

Blaze Quant Challenge January '24

Solana

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Introduction to Solana (SOL)

1. What is Solana?

Solana (SOL) is a blockchain platform and cryptocurrency designed to address scalability challenges in the decentralized space. Launched in March 2020, Solana stands out for its innovative solutions, emphasizing high throughput and low transaction costs. Launched in March 2020, Solana distinguishes itself by boasting over 400 transactions per second (TPS) due to its genuine web-scale blockchain features. As per Gemini, on an extreme Solana's TPS, *is around 10,000 times faster than Bitcoin, 4,000 times faster than Ethereum,*

2. How is it Mined?

Solana implements a hybrid mining strategy that combines Proof of Stake (PoS) with Proof of Replication (PoRep). This unique approach ensures both network security and energy efficiency. The PoRep mechanism contributes to the secure and decentralized storage of data, aligning with Solana's commitment to sustainability. Miners play a pivotal role in validating transactions and securing the Solana network.

3. How is it Governed?

Solana adopts a decentralized governance model, allowing active participation from *SOL* token holders. The community-driven governance system enables users to propose and vote on network upgrades, ensuring a responsive and adaptive platform. This approach empowers the Solana community, providing them with a voice in the platform's evolution.

4. What makes it Unique?

Solana's uniqueness stems from its innovative consensus mechanism, Proof of History (PoH). By timestamping transactions before inclusion in a block, Solana enhances security and achieves remarkable throughput. The platform's average block time is an impressive 400 milliseconds, showcasing its efficiency. This reduced validation time for smart contracts and transactions is made possible by Solana's hybrid protocols.

5. What are the Advantages of Solana over other Tokens?

Solana offers several advantages over other tokens, making it a compelling choice in the cryptocurrency landscape. Its exceptional speed surpasses many counterparts. Solana employs a Hybrid consensus, merging features from Proof of Work (PoW), Proof of Stake (PoS), and its distinctive Proof of History (PoH). This blend allows Solana to flexibly handle transactions, achieving an impressive 65,000 transactions per second. The hybrid mining strategy ensures network security and energy efficiency. Solana's decentralized governance fosters community involvement and adaptability. Furthermore the transaction fees is much lower in the case of Solana compared to it's closest competitor, ETH; for example current transaction price of SOL is 0.01 USD which is significantly lower compared to ETH's 2-10 USD per transaction. Overall, Solana's commitment to scalability, speed, and sustainability positions it as a frontrunner in the blockchain space.

Solana Token Historic Price Analysis

Overview

This section contains the in-depth analysis of the price of Solana token in USD all the way since it's inception in 2020 to December 2023.

The data sources for the analysis are:

- CoinMarketCap
- CoinGecko

Before delving into the analysis, let's understand some terms and concepts related to the token's price:

- *Open Price:* The price of the token at the start of the day (in USD).
- *Close Price:* The price of one unit of token at the end of the day (in USD).
- *Market Cap:* The market capitalization of one unit of token at the end of the day (Price of one share × Number of shares) (in USD).
- *Volume:* The trading volume of one unit of token at the end of the day.
- *High Price:* The highest price of one unit of token in the day (in USD).

- **Low Price:** The lowest price of one unit of token in the day (in USD).
- **Range:** The difference between the highest and lowest price of the token in the day (High Price - Low Price) (in USD).
- **Difference:** The difference between the close and open price of the token in the day (Close Price - Open Price) (in USD).
- **High Time:** The time of the day when the price of the token was the highest (in PST).
- **Low Time:** The time of the day when the price of the token was the lowest (in PST).
- **Moving Average:** The Moving Average of the token (Average of the prices of the token in the last 20 days).

Initial Outlook

The following plot shows the price of a unit of token, the market cap and the trading volume of the Solana token.

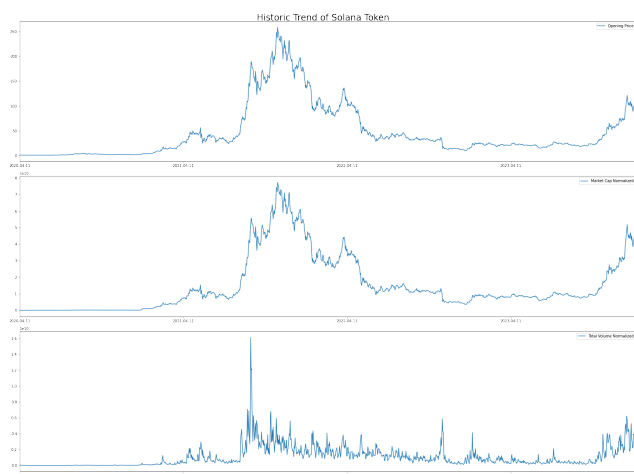


Figure 1: Historic Price, Market Cap and Volume

Inference and Comments

- We see an abrupt spike in the Price of the Solana Token. This was with the Company Solana Labs selling \$300 worth of the network's coins.
- This also led to a rapid and short lived rise in the total volume of the coins being traded in the marketplace.
- In the second half of 2023 we can see a steady rise in the price of the token, with a slight dip in December 2023.

Co-relations Among Price Variables

In the Figure2 above, we can use these rules to get an idea of the interdependence between various currencies:

- Darker colors indicate stronger correlations, while lighter colors indicate weaker correlations.
- Positive correlations (when one variable increases, the other variable tends to increase) are represented by warm colors.

