трейдерам у прийнятті більш ефективних та зважених торгово-інвестиційних рішень); метод узагальнення (для формулювання висновків проведеного дослідження).

Результати. Дослідження було зосереджено на встановленні ступеню взаємозв'язку між гістограмою MACD та мінімальною ціною біткоїна на тижневому тайм-фреймі як однієї з передумов для формування прогнозів трейдерів в рамках технічного аналізу. Основними завданнями дослідження було: визначити збільшувалася чи зменшувалася маінімальна ціна біткоїна у порівнянні з попереднім тижнем при аналогічній зміні MACD; визначити середні та максимальні серії для мінімальної щотижневої ціни. У дослідженні продемонстровано як спільне застосування цих двох індикаторів технічного аналізу може допомогти трейдерам у прийнятті більш ефективних та зважених торгово-інвестиційних рішень.

В результаті дослідження встановлено, що у 61,26% випадків трейдер може очікувати збільшення мінімальної ціни біткоїна на

поточному тижні, якщо гістограма MACD на попередньому тижні показувала зростання; або зменшення мінімальної ціни біткоїна на поточному тижні, якщо гістограма MACD на попередньому тижні показувала зниження. При падінні MACD з «Нижньої зони» і підйомі з «Вищої зони» на першому тижні ця ймовірність значно вища: 83,33% і 82,35% відповідно. Трейдер може очікувати, що низька ціна біткоїна продовжить свій напрямок руху на другому тижні в 49,08% випадків. Трейдер може очікувати, що якщо мінімальна ціна падає, то це падіння зупиниться після 3-го тижня з ймовірністю 92,59%; а зростання мінімальної ціни зупиниться після 5-го тижня з ймовірністю 91,46%.

Перспективи. В подальших наукових дослідженнях з метою глибокого та різностороннього розуміння ціноутворення біткоїна передбачається комплексне дослідження, що включатиме аналіз зміни MACD за поточний тиждень по відношенню до ціни закриття на наступний тиждень. На думку авторів, дослідження взаємозв'язку між ціною закриття і MACD є особливо важливим, оскільки: надасть трейдеру важливу інформацію про силу тренду і ринкові настрої; допоможе трейдерам визначити потенційні розвороти або підтвердження поточних тенденцій біткоїна.

__Ключові слова:__ криптовалюта, біткоїн, MACD, гістограма MACD, прогнозування.

Problem statement. The bitcoin market remains one of the most dynamic and attractive sectors in the world of modern finance. In recent years, bitcoin has repeatedly experienced significant price fluctuations, which has encouraged investors and traders to constantly monitor and analyze this asset. The importance of bitcoin is enhanced by its status as the first decentralized cryptocurrency that has changed the approach to financial transactions and become a symbol of a new era in the electronic economy.

In the modern world of cryptocurrency, where market conditions change instantly, it is important to have accurate tools for making forecasts. Forecasting is a critical tool for successful operations in the bitcoin market, and its importance for a trader is driven by the need to make informed decisions, reduce risks, identify market trends, optimize portfolio and conduct strategic planning. Given these factors, forecasting is an integral part of a successful bitcoin trading strategy.

In this context, one of the key aspects for traders is to analyze the dynamics of the minimum price of bitcoin, which is the most widely used and most liquid digital asset. The use of technical indicators, such as the MACD histogram, which is based on the difference between short-term and long-term moving averages, in turn, allows traders to assess crypto market trends and potential entry or exit points. According to the authors, the analysis of the dynamics of these two technical indicators - the minimum price of bitcoin and the MACD histogram - is an effective tool that allows traders to make informed forecasts and predict future movements of the bitcoin price.

Accordingly, this article will discuss a practical mechanism for forming trader forecasts based on a comprehensive analysis of the dynamics of the minimum bitcoin price and the MACD histogram, which will help traders increase the efficiency and accuracy of market decisions.

Analysis of recent research and publications. In today's digital society, crypto currencies, in particular bitcoin, have become an important aspect of financial markets and innovation. Bitcoin was the first decentralized cryptocurrency to usher in a new era in financial technology, and since then it has attracted considerable interest among academics, economists and investors.

