Електронний журнал «Ефективна економіка» включено до переліку наукових фахових видань України з питань економіки (Категорія «Б», Наказ Міністерства освіти і науки України № 975 від 11.07.2019). Спеціальності – 051, 071, 072, 073, 075, 076, 292.

Ефективна економіка. 2026. № 5.

ISSN 2307-2105

DOI: http://doi.org/10.32702/2307-2105.2026.5.214

УДК 336.76:004.031.4

V. Hanusych,
PhD in Economics, Associate Professor,
Associate Professor of the Department of Accounting and Auditing,
Ferenc Rakoczi II Transcarpathian Hungarian University
ORCID ID: https://orcid.org/0000-0001-6902-6303

ANALYTICAL APPLICATION OF THE MVRV RATIO IN DIAGNOSING MARKET CYCLES OF DIGITAL ASSETS

В. О. Ганусич,
к. е. н, доцент, доцент кафедри обліку і аудиту,
Закарпатський угорський університет ім. Ф.Ракоці ІІ

АНАЛІТИЧНЕ ЗАСТОСУВАННЯ КОЕФІЦІЄНТА MVRV У ДІАГНОСТИЦІ РИНКОВИХ ЦИКЛІВ ЦИФРОВИХ АКТИВІВ

The rapid development of digital asset markets and the growing methodological role of on-chain analytics have significantly transformed approaches to the assessment of market cycles, investment behaviour and the diagnosis of valuation imbalances within blockchain ecosystems. Unlike traditional financial markets, where asset valuation is primarily based on accounting indicators, macroeconomic variables or exchange-based market metrics, digital assets generate continuously accessible transactional data that make it possible to analyse the internal economic state of the network through blockchain records. Under such conditions, one of the most significant indicators of on-chain analysis has become the Market Value to Realized Value (MVRV) ratio, which makes it possible to assess the relationship between the current market capitalisation of a digital asset and its realised capitalisation, reflecting the historically embedded value of assets within the network.

The purpose of the article is to improve the methodological application of the MVRV ratio in diagnosing market cycles of digital assets through a critical reconsideration of the traditional approach based on fixed threshold values and the development of an adaptive analytical framework based on the relative historical distribution of the indicator. The study reveals the economic essence of the MVRV ratio and substantiates its role as a valuation indicator, a behavioural diagnostic instrument and a tool for identifying market-cycle phases. Conventional interpretative approaches to MVRV analysis are systematised, and the principal methodological limitations associated with the use of universal threshold values are identified.

Based on the comparative analysis of Bitcoin and Ethereum, it is demonstrated that different digital assets exhibit substantially different MVRV trajectories, which limits the analytical reliability of identical absolute threshold levels across distinct blockchain ecosystems. An adaptive methodological approach to MVRV interpretation based on rolling percentile distribution is proposed, allowing market conditions to be assessed not through rigid numerical boundaries, but through the historical positioning of the indicator within its own distribution. The practical significance of the proposed approach lies in improving the accuracy of market-cycle diagnostics, enhancing the assessment of valuation imbalances and strengthening the analytical support for investment decision-making in digital asset markets.

Стрімкий розвиток ринку цифрових активів та зростання методологічної ролі ончейн-аналітики суттєво трансформували підходи до оцінки ринкових циклів, інвестиційної поведінки та діагностики цінових дисбалансів у блокчейн-екосистемах. На відміну від традиційних фінансових ринків, де оцінка вартості активів базується переважно на бухгалтерських, макроекономічних показниках або біржових ринкових індикаторах, цифрові активи генерують безперервно доступні транзакційні дані, що дозволяють аналізувати внутрішній економічний стан мережі на основі блокчейн-записів. За таких умов одним із найбільш значущих індикаторів ончейн-аналізу став коефіцієнт Market Value to Realized Value (MVRV), який дозволяє оцінювати співвідношення між

поточною ринковою капіталізацією цифрового активу та його реалізованою капіталізацією, що відображає історично зафіксовану вартість активів у мережі.