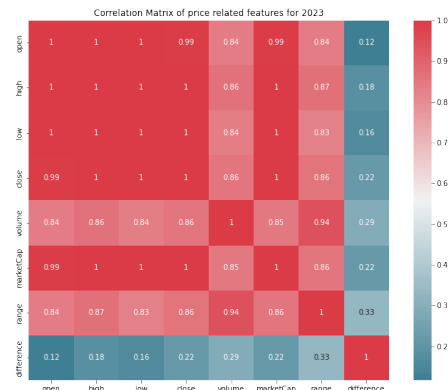


Figure 2: Variables Correlation Plot

- Negative correlations (when one variable increases, the other variable tends to decrease) are represented by cool colors.

High positive correlation is seen among price-related variables, including: Open price, Close price, High price, Low price, Market Cap

There is a **high positive correlation** between **volume** and **range**. This indicates that the higher the trading volume, the higher the range of the price of the token might be for a given day.

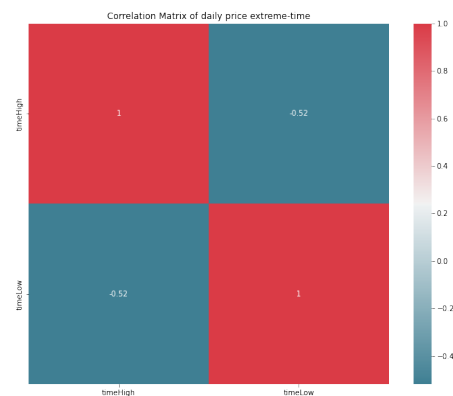


Figure 3: Variables Correlation Plot

Furthermore in the Figure3 we can see that the daily High Price and Low Price data is

Normalized Yearwise Price Development

The following plots show the price development of the Solana token in each year since its inception in 2020. The prices have been normalized on a scale of 0 to 1 for better comparison minimizing the effect of varied mean prices

through the years.

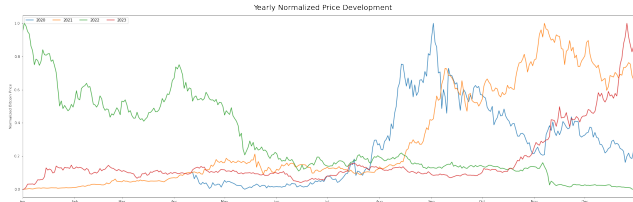


Figure 4: Price Development Comparison

Inference and Comments

If we have a look at the plots for 2021 and 2023 in Figure 5, we see a similar trend, this can be attributed to the bull run of the Crypto world in the second half of these years.

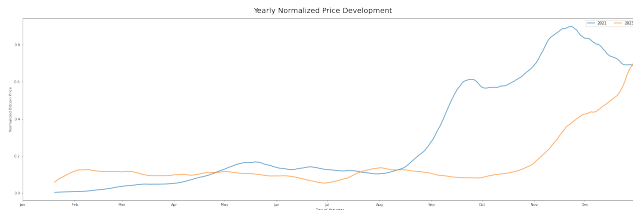


Figure 5: Normalized 20-Day Moving Average Price Development

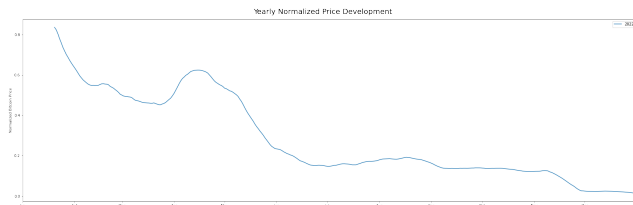


Figure 6: Normalized 20-Day Moving Average Price Development

We could see a similar trend in 2024 as has been observed in 2022, if we base our prediction only on the trend similarities in 2023 and 2021. The Figure 6 shows the trend form 2022.

Daily Extreme Analysis for 2023

The Color Maps in the Figure 7 and Figure 8 indicate the time of day of the occurrence of the High time and Low time of the price of the Solana Token. We see a cluster over the midnight, this would occur in the case the token is seeing a steady cross-day rise or fall. Also, it is interesting to see the rise of the extreme prices in the month of December. As per Forbes, "Solana's upwards price pressure comes from an increasing demand in traders holding SOL tokens as well as Solana's TVL increasing as seen on DefiLlama. Furthermore, "The recent surge in SOL price is closely linked to heightened on-chain activities on Solana," Hosam Mahmoud, a research analyst for CCdata, stated via e-mailed comments.

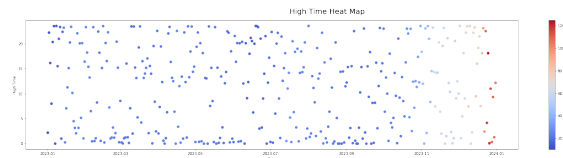


Figure 7: Daily High Time Color Map

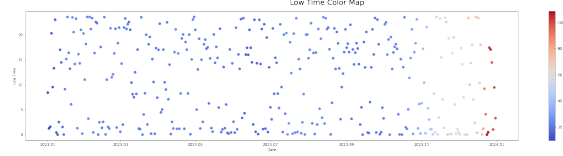


Figure 8: Daily Low Time Color Map

Market Competition Analysis

Overview

To understand the competition related Solana we can analyse the data corresponding to similar cryptocurrencies. These are the top five cryptocurrencies similar to Solana which are direct competitors in the market:

- **Avalanche (AVAX)** : Avalanche is a decentralized platform known for its high scalability and low latency. It employs the Avalanche consensus for fast finality and supports customizable blockchain networks.
- **Cardano (ADA)** : Cardano is a research-driven blockchain platform focused on scalability, sustainability, and interoperability. It uses the Ouroboros consensus, a proof-of-stake algorithm designed to be energy-efficient.
- **BNB (BNB)** : Binance Coin is the native cryptocurrency of the Binance exchange, initially an ERC-20 token on Ethereum and later migrated to Binance Chain. BNB plays a central role in the Binance Smart Chain (BSC).

