UDC 519.688; 004.89; 004.9 https://doi.org/10.20535.2786-8729.5.2024/316456

DYNAMIC MODEL OF CURRENCY EXCHANGE BASED ON INVESTOR BEHAVIOR

Mykhailo Miahkyi *
National Technical University of Ukraine
"Igor Sikorsky Kyiv Polytechnic Institute", Kyiv, Ukraine
https://orcid.org/0000-0002-8038-8839

*Corresponding author: mishamyagkiy3@gmail.com

In the modern financial environment, cryptocurrencies have gained significant popularity, becoming an important element of the global economy and financial markets. The dynamic development of blockchain technologies and decentralized financial instruments fosters increased interest from both private investors and institutional players. However, the high volatility of cryptocurrencies and the complexity of the mechanisms behind their price formation necessitate a detailed study of these processes.

This paper models cryptocurrency exchange operations, analyzing price formation influenced by buying, selling, and introducing new crypto coins to the market. The system simulates investor behavior with individual parameters: initial balances, risk profiles, and profit-driven trading strategies over a specified period. The model takes into account the psychological aspects of investor behavior, their reaction to changing market conditions, and the impact of external factors such as news and regulatory changes.

Special attention is paid to analyzing the impact of adding additional quantities of coins to the exchange at a reduced price during peak cryptocurrency price values. This creates conditions for activating trading operations, increasing liquidity, and affecting overall market dynamics, particularly volatility and price fluctuation trends. The study shows how such interventions can be used to stabilize the market or stimulate its further growth.

The analysis of the obtained data allows for detailed observation of changes in the cryptocurrency's value over time, identifying patterns and trends. Using statistical and analytical methods, the impact of different investor strategies on their financial results and the overall market situation was investigated. This enables assessing how investor decisions-timing, trade volume, and market reactions-impact profits and market dynamics.

The research emphasizes the importance of a deep understanding of market mechanisms and trading psychology and can serve as a basis for developing effective trading strategies on cryptocurrency exchanges. The obtained results may be useful for traders, financial analysts, and developers of algorithmic trading systems, contributing to increased efficiency and stability of cryptocurrency markets. Moreover, the findings of the work can be applied to improve regulatory approaches and policies regarding cryptocurrencies.

Key words: cryptocurrency modeling, price dynamics, investor strategies, market analysis, decision-making.

1. Introduction

In the modern world, technological advancements and digital innovations significantly impact all areas of the economy and finance. One of the most critical phenomena of recent years is the emergence and rapid growth of cryptocurrencies. They have opened new opportunities for investors and entrepreneurs while presenting the scientific community with several complex questions about their nature, operational mechanisms, and impact on global financial markets.

This article is dedicated to the scientific field of financial modeling and computational economics, focusing on the problem of understanding and simulating the mechanisms of cryptocurrency price formation on exchanges. Cryptocurrency exchanges have become the primary platforms for trading digital assets, where demand and supply determine the value of specific coins.

However, the dynamics of cryptocurrency price formation significantly differ from traditional financial instruments due to high volatility, the absence of centralized regulation, and the influence of various external factors. This discrepancy necessitates the development of models that can adequately describe and predict the behavior of cryptocurrency markets.

One of the key aspects influencing cryptocurrency prices is the behavior of market participants – investors, traders, and miners. Their decisions regarding buying, selling, or introducing new coins directly impact the balance of demand and supply and, therefore, the cryptocurrency price. Traditional economic models often fail to accurately describe these processes due to the unique characteristics of cryptocurrency markets, such as decentralized governance and the significant role of psychological factors.

Therefore, there is an increasing need for specialized information technologies and modeling approaches that capture the specifics of cryptocurrency exchanges and the behavioral patterns of their participants. Such technologies would allow for a deeper understanding of the mechanisms behind cryptocurrency price formation and enable researchers to study the impact of various factors on market dynamics.

The relevance of this research lies in the growing significance of cryptocurrencies in the global economy and the necessity to comprehend their influence on financial markets. Developing accurate models of cryptocurrency exchange operations is crucial for predicting market trends, managing risks, and formulating effective trading strategies. This study aims to contribute to the scientific community by providing tools for analyzing and modeling cryptocurrency markets, thereby filling existing gaps in both academic literature and practical applications.