Modern studies by national authors such as Denysenko [1], Pylypchenko et al. [3], Savchenko et al. [4], Tarasov [5], Troyan [6] and others are limited to analyzing the development of the cryptocurrency market in the world and Ukraine, analyzing trading strategies in the cryptocurrency market, assessing

existing trends and forecasting further prospects for the development of the cryptocurrency market.

As for the analysis of bitcoin, as the most famous cryptocurrency, there are few modern domestic scientific studies, for example, Matskevich & Granovska consider the dynamics of the Bitcoin hashrate and highlight the main factors that shape the Bitcoin ecosystem [2], Tarasov explores the possibilities and prospects of using graphical technical analysis to predict the movement of bitcoin prices [5], Ignatenko & Dokiienko research the relationship between the MACD histogram and the maximum price of bitcoin [14].

At the same time, there is an increased interest in bitcoin and the analysis of its price dynamics in the world practice, which is the subject of a significant number of studies, for example, Andrade et al. [7], Biedscheid [9], Bistarelli et al. [10], Chen & Yang [11], Guisen et al. [12], Kapar & Olmo [15], Kjærland et al. [16], Roozkhosh & Pooya [17], Rudd & Porter [18], Samizadeh [19], Shahzad et al. [20], Tamandi [21].

Thus, today in the domestic scientific literature, unjustifiably insufficient attention is paid to the technical analysis of bitcoin, which is a tool for predicting medium-term trends in the cryptocurrency market and, accordingly, the topic of the scientific article is very relevant.

The purpose of the article is to study the relationship between the dynamics of the minimum price of bitcoin on the weekly timeframe and the MACD histogram as a prerequisite for forming traders' forecasts and their behavior in the cryptocurrency market.

Materials and methods. The research methodology was based on the use of the MACD (Moving Average Convergence Divergence) indicator, which is a trend tracking tool that uses moving averages to determine the momentum of a stock, cryptocurrency or other trading asset. MACD allows you to assess the previous price movement and helps traders in making investment decisions.

Based on it, a trader can assess the strength of a trend, predict changes in its direction, and receive signals for further sale/purchase of a certain asset [8].

The following indicators were used for calculations and further analysis in the study (Table 1).