Exploratory Data Analysis

The data used for this analysis is taken from CoinMarket-Cap. The data is taken for the starting from the January of 2021 till date. The data is sample on monthly basis for each of the tokens. The data is then cleaned and preprocessed to remove any null values and outliers. The data is then visualized using various plots to understand the trends and patterns in the data. Following metrics are used:

- **Price**: The price of the token at the end of the month.
- **Open**: The price of the token at the start of the month.
- **High**: The highest price of the token in the month.
- **Low**: The lowest price of the token in the month.
- **Close**: The price of the token at the end of the month.
- **Spread**: The difference between the highest and lowest price of the token in the month.
- **Close Ratio**: The ratio of the closing price to the highest price of the token in the month.

- **Market Cap:** The market capitalization of the token at the end of the month.
- **Volume:** The trading volume of the token at the end of the month.
- **Rank:** Current rank of the token in the market.

We have compared AVAX, ADA, BNB, LINK with SOL.

Data Source : CoinMarketCap

Correlation

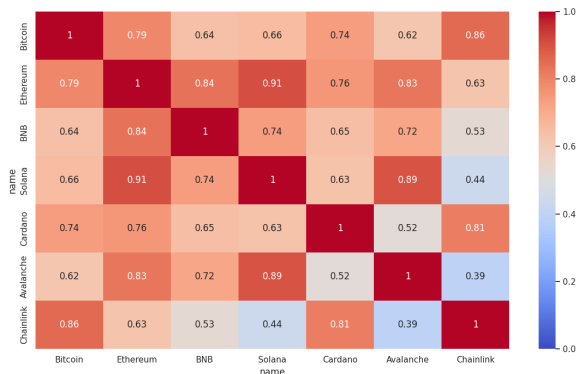


Figure 9: Correlation between cryptocurrencies

From the correlation plot in *Figure 9*, we observe that the correlation between Solana and various other tokens. Note the high correlation between Solana and Avalanche. It occurs because both the tokens have similar use-case and are direct competitors.

Highest correlation is obtained between Ethereum and Solana; indicates that they tend move in a similar direction even though the use cases are completely different.

Using these correlation values of Solana and their effects, we have analyzed the trends between the currencies with respect to market cap, transaction volume and price.

Market Cap

- From *Figure 10*, we see that Solana is 2nd among the tokens in our dataset as per the latest data.
- From *Figure 11*, we see that Solana was consistently at around 3rd position but took a leap in the second half of 2023.
- The market cap of BNB is almost always at the top for the duration of Jan 2021- Dec 2023.
- We can observe a close competition between ADA and SOL for the time period Jan 2022 - Jan 2023 (1 year).
- The crypto market bull run of 2021 is clearly visible in *Figure 11* and *Figure 12*.

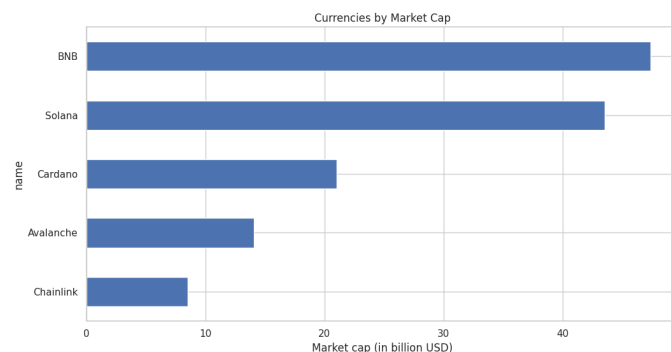


Figure 10: Currencies by market cap

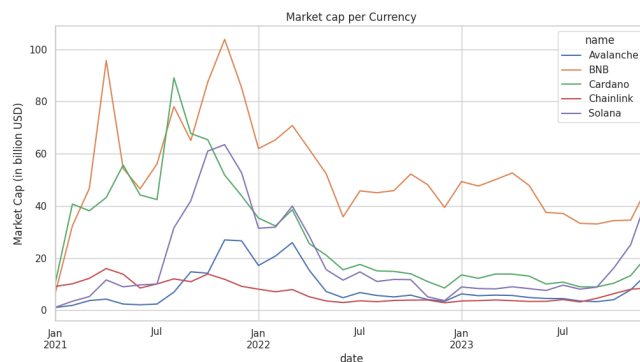


Figure 11: Market Cap per Currency

Qualitatively, we can reason that the surge in market cap of SOL is due to the following reasons:

1. **Jito Airdrop's Impact:** The distribution of Jito tokens to Solana users might have contributed to SOL's recent price increase.
2. **Robinhood's Influence:** SOL's valuation could have also been driven by Robinhood adding Solana to its cryptocurrency offerings in the EU.

Source : CryptoPotato

Transaction Volume

- From *Figure 13*, we see that Solana is first among the tokens in our dataset as per the latest data.
- From a detailed view through *Figure 14*, we see that Solana was consistently at around 1st - 2nd position but took a leap in the second half of 2023.
- Similar to SOL, AVAX took a big leap in the second half of 2023.
- The crypto market bull run of 2021 is clearly visible in *Figure 14* and *Figure 15*.

The crypto market bull run of 2021 is clearly visible in both the plots.

