

# VolaTrade Trading Dashboard Report

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## I. ABSTRACT

This data visualization project was designed to provide users with an interactive visual exploration of the cryptocurrency market. Three visualizations were created, a candle stick chart, volume bar graph, and treemap. These three visualizations were implemented using D3, and include features such as annotations, tooltips, zooming, and panning. You will learn about several different approaches taken to achieve the final product for this project. Finally, you will see the finished product, and learn about which approaches worked well, and which approaches did not.

## II. INTRODUCTION

This project was started to create an array of data visualizations that can later be used as interactive tools for trading analysis. Three data visualizations have been created using a static dataset, but in the future these visualizations will be used with live data, in order to visualize cryptocurrency trading sessions and price prediction data in real time. Having the ability to use these data visualizations for live trading will facilitate the trading process by accurately conveying the data, and by providing features that tell the user a story.

## III. PROJECT OBJECTIVES

### A. *Interactive Visual Analysis*

To provide users with an in depth and interactive visual analysis of 17 different cryptocurrencies over multiple time intervals.

### B. *Users Can Perform Analysis*

To give users the ability to perform their own analysis with the data, and to provide users with additional tooling to facilitate their analysis.

### C. *Customizable Visual Exploration*

To provide users with an in-depth and customizable visual exploration experience of the crypto market. This allows users to pinpoint specific moments in time and explore further.

### D. *Trading Dashboard Tool*

Create three data visualizations as a part of a dashboard tool that will be used to visualize trading sessions and price prediction data, in order to facilitate the trading process.

## IV. RELATED WORK

### A. *Interactive Cryptocurrency Dashboards*

Two relevant data visualizations that inspired me utilized an interactive cryptocurrency dashboard (e.g., [1, 2]). When it came to styling and adding additional useful features. Binance [1] had a very aesthetically pleasing color scheme, and their implementation of a tooltip that provides data for a specific data point when the user hovers over its position on the x-axis was particularly useful. Coin360 [2] created a dynamic cryptocurrency treemap that displayed useful information regarding price performance and trading volume.

### B. *D3 Resources and Tutorials*

There were four main D3 resources that I used for this project (e.g., [3, 4, 5, 6]). The D3 treemap layout tutorial [3] was extremely useful when learning how to create a D3 treemap visualization. It covers how to create a hierarchy using your data, and the different treemap layout techniques you can use. The D3-annotation tutorial [4] provides a detailed explanation of how to install and use the D3-annotations library. Interactive data visualizations for the web [5] provides a series of D3 tutorials, and the chapter 10 tutorial on interactivity and div tooltips was particularly useful for my project. Finally, the zoomable candlestick chart [6] block was an extremely helpful resource when creating my candlestick chart, helping me implement the initial zooming and panning feature for my visualization.

## V. APPROACH

### A. *Different Approaches and How They Were Implemented*

There were a few different approaches that I tried for the three visualizations, some of which worked, and some of which did not. For my first visualization, the candlestick chart, I initially tried adding a conventional tooltip that appeared over the visualization as you hovered over a candle. I realized that the tooltip was taking up too much space and covering up other candles which would be useful to view simultaneously. To fix this, I decided to create a tooltip in a static position on the screen so that it didn't block any of the data.



Figure 1. Candle stick chart with bad tooltip positioning. It blocks the view of other candles.



Figure 2. Candle stick chart with good tooltip positioning. View of other candles is never blocked.

Another approach that I tried was implementing the tooltips so that when a user hovered over a candle, the tooltip would display. At first this seemed like a fool proof approach, but what I realized after I had implemented it was that some candles were so small, that it was almost impossible to hover over them and display the tooltip. In order to solve this, I implemented a tooltip that displays when the user hovers over the candles position on the x-axis, therefore eliminating the problem. I did this by creating invisible candles the height of the chart.



Figure 3. Candle stick chart. (A) tiny candle that is difficult to hover over to display tooltip.