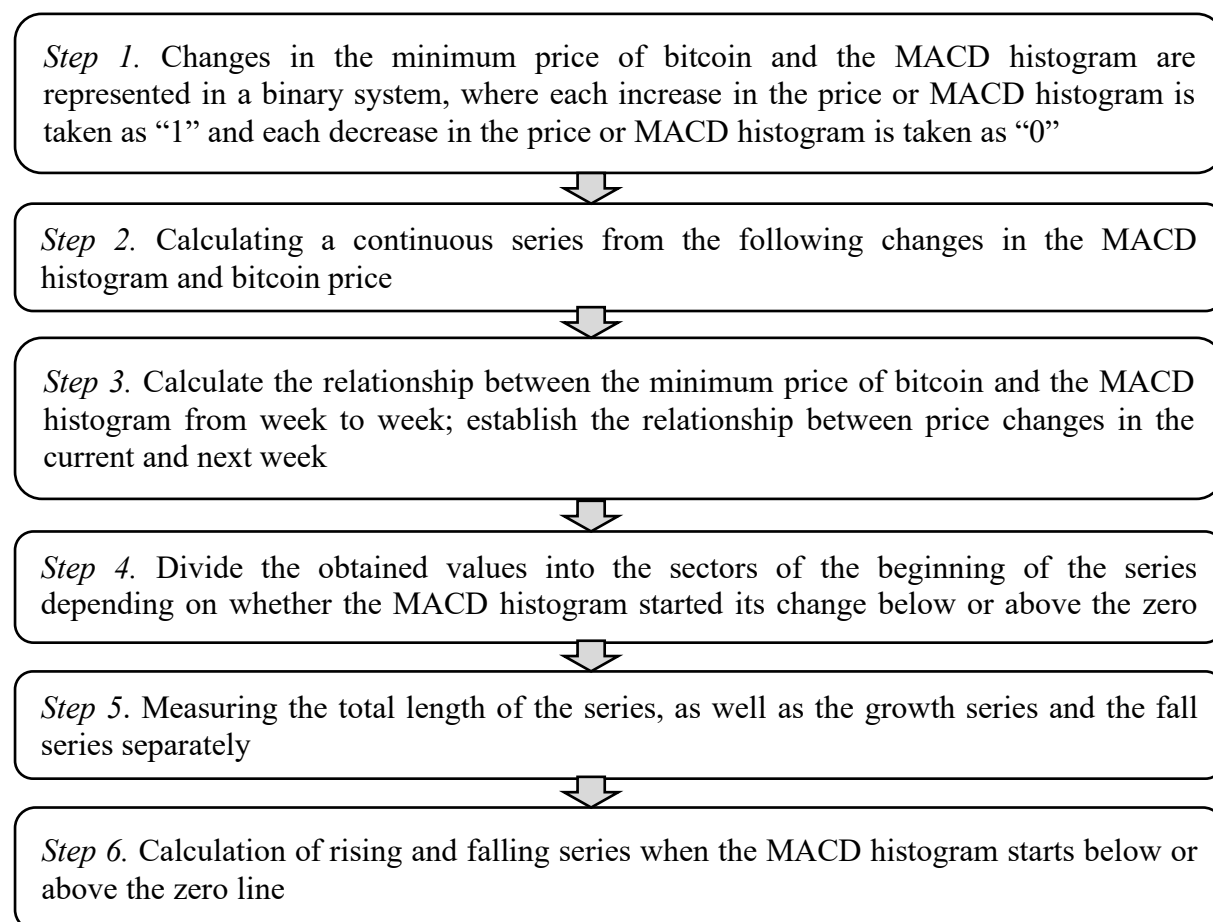*Table 1*

Methodological tools of the research

Indicator	Calculation algorithm
1. Exponential moving averages (EMA)	$EMA_{week}=(Price_{week} \times Multiplier)+\left(Price_{last\_week} \times (1\text{-}Multiplier)\right)$ where $Price_{week}$ – current closing price; EMA_{last_week} – EMA value for the previous week
2. Multiplier	$$Multiplier = \frac{2}{N+1}$$ where N – period EMA
3. Moving Average Convergence Divergence (MACD)	$MACD=EMA_{12} \text{ - } EMA_{26}$ where EMA_{12} – 12-period exponential moving average (for a short period); EMA_{26} – 26-period exponential moving average (for a long period)
4. The signal line (9-period EMA from MACD)	$Signal\ Line = EMA_9(MACD)$ where MACD values obtained from the difference between EMAs with periods of 12 and 26.
5. MACD Histogram	$Histogram = MACD \text{ - } Signal\ Line$ where MACD values obtained from the difference between EMAs with periods of 12 and 26; Signal Line – 9-period EMA from MACD

Source: compiled by the authors on the basis of [8]

In the process of writing the article, the following methods of general theoretical and empirical research based on a systematic approach were used: abstract-logical method (for systematization of scientific publications on the problems of analysis of the cryptocurrency market and the price of bitcoin); graphical method (for construction of the MACD histogram and dynamics of the minimum price of bitcoin); analysis method (for analysis of the dynamics of the minimum price of bitcoin on a weekly timeframe and the MACD histogram); the method of comparisons (in the process of comparing the dynamics of the minimum price of bitcoin and the MACD histogram, establishing the relationship between them); the method of coefficients (to determine the average

and maximum length of the series of the minimum price of bitcoin, the length of the series of price repetition of the MACD movement direction); the method of formalization (to establish the relationship between the minimum price of bitcoin and the MACD histogram from week to week; to establish the relationship between price changes in the current and next weeks), the method of synthesis (to demonstrate how the joint use of two technical analysis indicators - MACD and the minimum price of bitcoin - can help traders make more effective and balanced trading and investment decisions); the method of generalization (to formulate the conclusions of the study).

The algorithm for calculating and analysing the results is as follows (Fig. 1).

Step 1. Changes in the minimum price of bitcoin and the MACD histogram are represented in a binary system, where each increase in the price or MACD histogram is taken as "1" and each decrease in the price or MACD histogram is taken as "0"

Step 2. Calculating a continuous series from the following changes in the MACD histogram and bitcoin price

Step 3. Calculate the relationship between the minimum price of bitcoin and the MACD histogram from week to week; establish the relationship between price changes in the current and next week

Step 4. Divide the obtained values into the sectors of the beginning of the series depending on whether the MACD histogram started its change below or above the zero

Step 5. Measuring the total length of the series, as well as the growth series and the fall series separately

Step 6. Calculation of rising and falling series when the MACD histogram starts below or above the zero line

Fig. 1. Algorithm for studying the minimum price of bitcoin and MACD histogram

Source: author's development

In general, this study used statistical methods to analyze the weekly

minimum price of bitcoin and the MACD histogram built on the closing prices of each week based on a sample of 346 weeks for the study period from 2018-04-02 to 2024-11-11[12].

