CS 732: Data Visualization Assignment 4 Report

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I. DATASET

In this assignment, we work with the Cryptocurrency Historical Prices [1]. The given dataset has values of the following variables on a daily basis from the time when the particular cryptocurrencies were first introduced till July 06, 2021 for 23 cryptocurrencies:

- Date: date of observation.
- Open: Opening price on the given day.
- High: Highest price on the given day.
- Low: Lowest price on the given day.
- Close: Closing price on the given day.
- Volume: Volume of transactions on the given day.
- Market Cap: Market capitalization in USD, which refers to the total dollar market value of a company's outstanding shares of stock [2].

The cryptocurrencies are namely, Chainlink, Cardano, Solana, Dogecoin, Polkadot, NEM, XRP, Ethereum, Aave, Bitcoin, Cosmos, Litecoin, Uniswap, EOS, Binance Coin, Crypto.com Coin, USD Coin, Monero, TRON, Wrapped Bitcoin, Tether, IOTA, and Stellar.

II. TASKS

Through the visualizations, users must be able to perform the following tasks:

- **T1**: Analyze price and volume trends for each cryptocurrency and identify abnormalities.
- **T2**: Analyze market composition and trends.
- **T3**: Compare trends of multiple coins. Identify any relationship between prices of multiple coins, if they exist.

III. VISUALIZATION

All the visualizations mentioned below have been created using Tableau [3].

A. Line graphs for prices

We started by plotting polylines corresponding to High, Low, Open and Close for all time-stamps (Figure 1). However, due to a high overlap, not much could be inferred. Taking two attributes at a time also didn't give much to infer from. The only fact that could be inferred from the High-Low plot was that Highs are always greater than Lows, which is trivial. An inference from the Open-Close plot revealed that both lines were identical, but skewed by 1 day. This is because, unlike a stock market, which has an opening and closing time, the crypto-market is open 24x7. The current day's closing price is the opening price for the next day.

Fig. 1: Line graphs denoting Close, High and Low prices corresponding to BTC

B. Candlestick plot

Feedback Loop 1: Since superimposing line graphs corresponding to High, Low, Open and Close didn't prove to be effective, we tried the CandleStick plot (Figure 2). The upper and lower ends of the grey Gantt bars denote the high and low value at that time-stamp, while the colored Gantt bar varies from the Open and Close price. The color is set as green when the closing price is greater than opening price and red otherwise.

Using Tableau, we can plot the candlestick plot for any coin and compare the price trends across currencies, which allows the user to achieve **T1**. We have referred to [4] to make the candlesticks chart.

Fig. 2: Candlestick plot corresponding to BTC

C. Volume bar graph

Volume indicates the amount of cryptocurrency being traded on a particular day. It includes both purchases and sales. A bar graph of volume allows us to observe sudden spikes in interest of a particular coin (Figure 3). This visualization is a useful reference to a candlestick plot, wherein we can see whether the interest in a coin results in a positive or negative growth. Analyses of volume for each cryptocurrencies as demanded by **T1** can be accomplished using this visualization. In order to do just that, we have created a dashboard within Tableau that combines candlestick plot and the volume bar graph in a juxtaposed view with synchronized axis (Figure. 4).
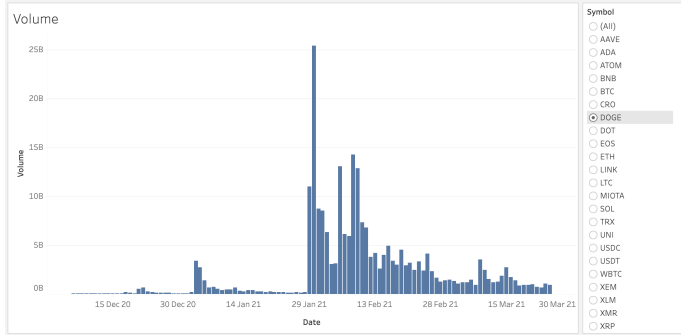

Fig. 3: A volume bar graph corresponding to DOGE coin. Observe the spike on 28th Jan 2021

Fig. 4: Dashboard of candlestick and Volume bar graph

D. Moving averages

While plotting an attribute would allow a user to attain the values at a specific timestamp, it does little to nothing to analyze the trend over a larger time frame as most cryptocurrencies are often considered volatile i.e, their values fluctuate too much. Therefore we superimpose line graphs corresponding to multiple moving averages to visualize trends. We added a 7-day, 30-day and 90-day moving average that gives a weekly, monthly and quarterly trend respectively (Figure 5). Crossover points of the moving averages gives an indication for when the trend changes. This visualization contributes to accomplish **T1** as it can be plotted for each cryptocurrency separately to observe trends in a time frame.