## B. Problems and How They Were Addressed

While trying to implement the annotations for my candle stick and bar graph, I ran into a problem where I couldn't get the annotations to dynamically resize and reposition themselves with the rest of the chart. To fix this, I decided to make the annotations invisible when the user zooms in for the first time, therefore hiding the annotations and solving the problem.

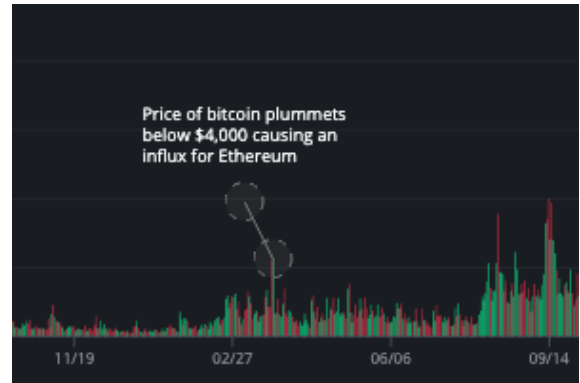


Figure 4. Annotations that turn invisible when the user zooms in.

One last problem that I ran into was using the built in treemap functionality of D3. While displaying data on each box in the treemap, I ran into an issue where some boxes were too small to display the text, so the text would overflow. In order to fix this, I checked the width and height of each box, and then checked whether or not the bit of data was too large to display within that box.

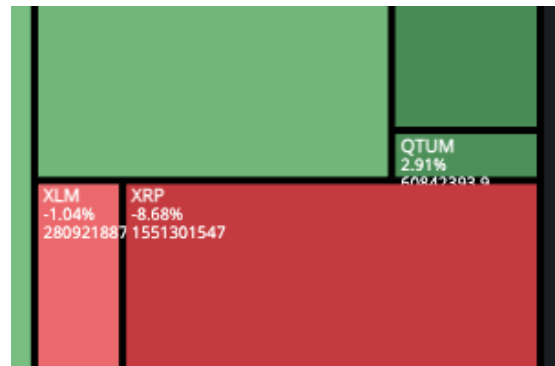


Figure 5. Certain bits of data were too large to display in their boxes.

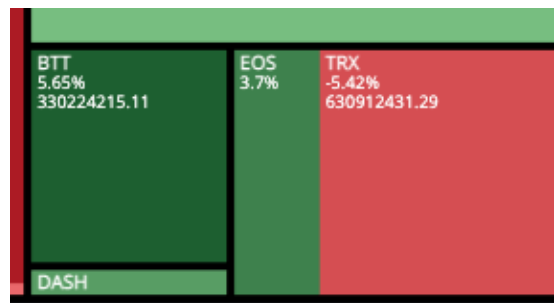


Figure 6. Fixed by checking the size of each block and displaying data if it can fit.

## VI. RESULTS

### A. Candle Stick Chart

The candle stick chart that I implemented for this project aligns with three of my project objectives. Firstly, users can perform analysis using this chart. I have provided a tooltip for this chart, as well as annotations marking important points throughout Bitcoin's history. Second, this chart provides a customizable visual exploration experience by giving users the ability to zoom and pan throughout the time series data, viewing different moments in time and displaying relevant data for each date. Lastly, this visualization will be used as a trading dashboard tool and has been written with portability and reusability in mind for the future.



Figure 7. Full view of the candle stick chart.

### B. Volume Bar Graph

The volume bar graph that I implemented for this project also aligns with three of my project objectives. Firstly, users are able to perform analysis using this chart. I created a conventional tooltip for this chart, as well as annotations marking important points throughout Ethereum's history. Second, this chart provides a customizable visual exploration experience by giving users the ability to zoom and pan throughout the time series data, viewing different moments in time and displaying relevant data for each date. Lastly, this visualization will be used as a trading dashboard tool and has been written with portability and reusability in mind for the future, it will be connected to the candle stick chart so that both get updated dynamically at the same time.



Figure 8. Full view of the volume bar graph.

