Understanding Bitcoin Market Bubbles

Introduction:

Cryptocurrency markets such as Bitcoin are prone to these market ‘bubbles.’ These bubbles are where the price of an asset is driven farther above its natural value because of speculative demand by investors, leading to a collapse in price. In understanding this strange phenomena, we can provide valuable insights into the behavior of the market, anticipating future price crashes. In my project, I attempt to model Bitcoin’s market bubbles by using historical price data that I find from datasets, and to analyze the results in order to understand the reasons for these market bubbles.

Method:

The method I used was to create a logistical growth model in order to reproduce bubble-like behavior, but under controlled conditions. Although logistical growth models are typically used to model population growth, it can also be used to simulate the rapid growth and decay of prices in speculative bubbles. The equation down below will be able to provide a realistic simulation model of Bitcoin’s market behavior.

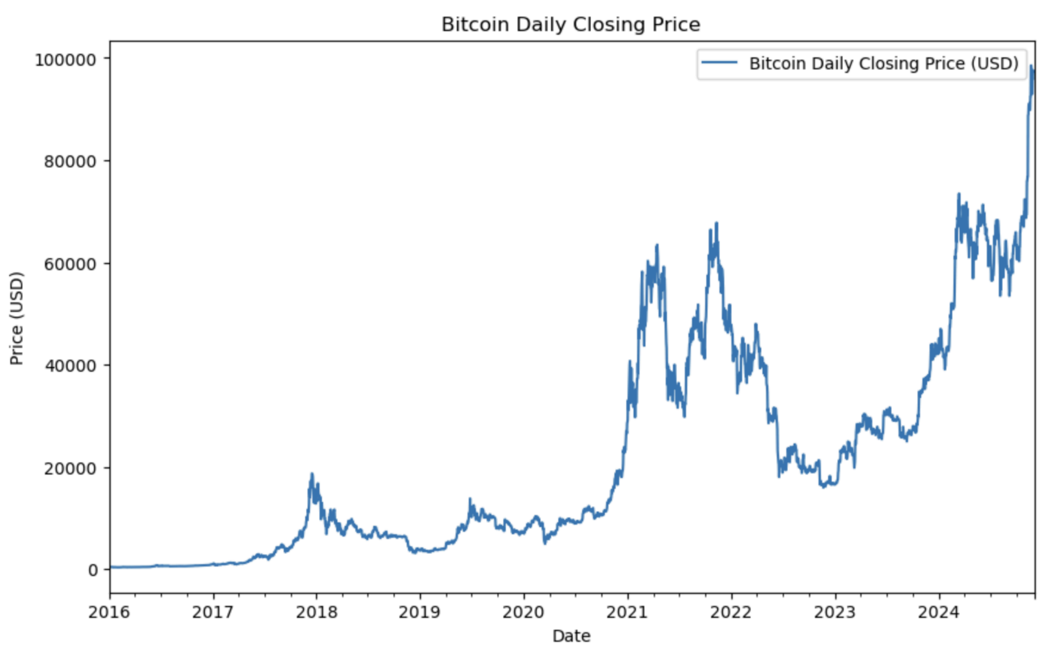
$$F(t) = \frac{L}{1 + e^{-k(t - t_0)}}$$

Libraries:

The libraries that I used were Pandas, NumPy, and Matplotlib. I used Pandas and NumPy to conduct data filtering to ensure relevant information from a large dataset. In using Matplotlib, I was able to accurately display my data and the fitted model above.

Data Filtering:

Once I collected my data, I put it through two different types of cleansing: Temporal filter and Missing Data. Temporal filtering is just selecting data from a specific time frame. Originally, the data I had began in 2012. I decided to filter it to start from 2016 because there were only tiny amounts of movements starting from 2012. In 2016, Bitcoin's closing price showed a steady increase throughout. For missing data, it was simple; I just filtered out rows where the closing price was missing.



Results:

The model's fit was good for the dataset, as it captured the rise and fall of these market bubbles pretty well. However, there are deviations in the tail end of bubbles which were noticeable. This may indicate external market events or changes to the cryptocurrency realm may have occurred, influencing the burst of the bubble. All in all, based on a research study by Michael Brode, the main reason for bubbles are the fear of missing out among investors, leading to prices skyrocketing to unsustainable levels until the bubble bursts, causing a steep price correction (Brode, 2023).

References

Brode, M. (2023). The Drivers of Economic Bubbles in Cryptocurrencies That Affect Its Long-Term Sustainability. Open Journal of Business and Management, 11(6), Article 6. https://doi.org/10.4236/ojbm.2023.116167

https://www.kaggle.com/datasets/mczielinski/bitcoin-historical-data/versions/89?resource=download