Метою статті є вдосконалення методологічного застосування коефіцієнта MVRV у діагностиці ринкових циклів цифрових активів шляхом критичного переосмислення традиційного підходу, заснованого на фіксованих порогових значеннях, та розробки адаптивного аналітичного підходу на основі відносного історичного розподілу індикатора. У дослідженні розкрито економічну сутність коефіцієнта MVRV, обґрунтовано його роль як поведінкового діагностичного інструменту та засобу ідентифікації фаз ринкового циклу. Систематизовано класичні інтерпретаційні підходи до аналізу MVRV та визначено ключові методологічні обмеження використання універсальних порогових значень.

На основі порівняльного аналізу Bitcoin та Ethereum доведено, що різні цифрові активи демонструють суттєво відмінні траєкторії динаміки коефіцієнта MVRV, що обмежує аналітичну надійність однакових порогових рівнів для різних блокчейн-екосистем. Запропоновано адаптивний методологічний підхід до інтерпретації MVRV на основі ковзного відсотку, який дозволяє оцінювати ринкові стани не через жорстко задані числові межі, а через історичне позиціонування індикатора в межах його власного розподілу. Практичне значення запропонованого підходу полягає у підвищенні точності діагностики фаз ринкового циклу, вдосконаленні оцінки дисбалансів та покращенні аналітичної підтримки інвестиційних рішень на ринку цифрових активів.

Ключові слова: *коефіцієнт MVRV, ончейн-аналіз, цифрові активи, діагностика ринкових циклів, блокчейн-аналітика.*

Keywords: *MVRV ratio, on-chain analysis, digital assets, market cycle diagnostics, blockchain analytics.*

General statement of the problem and its connection with important scientific or practical tasks. The rapid development of digital asset markets has created a new analytical environment in which traditional price-based approaches are no longer sufficient for diagnosing market cycles, valuation imbalances and behavioural transformations of investors. Unlike conventional financial assets, whose valuation is usually interpreted through accounting indicators, macroeconomic variables or exchange-based market data, digital assets generate continuously observable blockchain records that make it possible to analyse the internal economic state of the network. This circumstance has significantly increased the methodological importance of on-chain indicators capable of linking market prices with the historical cost basis, capital distribution and unrealised profitability of market participants. One of the most widely used indicators in this analytical field is the Market Value to Realized Value ratio, which compares the current market capitalisation of a digital asset with its realised capitalisation formed on the basis of prior on-chain movements. The significance of this metric lies in its ability to reflect not only the current speculative valuation of an asset, but also the relationship between market price and the historically embedded value of coins or tokens within the network.

At the same time, the growing practical use of the MVRV ratio reveals an important methodological problem. In analytical practice, this indicator is often interpreted through fixed threshold values. However, the use of static thresholds as universal diagnostic criteria becomes increasingly problematic under conditions of structural transformation in digital asset markets. The expansion of institutional participation, changes in liquidity regimes, the development of derivatives markets and the growing heterogeneity of blockchain ecosystems weaken the assumption that identical MVRV levels have the same analytical meaning across different assets and market cycles.

These circumstances create the need to reconsider the conventional methodological approach to MVRV interpretation and to develop more adaptive analytical frameworks capable of accounting for historical market evolution, asset-specific structural characteristics and changing behavioural conditions within digital asset ecosystems. Therefore, improving the methodological application of the MVRV ratio in market-cycle diagnostics represents both an important scientific task in the development of on-chain analytical methodology and a practically significant objective for enhancing investment decision-making in digital asset markets.

Literature review. Contemporary scientific literature demonstrates the growing institutionalisation of research on cryptocurrency markets, blockchain analytics and digital asset valuation. One important direction of scholarly inquiry focuses on the financial characteristics, return behaviour and predictive modelling of digital assets. Li X., Liu Y., Liu Z., Zhu S. [1] and Li X., Liu Z., Yu X., Yan J. [2] investigate cryptocurrency return prediction through machine learning approaches, demonstrating the increasing methodological complexity of digital asset forecasting. Liu Y., Tsyvinski A. [3] analyse the risk-return characteristics of cryptocurrencies and establish that digital assets exhibit distinctive financial properties compared with traditional asset classes, thereby requiring specialised analytical approaches for valuation and market diagnostics.

A closely related strand of research examines the structural determinants of cryptocurrency valuation and market equilibrium. Celig T., Ockenga T. A., Schoder D. [4], Ciaian P., Kancs d'Artis, Rajcaniova M. [5], Rudd M. A., Porter D. [6], and Biais B., Bisière C., Bouvard M., Casamatta C., Menkveld A. J. [7] investigate the relationships between supply distribution, demand dynamics, transaction activity and Bitcoin or Ethereum price formation. These studies demonstrate that blockchain-native variables, including supply concentration, transaction flows and network-level economic activity, play a significant role in shaping digital asset valuation and market equilibrium.