Fig. 5: Average, Weekly average, Monthly average and Quarterly average of closing prices in a superimposed view

E. Market Composition plot

Market composition gives us an idea about which cryptocurrency is valuated more at a particular time. To do so, we have made a pie chart of an Yearly average of Marketcap (Figure. 6). Marketcap is the product of the price and the amount of coins in circulation at a given time. Evidently, BTC is evaluated the highest and consists of a major part of the crypto market. Since we are looking at the market as a whole and analysing trends across coins, this visualizations helps the user accomplish **T2 and T3**.
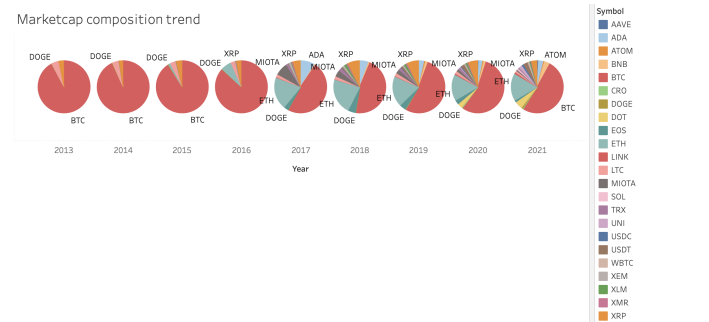

Fig. 6: Pie chart of market composition for marketcap of various coins

Another visualization used to look at the market composition is the Stacked Area plot for Volume. Multiple coins can be selected to have the areas corresponding to their volumes stacked over each other. At any time-stamp, the peak gives the total amount of cryptocurrencies traded at that point. The area gives the contribution of each coin to the final volume.

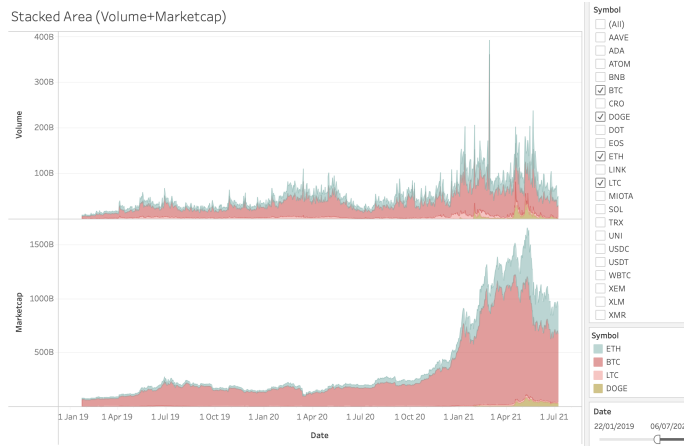This visualization (Figure. 7) also allows the user to achieve **T2 and T3**.

Fig. 7: Stacked area chart for volume and marketcap for multiple coins

F. Percentage change plot

The visualizations we used to analyze price trends allowed us to see that certain currencies like BTC and ETH etc. have a higher price compared to most of the other coins. The difference is so large that plotting them together would mean that the changes in most of the other cryptocurrencies would seem negligible and therefore, cannot be inferred. Thus we took a **feedback (Loop 2)** from our visualizations before to plot the percentage change in prices (Figure. 8). This would allow us to see trends clearer as the difference in change in values would not be as high as the difference in values themselves.