2. Literature review and problem statement

In [1], temporal sentiment analysis extracted causal rules from tweets to predict events, indicating that social media content supports forecasting tasks. Studies [2 – 5] further highlighted the potential of social media, network analysis, and topic modeling for understanding dynamic information flows. In [2], dynamic topic modeling examined shifting online discussions during the COVID-19 pandemic, showing that evolving narratives influence prediction accuracy. In [3], a comprehensive overview of social network analysis and mining presented methods to interpret complex relational structures. In [4], mining Twitter data improved influenza detection, proving that timely data streams enhance surveillance and early warnings. In [5], analyzing social networks predicted future knowledge transfers, suggesting that network insights help anticipate changes in interconnected systems.

Works [6] and [7 – 8] underscored the importance of robust statistical frameworks. In [6], various time series methods offered techniques for capturing temporal patterns in intricate datasets. Studies [7 – 8] emphasized foundational statistical principles, ensuring that data-driven models remain methodologically sound and interpretable.

Research [9 – 10] provided methodological guidelines for decision-making systems and decision support methods. In [9], decision-making frameworks guided structured reasoning, essential for complex financial scenarios. In [10], decision support systems integrated analytical tools that assist in selecting optimal strategies, which is vital in uncertain markets.

In [11], a fuzzy rule-based Bayesian algorithm managed selection problems under demand response conditions, illustrating how adaptive computational approaches handle intricate decision environments. Reference [12] demonstrated that identifying influential economic factors supports accurate exchange rate forecasts for traditional currencies. Study [13] analyzed numerous publications to inform forecasts of cryptocurrency rate changes, revealing that diverse data sources contribute to improved predictive capabilities.

In [14], an algorithm considered influential social media posts from prominent figures, refining cryptocurrency rate forecasts by integrating external signals. In [15], expert opinion rankings improved exchange rate prediction accuracy, proving that structured judgment complements

quantitative data. These studies advanced forecasting methods using sentiment, network, statistical, and decision support tools, but they mostly focused on external indicators, macroeconomic parameters, or aggregated social signals.

Despite these advancements, no integrated model fully simulates internal dynamics driven by individual investor strategies, particularly buying, selling, and introducing new coins. Existing approaches rarely capture how participant actions shape cryptocurrency price formation from within the exchange environment. This gap suggests that developing a comprehensive model, which accounts for investor behaviors and their collective effects on price, remains a crucial unresolved problem. Addressing this challenge can enhance predictive accuracy, refine strategic decision-making, and support more stable cryptocurrency markets.

3. The aim and objectives of the study

The study aims to model cryptocurrency exchange operations, focusing on investor strategies and behaviors, to analyze their collective impact on cryptocurrency price formation. This addresses the identified problem of lacking adequate models that reflect the unique dynamics of cryptocurrency markets influenced by participant behavior.

To achieve this aim, the following specific objectives are set:

1. Develop a mathematical model of a cryptocurrency exchange:

– Formulate a model that includes the initial balances of money and cryptocurrency for each investor.

– Incorporate the planned number of trading rounds by the investors.

– Define the mechanisms of buying and selling cryptocurrency by investors aimed at profit maximization.

– Integrate the mechanism of adding extra coins to the exchange at a discounted price during specific time intervals to simulate market interventions.

2. Analyze the impact of investor actions on cryptocurrency price formation:

– Examine how active buying and selling of cryptocurrency by investors affect its market value.

– Investigate how the addition of new coins alters the demand-supply balance and influences the price.

– Assess how strategic decisions regarding the timing and volume of transactions impact investors' profits and overall market dynamics.

3. Conduct computational simulations of exchange operations:

– Implement the developed model in a computational environment to simulate exchange operations.

– Collect data on cryptocurrency price dynamics during trading rounds.

– Record final balances of money and cryptocurrency for each investor.

– Track the number of buying and selling transactions conducted by each investor.

4. Perform an analytical evaluation of the simulation results:

– Identify patterns and trends in cryptocurrency price changes under the influence of various factors.