Another important direction concerns the technological and informational architecture of blockchain ecosystems, particularly the interpretation of transaction-level data and behavioural attribution mechanisms. Xia L., Zhu T., Jing Z., Wang Q., Ma Z., Huang Z., Yin Z. [8] propose methods for cryptocurrency address identity recognition based on transaction-network structures, highlighting the growing importance of behavioural clustering and blockchain entity attribution. Kim D., Ryu D., Webb R. I. [9] investigate the determinants of transaction fees in the Bitcoin network, while Sun W., Jin H., Jin F., Kong L., Peng Y., Dai Z. [10]

extend blockchain research to infrastructure-level analysis through the spatial examination of global Bitcoin mining activity. These studies strengthen the methodological foundations of blockchain analytics by demonstrating the analytical relevance of network architecture, transaction mechanics and structural blockchain behaviour.

A separate body of literature examines market microstructure, derivatives trading and broader digital financial ecosystems. Schär F. [11] explores the conceptual transformation of financial markets through decentralised finance infrastructures, while Aleti S., Mizrach B. [12] and Hung J.-C., Liu H.-C., Yang J. J. [13] investigate Bitcoin spot and futures market microstructure, trading activity and price discovery processes. Their findings demonstrate that cryptocurrency market dynamics are increasingly shaped not only by blockchain-native activity, but also by derivatives-market participation, liquidity conditions and speculative behavioural mechanisms.

Despite the breadth of existing research, an important methodological gap remains in the academic interpretation of blockchain-derived valuation metrics, particularly the Market Value to Realized Value ratio. While the broader literature extensively addresses cryptocurrency pricing, market behaviour, blockchain infrastructure and predictive modelling, significantly less attention has been devoted to the methodological interpretation of MVRV itself as a diagnostic instrument for identifying market-cycle phases. In practical analytical environments, MVRV is frequently applied through fixed threshold values, yet the scientific justification for treating such thresholds as universally stable across evolving market structures and heterogeneous digital assets remains insufficiently developed. This determines the necessity of re-examining the analytical application of the MVRV ratio and developing a more adaptive methodological framework for diagnosing valuation imbalances and cyclical transitions in digital asset markets.

Formulation of the article's objectives (setting the task). The purpose of the article is to improve the methodological application of the Market Value to Realized Value ratio in diagnosing market cycles of digital assets through a critical reassessment of conventional threshold-based interpretation and the development of an adaptive analytical framework based on the relative historical distribution of the indicator. The current draft explicitly centers on the methodological limitations of fixed MVRV thresholds and introduces a rolling percentile framework as the proposed alternative

In order to achieve this purpose, the following tasks are defined: to examine the economic essence and analytical significance of the MVRV ratio as a blockchain-derived valuation indicator; to analyse the methodological principles underlying the calculation of market capitalisation, realised capitalisation and the resulting MVRV ratio; to systematise the conventional interpretative framework of the MVRV ratio used in practical cryptocurrency market analysis; to identify the principal methodological limitations associated with the application of fixed MVRV threshold values in diagnosing market-cycle phases; to investigate the influence of structural differences between digital assets on the interpretative reliability of absolute MVRV thresholds through comparative analysis of Bitcoin and Ethereum.

Presentation of the main research material. The growing maturity of digital asset markets has substantially increased the methodological importance of blockchain-based analytical indicators capable of capturing internal market dynamics beyond conventional price-based observations. Unlike traditional financial markets, where valuation diagnostics are primarily derived from accounting disclosures, macroeconomic indicators or exchange-based market statistics, blockchain ecosystems generate continuously observable transactional records that enable the construction of fundamentally new analytical metrics reflecting investor behaviour, capital distribution and structural transformations of market participation. Within this analytical context, increasing methodological attention has been devoted to blockchain-derived valuation metrics designed to connect market prices with underlying network-level economic activity. Among such indicators, the Market Value to Realized Value ratio (MVRV) occupies a particularly important position due to its ability to compare the current market valuation of a digital asset with the aggregate realised valuation embedded in blockchain transaction history. Unlike classical valuation ratios used in traditional financial analysis, which are typically based on accounting fundamentals or corporate cash-flow expectations, the MVRV ratio derives its analytical meaning directly from blockchain settlement data, thereby reflecting the relationship between speculative pricing and the economically anchored cost basis of market participants. The MVRV ratio is calculated as the ratio between the market capitalisation of a digital asset and its realised capitalisation [15]:

$$\text{MVRV}=\frac{Market\ Cap}{Realized\ Cap} \qquad (1)$$

where Market Cap represents the conventional market capitalisation of the asset, determined as the product of the current market price and the circulating supply:

$$\text{Market Cap} = \text{Current Price} \times \text{Circulating Supply} \qquad (2)$$

This indicator reflects the aggregate market valuation of the asset under prevailing trading conditions. In contrast, Realized Cap represents a blockchain-specific valuation measure based on the historical movement of coins or tokens within the network. Rather than valuing all circulating units at the current market price, realised capitalisation assigns a value to each unit according to the market price at which it was last transferred on-chain. Its calculation can be expressed as:

$$\text{Realized Cap}=\sum_{i=1}^{n}(Q_i \times P_i) \qquad (3)$$

where: Q_i – quantity of the i-th coin or token unit (or transaction output);

P_i – market price of the asset at the moment of its last on-chain movement;

n – total number of units included in the circulating supply.

Accordingly, realised capitalisation reflects the cumulative historical cost basis of all circulating units recorded within blockchain transaction history. Unlike conventional market capitalisation, which fluctuates continuously in response to current price movements, realised capitalisation changes only when assets are transferred on-chain and therefore captures the economically committed value embedded in the network.

The MVRV ratio therefore measures the relationship between the current aggregate market valuation of a digital asset and the historical valuation derived from its realised on-chain transaction base.

The methodological significance of the MVRV ratio lies in its capacity to serve simultaneously as a valuation indicator, a behavioural diagnostic instrument and a market-cycle identification tool. Elevated MVRV values may indicate conditions of excessive market optimism and unrealised profit concentration, often associated with overheated market phases and increased distribution risk. Conversely, depressed MVRV values may reflect undervaluation, capitulation conditions or structural accumulation zones characterised by reduced speculative pressure and historically favourable risk-reward conditions. This dual interpretative capacity makes the metric particularly relevant for analysing cyclical dynamics within digital asset markets.

At the same time, despite the widespread practical use of the MVRV ratio in cryptocurrency analytics, its methodological interpretation often remains simplified and operationally fragmented. In analytical practice, the indicator is frequently applied as an isolated threshold-based signal without sufficient consideration of its underlying construction logic, behavioural assumptions, interpretative limitations or applicability across different categories of digital assets. Such an approach creates a risk of mechanical interpretation, where complex blockchain-derived valuation dynamics are reduced to oversimplified numerical thresholds detached from broader market context.

The analytical interpretation of the MVRV ratio is based on the relationship between market capitalisation and realised capitalisation, allowing the identification of valuation imbalances, investor profitability conditions and corresponding phases of digital asset market cycles, as systematised in Table 1.

Table 1. Interpretative framework for the analytical application of the MVRV ratio in digital asset market cycle diagnostics

MVRV ratio range and trend pattern	Analytical interpretation	Market implications
High MVRV values with an upward trend	The market valuation of the circulating digital asset supply increases relative to its realised capitalisation, indicating a growing divergence between current market prices and the aggregate historical cost basis of market participants. Such conditions reflect the accumulation of substantial unrealised profits within the system.	Elevated unrealised profitability increases the probability of profit-taking behaviour, asset distribution and intensified selling pressure, particularly during expansionary phases of the market cycle.
MVRV > 3.5	The market valuation significantly exceeds realised capitalisation, indicating an exceptionally high concentration of unrealised gains across the network. Historically, such values are associated with overheated market conditions and advanced stages of speculative expansion.	May serve as a strong indicator of late-stage bullish market conditions, heightened distribution risk and increased probability of cyclical market reversal.
Moderate MVRV values (approximately 1.0–3.5)	Market valuation remains above realised capitalisation, suggesting that market participants collectively hold unrealised profits, but without extreme overvaluation conditions. The ratio indicates relatively balanced market conditions between speculative pricing and historical acquisition cost.	May correspond to transitional or structurally stable phases of the market cycle, depending on trend direction and supporting behavioural indicators.
Low MVRV values with a downward trend	The market valuation of the digital asset declines relative to realised capitalisation, indicating a contraction in unrealised profitability and a reduction in speculative market valuation.	May signal weakening demand, deteriorating market sentiment, reduced investor profitability and transition toward contractionary market conditions.
MVRV < 1.0	Market capitalisation falls below realised capitalisation, indicating that a substantial proportion of market participants hold assets at or below their aggregate cost basis. Such conditions reflect widespread unrealised losses across the network.	Commonly interpreted as a signal of market capitulation, depressed valuation conditions and potential long-term accumulation zones characteristic of late-stage bearish market phases.

