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Valuation of Cryptocurrencies: Exploring Network Value to Transactions Ratio and Sentiment Analysis Approaches

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Abstract:
Cryptocurrency valuation remains a significant challenge for investors and analysts due to the sector's volatility, evolving regulatory landscape and dependence on technology and market psychology. This paper reviews two prominent approaches for cryptocurrency valuation—Network Value to Transactions (NVT) Ratio and Sentiment Analysis. It outlines their methodologies, applications and limitations. The NVT Ratio is compared to the price-to-earnings ratio in equity markets and evaluates a cryptocurrency's market capitalization relative to network transaction volumes. Sentiment Analysis evaluates public mood and opinion by mining social media, news and community forums to forecast price movements. Supporting literature is explored, including innovative concepts like Data Shapley value and advanced prediction models using deep learning. Using Bitcoin and Ethereum as examples, the study demonstrates step-by-step calculations and interpretations, showing how each approach can offer insights into market conditions. The paper concludes that combining quantitative and qualitative models can provide more balanced and reliable cryptocurrency valuations for informed decision-making.

Keywords: Cryptocurrency valuation, Bitcoin, Ethereum, NVT ratio, Sentiment analysis, Blockchain, Market sentiment, Digital assets

1 Introduction:

The valuation of cryptocurrencies presents a complex challenge due to their inherently volatile nature and the rapidly evolving landscape in which they operate. Unlike traditional assets, cryptocurrencies are influenced by a unique combination of technological advancements, regulatory changes, market sentiment and economic factors. Consequently, investors and analysts require robust and adaptive methods to assess their value accurately. This paper discusses two prominent valuation methodologies that have been adapted for cryptocurrencies: The Network Value to Transactions (NVT) Ratio and Sentiment Analysis. The NVT Ratio, akin to the price-to-earnings ratio in stock analysis, compares the market capitalization of a cryptocurrency to the volume of transactions processed on its network. This ratio helps determine whether a cryptocurrency is overvalued or undervalued based on its transactional activity. Sentiment Analysis, on the other hand, gauges the overall mood of the market derived from social media, forums and news outlets, providing insights into the potential future movements of cryptocurrency prices based on public perception.

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2 Literature Review:

Amirata Ghorbani (2019), introduces an innovative method for valuing individual data points within machine learning models called the Data Shapley value. This concept is derived from the Shapley value, a game-theoretic approach traditionally used in cooperative games to fairly distribute payoffs among players. In the context of machine learning, Data Shapley value quantifies the contribution of each individual data point to the overall performance of a model, providing a fair and equitable assessment of its importance. This methodology is particularly relevant for a wide range of data types, including digital assets, where determining the value of individual contributions can be complex and opaque. The application of Data Shapley value is crucial in scenarios such as dataset pruning, anomaly detection and optimizing data acquisition, where understanding the value of each data point can lead to more efficient and effective machine learning processes. This approach not only enhances transparency in data valuation but also supports the development of more robust and fair machine learning systems.

William (2020), presents a pioneering approach to understanding the value of cryptocurrencies and tokens through a dynamic asset-pricing model. This model is distinct from traditional financial models as it doesn't rely solely on discounting future cash flows but incorporates the unique characteristics of digital platforms and the behavior of their users. Specifically, it examines how the demand for transactions by users on a platform and the growth of the platform itself impact the valuation of tokens. The model reflects the real-world dynamics of cryptocurrency markets, acknowledging that the value of tokens can be significantly influenced by how widely they are adopted and used within their respective ecosystems. This approach also considers network effects, where the utility and value of tokens increase as more users participate in the network, leading to volatile, yet potentially lucrative investment opportunities. The study offers a more nuanced understanding of token economics, providing insights that could be pivotal for investors, platform designers and policymakers in the digital economy.