– Evaluate the effectiveness of different investor strategies and their impact on the overall market situation.

– Provide insights into the collective behavior of investors and its effect on market stability and volatility.

5. Develop recommendations for optimal trading strategies and further research:

– Propose recommendations for selecting optimal trading strategies on cryptocurrency exchanges based on the analysis.

– Suggest enhancements to the model by incorporating additional factors such as news events, regulatory changes, and the behavior of large market players [3 – 5].

– Explore the adaptability of the model to other types of financial markets or digital assets.

The study aims to address the literature gap by developing models that simulate cryptocurrency exchange operations influenced by investor behavior. This will contribute to a better understanding of cryptocurrency price formation mechanisms and support the development of effective trading strategies.

4. The study materials and methods of research of the cryptocurrency exchange

4.1. Object and hypothesis of research of the cryptocurrency exchange

The object of this research is the cryptocurrency exchange market, focusing on the mechanisms of cryptocurrency price formation influenced by investor behavior and market dynamics. The research focuses on developing and analyzing a computational model simulating cryptocurrency exchange operation, including investor strategies, market interactions, and additional coin introductions. To conduct this study, we employed computational modeling and simulation methods to recreate the dynamics of a cryptocurrency exchange. The research methodology includes:

Mathematical modeling: developing mathematical representations of investor behavior, market supply and demand, and price formation mechanisms. This approach is grounded in established financial modeling techniques as outlined in [6 – 8].

Simulation: implementing the mathematical model in a computational environment using Python programming language and relevant libraries such as NumPy and Pandas. Simulation allows for iterative testing and analysis of various market scenarios over multiple trading rounds.

Data analysis: collecting and analyzing simulation data to evaluate investor performance, price dynamics, and market trends. Statistical methods are applied to identify patterns and assess the effectiveness of different trading strategies.

The research was organized into the following steps:

4.2. System description

The modeling system comprises several key components that interact to simulate real processes on a cryptocurrency exchange:

Investors

Number of investors: the system includes a specific number of investors N, each with unique parameters.

Initial balance: each investor i has an initial United States dollar (USD) balance B_i^0 and an initial cryptocurrency balance Q_i^0.

Trading strategy: investors follow different strategies regarding the number of trading rounds R_i, criteria for buying and selling, and risk profiles.

Cryptocurrency

Initial value: the initial price of the cryptocurrency is set as P_0.

Total number of coins: the initial supply of coins in the market is calculated:

$$M_0 = \sum_{i=1}^{N} Q_i^0. \quad (1)$$

Exchange

Trading mechanisms: the exchange ensures the execution of buy and sell transactions among investors based on market rules.

Coin addition: at specific moments, additional coins ΔM_{add} are introduced to the exchange at a discounted price, simulating market interventions.

4.3. Model description

The modeling process involves the following steps:

Step 1: Initialization

Set initial parameters: establish the initial balances for investors B_i^0, Q_i^0, the initial cryptocurrency price P_0, and the total number of coins M_0.

Step 2: Simulation of trading rounds

For each trading round r from 1 to n:

Update cryptocurrency price: the price P_r is updated based on demand D_r and supply S_r:

$$P_r = P_{r-1} \times \left(\frac{D_r}{S_r}\right). \quad (2)$$

In formula (2), P_{r-1} is the price in the previous round, following the supply-demand equilibrium model [6].

Investor decisions on buying or selling:

– Each investor i decides to buy or sell based on the expected future price $E[P_{r+1}]$ and predefined θ_{buy} and θ_{sell}.

Buying criteria:

$$E[P_{r+1}] > P_r, \quad (3)$$

$$P_r < \theta_{buy}, \quad (4)$$

Selling criteria:

$$E[P_{r+1}] < P_r, \quad (5)$$

$$P_r > \theta_{sell}. \quad (6)$$

The expected future price $E[P_{r+1}]$ is estimated using trend analysis and moving averages as per standard financial forecasting method [7].

Execute transactions:

– Transactions are executed based on investor decisions and available balances.