Results. Choosing the optimal price for buying/selling bitcoin is a strategic step, as it determines the 'timeliness' and profitability of entering/exiting the market. To choose the right period and form a certain strategy, you need to pay attention to certain factors: investment goals, riskiness, the trader's overall strategy, technical analysis results, and others. Undoubtedly, a preliminary technical analysis of the crypto market and the chosen cryptocurrency is the basis for making informed decisions. Technical analysis of bitcoin focuses on graphical models that illustrate the dynamics of its price over a certain period of time. Combining chart analysis with an understanding of fundamental factors allows traders to get a complete picture of bitcoin market dynamics, price movements, and the overall behavior of the crypto market, and thus make more informed decisions.

Moreover, studying the low price of bitcoin is particularly important for several reasons. The low price points can signal potential support levels, indicating where Bitcoin's price may stabilize after a decline. Identifying these levels helps traders understand when to enter the market or place stop-loss orders. By tracking Bitcoin's low prices over time, investors can better predict when the market is due for a rebound, increasing the accuracy of their predictions and strategy development. Additionally, analyzing the lows helps to determine the strength of the trend. A strong trend is often reflected by higher lows, indicating that the market is gaining momentum, while lower lows may suggest a weakening trend or potential reversal (Fig. 2).

On the other hand, the MACD histogram, which is an important tool for analyzing and building trading strategies in the cryptocurrency market, allows you to identify changes in market direction, assess the strength of the trend, and synchronize with other indicators to improve the accuracy of analysis and

further forecasts. In other words, the MACD histogram is a conditional indicator of trend direction and strength, and it is very important to know how often a trend is repeated and what decisions a trader should make in a given situation (Fig.2).
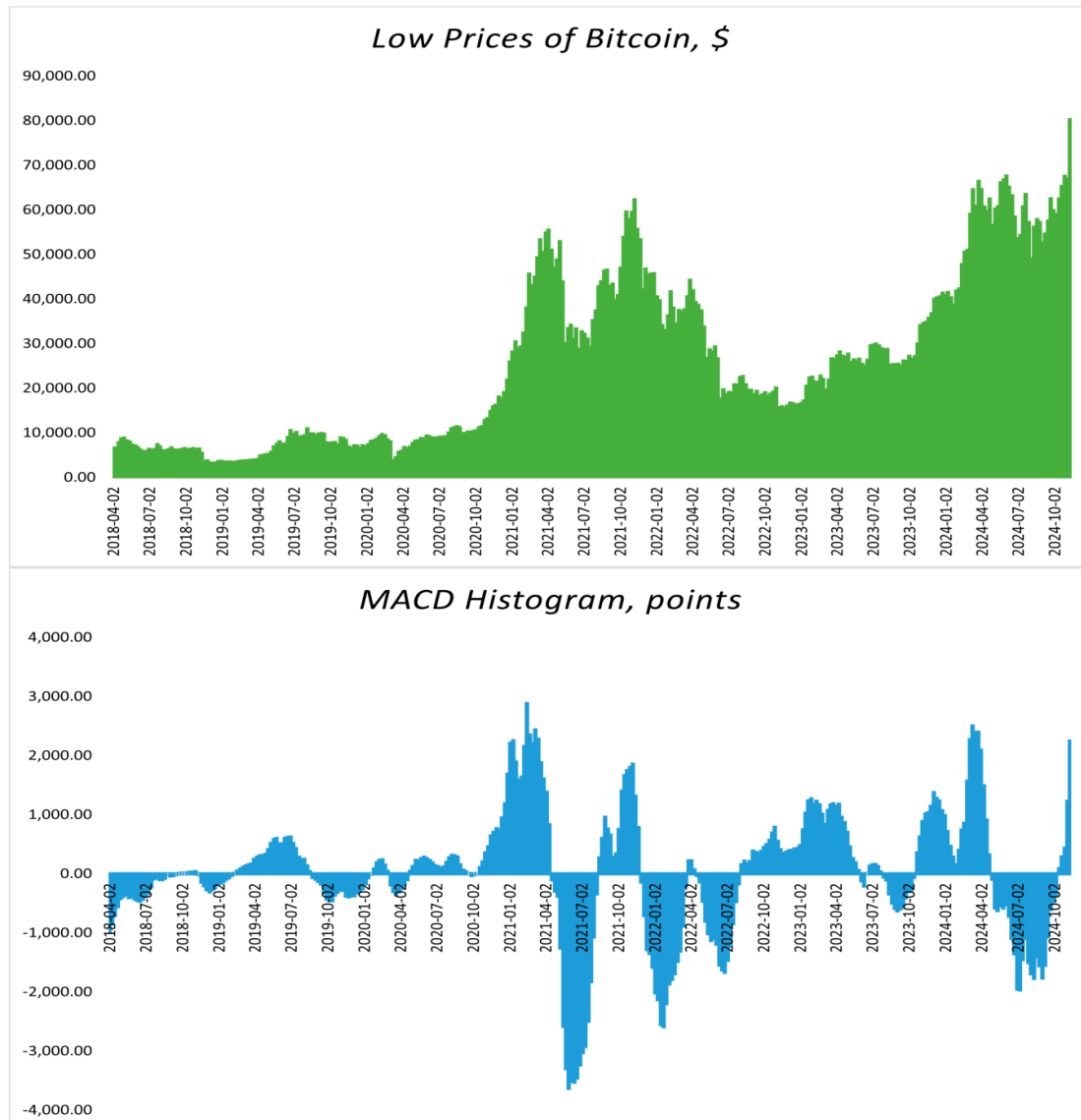
Fig. 2. MACD histogram and dynamics of the minimum price of bitcoin for the period from 2018-04-02 to 2024-11-11