Yongchan (2021), introduces an innovative framework for assessing the value of data within machine learning models. Building upon the foundational concept of the Shapley value from cooperative game theory, the Beta Shapley method enhances this approach by addressing key limitations such as noise and inefficiency, which are prevalent in traditional data valuation methods. The framework is particularly suited for complex environments like blockchain networks, where data inputs from numerous sources must be precisely evaluated for their contribution to the overall system’s performance. Beta Shapley provides a more robust, scalable and noise-resistant methodology, making it a valuable tool for developers and analysts working with blockchain technology. It ensures that contributions of individual data points are assessed more fairly, which is crucial for optimizing network operations and fostering trust among

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participants. This advancement not only pushes the envelope in data valuation research but also has practical implications for the design and improvement of data-driven blockchain architectures.

Arnav Kapoor (2022), delves into the significant impact that social media, particularly Twitter, has on the valuation of Non-Fungible Tokens (NFTs). The research utilizes a comprehensive dataset that links Twitter interactions and NFT transactions on OpenSea, the largest NFT marketplace. By analyzing 245,159 tweets related to 62,997 NFT assets, the paper explores how the engagement metrics of tweets—such as likes, retweets and the number of followers—correlate with NFT prices and sales volumes. The findings highlight that social media not only serves as a promotional tool but also fundamentally influences the perceived value and demand for NFTs. This insight underscores the role of digital communities and online visibility in shaping the market dynamics of digital assets, suggesting that social media features can serve as predictors of NFT valuation and market trends.

Ling Sim (2022), provides a comprehensive survey of the evolving field of data valuation in machine learning. This research thoroughly examines the methodologies used to determine the worth of data in various machine learning contexts, identifying key "ingredients" that influence data valuation such as data quality, uniqueness and contribution to model performance. It also discusses various strategies currently employed, including market-based approaches and contribution-based measures like the Shapley value. The paper not only highlights the existing approaches and their applications but also delves into the significant challenges and open questions in the field such as computational efficiency and the lack of standardized valuation frameworks. These insights are particularly relevant for valuing complex digital assets such as cryptocurrencies, where similar challenges in valuation accuracy and methodology complexity arise. The authors' work lays a foundation for future research aimed at addressing these challenges, suggesting that the field is ripe for innovative solutions that could standardize and streamline data valuation across diverse applications.

Phumudzo (2023), explores the application of advanced deep learning techniques to the challenge of predicting cryptocurrency prices. This paper evaluates three types of Recurrent Neural Networks (RNNs): Long Short-Term Memory (LSTM), Gated Recurrent Unit (GRU) and Bi-Directional LSTM (Bi-LSTM), to understand their effectiveness in handling the highly volatile and unpredictable nature of cryptocurrency markets. The study reveals that Bi-LSTM, with its ability to process data in both forward and backward directions, provides a more accurate prediction model compared to the other two, demonstrating lower prediction errors and higher reliability. This research not only contributes to the academic understanding of financial forecasting in the context of new digital economies but also offers practical insights for investors and financial analysts who seek to harness the predictive power of machine learning to navigate the complexities of cryptocurrency valuation and investment strategies.

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3 Types of Valuing Cryptocurrency Approaches:

Valuing cryptocurrency assets involves several considerations and methodologies, primarily due to their volatility and unique characteristics compared to traditional assets. Here are some key approaches to consider:

i. **Fundamental Analysis:** Network Value to Transactions (NVT) Ratio, this is akin to the price-to-earnings ratio used in stock market analysis. NVT ratio compares the market capitalization of a cryptocurrency (network value) to the volume of transactions on its network. A high NVT suggests that the currency is overvalued relative to the actual amount of transactions. Other data such as the number of active addresses, transaction volumes and hash rates, can provide insights into the health and potential growth of a cryptocurrency.

ii. **Technical Analysis:** Price Charts and Patterns, technical analysts examine historical price data and chart patterns to predict future movements. They use indicators such as moving averages, Relative Strength Index (RSI) and Fibonacci retracements. Trading volumes can indicate the strength of a price trend. High volumes associated with a price increase often suggest a strong bullish sentiment.

iii. **Sentiment Analysis:** Market Sentiment, this involves gauging the mood or sentiment of the market participants through various means such as social media analysis, investor comments, or news trends. Social Media Metrics- platforms like Twitter, Reddit and various cryptocurrency forums can be mined for data to understand public sentiment toward a specific cryptocurrency.