– Investor balances are updated:

$$B_i^{new} = B_i^{old} \pm \Delta B_i, \quad (7)$$

$$Q_i^{new} = Q_i^{old} \pm \Delta Q_i, \quad (8)$$

where, ΔB_i and ΔQ_i represents changes due to buying or selling [8].

Update Market Supply and Demand.

The total market coin amount M_r and money supply C_r are updated:

$$M_r = M_{r-1} + \Delta M_r, \quad (9)$$

$$C_r = C_{r-1} \pm \Delta C_r. \quad (10)$$

Demand and supply are recalculated based on the aggregated of all investors.

Add additional coins:

– Introduce new additional coins and additional price, to simulate market interventions.

– Update supply and price:

$$S_{r+1} = S_r + \Delta M_{add}, \quad (11)$$

$$P_{r+1} = P_r \times \left(\frac{D_{r+1}}{S_{r+1}}\right). \quad (12)$$

Update statistics:

Record updated investor balances, transaction counts, new prices, and trading volumes for analysis [9].

Step 3: Simulation completion

After trading rounds, final data on investor balances and cryptocurrency price dynamics are collected for comprehensive analysis [10].

4.4. Data collection and analysis

Data on each investor's transactions, balances, and the cryptocurrency's price at each round were recorded.

Statistical analysis was performed using tools like Pandas and Matplotlib to identify trends, patterns, and the effectiveness of different trading strategies.

Equipment and tools used

Computational resources:

– Hardware: simulations were run on a computer with [specify CPU, RAM, etc.].

– Software: python programming language with libraries such as NumPy, Pandas, and Matplotlib.

Mathematical libraries:

– Software: python programming language with libraries such as NumPy, Pandas, and

– Utilized for numerical computations and statistical analysis to ensure accuracy and efficiency.

References to methods and standards

– The modeling techniques align with methodologies in financial modeling and simulation as discussed in [6 – 8].

– Simulation practices are based on standard computational methods used in similar financial studies [9 – 10].

Initial investor data

Table 1 outlines the initial values for investors, detailing their USD balances, cryptocurrency holdings, and the number of trading rounds. These parameters are fundamental for assessing how starting conditions, such as financial resources and market exposure, influence individual strategies and overall simulation outcomes. Each investor's data provides insight into their capacity to engage in trades, respond to market changes, and adapt strategies, shaping the dynamics of the modeled cryptocurrency exchange. This information is essential for identifying patterns and evaluating the effects of investor diversity on market stability and price formation. It also highlights how variations in initial conditions can lead to different outcomes in trading behavior.

Ethical considerations

Data privacy: as the simulation involves synthetic data, there are no privacy concerns related to personal information.

Reproducibility: the methods and models used are documented thoroughly to allow for replication of the study by other researchers.

Table 1 Initial values for investors

Name	USD Balance	Cryptocurrency balance	Rounds
Person_1	905.90	57.63	5
Person_2	939.89	98.92	2
Person_3	788.83	99.22	3
Person_4	1037.63	93.41	6
Person_5	799.88	32.47	3
Person_6	827.29	33.86	5
Person_7	1209.10	97.18	4
Person_8	861.86	54.67	2
Person_9	985.39	62.01	3
Person_10	1085.87	54.29	3

Limitations

The model simplifies certain aspects of real-world cryptocurrency markets, such as ignoring external market influences (news, regulations) and high-frequency trading by institutional investors.

Conclusion of methods

By utilizing computational modeling and simulation, this study effectively replicates the operations of a cryptocurrency exchange. The methods applied allow for a detailed analysis of how investor behavior and market mechanisms influence cryptocurrency price formation. The subsequent results provide insights into optimal trading strategies and market dynamics.

5. Results of investigating the simulation of a cryptocurrency exchange

In this section, we present the simulation results of our cryptocurrency exchange model, organized according to our study objectives. We highlight the scientific novelty and provide detailed information for reproducibility, including statistical analyses to evaluate the outcomes

5.1. Simulation outcomes based on investor behavior

After completing the simulation over the specified trading rounds, we obtained the final balances and trading activities for each investor, summarized in Table 2.