Qualitatively, we see that:

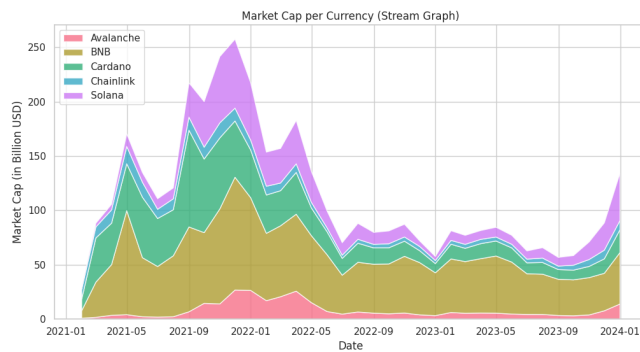


Figure 12: Market Cap per Currency (Stream)

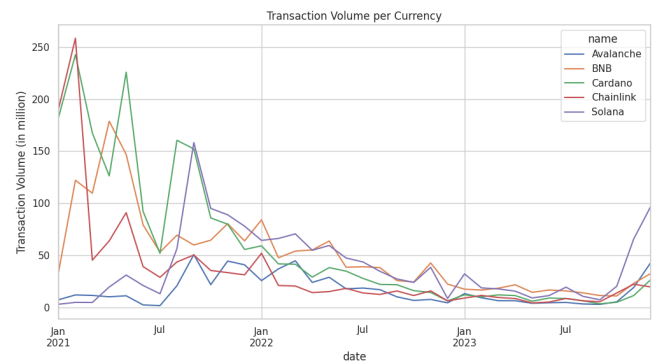


Figure 14: Transaction Volume per Currency

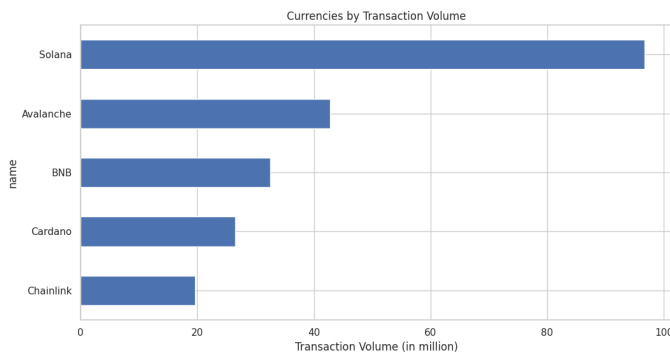


Figure 13: Currencies by transaction volume

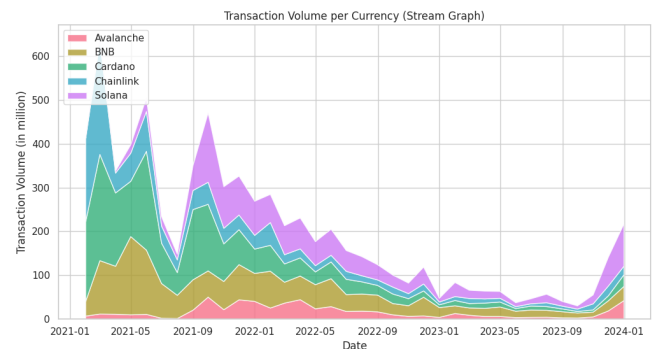


Figure 15: Transaction Volume per Currency (Stream)

1. The increase in SOL and AVAX appeared at around same time last year. This is due to the high correlation value of 0.89 between the two tokens.
2. The increasing popularity of SOL is due to its recent air-drops and institutional capital.

Source : Coin Telegraph

Price

- From Figure 16, we see that Solana is second among the tokens in our dataset as per the latest data.
- The price of BNB is consistently highest for the time period Jan 2021 - Dec 2023.
- We observe that both SOL and AVAX prices surged at around the same instance.
- At its highest, price of SOL is 0.33 times price of BNB.

Qualitatively, we can understand the increase in SOL through:

1. Recent increase in gas fee of ETH, SOL's layer one blockchain rival motivated users to switch towards blockchain with lesser transaction cost.
2. Uptick in user activity combined with the growing popularity and adoption has promoted the SOL price increase over the time duration of Jan 2021-Dec2023.

Source : CryptoPotato

Insights from 2023

To understand the latest trends in market cap, transaction volume and price, we have analyzed the data of previous year in detail. Here, we have attached the figures related to the three mentioned metrics.

- From Figure 18, we observe that BNB was performing better in terms of market cap until it was recently matched by SOL (Solana).
- SOL outperformed ADA (Cardano) starting from Sep 2023 resulting in a massive difference in the market cap at the end of year.
- In addition to the increase in market cap, we observe a meteoric rise in the transaction volume of SOL through Figure 19 with the closing volume at the end of November equal to 96,652,075,132.
- The transaction volume of SOL is more than double of the second highest value (AVAX).
- From Figure 20, we observe that SOL is consistently second in terms of price. SOL closed at \$101.51 in the end of November 2023.

Qualitatively, we can reason that the success of SOL in second half of 2023 can be attributed to the following:

1. Positive Market Sentiment

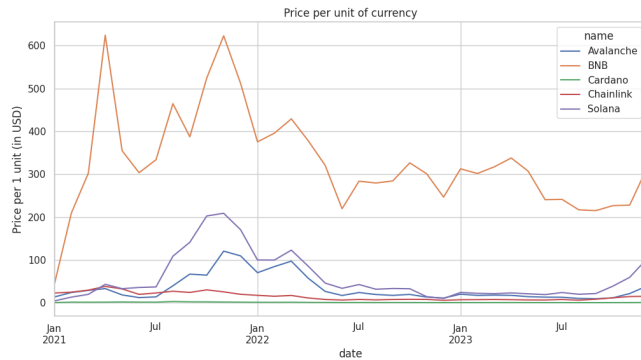


Figure 16: Price per Currency

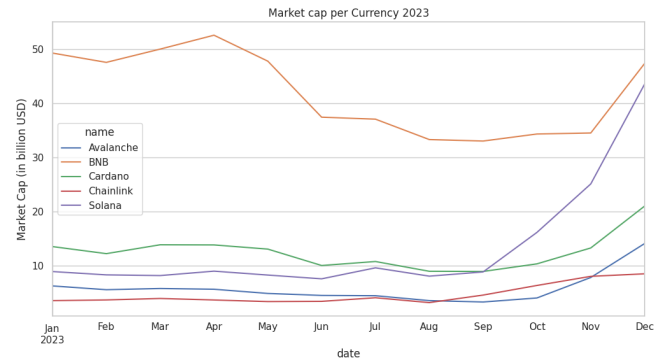


Figure 18: Market Cap per Currency in 2023

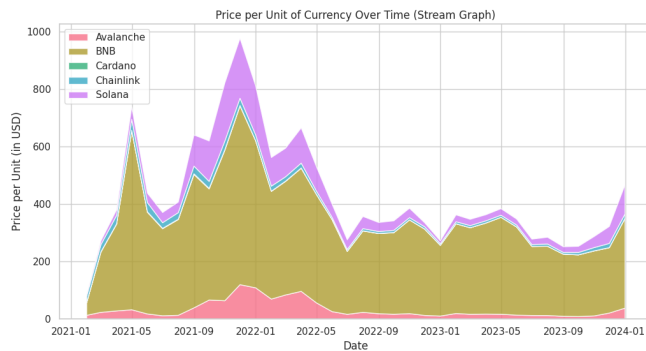


Figure 17: Price per Currency (Stream)

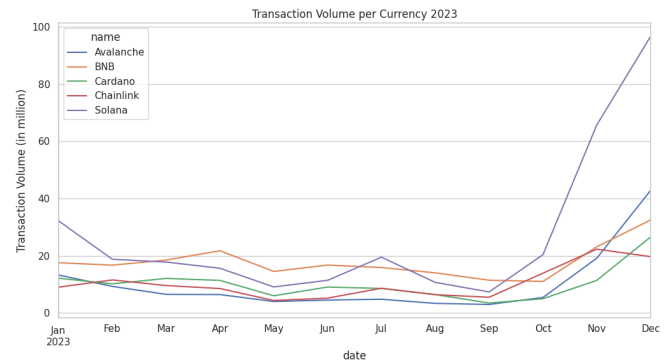


Figure 19: Transaction Volume per Currency in 2023

- (a) General recovery of the crypto market: After a rough first half of 2023, overall sentiment in the crypto market turned positive, which benefited Solana alongside other major coins. Bitcoin's strong performance likely played a role in this.
- (b) Ethereum scalability concerns: Ethereum's high gas fees and network congestion remained a concern for users and developers, leading some to explore alternative blockchains like Solana with its faster and cheaper transactions.

2. Specific Developments on Solana

- (a) Increased on-chain activity: Solana's DeFi ecosystem saw significant growth in the second half. The total value locked (TVL) in DeFi protocols on Solana skyrocketed, indicating rising usage and investor confidence.
- (b) Meme coin frenzy: The success of meme coins like BONK and SAMO on Solana attracted investor attention and boosted transaction volume. These coins were fueled by airdrops and community hype, generating excitement and speculation around the Solana ecosystem.
- (c) Strategic partnerships and ecosystem growth: Solana formed partnerships with various projects and institutions, including Google Cloud and FTX, which contributed to its legitimacy and attracted further develop-

ment activity.

3. Technical Improvements

- (a) Solana Mainnet Beta launch: The launch of Solana Mainnet Beta in July 2023 brought numerous performance improvements and new features, solidifying confidence in the network's scalability and technical capabilities.
- (b) Reduced network outages: Compared to earlier struggles, Solana experienced fewer network outages in the second half, boosting user confidence and network reliability.

Empirical Analysis

We will conducting two types of analysis based on our dataset from Jan 2021 - Dec 2023 for the tokens.

Return on Investment

Figure 21 shows the return on investment for each token in the period of 2021 to 2023. The plot for the year 2023 can be observed in Figure 22. It shows the return on an investment made in the beginning of 2023. The plots are calculated using the closing prices at the end of the particular month. The following plots assume an initial investment of 1000 USD in the each token at the beginning.

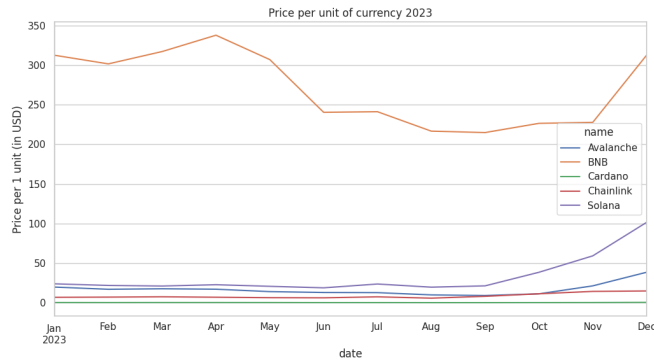


Figure 20: Price per Currency in 2023

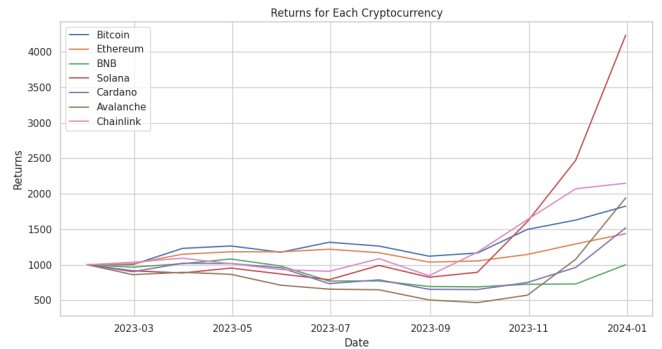


Figure 22: Return on Investment in 2023

We observe that ROI of Solana has performed consistently better than all the other tokens for each time period except around at the end of 2022 till first quarter of 2023. This was due to the collapse of FTX crypto exchange in November 2022.