Source: developed by the author.

The interpretative significance of the MVRV ratio lies in its ability to reflect the aggregate unrealised profitability of market participants and, consequently, the prevailing behavioural state of the digital asset market. Elevated values are generally associated with increased speculative optimism and a higher probability of profit realisation, whereas depressed values indicate compressed profitability, capitulation dynamics and potential accumulation conditions. However, the analytical interpretation of threshold values should not be considered universally fixed, as their significance may vary depending on the specific characteristics of the digital asset, market maturity, liquidity structure and broader cyclical context.

Despite its widespread use, the conventional interpretative framework of the MVRV ratio is characterised by a significant methodological limitation associated with the static treatment of threshold values. In analytical practice, benchmark levels such as MVRV > 3.5 or MVRV < 1.0 are frequently applied as universal market-cycle indicators. However, the structural evolution of digital asset markets, changes in liquidity regimes, increasing institutional participation and the heterogeneity of blockchain ecosystems raise substantial questions regarding the temporal stability and cross-asset applicability of such thresholds.

An additional methodological limitation arises from the heterogeneity of digital assets themselves. The economic structure, transaction dynamics, supply mechanisms and behavioural characteristics of Bitcoin differ substantially from those of Ethereum, DeFi-related assets or other blockchain ecosystems.

The empirical relevance of this limitation may be illustrated by comparing the long-term dynamics of key on-chain and market indicators for Bitcoin and Ethereum. Although both assets demonstrate broadly synchronised cyclical movements in price and market capitalisation, their MVRV trajectories and supply structures reveal important differences that should be considered when applying valuation thresholds in market-cycle diagnostics (Fig. 1).

The comparative dynamics presented in Fig. 1 demonstrate that Bitcoin and Ethereum exhibit broadly similar cyclical patterns in terms of price and market capitalisation, reflecting the general synchronisation of major digital assets during expansionary and contractionary phases of the cryptocurrency market. At the same time, the behaviour of the MVRV ratio differs across the two assets in terms of amplitude, volatility and the frequency of extreme values. This indicates that identical absolute MVRV thresholds may not capture valuation imbalances with the same analytical precision across different blockchain ecosystems.