Table 2 Final values for investors

Name	USD Balance	Cryptocurrency balance	Sales	Purchases	USD Change	Crypto Change	Crypto Value to USD
Person_1	457.26	58.21	5	4	-448.64	+0.59	1277.63
Person_2	140.89	177.72	2	2	-789.99	+78.81	3900.64
Person_3	1546.06	58.54	3	3	+757.23	-40.68	1284.88
Person_4	211.59	166.72	4	1	-826.03	+73.3	3659.02
Person_5	6.8	103.35	3	8	-793.08	+70.87	2268.22
Person_6	1804.29	2.59	5	4	+976.99	-31.27	56.88
Person_7	1777.39	27.69	3	4	+568.29	-69.49	607.72
Person_8	1161.65	14.37	2	1	+299.79	-40.3	315.49
Person_9	706.65	70.41	3	6	-278.74	+8.4	1545.37
Person_10	1629.06	4.05	3	0	+543.19	-50.23	88.98

Analysis of final data

The USD balance changes among participants reveal distinct financial strategies and outcomes:

Increased USD balances: Person_3, Person_6, Person_7, Person_8, and Person_10 increased their USD balances, indicating profitable trading activities.

Decreased USD balances: Person_1, Person_2, Person_4, Person_5, and Person_9 experienced reductions in their USD balances, likely due to investments in cryptocurrency or less successful trading strategies.

Changes in cryptocurrency balances

Accumulation strategies: Person_2, Person_4, Person_5, and Person_9 increased their cryptocurrency holdings, suggesting a focus on long-term investment.

Asset liquidation: Person_3, Person_6, Person_7, Person_8, and Person_10 reduced their cryptocurrency holdings, indicating profit-taking strategies.

Changes in cryptocurrency balances for each investor are shown in Figure №1.

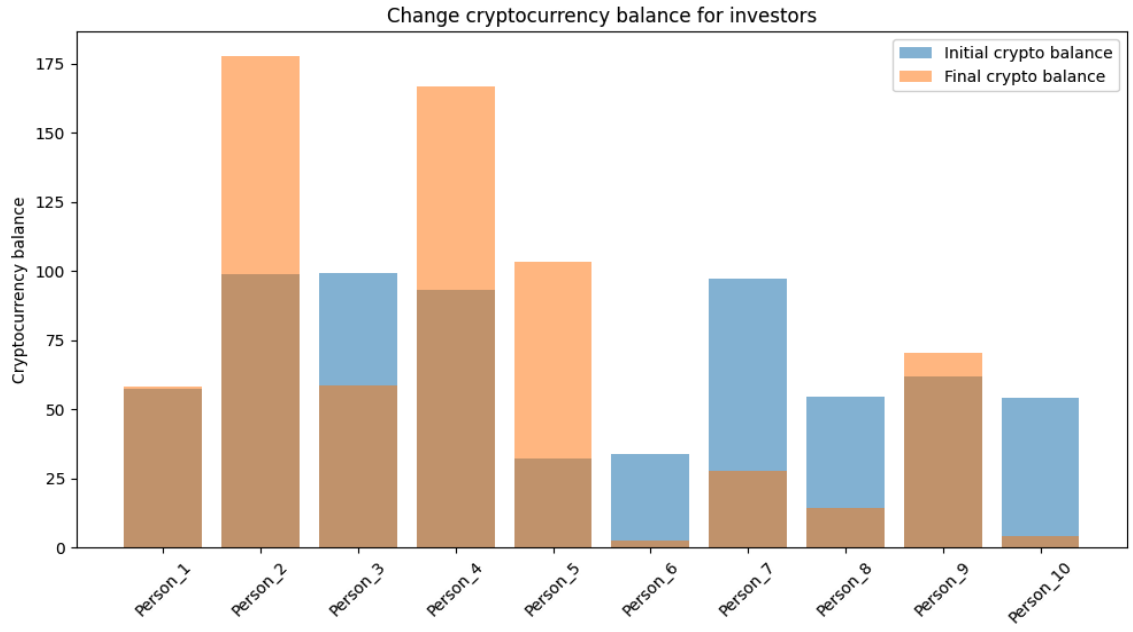

Fig. 1 Changes in cryptocurrency balance for investors

Figure №1 visually represents the dynamic shifts in cryptocurrency balances for each investor, comparing their initial and final holdings. This highlights the diversity in trading approaches and corresponding outcomes.