### C. Price Performance Treemap

The price performance treemap aligns with three of my project objectives. Firstly, it is an in-depth visual analysis of 17 different

cryptocurrencies, providing users with a snapshot of the market in an instant. Second, it is a customizable visual exploration tool where users can select specific boxes and display a plethora of relevant information for each cryptocurrency. Finally, this treemap will be used as a trading dashboard tool in the future, where soon it will be visualizing a lot more than 17 different cryptocurrencies.

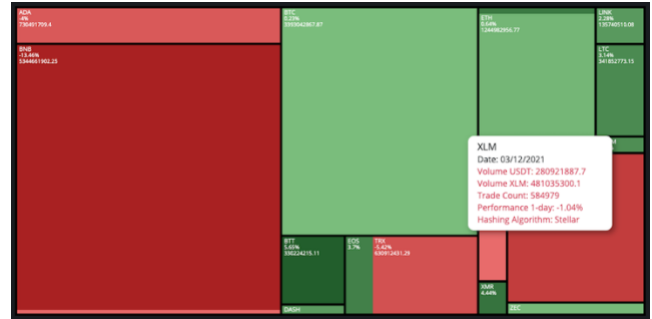


Figure 9. Full view of treemap.

### D. How I Measured Success

Throughout this project the main way that I measured success was with accuracy, aesthetics, and finished functionality. Firstly, I wanted to ensure that every bit of data I displayed was accurate, and that my charts were displaying the data correctly, so the first thing I perfected for this project was the axes, positioning, and sizing. Secondly, I wanted to make sure that all my visualizations were aesthetically pleasing and nice to look at, so I worked really hard to make it look exactly like I wanted it to. I did a lot of CSS styling, HTML formatting, and color picking. Finally, my last measure of success was the number of features I implemented. I wanted to give all 3 of my charts more than one interesting feature, and there were times where I felt like giving up and settling for only one. But I wanted to feel like my project was useful, so I implemented additional functionality such as tooltips and annotations for all three of my charts, and I made sure that they all worked smoothly and correctly.

## VII. DISCUSSION

### A. Was the Approach Promising?

I think after finishing the project, I can say for certain that the approach I took was promising. The visualizations that I created were things that I was personally proud of after I completed them. I think that the approach I took set me up for continuing this work in the future. All of these charts were developed with the idea in mind that I would be using them later and adding additional functionality, so they all work very smoothly, and are extremely reusable.

### B. What Different Approach is Better?

I think the only other approach that I could have taken differently that would have been better, would have been to dive deeper and add more. I think that if I had started earlier then I could have added additional functionality that would have made this project a lot more dynamic.

### ***C. What I Learned by Doing This Project***

I learned a tremendous amount from doing this project. I learned how to use the Pandas library in Python to transform candle stick data. I dove deeper into learning HTML, creating a website, and styling it using CSS. I also learned the D3 library in depth, giving me the knowledge necessary to continue creating data visualizations for my work in the future.

### ***D. What Would I Have Done Differently?***

The only things that I would have done differently for this project would be to have started earlier, add additional functionality, and use the Scott Murray and provided D3 resources rather than googling. I think that if I had started earlier, I could have created a much more interactive and customizable experience with the implementation of additional features. I like the number of features currently implemented, and I think I did a good job of perfecting them and making sure nothing was broken, but there were a few more things that would have brought it all together. Finally, I think that if I had relied on the D3 resources provided to us for every problem I encountered, then I would have fixed those problems a lot quicker.

## **VIII. FUTURE WORK**

In the future there are a few additional features that I would like to implement. Firstly, I would like to add the ability to switch between different time periods for each chart. This way users could perform analysis over different periods of time (1 min, 1 hour, 1 day). Secondly, I would like to add the ability for users to switch between different cryptocurrencies for each chart

dynamically. So, for example, you could view Bitcoin using the candle stick chart, but then switch to Ethereum if you would rather view that instead. Lastly, I would like to implement a drawing functionality so that users can draw on top of each chart to perform technical analysis and be able to recognize trends in the data more easily.

## **REFERENCES**

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