Fig. 8: Percentage change in Closing price for USDT, DOGE, ETH and BTC

IV. Data Story

Relevant visualizations are combined into dashboards in Tableau so that they can be viewed and analyzed together. The visualizations and dashboards are showed together in a data story as shown in Figure. 9 and inferences are made using all of them.
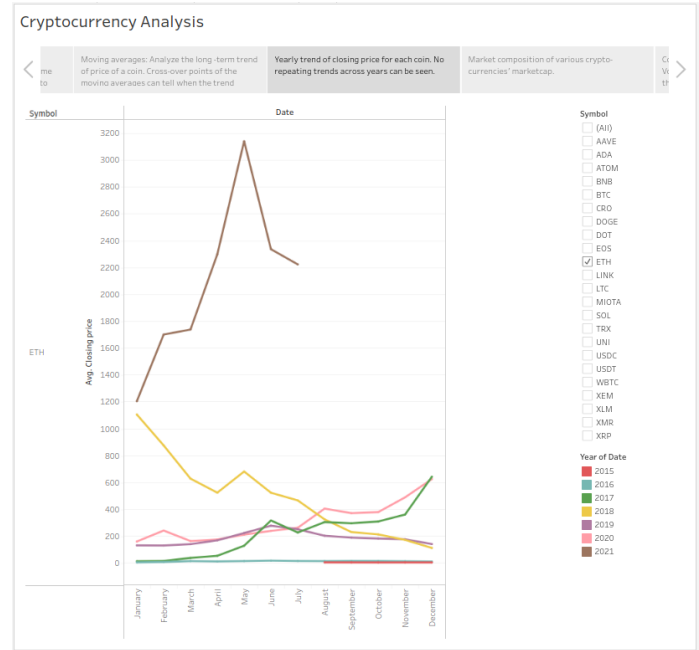

Fig. 9: Data Story of Visualizations and Dashboards in Tableau

V. Inferences

The inferences we could draw from **T1** is that the drastic changes in prices on any day is directly related to the amount of volume being traded. Depending on whether the crypto-currency is being sold or bought, the prices vary.

From **T2**, we can infer that market is dominated by two coins in all the years that data is available. The coins are Bitcoin and Ethereum. This is also in correspondence with the popularity of these coins in the past years. Similarly, Binance has been popular in the last two-three years, which can also be inferred from the visualization, where we can see the market composition of Binance growing gradually and is more than most of the coins in the dataset.

In **T3**, generally the prices trend for all the coins are similar in terms of percentage change. The anomalies are either spike/drop in prices or spikes in volume traded.

One of the anomalies we spotted was a spike in the volume traded in Doge Coin. **Feedback Loop 3:** So, we analyzed the trend of prices and volume for the other coins as well (using Figure 10). We found that almost all the coins has positive growth in the period of 28-29 Jan 2021. Even those coins that had negative growth, they had very less negative change. This shows that the popularity of crypto-currencies increased during this time. These changes can be mainly attributed to Elon Musk tweeting about Dogecoin, making it the GameStop of the cryptomarket.
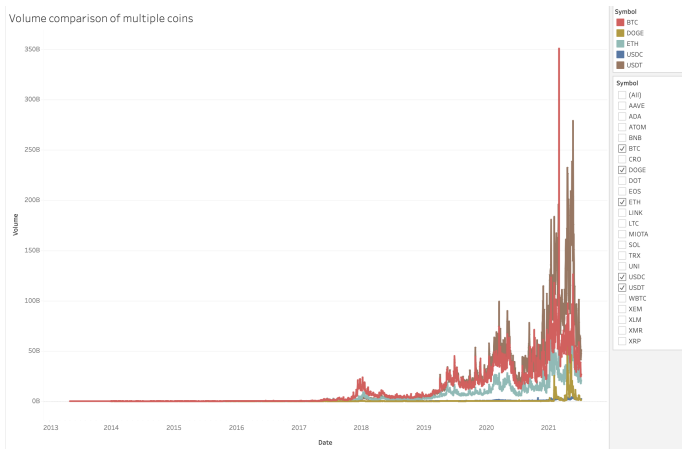
Fig. 10: Volume plot for multiple coins in a superimposed view

VI. WORK DISTRIBUTION

The tasks were initially discussed over a meeting and we came up with the tasks together, building upon each other's ideas. For the visualizations, dashboards and stories, all of us worked together. The tasks weren't divided amongst us as our productivity and creativity was much better when we worked together. Each individual contributed to every aspect of the assignment.

REFERENCES

[1] SRK. Cryptocurrency historical prices. [Online]. Available: https://www.kaggle.com/datasets/sudalairajkumar/cryptocurrencypricehistory
[2] J. Fernando. Market capitalization. [Online]. Available: https://www.investopedia.com/terms/m/marketcapitalization.asp
[3] Tableau. Tableau support. [Online]. Available: https://www.tableau.com/support/help
[4] ——. Candlesticks in tableau. [Online]. Available: https://kb.tableau.com/articles/howto/creating-a-candlestick-chart