5.2. Analysis of trading activity

The trading activity of market participants provides insight into their strategies. The trading activity of an investor is shown in Figure №2.

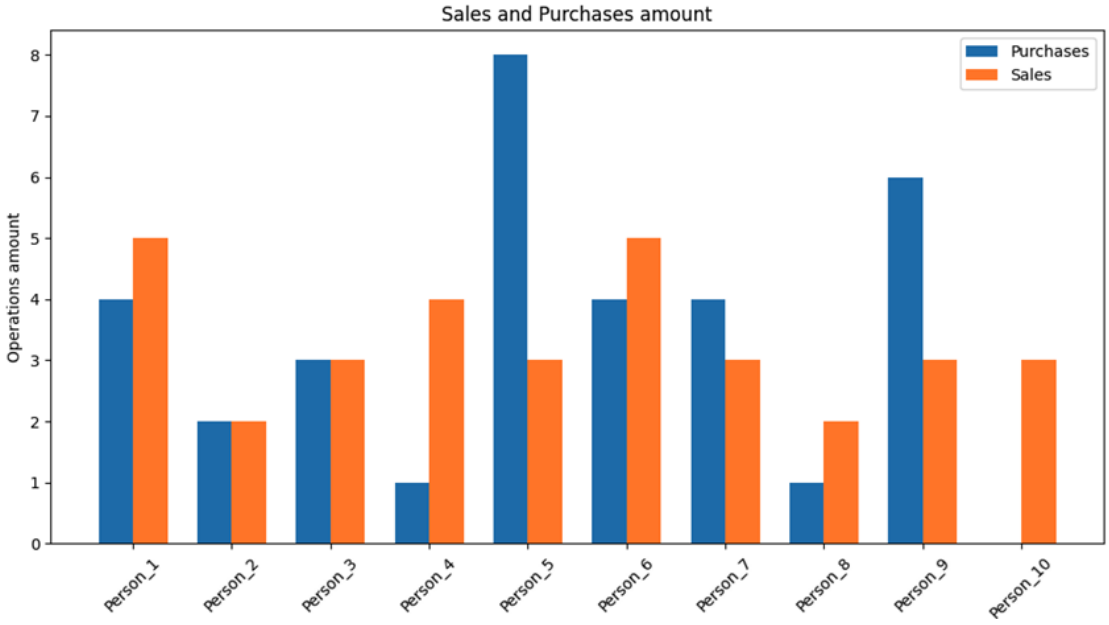

Fig. 2 Investors activity

Figure №2 displays the number of purchases and sales conducted by each investor, illustrating their level of market engagement and preferred strategies.

Active sellers: Person_1 and Person_6 completed 5 sales each, suggesting profit-taking strategies aimed at capitalizing on favorable market conditions.

Active buyer: Person_5 conducted 8 purchases, indicating an aggressive accumulation strategy, possibly reflecting confidence in future market growth.

5.3. Cryptocurrency value in USD

The cryptocurrency value in USD represents the total value of an investor's cryptocurrency holdings converted to USD:

$$V = B \times R\ . \tag{13}$$

In formula (13), V is the cryptocurrency value in USD, B is the balance of cryptocurrency units held, R is the current exchange rate of the cryptocurrency to USD.

Understanding this value is crucial for investors, as it helps in making informed decisions regarding buying, selling, or holding assets. It also facilitates comparisons with other investment options and aids in evaluating the performance of the cryptocurrency within the broader financial market context.

Example calculation for Person_2

Final USD balance: $B_{USD} = 140.89$ USD.

Cryptocurrency value:

$$V = 177.72 \times (current\ exchange\ rate) = 3900.64\ USD \tag{14}$$

Total asset value:

$$T = B_{USD} + \mathrm{V} = 140.89\ \mathrm{USD} + 3900.64\ \mathrm{USD} = 4041.53\ \mathrm{USD} \tag{15}$$

Compared to the initial assets, the total asset value of Person_2 has increased significantly, indicating a successful investment strategy.

