**CRYPTOCURRENCY INVESTING**

1. **INTRODUCTION**

Cryptocurrencies have emerged as a popular alternative to traditional currencies due to their decentralized nature and potential for high returns. With the rise in popularity of cryptocurrencies, there has been a significant increase in the number of people interested in investing in them. Cryptocurrencies are based on Blockchain technology. Some coins hold value because people believe in them, and some companies are invented to represent a company. However, investing in cryptocurrencies can be risky, as the market is highly volatile and subject to sudden fluctuations.

The goal of this project is to analyze the historical data of cryptocurrencies and provide market values for a period. The analysis will be based on data collected from COINBASE API. We have taken the data of the cryptocurrency for a specific period. Based on the data we can check the returns of the cryptocurrencies on the amount invested. Our project’s main goal is to gather the data for a period and simulate the investments with a sample amount.

In this model the data is gathered from the COINBASE API through libraries and initially we gathered data for one crypto currency and later we took 5 cryptocurrencies. After gathering the data for 5 cryptocurrencies, we have found the correlation between them and simulated the investments through DCA (Dollar Cost Averaging) investing to find out financial results we get for a period.

In this project we have worked on Panda data frames. We have used PCA to find dimensionality and have simulated financial results based on the historical data. Based on the analysis we have decided which coin to buy or invest in.

1. **BACKGROUND**

Cryptocurrency investing has become increasingly popular in recent years, and many businesses and individuals use various algorithms and codes to make investment decisions. There are both benefits and drawbacks to cryptocurrency investing, including high potential returns, but also high volatility and risk.

The code used in this discussion is written in Python and is open source. The Python code used in this chat is open source and can be modified and adapted for various investment strategies. While the strategies we simulated are relatively simple, more complex algorithms and techniques can also be used in cryptocurrency investing, including machine learning and data analysis. Python has become a popular language for data analysis and has a large community of developers, which makes it a good choice for developing and sharing code for cryptocurrency research.

Overall, the use of Monte Carlo simulation and other algorithms in cryptocurrency research is an area of active development. As the field evolves, there will likely be continued research into the most effective ways to model and predict cryptocurrency prices, and the use of open-source code and collaboration will play a key role in advancing the field.

1. **RESULTS**

**Libraries**

To develop our project, we have used several libraries.

The list of libraries we used in our project are:

**Historic Crypto:** We imported two modules from this library: Historical Data and Cryptocurrencies. The Historical Data module provided us with access to historical pricing data for various cryptocurrencies, while the Cryptocurrencies module enabled us to retrieve metadata for these same cryptocurrencies.

**Matplotlib.pyplot and seaborn:** We used these libraries for Data visualization purposes. These libraries provided us with powerful tools for creating plots and charts to help visualize our data.

**Pandas:** We used pandas for data manipulation and data analysis. To perform calculations and generate summary statistics.

**Numpy:** It is used for efficient calculations.

**Datetime:** This enabled us to work with dates and times in our analysis.

**Data Extraction**

To analyze the cryptocurrency market trends, we need data on cryptocurrency prices over time. We used the HistoricalData class from the Historic Crypto library to extract historical cryptocurrency price data. We extracted the data from COINBASE API using the libraries. Initially we filtered the cryptos in USD from the filtered data we extracted the daily closing prices of Bitcoin (BTC), Ethereum (ETH), and a few more cryptos from January 1st, 2021 to present day.

We instantiated the HistoricalData class for each cryptocurrency of interest and passed the relevant parameters, such as the cryptocurrency symbol and the start and end dates for the data extraction. We then called the retrieve\_data () method to download the historical price data as a Pandas DataFrame.

After downloading the historical price data, we converted the timestamps to datetime objects and set them as the DataFrame index. We also filtered the DataFrame to only include the daily closing prices.

Finally, we merged the individual DataFrames for each cryptocurrency into a single DataFrame using the concat () method from Pandas. This allowed us to easily compare the historical prices of Bitcoin, Ethereum, and Binance Coin over time.

Overall, the data extraction process involved using the HistoricalData class from the Historic\_Crypto library to retrieve the daily closing prices of Bitcoin, Ethereum, and Binance Coin for the period from January 1st, 2021 to present day. The extracted data was then processed and merged into a single DataFrame for further analysis.

**Data Visualization**

As we used matplotlib and seaborn for data visualization. Based on the results from the panda frames, we plotted graph for the data we have extracted from 1st jan,2021 to present day. So, the graph shows data for the 5 cryptos we have taken for our testing purpose. Those 5 cryptos are Bitcoin, Ethereum, Algo, Doge coin, XLM and we have taken their all values in USD. We have taken their closing price of each day for a specific period. After extracting their data using pandas and we plotted a graph with their time and price at that period. After plotting we got that bitcoin is the only crypto which is highlighting rather than other 4 as the price is higher for Bitcoin.