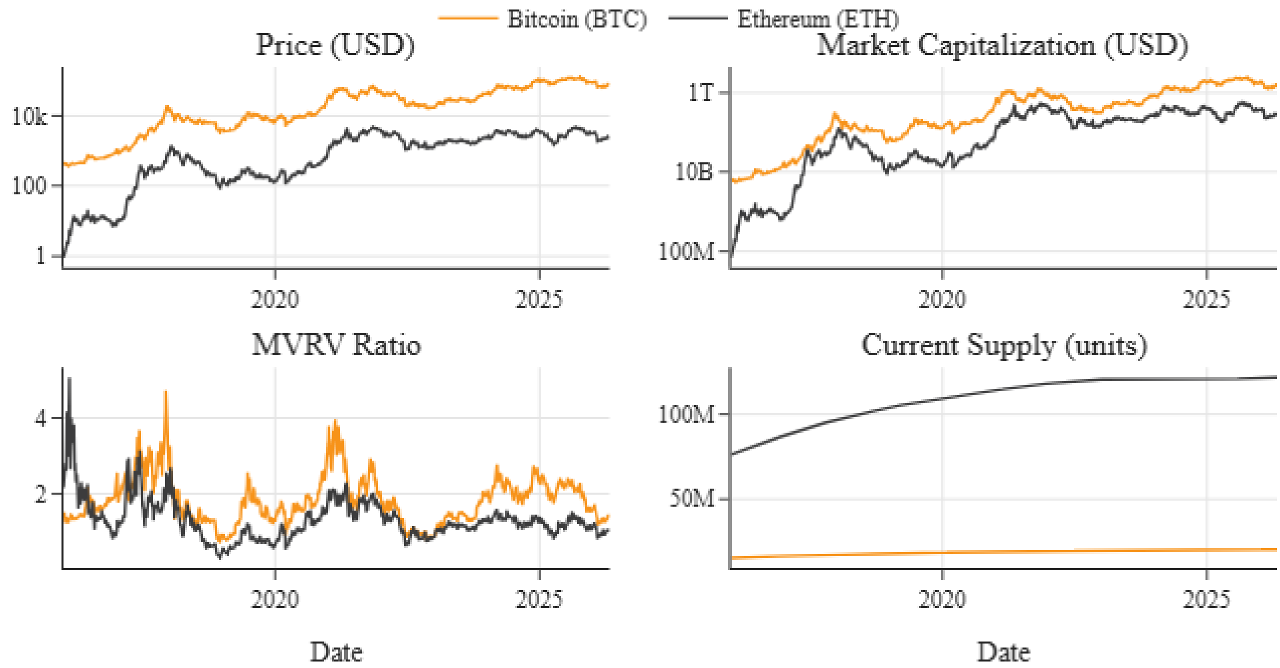

Fig. 1. Comparative dynamics of price, market capitalisation, MVRV ratio and current supply for Bitcoin and Ethereum, 2016–2026

Source: compiled by the author based on Coin Metrics Community API data [14].

A further distinction is observed in the dynamics of current supply. Bitcoin supply follows a relatively gradual and predictable trajectory determined by its protocol-based issuance mechanism, whereas Ethereum supply reflects a different monetary architecture and post-issuance dynamics. These structural differences influence the formation of market capitalisation, realised capitalisation and, consequently, the interpretation of the MVRV ratio. Therefore, cross-asset comparison confirms that MVRV should not be interpreted solely through fixed universal thresholds, but should be adjusted to the historical distribution and structural characteristics of each asset.

To address these limitations, a more adaptive analytical approach is proposed, based not on fixed absolute threshold values, but on the relative historical position of the MVRV ratio within its own rolling distribution. Within this framework, the analytical significance of the indicator is determined not by predefined universal levels, but by its percentile position relative to historical observations over a selected time window. Such an approach allows the interpretation of market valuation conditions to adjust dynamically to evolving market structures, changing behavioural regimes and asset-specific characteristics. The adaptive MVRV framework may be formally expressed through the rolling percentile transformation:

$$\mathrm{MVRV}_{\mathrm{percentile},t} = \frac{Rank(MVRVt)}{N} \quad (4)$$

where: $\mathrm{MVRV}_{\mathrm{percentile},t}$ – observed MVRV value at time t;

$\mathrm{Rank}(\mathrm{MVRV}_t)$ – ordinal position of the observed value within the selected rolling historical sample;

N – total number of observations within the rolling analytical window.

Under this methodological approach, market overheating may be identified when the MVRV ratio approaches historically extreme upper percentiles, while potential accumulation conditions may be associated with lower percentile zones rather than with rigid absolute numerical thresholds. For example, instead of interpreting MVRV > 3.5 as a universal signal of speculative excess, the analytical conclusion would be based on whether the current value belongs to the upper decile or upper percentile range of the asset's own historical valuation distribution.

Such an approach substantially enhances methodological flexibility and analytical comparability. It allows the MVRV ratio to remain sensitive to structural market evolution while preserving its core interpretative function as an indicator of valuation imbalance, investor profitability conditions and cyclical behavioural transitions within digital asset markets.

Conclusions and prospects for further research in this area. The conducted research confirms that the Market Value to Realized Value ratio represents one of the most analytically significant blockchain-derived indicators for diagnosing valuation conditions and cyclical behavioural transitions in digital asset markets. Unlike conventional price-based analytical tools, the MVRV ratio provides a blockchain-native valuation perspective by linking current market capitalisation with the historically embedded realised value of circulating digital assets. This allows the indicator to reflect not only speculative market pricing, but also the aggregate unrealised profitability and economic positioning of market participants.