5.4. Price dynamics overview

Analysis of cryptocurrency price dynamics during trading rounds reveals key factors affecting price formation:

Impact of buying and selling

Price growth: active buying increases demand, leading to higher prices.

Price decline: mass selling increases supply, causing price reductions.

Adding additional coins

Temporary price reduction: introducing new coins at a reduced price increases supply, leading to a temporary price drop.

Stimulating buying: lower prices attract investors, activating purchases and contributing to subsequent price growth.

Investor behavior

Trading strategies: different strategies impact market volatility.

Market expectations: expectations of future price movements influence buying and selling decisions.

General Trends

Volatility: high volatility is observed, especially in response to sharp changes in demand and supply.

Cyclicality: cycles of price increases and decreases are associated with investor actions and coin additions.

6. Discussion of the results of investigating the simulation of a cryptocurrency exchange

6.1. Interpretation of results

Successful strategies

Profit maximization: Person_3 and Person_6 significantly increased their USD balances by strategically timing their sales. Their actions indicate effective profit-taking strategies that capitalize on market volatility.

Accumulation for long-term gains: Person_2 and Person_4 reduced their USD balances but substantially increased their cryptocurrency holdings. This suggests a strategy focused on long-term investment, anticipating future price appreciation of the cryptocurrency.

Risky strategies

High liquidity risk: Person_5 depleted their USD funds to accumulate cryptocurrency, which could be profitable if the market rises but carries high liquidity risks.

6.2. Impact of market mechanisms

Effectiveness of adding additional coins

Regulating price: adding new coins at reduced prices effectively increased supply, leading to temporary price reductions and preventing market overheating.

Stimulating market activity: lower prices attracted investors, increasing trading volume and contributing to market liquidity.

Investor responses

Investors adjusted their strategies in response to market interventions, demonstrating the importance of flexibility and responsiveness in trading.

6.3. Scientific novelty and contributions

Modeling investor behavior: the study integrates individual investor strategies into the simulation, providing a nuanced understanding of market dynamics.

Market regulation insights: findings highlight how supply-side interventions can be used to manage market volatility.

6.4. Limitations and future research

Limitations

External factors not included: the model does not account for external influences such as news events or regulatory changes.

Fixed strategies: investor strategies were predefined and did not adapt dynamically during the simulation.

Future Research directions

Incorporate external variables: including news sentiment and regulatory developments could enhance the model.

Dynamic strategy adaptation: implementing adaptive strategies using machine learning could reflect more realistic investor behavior.

7. Conclusions

1. Development of a comprehensive cryptocurrency exchange model

We successfully developed a comprehensive mathematical model that simulates the operations of a cryptocurrency exchange, incorporating individual investor behaviors and strategies. The model incorporates investor balances, trading rounds, profit-driven trading mechanisms, and discounted coin additions to simulate market interventions. This model effectively reflects the key factors influencing cryptocurrency price formation-buying, selling, and the introduction of new coins.

2. Analysis of investor actions on price formation

The analysis demonstrated that investor actions significantly influence cryptocurrency price formation. Active buying operations by investors lead to increased demand, stimulating the growth of the cryptocurrency's value. Conversely, mass selling increases supply, causing a decrease in price. The mechanism of adding additional coins at reduced prices effectively alters the supply-demand balance, temporarily reducing prices and preventing excessive value growth. Strategic decisions regarding the timing and volume of transactions have a substantial impact on individual profits and overall market dynamics.

3. Successful simulation and data collection

We implemented the developed model in a computational environment and conducted simulations of exchange operations across multiple trading rounds. The simulations provided detailed data on cryptocurrency price dynamics, final balances of money and cryptocurrency for each investor, and the number of buying and selling transactions conducted. This comprehensive dataset allowed

for an in-depth evaluation of market behavior and investor performance within the simulated environment.