Source: calculated and constructed by the authors

In the initial stage of the analysis, the relationship between the MACD histogram and Bitcoin's low price on a weekly timeframe was examined as a key factor for making trading predictions based on technical analysis. The calculation results revealed that when comparing the numerical values of the

low price and the MACD histogram, there is no significant correlation (the correlation coefficient is 0.06).

However, when analyzing the correlation between the low price and the MACD histogram in binary terms, a moderately positive correlation was found between the weekly data sets (with a correlation coefficient of 0.38). Additionally, a weak positive correlation was observed between the arrays when shifted by one week (where the price array is shifted one week ahead of the MACD histogram array, with a correlation coefficient of 0.15).

The study found that the percentage of weeks with rising prices was higher (60.29%) than the percentage of weeks with falling prices (39.71%), which indicates a general bull trend over the previous period (Fig. 3).
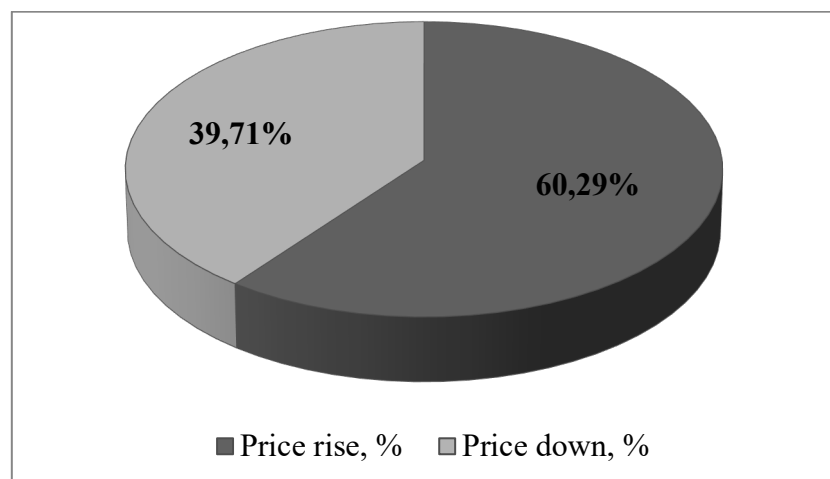
Fig. 3. Percentage of weeks by direction of bitcoin low price change

Source: compiled by the authors on the basis of [13]

At the same time, the number of series with rising and falling prices is almost the same (Table 2).

