# History of the Price of Cryptocurrency

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***Abstract*—The project discusses about cryptocurrency prices and what might affect them. The visualizations show comparisons between prices of cryptocurrencies, networks used by the cryptocurrencies, history of Bitcoin, and cryptocurrencies as a method of investment.**

## I. Introduction

This project will help people in understanding how cryptocurrencies are volatile and what events may affect the price. Cryptocurrency is growing in number of investors and people who create their own cryptocurrency. This project aims to help beginners and experts decide how much more to invest or withdraw in a certain cryptocurrency based on the market.

- Show the growth projections over time and volatility of the crypto currency.
- See which cryptocurrencies share the same network
- Understand the history of Bitcoin from its inception to major events that positively and negatively affected the price
- Visualize which cryptocurrency has the best return on investments

## II. Related Work

There have been multiple research papers published around cryptocurrency ranging from breaking down new methods of making a more economically viable cryptocurrency by creating payments without being posted on the blockchain[1] [1] to involving cryptocurrency in religions by transferring money globally quickly and cost effective[2]. [2]

The paper published on attacks on bitcoin's P2P network[3] [3] led me to wonder how using the same networks across various cryptocurrencies had benefits and downfalls.

## III. Approach

I had to find the dataset with the right values. I found the dataset and created new columns: Difference, Closing Price, and Change% with some simple data manipulation.

| | A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Currency | CurrencyName | Date | Closing Price (USD) | 24h Open (USD) | 24h High (USD) | 24h Low (USD) | Difference | Change% | LogClosingPrice |
| 2 | ADA | Cardano | 5/31/2018 | 0.218973364 | 0.224155291 | 0.224991291 | 0.216745713 | 0 | 0 | -0.65960871 |
| 3 | ADA | Cardano | 6/1/2018 | 0.219179557 | 0.223206996 | 0.227987834 | 0.213887003 | 0.000206193 | 0.000940749 | -0.659199955 |
| 4 | ADA | Cardano | 6/2/2018 | 0.227665132 | 0.220316919 | 0.228961934 | 0.216588095 | 0.008485575 | 0.037272177 | -0.642703479 |
| 5 | ADA | Cardano | 6/3/2018 | 0.226597181 | 0.226565203 | 0.236649961 | 0.222871825 | -0.001067951 | -0.004712993 | -0.644745497 |
| 6 | ADA | Cardano | 6/4/2018 | 0.213312724 | 0.22640947 | 0.230272469 | 0.209228365 | -0.013284457 | -0.062276909 | -0.670983238 |
| 7 | ADA | Cardano | 6/5/2018 | 0.218860107 | 0.213312871 | 0.221060239 | 0.202165239 | 0.005547383 | 0.025346707 | -0.659833393 |
| 8 | ADA | Cardano | 6/6/2018 | 0.214669717 | 0.218022286 | 0.219497973 | 0.208366004 | -0.00419039 | -0.019520173 | -0.668229216 |
| 9 | ADA | Cardano | 6/7/2018 | 0.209952288 | 0.214669717 | 0.2184372 | 0.2079938 | -0.004717429 | -0.022469053 | -0.677879388 |

I decided to use D3.js along with D3 color legend library by Susie[4]. D3.js gives an ease of use for Data Visualization compared to other visualizations such as P5.js.

For the first objective, I decided to use line chart to show the volatility through fluctuations of the graph. I worked on the line chart on the closing price of multiple cryptocurrencies. I used 20-line graphs on a single visualization, which was cluttering and hard to read, especially when trying to visualize which graph links to which color on the color scale from D3.js color legend. After removing 11 line graphs, there was still the problem with the graph hard to visualize due to Bitcoin's extremely high price compared to the rest. Due to this, the log of values was taken so the line graphs that have small closing prices can be visualized better. I thought to use a bisecting line to show the value of each cryptocurrency instead of hovering over with tooltips. The problem with this was many cryptocurrencies were close in value and adding a bisecting line like I did for the timeline of Bitcoin prices; it would increase in clutter.

For the second objective, I decided to use a bar graph to see a simple comparison of network types and the closing price to also show which networks are worth more in general. I worked on the visualization based around the networks used by cryptocurrencies. This visualization required only one change. Certain cryptocurrencies had a closing price extremely close to 1. Since the log value was taken, the output was nearly 0. It was hard to visualize this on the bar graph, thus certain crypto currencies were removed.