4. Analytical evaluation of simulation results

The analytical evaluation of the simulation results identified clear patterns and trends in cryptocurrency price changes influenced by various factors. The high volatility characteristic of real cryptocurrency markets was reflected in the model, with price fluctuations associated with investor activity and changes in cryptocurrency supply. The effectiveness of different investor strategies was assessed, revealing that investors who adapt their strategies to changing market conditions and actively respond to emerging opportunities can significantly increase their capital. Understanding the complex interaction between investor behavior and market mechanisms is critical for successful trading on cryptocurrency exchanges.

5. Recommendations and future model enhancements

Based on our findings, we recommend that investors adopt flexible trading strategies that consider market trends and investor behavior to maximize profitability. The model highlights the importance of investors' flexibility and awareness of market mechanisms and trends. Future research should enhance the model by adding external factors, psychological aspects of investor behavior, and actions of major market players. Expanding the model in this way will provide a more accurate and complete understanding of market dynamics and open prospects for improving methods of modeling cryptocurrency markets.

Overall, the study contributes significantly to understanding the mechanisms of cryptocurrency price formation and the role of investors in this process. The developed model serves as a valuable tool for analyzing cryptocurrency markets, taking into account both economic and behavioral factors. The results obtained are useful for investors, traders, and researchers aiming to develop effective trading strategies and contribute to the development of more stable and predictable cryptocurrency markets.

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УДК 519.688; 004.89; 004.9

ДИНАМІЧНА МОДЕЛЬ КРИПТОВАЛЮТНОЇ БІРЖІ НА ОСНОВІ ПОВЕДІНКИ ІНВЕСТОРІВ

Михайло Мягкий
Національний технічний університет України
«Київський політехнічний інститут імені Ігоря Сікорського», Київ, Україна
https://orcid.org/0000-0002-8038-8839

У сучасному фінансовому середовищі криптовалюти набули значної популярності, стаючи важливим елементом глобальної економіки та фінансових ринків. Динамічний розвиток технологій блокчейн та децентралізованих фінансових інструментів сприяє збільшенню інтересу як з боку приватних інвесторів, так і з боку інституційних гравців. Однак висока волатильність криптовалют та складність механізмів формування їх курсу викликають потребу у детальному дослідженні цих процесів.

У даній роботі представлено дослідження моделювання роботи криптовалютної біржі, зосереджене на детальному аналізі механізмів формування курсу валюти під впливом трьох основних факторів: купівлі, продажу та додавання нових криптомонет до ринку. Система імітує поведінку інвесторів з індивідуальними параметрами: балансами, ризиковими профілями та стратегіями торгівлі для максимізації прибутку за певний час. У моделі враховуються психологічні аспекти поведінки інвесторів, їх реакція на зміну ринкових умов та вплив зовнішніх факторів, таких як новини та регуляторні зміни.

Особлива увага приділяється аналізу впливу додавання додаткової кількості монет на біржу за зниженою ціною у моменти пікових значень вартості криптовалюти. Це створює умови для активізації торгових операцій, підвищення ліквідності та впливає на загальну динаміку ринку, зокрема на волатильність та тренди цінових коливань. Дослідження показує, як такі інтервенції можуть бути використані для стабілізації ринку або стимулювання його подальшого зростання.

Аналіз отриманих даних дозволяє детально спостерігати за змінами вартості криптовалюти в часі, виявляти закономірності та тенденції. Використовуючи статистичні та аналітичні методи, досліджено вплив різних стратегій інвесторів на їх фінансові результати та загальну ринкову ситуацію. Це дає можливість оцінити, як стратегічні рішення інвесторів, такі як вибір моменту купівлі або продажу, обсяг операцій та реакція на ринкові сигнали, впливають на їх прибутки та загальну динаміку ринку.

Дослідження підкреслює важливість глибокого розуміння ринкових механізмів, психології торгівлі та може слугувати основою для розробки ефективних торгових стратегій на криптовалютних біржах. Отримані результати можуть бути корисними для трейдерів, фінансових аналітиків та розробників алгоритмічних торгових систем, сприяючи підвищенню ефективності та стабільності криптовалютних ринків. Крім того, висновки роботи можуть бути застосовані для вдосконалення регуляторних підходів та політик щодо криптовалют.

Ключові слова: моделювання криптовалют, динаміка цін, стратегії інвесторів, аналіз ринку, прийняття рішень