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DSCI 510 Project Description

Motivation

The quantitative easing the Federal Reserve and Treasury have enacted since the pandemic has led to 40% of US dollars in existence being printed in the last 16 months, likely leading to impending inflation. As such, I felt it was only right to mesh my interest in the digital asset space with the current financial climate for this project. The question that I will investigate is "In the past 5 years, which asset has proven to serve as the best hedge against inflation – S&P 500 or digital assets such as Bitcoin?" I plan to achieve this by comparing the performance of these assets in the last 5 years alongside the Consumer Price Index, from the point of view of an average American investing $1,000 in 2016 and assessing what their respective returns would be in present value.

Data Sources

For this project, I analyzed three time-series data sources, focusing on a date range from 2016 to now: the Consumer Price Index, the S&P 500 ETF ($SPY), and the Bitcoin ($BTC) price chart. I connected to APIs using free custom-generated keys to access the $SPY and $BTC data, while utilizing Beautiful Soup to web scrape the BLS.gov site's Consumer Price Index historical data. My thought process was to use the scraped data as a way of measuring inflation, and the data collected from the APIs as a way of calculating which asset yielded a better ROI, or hedge against said inflation. The sources are listed at the bottom of this document for reference.

Analysis

As seen in Figure 1 below, the analysis began by collecting the data from the respective databases and webpages, ensuring the correct data types and data parameters (2016-present) were applied. Next, I cleaned up the data then converted it into Pandas data frames. Once the data was in the correct format, I converted the appropriate columns into the correct data types (ie. Date as date time, Price as a float, etc.) and then performed some EDA to see how the data looked before continuing. After confirming that the data looked proper, I visualized the data using Matplotlib.

The plots passed the eye test, so it was time to perform some analysis and find hidden insights from the resulting visualizations.

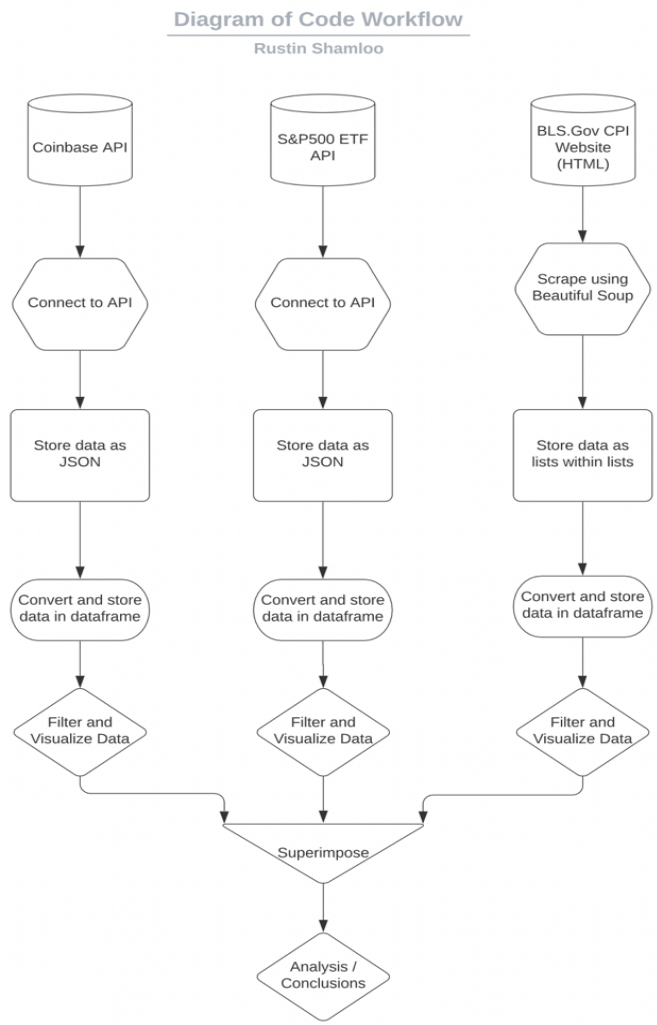
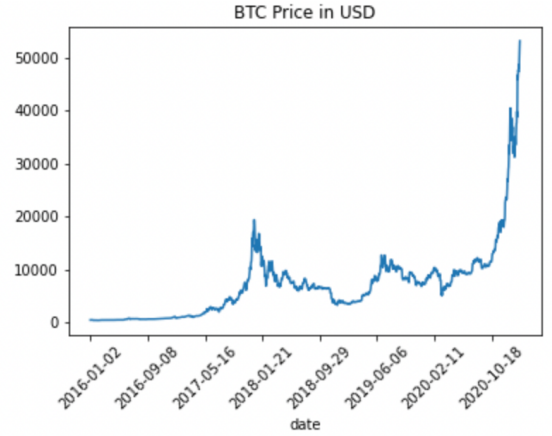


Figure 1: Project workflow.