For the third objective, I decided to use a line chart since it helps in visualizing the changes in closing price. I worked on the timeline of Bitcoin prices. This was a more straightforward by displaying a certain date, closing price on said date, and the event that affected the closing price of Bitcoin on that date. There are multiple static graphs and information in the timeline, sometimes with links to further research on the event. At the end of the timeline, there is an interactive Bitcoin closing price line graph.

For the fourth objective I decided to use a bar chart race, since it would show the ranking change. I worked on the percentage change in closing price bar chart race. This visualization was easy to make, but difficult in finding the right time difference. Initially, I thought about finding the percentage change for each quarter of the year. Feedback on the graph mentioned that it is too quick and could not properly see the specific change. I switched to both months and bi-weekly. Testers mentioned that month was the best choice.

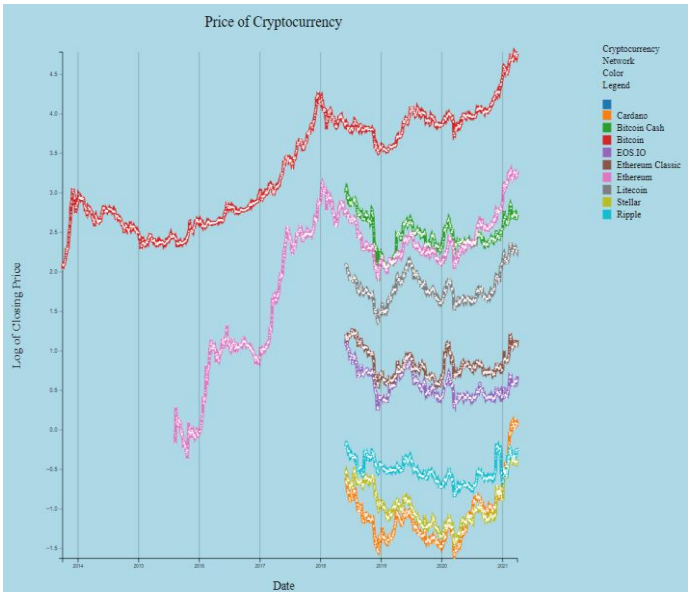
[1] https://coinrivet.com/research/papers/the-bitcoin-lightning-network-scalable-off-chain-instant-payments/

[2] https://www.researchgate.net/publication/282533114_Bitcoin_in_Islamic_Banking_and_Finance

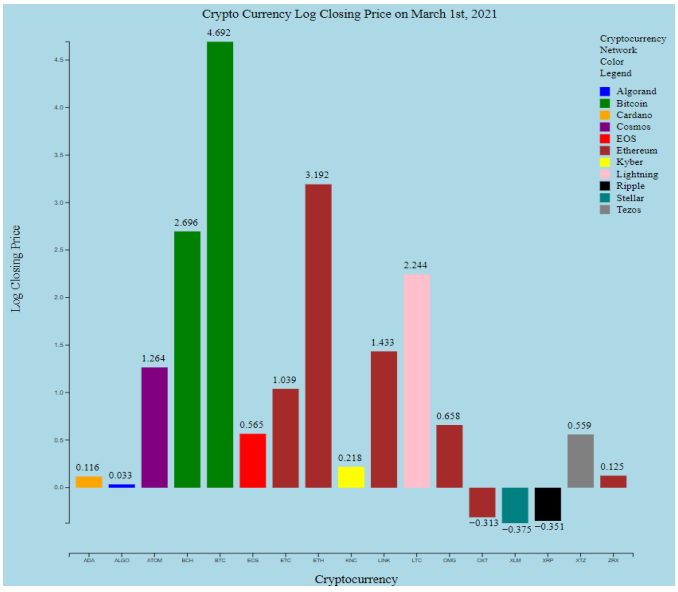
[3] https://www.usenix.org/system/files/conference/usenixsecurity15/sec15-paper-heilman.pdf