However, Solana has recovered from it and as we can see from *Figure 21*, it provides the best ROI for an investment made in the beginning of 2021.

Source: Capital

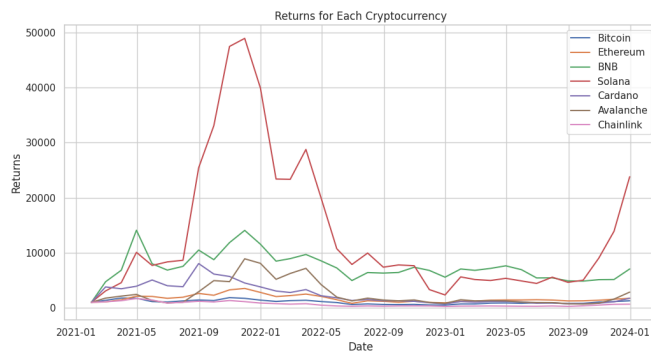


Figure 21: Return on Investment (begin of dataset:Jan 2021)

Earnings

Figure 23 shows earnings for each token in the period of 2021 to 2023. The plot for the year 2023 can be observed in *Figure 24* the earnings made in 2023. The plots are calculated using the closing prices at the end of the particular month. The following plots assume an initial investment of 1000 USD in the each token at the beginning.

We observe that Solana gives the best earnings for both the cases, beating Bitcoin and Ethereum. This shows the meteoric rise in popularity and adoption of SOL which increased its price from 4.26 USD in Jan 2021 to 101.5 USD in Dec 2023.

Furthermore, from the earnings data presented in *Figure 24*, we can conclude that SOL was widely accepted in the previous year of 2023. Therefore, there are high chances of a similar growth and adoption in coming years for Solana.

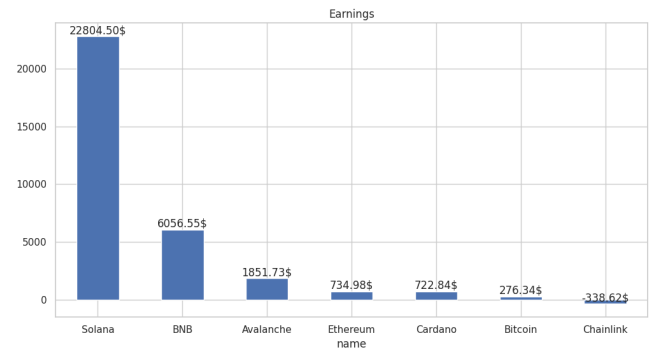


Figure 23: Earnings (begin of dataset:Jan 2021)

Social Media Analysis

Overview

In this section we have use the Twitter/X data obtained from TwExportly to analyze the impact of Solana in social media. The data includes tweets from Jul 2023 till Jan 2024. It contains all the relevant information related to the tweet.

Fundamental Analysis

After performing fundamental analysis on Twitter data from Jul 2023 till Jan 2024, we obtain plots presented from *Figure 25* till *Figure 29*.

From *Figure 25*, we observe a sudden peak at around Nov 2023. This can be explained by increase in popularity of Solana due to the increase in ETH transaction fee prices.

Similarly, we observe peaks in *Figure 26* and *Figure 28*. This corresponds to price surge of SOL token in September 2023, where the price of SOL token increased to almost



Figure 24: Earnings in 2023

530% of its previous month's value.

From *Figure 27* and *Figure 29*, we observe a consistent increase in favorites count and views count, indicating the growing popularity and adoption of Solana.

Figure 30 shows the relation between the tweet count and closing price of Solana. Similarly, *Figure 31* shows the relation between retweet count and closing price of Solana. We observe that tweet count is not a good indicator of closing prices in general. However, retweet count is observed to be a better indicator for closing price, apart from a few anomalies.

Therefore, after analyzing the the *Figure 26* till *Figure 29*, we can comment that Solana's social activity has heightened with an increasing interest in its development and adoption.