At the same time, the study demonstrates that the conventional methodological interpretation of the MVRV ratio through fixed threshold values possesses significant analytical limitations. The widespread practical application of static benchmark levels, such as universal overvaluation or capitulation thresholds, does not sufficiently account for the structural evolution of digital asset markets, changes in liquidity architecture, increasing institutional participation and the growing heterogeneity of blockchain ecosystems. The comparative analysis of Bitcoin and Ethereum confirms that digital assets with different supply mechanisms, market structures and behavioural characteristics may exhibit substantially different MVRV trajectories, which reduces the analytical reliability of identical absolute threshold values across distinct market environments.

An important scientific result of the study is the substantiation of an adaptive methodological approach to MVRV interpretation based on the relative historical position of the indicator within its rolling distribution. The proposed framework replaces rigid absolute threshold logic with a percentile-based interpretative model that allows the diagnostic significance of MVRV to adjust dynamically to historical market conditions, structural asset characteristics and changing behavioural regimes. Such an approach improves methodological flexibility, enhances analytical comparability and reduces the risk of distorted valuation interpretation caused by static analytical assumptions. Prospects for further research are associated with the empirical validation of the proposed adaptive framework across broader groups of digital assets and different historical market regimes.

Література

1. Li X., Liu Y., Liu Z., Zhu S. 2024. Cryptocurrency return prediction: A machine learning analysis. SSRN Electronic Journal. 2024. DOI: https://doi.org/10.2139/ssrn.4703167

2. Li X., Liu Z., Yu X., Yan J. Unveiling Bitcoin market dynamics: a machine learning perspective on return predictions. Applied Economics Letters. Routledge. 2025. DOI: https://doi.org/10.1080/13504851.2025.2567617

3. Liu Y., Tsyvinski A. Risks and returns of cryptocurrency. The Review of Financial Studies. 2020. 34(6). 2689–2727. DOI: https://doi.org/10.1093/rfs/hhaa113

4. Celig T., Ockenga T. A., Schoder D. Distributional equality in ethereum? on-chain analysis of Ether Supply Distribution and Supply Dynamics. Humanities and Social Sciences Communications. 2025. № 12(1). DOI: https://doi.org/10.1057/s41599-025-04728-9

5. Ciaian P., Kancs d'Artis, Rajcaniova M. On- and off-chain demand and supply drivers of Bitcoin Price. Economics. 2026. № 20(1). DOI: https://doi.org/10.1515/econ-2025-0169

6. Rudd M. A., Porter D. Bitcoin supply, demand, and Price Dynamics. Journal of Risk and Financial Management. 2025. № 18(10). pp. 570. DOI: https://doi.org/10.3390/jrfm18100570

7. Biais B., Bisière C., Bouvard M., Casamatta C., Menkveld A. J. Equilibrium bitcoin pricing. The Journal of Finance. № 78(2). pp. 967–1014. DOI: https://doi.org/10.1111/jofi.13206

8. Xia L., Zhu T., Jing Z., Wang Q., Ma Z., Huang Z., Yin Z. A two-layer transaction network-based method for virtual currency address identity recognition. Cryptography. 2025. № 9(4). DOI: https://doi.org/10.3390/cryptography9040065

9. Kim D., Ryu D., Webb R. I. Determination of equilibrium transaction fees in the Bitcoin Network: A rank-order contest. International Review of Financial Analysis. 2023. № 86. pp. 102487. DOI: https://doi.org/10.1016/j.irfa.2023.102487

10. Sun W., Jin H., Jin F., Kong L., Peng Y., Dai Z. Spatial Analysis of Global Bitcoin Mining. Scientific Reports. 2022. № 12(1). DOI: https://doi.org/10.1038/s41598-022-14987-0

11. Schär F. Decentralized finance: on blockchain-and smart contract-based financial markets. Federal Reserve Bank of St. Louis Review. 2022. № 103(2). pp. 153–174. DOI: https://doi.org/10.20955/r.103.153-74

12. Aleti S., Mizrach B. Bitcoin spot and futures market microstructure. Journal of Futures Markets. 2021. № 41(2). pp. 194–225. DOI: https://doi.org/10.1002/fut.22163

13. Hung J.-C., Liu H.-C., Yang J. J. Trading activity and price discovery in Bitcoin futuresmarkets. Journal of Empirical Finance. 2021. № 62. pp. 107–120. DOI: https://doi.org/10.1016/j.jempfin.2021.03.001