[4] https://d3-legend.susielu.com/

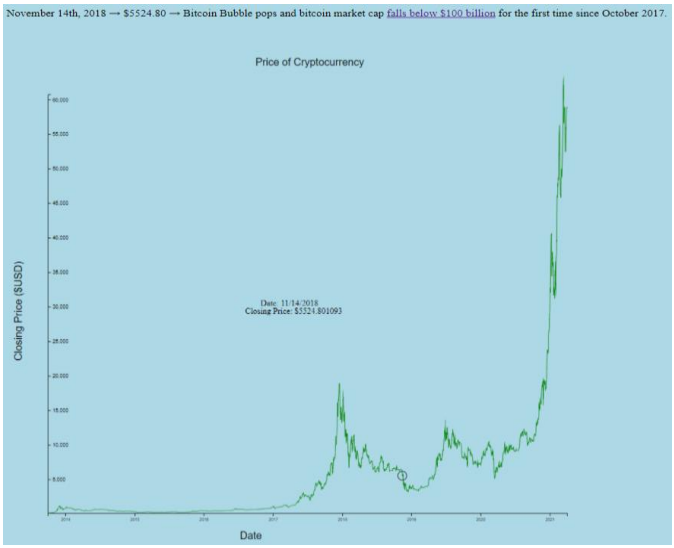
## IV. Results



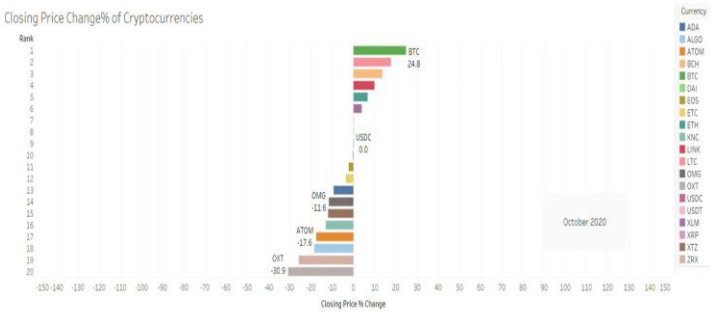

- This graph links with the objective of comparing the volatility and the growth of cryptocurrencies over time.
- I measured success with this graph by seeing how easy it was to visually compare the prices and volatility, which I believe has been done well.
- It should also be noted that there is an extra blue box on the legend that does not match any line graph which is a bug in the software.




- This bar chart graph shows which cryptocurrency uses which network. Using color in this type of graph helped quickly count the number of cryptocurrencies and see which networks generally perform better.
- I measured success in this by seeing how quickly the user can see which networks have been used, which is good.




- This line chart again helps in viewing how an event affected the Bitcoin closing price. As seen during the event of the Bitcoin bubble popping, this led to a sharp decline in Bitcoin price.
- I measured success by seeing how well the user could see the effects of a certain event on the price. This was done well on the graph but could be improved by implementing a zoom feature.




- This bar chart race helps investors in seeing which cryptocurrencies provide the best return percentage. This graph shows in order from greatest to least how much percentage return is provided during the end of a certain month.
- I measured success in this bar chart race by how well a user could see the percentage change of each cryptocurrency. I feel I could have done this better with showing the percentage changes for each bar. I allowed the user to slow or speed up the animation if they want, but there are areas in improvement in this chart.

## V. Discussion

I believe overall I took a good approach towards this project. I met all my objectives. Although there are some places that could be improved, I feel in general this project was taken in a good direction.

I learnt multiple useful things during this project. The most important is I understood how important feedback is. I made multiple changes that I did not notice but was mentioned by testers that graphs were cluttered, did not produce useful information, or needed to improve on the color scheme.

If I were to start this project again, for the timeline of bitcoin prices, I would have created a graph that shows the event information as a hover tooltip instead of having the user scroll through the page. This would create less work by the user for the same amount of information.

## VI. Future Work

I would want to implement some sort of comparison between prices of cryptocurrencies using a certain network compared to other networks. Also, I would like to implement a date against the price of various cryptocurrencies using the same network. If I could find a significant correlation between networks and prices, this could further help investors to invest based on how the cryptocurrency network is performing as well.

As mentioned before, a zoom feature could have been implemented on both line graphs. This would make it easier to visualize the small changes between certain dates, especially for the bitcoin timeline graph.

With the bar chart race, the graph as mentioned should be updated to show percentage changes on each cryptocurrency.

## References


[1] Joseph Poon, T. D. (2015). The Bitcoin Lightning Network

[2] Evans, C. (2015). Bitcoin in Islamic Banking and Finance

[3] Ethan Heilman, Alison Kendle, Aviv Zohar, Sharon Goldberg. (2015). *Eclipse Attacks on Bitcoin's Peer-to-Peer Network*