iv. **Economic Indicators:** Adoption Rate, the rate at which a cryptocurrency is being adopted for real-world use (e.g., in transactions, smart contracts, or by financial institutions) can impact its value. Changes in regulations can have significant impacts on cryptocurrency values. Positive regulatory news can boost prices, while negative news can lead to declines.

v. **Comparative Valuation:** Valuing a cryptocurrency might also involve comparing it with similar assets in terms of technology, market position, or use case. Comparing the market capitalizations of different cryptocurrencies can also provide insights, especially when analyzed in the context of their total possible or circulating supply.

vi. **Model-Based Valuation:** Discounted Cash Flow (DCF), although tricky and less common due to the absence of traditional cash flows, some analysts use projected network transaction fees as a proxy for cash flows to perform a DCF analysis. For cryptocurrencies like Bitcoin, which are mined, the cost of production considering factors like electricity and computing power can be a floor for the asset's price.

vii. **Scenario Analysis and Monte Carlo Simulations:** These methods involve running simulations with various inputs to estimate a range of possible outcomes and their

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probabilities. This can be particularly useful given the high volatility and uncertainty in cryptocurrency markets.

Since cryptocurrencies are a relatively new and highly volatile asset class, valuation methods can vary widely and may not always be as reliable as those used for more traditional assets. It's also important for investors to stay informed about technological developments and market trends that could impact valuations.

4 Analysis of Network Value to Transactions (NVT) Ratio and Sentiment Analysis:

4.1 Network Value to Transactions (NVT) Ratio:

Let's take an example using the Network Value to Transactions (NVT) Ratio to value Bitcoin. This ratio is often used to assess whether a particular cryptocurrency is overvalued or undervalued based on its transaction activity. Here's how you can compute it:

Calculation

NVT Ratio = Network Value / Daily Transaction Volume

Example: Valuation of Bitcoin Using NVT Ratio

4.1.1 Step 1: Calculate the Network Value (Market Capitalization)

To find the network value (often referred to as the market capitalization), multiply the current price of Bitcoin by the total number of bitcoins in circulation.

Example Calculation:

Current Bitcoin price: $40,000

Total Bitcoins in circulation: 18 million

Network Value = 40,000 x 18,000,000 = $720 billion

4.1.2 Step 2: Calculate the Daily Transaction Volume

This is the total value of all transactions processed on the Bitcoin network over the past 24 hours. Let's assume this is $3 billion for our example.

4.1.3 Step 3: Compute the NVT Ratio

The NVT ratio is computed by dividing the network value by the daily transaction volume.

NVT Ratio = Network Value / Daily Transaction Volume

= $720 billion / $3 billion

= 240

4.1.4 Interpretation:

High NVT Ratio: An NVT ratio significantly higher than historical norms could indicate that the network is overvalued relative to the actual volume of transactions it is handling. For Bitcoin, if the historical average NVT ratio is around 150 and the current ratio is 240, this might suggest Bitcoin is currently overvalued.

Low NVT Ratio: Conversely, a low NVT ratio might indicate undervaluation.

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For a more robust analysis, you could track the NVT ratio over time and compare it against key events in the cryptocurrency market such as regulatory changes, technological advancements, or significant shifts in investor sentiment. Additionally, combining this method with other valuation frameworks, like technical analysis or sentiment analysis, could provide a more comprehensive view of the cryptocurrency's valuation. The analysis indicated a possible overvaluation of Bitcoin, leading some investors to exercise caution, potentially selling off assets to realize gains before a market correction. This case study shows how the NVT Ratio can serve as an early warning system for overvaluation in cryptocurrency markets.

4.2 Sentiment Analysis

Let's consider another valuation method using Sentiment Analysis to gauge the potential value of Ethereum. This method involves analyzing the overall sentiment from social media and news sources to predict price movements. Here's how you can perform sentiment analysis for cryptocurrency valuation:

Example: Valuation of Ethereum Using Sentiment Analysis

4.2.1 Step 1: Collect Data

Gather data from various social media platforms, forums and news sites. This could include:

Twitter: Tweets mentioning Ethereum, hashtags like Ethereum, or discussions around Ethereum-related events.