14. Coin Metrics Community Data. Coin Metrics Product Docs. 2026. URL: https://gitbook-docs.coinmetrics.io/packages/coin-metrics-community-data

15. MVRV Ratio. Glassnode Docs. 2021. URL: https://docs.glassnode.com/guides-and-tutorials/metric-guides/mvrv/mvrv-ratio

References

1. Li, X., Liu, Y., Liu, Z. and Zhu, S. (2024), "Cryptocurrency return prediction: A machine learning analysis", SSRN Electronic Journal. https://doi.org/10.2139/ssrn.4703167

2. Li, X., Liu, Z., Yu, X. and Yan, J. (2025), "Unveiling Bitcoin market dynamics: A machine learning perspective on return predictions", Applied Economics Letters. https://doi.org/10.1080/13504851.2025.2567617

3. Liu, Y. and Tsyvinski, A. (2020), "Risks and returns of cryptocurrency", The Review of Financial Studies, vol. 34, no. 6, pp. 2689–2727. https://doi.org/10.1093/rfs/hhaa113

4. Celig, T., Ockenga, T.A. and Schoder, D. (2025), "Distributional equality in ethereum? On-chain analysis of Ether supply distribution and supply dynamics", Humanities and Social Sciences Communications, vol. 12, no. 1. https://doi.org/10.1057/s41599-025-04728-9

5. Ciaian, P., Kancs, d'Artis and Rajcaniova, M. (2026), "On- and off-chain demand and supply drivers of Bitcoin price", Economics, vol. 20, no. 1. https://doi.org/10.1515/econ-2025-0169

6. Rudd, M.A. and Porter, D. (2025), "Bitcoin supply, demand, and price dynamics", Journal of Risk and Financial Management, vol. 18, no. 10, article 570. https://doi.org/10.3390/jrfm18100570

7. Biais, B., Bisière, C., Bouvard, M., Casamatta, C. and Menkveld, A.J. (2023), "Equilibrium bitcoin pricing", The Journal of Finance, vol. 78, no. 2, pp. 967–1014. https://doi.org/10.1111/jofi.13206

8. Xia, L., Zhu, T., Jing, Z., Wang, Q., Ma, Z., Huang, Z. and Yin, Z. (2025),

“A two-layer transaction network-based method for virtual currency address identity recognition”, Cryptography, vol. 9, no. 4. https://doi.org/10.3390/cryptography9040065

9. Kim, D., Ryu, D. and Webb, R.I. (2023), “Determination of equilibrium transaction fees in the Bitcoin Network: A rank-order contest”, International Review of Financial Analysis, vol. 86, article 102487. https://doi.org/10.1016/j.irfa.2023.102487

10. Sun, W., Jin, H., Jin, F., Kong, L., Peng, Y. and Dai, Z. (2022), “Spatial analysis of global Bitcoin mining”, Scientific Reports, vol. 12, no. 1. https://doi.org/10.1038/s41598-022-14987-0

11. Schär, F. (2022), “Decentralized finance: On blockchain- and smart contract-based financial markets”, Federal Reserve Bank of St. Louis Review, vol. 103, no. 2, pp. 153–174. https://doi.org/10.20955/r.103.153-74

12. Aleti, S. and Mizrach, B. (2021), “Bitcoin spot and futures market microstructure”, Journal of Futures Markets, vol. 41, no. 2, pp. 194–225. https://doi.org/10.1002/fut.22163

13. Hung, J.-C., Liu, H.-C. and Yang, J.J. (2021), “Trading activity and price discovery in Bitcoin futures markets”, Journal of Empirical Finance, vol. 62, pp. 107–120. https://doi.org/10.1016/j.jempfin.2021.03.001

14. Coin Metrics Product Docs (2026), “Coin Metrics Community Data”, available at: https://gitbook-docs.coinmetrics.io/packages/coin-metrics-community-data (Accessed 15 May 2026).

15. Glassnode Docs (2021), “MVRV Ratio”, available at: https://docs.glassnode.com/guides-and-tutorials/metric-guides/mvrv/mvrv-ratio (Accessed 15 May 2026).

Отримано редакцією журналу / Received: 15.05.26

Прорецензовано / Revised: 22.05.26

Дата публікації / Published: 26.05.26