Table 2

Number of series with rising and falling bitcoin low prices

	Total number of series, pcs.	Rise (growth series), pcs.	Down (fall series), pcs.	Below series, pcs.	Above series, pcs.
Price	163	82	81	82	81

Source: calculated by the authors on the basis of [13]

Accordingly, it has been determined that the average and maximum lengths of growth series are longer than those of decline series (Table 3). This confirms the overall bullish trend in the bitcoin market.

Table 3

Average and maximum series lengths of bitcoin low price

Direction of change	Average length of series, weeks	Maximum length of series, weeks
All	2.12	12
Rise	2.54	12
Down	1.69	7

Source: calculated by the authors on the basis of [13]

For a more in-depth analysis, it is proposed to consider the length of bitcoin low price series taking into account the starting zone of the series.

The study revealed that the average duration of low price series starting below the zero MACD line is longer than those starting above it. The average duration of price increases from both zones is nearly identical, at around 2.54 weeks. On the other hand, the average length of a price decline from the zone above the zero MACD line is 1.57 weeks, which is notably shorter than the average decline from the zone below the zero MACD line, which lasts 1.82 weeks (Table 4). However, in the case of maximum series length, this trend is not confirmed. The maximum series lengths from the above zone are almost 2 times higher than from the below zone. These maximum series lengths are not common, they were only 3 times out of 163 series.

Table 4

Average and maximum series lengths of bitcoin low price, taking into account the starting zone of the series

Indicators	Length of series from Above zone, weeks	Length of series from the Below zone, weeks
Total average series length, weeks	2.02	2.21
Average length of growth series, weeks	2.51	2.56
Average length of fall series, weeks	1.57	1.82
Maximum length of growth series, weeks	12	6
Maximum length of drop series, weeks	11	7

Source: calculated by the authors on the basis of [13]

In trading practice, this means that when trading on a bearish trend in the zone below the zero MACD line, you can expect a little longer series of declines in the low price. Accordingly, a trader can place an asset for sale with more confidence. And at the same time, the long length of the maximum series when trading on a bullish trend in the Above zone warns the trader about possible strong price growth. This allows a trader not to expect a trend reversal soon.

With the average length of price growth series at 2.54 weeks and price decline series at 1.69 weeks, the percentages for them are 67.07% and 83.95%, respectively. And all series longer than 4 weeks inclusive are included in 92.02% of all series that started. At the same time, the balance is significantly shifted towards the fall series: 3 weeks inclusive for down series are included in 92.59% of series. While 3-week growth series are only 79.27% (Table 5).

From a practical perspective, this suggests that when a trader observes the price moving consistently in one direction for 2-4 weeks, they are more likely to anticipate a trend reversal and, therefore, may choose to close or reduce their position, seeing it as a warning of potential risks—a so-called "leading" indicator.

Table 5

Average and maximum length of bitcoin price series in percentage terms

Length of price series, weeks	Total length of the price series, %	Length of price growth series, %	Length of price drop series, %	Length of price series from Below zone,%	Length of price series from Above zone, %
1	50.92	41.46	60.49	47.56	54.32
2	75.46	67.07	83.95	74.39	76.54
3	85.89	79.27	92.59	84.15	87.65
4	92.02	86.59	97.53	91.46	92.59
5	94.48	91.46	97.53	93.9	95.06
6	96.93	95.12	98.77	96.34	97.53
7	98.16	96.34	100	97.56	98.77
8	98.16	96.34		97.56	98.77
9	98.16	96.34		97.56	98.77
10	98.77	97.56		98.78	98.77
11	99.39	98.78		100	98.77
12	100	100			100

Source: calculated by the authors on the basis of [12]

Additionally, nearly half of all series (50.92%) ended with a single event, while just over half of the remaining series involved multiple events. This implies a 49.08% chance that a price movement series will continue after the first event, meaning at least one more similar event is likely to occur. If other indicators support this trend, a trader can act with more confidence in the direction of the movement, which is favorable for medium-term strategies of 1-2 weeks.

Also, in the case of a series of low price drops, the trader can expect a faster termination of the drop after 3 weeks. This is a good indicator for setting take-profit and stop-loss (depending on the direction of trading).