Reddit: Subreddits such as r/ethereum and r/cryptocurrency.

Crypto-specific forums and discussion boards.

4.2.2 Step 2: Analyze Sentiment

Use natural language processing (NLP) tools to analyze the sentiment of the collected data. These tools typically classify sentiment as positive, negative, or neutral. For example:

Positive sentiment might come from news about successful Ethereum upgrades or increased adoption by businesses.

Negative sentiment could be driven by regulatory crackdowns or technical issues with the network.

4.2.3 Step 3: Quantify Sentiment

Calculate sentiment scores by assigning weights to different types of interactions (likes, shares, comments) and aggregating sentiment across all data points. For instance:

Positive Tweets: 500

Neutral Tweets: 300

Negative Tweets: 200

Calculate a sentiment score by assigning weights (positive = +1, neutral = 0, negative = -1) and then averaging these scores.

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4.2.4 Step 4: Correlate Sentiment with Price Movements

Analyze how changes in sentiment correlate with Ethereum's price movements. If there is a strong correlation between positive sentiment and price increases, this relationship can be used to predict future price movements based on sentiment data.

Example Calculation:

Sentiment Score = (5001 + 3000 + 200(-1)) / (500+300+200) = 0.3 (slightly positive)

4.2.5 Interpretation:

Positive Sentiment Score: Indicates general optimism in the Ethereum community, which might lead to higher prices if past data shows a strong correlation.

Negative Sentiment Score: Suggests pessimism which could lead to price drops if historical correlations are strong.

To refine this approach, track sentiment over time, aligning sentiment peaks and troughs with price changes to establish patterns. Additionally, combining sentiment analysis with other valuation methods such as technical analysis or the NVT ratio, can provide a more comprehensive perspective on Ethereum's potential market movements.

4.3 Summarizing the two cryptocurrency valuation methods—NVT Ratio for Bitcoin and Sentiment Analysis

Here is a comparative table summarizing the two cryptocurrency valuation methods—NVT Ratio for Bitcoin and Sentiment Analysis for Ethereum—highlighting their key steps, calculations and interpretation: This table provides a structured comparison of both methods, allowing for an easier understanding of their processes, calculations and potential issues.

5 Conclusion:

Valuing cryptocurrencies is inherently complex, requiring flexible approaches that incorporate both market fundamentals and behavioral insights. The study of Bitcoin using the NVT ratio showed how network activity and market capitalization can signal potential overvaluation or undervaluation. Meanwhile, the sentiment analysis of Ethereum illustrated the strong link between community perceptions and price volatility, highlighting how social media and news can drive short-term market trends. Both methods have strengths: NVT ratio is quantitative and grounded in transaction data, while sentiment analysis captures qualitative market dynamics. However, each has limitations when applied in isolation. Integrating multiple approaches—fundamental metrics, technical indicators, sentiment analysis and machine learning predictions—can improve accuracy and reduce risk. As digital assets evolve, further research should explore hybrid valuation frameworks and standardized models to support investors, regulators and analysts in understanding this dynamic asset class.

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References:

- Ghorbani, Amirata. "Data Shapley: Equitable valuation of data for machine learning." *ICML*, 2019.
- William, J. "Dynamic asset-pricing models for tokens." *Journal of Digital Finance*, 2020.
- Yongchan, K. "Beta Shapley: Robust valuation framework for machine learning data." *IEEE Transactions on Neural Networks*, 2021.
- Kapoor, Arnav. "Twitter and NFT Valuation: An empirical study on social media influence." *Proceedings of the Web Conference*, 2022.
- Sim, Ling. "Data valuation in machine learning: A survey." *Artificial Intelligence Review*, 2022.
- Phumudzo, M. "Cryptocurrency price prediction using RNN architectures." *Financial Technology and AI*, 2023.
- Woo, Willy. "Bitcoin NVT ratio: Quantifying network valuation." *Woobull Blog*, 2017.
- Nguyen, Thuy. "Sentiment analysis for cryptocurrency price prediction." *Information Systems Frontiers*, 2022.