Conclusions

From the resulting graphs below in Figures 2-4, it is no surprise that Bitcoin was far and away the best hedge against inflation and store of value the past 5 years.

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--------------------------------------------------------------------------------
The price of BTC has increased 12154.290802397287 % in the past 5 years.
If you invested $1,000 in 2016 into BTC, you'd now have $121542.90802397286 in today's dollars.
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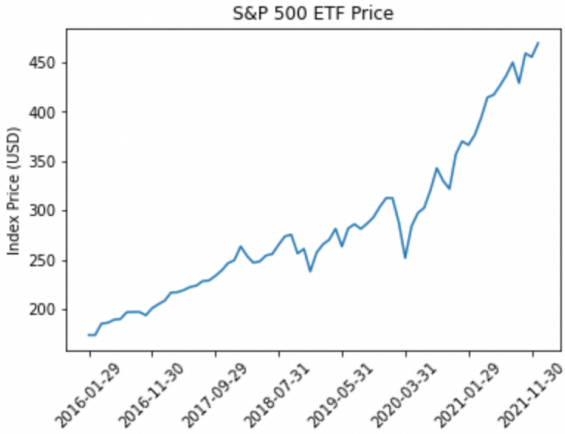
Figure 2: $BTC Price Chart and ROI.

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The price of $SPY has increased 163.80109081822857 % in the past 5 years.
If you invested $1,000 in 2016 into the S&P 500 ETF, you'd now have $1638.0109081822857 in today's dollars.
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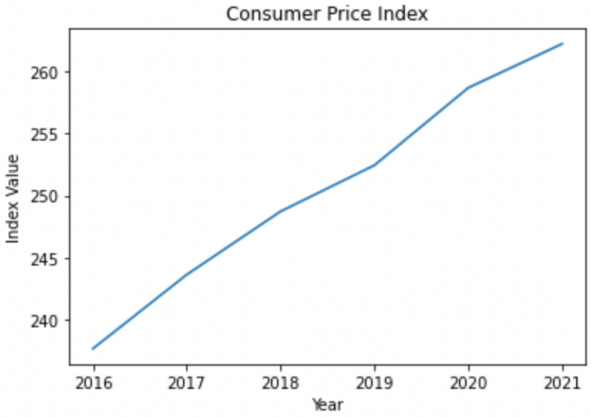
Figure 3: $SPY Price Chart and ROI.

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We see a 10.342433474155492 % increase in inflation during the past 5 years.
To hedge against inflation, we would need to earn a ROI greater than this.
What cost you $1,000 to buy in 2016 now costs you $1103.424334741555 today.
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Figure 4: Consumer Price Index and Resulting Inflation, 2016-present.

Since 2016, $BTC yielded a 122x return, the S&P 500 a 1.64x return, all while the inflation rate rose over 10%. While investing in $SPY may be seen as a safer and proven investment, the answer to "which investment provided the higher ROI and served as a better hedge against inflation?" is Bitcoin – at least for now. As seen when running the .py file, I was able to find the percent change in each index and then output a statement demonstrating what a person who invested $1,000 back in 2016 would have today, had they invested in $SPY or $BTC. I also output a statement explaining the opportunity cost and what it would take in today's dollars to buy something that cost $1,000 back then, had they simply held onto the money and forgone investing altogether.

Ideally, if given more time, I would have liked to dive deeper into this analysis, performing anomaly detection and local analysis on the visualizations to see if any historically significant events (ie. COVID-19, new administration, economic regulations, etc.) may have causation with market volatility in the stock and cryptocurrency markets. It would also have been helpful to have more data on the BTC volume, so that I could have divided the $BTC price for each day by the volume to find the circulating supply, then look for large deviations from the previous or following days to flag as potential datapoints of interest. The granularity may also have been an important factor to change, since the data integration would require either data imputation or a different sampling rate, given the stock market's hours are different from the cryptocurrency market's. Lastly, it would have also been ideal to analyze the trend, seasonal, and remainder of the time-series data to uncover more insights. Ultimately, I found this to be a great project to showcase my web scraping and Python skills, as well as digging deeper into a field I am very passionate about. My hope is that the information found through my analysis is found to be informative, and not seen as financial advice.

Sources:

- https://docs.coincap.io/
- https://www.alphavantage.co/documentation/
- https://download.bls.gov/pub/time.series/cu/cu.data.1.AllItems