The study also found that the price tended to follow the direction of the MACD histogram movement from the previous week. For MACD histogram series with a single event, the price moved in the same direction 69.33% of the time on average. In cases where the MACD histogram started below the zero line and moved downward, this figure increased to 83.33%. In practical terms, this means that when the MACD histogram declined after a slight rise in the zone below the zero line, the price also dropped the following week 83.33% of the time (Table 6).

Furthermore, unlike the study [14], there is an 82.35% probability that when the MACD starts from the above-zero zone and moves upward, the low price will also rise 82.35% of the time in the following week. In trading practice, this allows traders to place more confident bets on price growth.

In general, in 71.62% of cases, the price followed the movement of the MACD histogram in the following week. However, when analyzing only up to week 15 (excluding the longest 24-week series from the sample), this percentage drops to 61.26%, offering a more accurate result. This is because there was only one 24-week series during the study, where the price consistently followed the MACD movement in nearly every instance. If, in the next week, the price does not follow the direction of the MACD movement, it suggests an increased

probability of a reversal in the MACD trend itself. This is due to the fact that the longest MACD series in all cases ended at zero, meaning the price did not follow the direction of the MACD movement.

Table 6

Length of series of price repetition of the MACD movement direction

MACD series length, weeks	Total length of MACD series with price repeating the same direction, %	Length of MACD series with price repeating the same direction (start zone - Below, direction - Rise), %	Length of MACD series with price repeating the same direction (start zone - Below, direction - Down),%	Length of MACD series with price repeating the same direction (start zone - Above, direction - Rise), %	Length of MACD series with price repeating the same direction (start zone - Above, direction - Down), %
1	69.33	66.67	83.33	82.35	56.00
2	50.94	46.67	42.86	53.85	55.56
3	48.89	50.00	50.00	81.82	21.43
4	50.00	50.00	33.33	62.50	45.45
5	58.62	63.64	0.00	80.00	54.55
6	44.00	63.64		50.00	20.00
7	60.00	88.89		50.00	33.33
8	78.57	85.71		100.00	66.67
9	66.67	71.43		100.00	50.00
10	66.67	80.00		0.00	66.67
11	28.57	25.00			33.33
12	80.00	66.67			100.00
13	66.67	100.00			0.00
14	50.00	100.00			0.00
15	100.00	100.00			100.00
16	100.00	100.00			
17	100.00	100.00			
18	100.00	100.00			
19	100.00	100.00			
20	100.00	100.00			
21	100.00	100.00			
22	100.00	100.00			
23	100.00	100.00			
24	0.00	0.00			

Source: calculated by the authors on the basis of [12]

To summarize the research, the following conclusions can be drawn:

1) In 61.26% of cases, a trader can expect an increase in the minimum

price of bitcoin this week if the MACD histogram showed an increase in the previous week, or a decrease in the minimum price of bitcoin this week if the MACD histogram showed a decrease in the previous week. With the MACD falling from the "Below zone" and rising from the "Above zone" in the first week, this probability is significantly higher: 83.33% and 82.35% respectively.

2) A trader can expect that the low price of bitcoin will continue its direction of movement in the second week in 49.08% of cases.

3) A trader can expect that if the minimum price falls, this fall will stop after the 3rd week with a probability of 92.59%; and the growth of the minimum price will stop after the 5th week with a probability of 91.46%.

Conclusions and prospects for further research. Thus, analyzing the dynamics of Bitcoin's minimum price in relation to the MACD histogram reveals that this indicator can be a valuable tool for predicting medium-term trends in the cryptocurrency market. When combined with other indicators, it allows traders to make more informed investment decisions, potentially increasing profits or minimizing losses. The importance of the low price is also crucial, as it often signals support levels and potential reversals, offering traders additional insights into when to enter or exit the market.

However, while the MACD histogram can provide useful insights into Bitcoin price dynamics, it is not a foolproof tool for precise predictions. The cryptocurrency market is highly volatile, influenced by numerous external factors, making accurate forecasts challenging. As such, investors should approach the MACD with caution, recognizing that it is just one of many elements to consider when making trading decisions.

To gain a deeper understanding of Bitcoin's price formation, a more comprehensive study is necessary – one that includes an analysis of the current week's MACD change, in relation to the closing prices for the following week. The relationship between the closing price and the MACD is particularly important, as it can offer critical insights into trend strength and market

sentiment. Understanding how the closing price aligns with the MACD can help traders identify potential reversals or confirmations of ongoing trends.

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