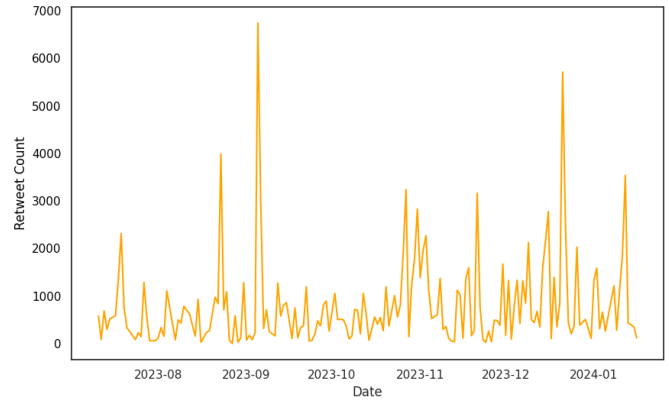


Figure 26: Total Retweets

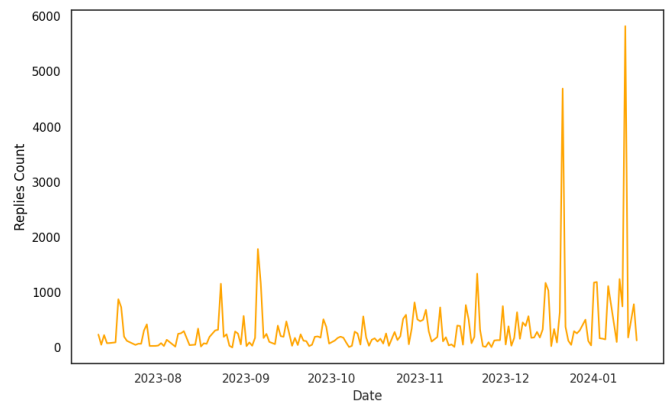


Figure 27: Total Replies

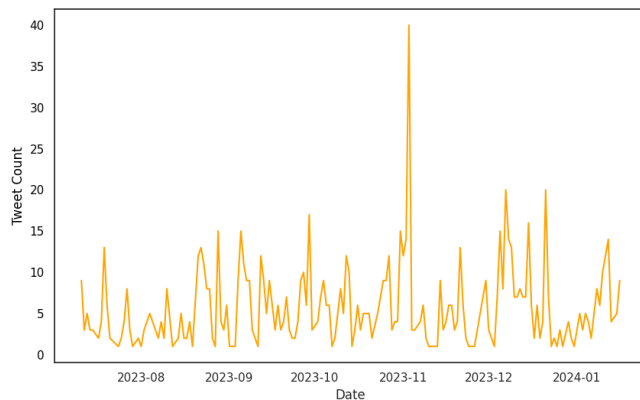


Figure 25: Total Tweets

Sentiment Analysis

Sentiment analysis plays a crucial role in analyzing cryptocurrency tokens as it provides valuable insights into the

market's perception and emotions surrounding a particular token. Understanding the sentiment of investors and traders is essential for making informed decisions in the highly volatile and speculative cryptocurrency market. Sentiment analysis can help us understand the following metrics:

- Market Sentiment Influence
- Investor Perception
- Social Media Impact
- Risk Management

To perform sentiment analysis, we have used the Twitter data from Jul 2023 till Jan 2024. *Figure 32* contains the word cloud which was generated using combined text of all the tweets in the 6 month period.

Word clouds are visual representation of the most frequently occurring words in the dataset. Generating a word cloud is beneficial as it provides better insights into data using:

- Visual Representation

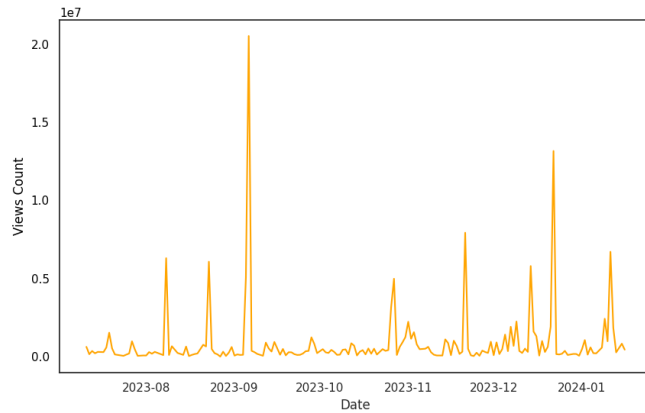


Figure 28: Total Views

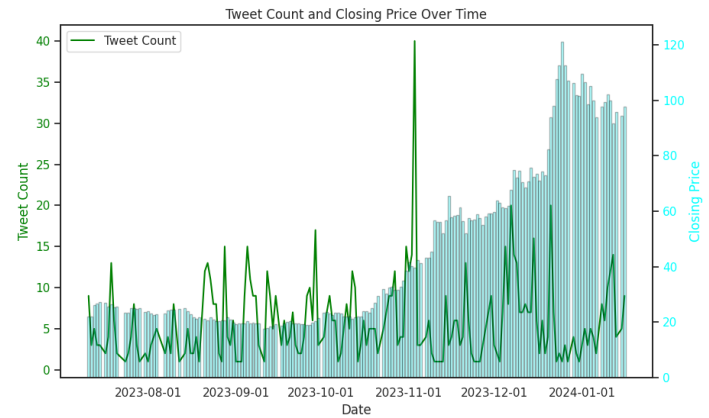


Figure 30: Tweet Count vs Closing Price

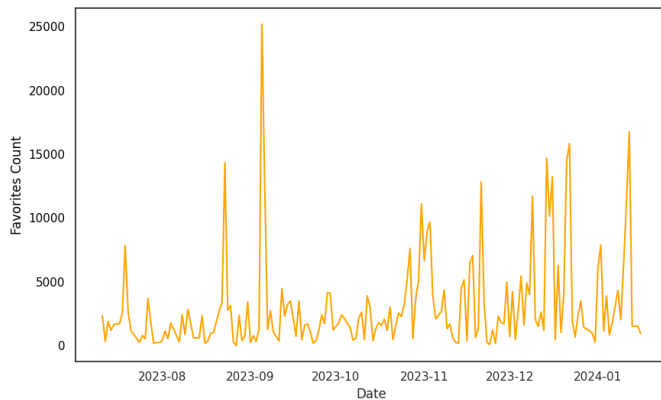


Figure 29: Total Favorites

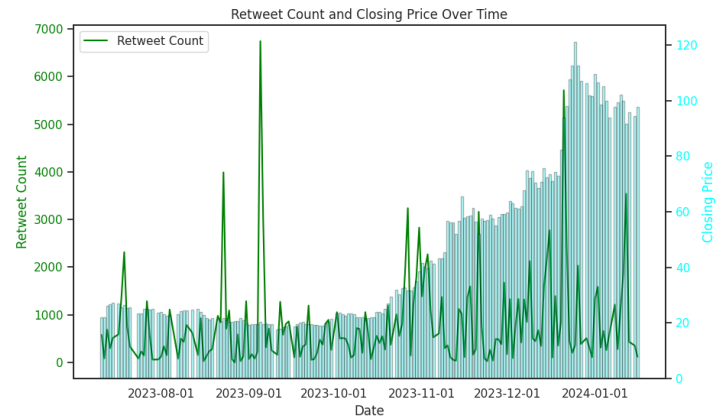


Figure 31: Retweet Count vs Closing Price

- Keyword Identification
- Trend Monitoring

Generation of word cloud have helped us to identified the following prominent terms in the tweets:

- *solana, solana ecosystem, onlypossibleonsolana*
- *new, build, learn, develop, today*
- *nft, game, art*
- *payment, transact*
- *support, web3, power, live, work*

These prominent terms suggests that a focus on building, learning and developing is observed among the users of Solana online. Further, they also suggests the role of SOL in gaming and NFT arts.

We observe that payments and transactions represent a focus on developing a superior and scalable solution for transaction using Solana tokens. The last point shows the user adoption and community response present in social

media with regards to SOL.

Figure 33 shows the sentiment polarity of Twitter data in the time period Jul 2023 till Jan 2024.

We observe that the majority of the sentiment score is clustered around 0.3 indicating a positive sentiment across the tweets for a 6 month period.

Another important observation is that the sentiment distribution is asymmetrical. Furthermore, it favors the positive side. This indicates a higher prevalence of tweets with positive sentiment compared to negative sentiment.

Fewer tweets show strong positive or negative sentiment (scores near 1 or -1). Notably, there is a distinct peak around the -0.6 area, suggesting a concentration of tweets with strongly negative sentiments.

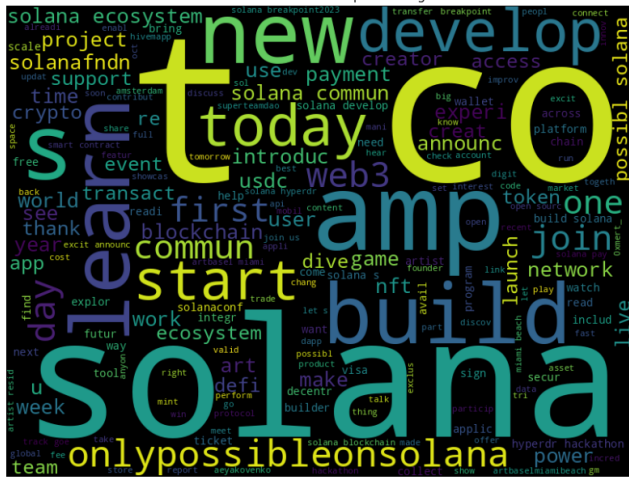


Figure 32: Word Cloud

Predictions

Predictions from our model from December Challenge

We have used ARIMA for predicting closing price of SOL.

The closing price prediction from our ARIMA model is as follows for the next 7 days:

Data	Prediction
18th January	108.76944253
19th January	106.21789454
20th January	96.94337974
21st January	101.39335108
22nd January	99.59358893
23rd January	99.96333642
24th January	103.47236453

Predictions from Established Websites

According to Changelly, Solana Token is predicted to experience a bull run in the year 2024. The analysis suggests a slight dip in price in January but an overall bullish trend of 85%.

Similarly, based on the technical analysis conducted by CoinDCX, Solana is expected to maintain an approximately 80% bullish trend throughout the year 2024.

Final Call on Bull/Bear

We can note from the Price History that the Solana Token had hit its recent peak on 25th of December 2023. This was an effect of an increased interest among users for the massive airdrop by Solana based Jito Labs.

A similar airdrop is being anticipated by Jupiter Labs on 31st January which strongly strengthens the backing for a **bullbull** run of the Solana Token in the next few weeks. This is also in line with the bullish predictions from our

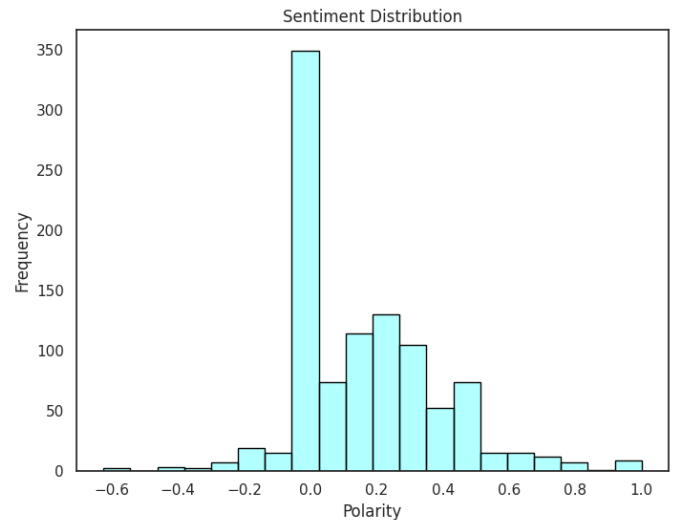


Figure 33: Sentiment Polarity

ARIMA model prediction and that of established websites such as Changelly and CinDCX.

In the long run, for the year of 2024, many more airdrops are in the line. Furthermore, the positive sentiment towards Solana combined with the advantages of sustainable mining, speed of transaction and lower transaction fee of Solana over Ethereum and other counterparts will boost overall **bullish** trend in the long run.