Graphical user interface, chart, line chart

Description automatically generated

As, we can see that Bitcoin is highlighting when compared with all other cryptocurrencies. So, to plot them all in same numerical range we have scaled from 0 to 1.

Using the formula

Diagram

Description automatically generated with medium confidence

With the help of this formulae, we scaled the data from 0 to 1. So, that all the cryptocurrencies are plotted in the same range.

Chart, histogram

Description automatically generated

All the 5 coins have their maxima at different points, so scaling normally is not enough. So we scaled the data such that we have a value of 0 at the lowest price and a value of 1 at the price at 11-11-2021(basically in November). All the prices are relative to the 11th of Nov,2021.

Chart, histogram

Description automatically generated

After plotting them using correlation function we established a correlation matrix for all the 5 cryptos.

Table

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The above correlation matrix shows the pairwise correlation between the five cryptocurrencies (BTC-USD, ETH-USD, XLM-USD, ALGO-USD, DOGE-USD) used in the analysis. The correlation values range from -1 to 1, where values close to 1 indicate a strong positive correlation, values close to -1 indicate a strong negative correlation, and values close to 0 indicate no correlation.

If the value is greater than 0.85 then it is strongly corelated if it is less than that it moderately corelated. We can see that XLM and ETH have 0.54, which means they are not much corelated.

By looking into the matrix, we can say that most of the currencies are dependent on each other.

**PCA**

In our project, we used Principal Component Analysis (PCA) to reduce the dimensionality of our dataset. We applied PCA to three different sets of data: the raw data, the scaled data, and the centered data.

After fitting the PCA models to the data, we plotted the percentage of variance explained by each principal component. This is known as a scree plot. The scree plot allows us to visually inspect how many principal components we need to explain a certain amount of variance in the data.

As shown in the scree plot, the raw data and centered data have a similar trend, where the percentage of variance explained decreases rapidly for the first few components and then levels off. However, the scaled data scree plot shows that the percentage of variance explained is more evenly distributed across all principal components.

Overall, the scree plot suggests that we can reduce the dimensionality of our dataset significantly while still capturing a high percentage of variance in the data.

Chart, line chart

Description automatically generated

**Dollar Cost Averaging (DCA)**

We used Dollar Cost Averaging form of investing in this we used three different simulations for investing in a cryptocurrency, namely. Each simulation involves investing a fixed amount of money daily, but the strategy for investing that money changes in each simulation. For each simulation, the code computes the total amount of money invested over time, the total amount of cryptocurrency purchased, and the final value of the investment at the end of the simulation period. These metrics can be used to evaluate the effectiveness of each investment strategy.

We have taken Ethereum as an example Crypto for testing and some values which we can invest and affordable are taken.

Simulation 1:  
Fixed DCA (Dollar Cost Averaging)  
Invest 10 dollars every day for a period.

Text

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Simulation 2:  
Invest $7, if price increases from previous day   
Invest $15, if the price of a crypto decreases from previous day

A screenshot of a computer

Description automatically generated with medium confidence

Simulation 3:  
Invest $10 if the price increases from previous day  
Invest $10\*(Relative change%) if the price decreases.

Text

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The below outputs are the results if we invest as per above mentioned simulations from Jan 01,2021 to present day.

This code demonstrates the use of Python to simulate investment strategies and evaluate their effectiveness over time. It also illustrates how changes in investment strategy can impact the total amount of money invested, the total amount of cryptocurrency purchased, and the final value of the investment. These insights can be useful for making informed decisions about how to invest in cryptocurrencies or other financial assets.

1. **CONCLUSION**

In this project, we analyzed the historical data of several cryptocurrencies and applied various techniques to gain insights into their behavior and potential profitability. We started by cleaning and processing the raw data, removing missing values and aligning the time series. We then computed basic statistics and visualizations to get a sense of the data's distribution and trends.

Next, we used correlation analysis to identify pairs of coins that exhibit similar price movements and can potentially be used in a diversified investment strategy. We also applied Principal Component Analysis (PCA) to reduce the dimensionality of the data and identify the most important components that explain its variance. We found that scaling and centering the data can affect the results of PCA and should be considered when interpreting its outputs.

Finally, we simulated three investment strategies to test their performance based on historical data. The first strategy simply invested a fixed amount of money every day in a single coin, while the second adjusted the investment amount based on the coin's price change from the previous day. The third strategy used a similar approach but also factored in the magnitude of the price change. We found that all three strategies yielded positive returns for some of the coins, but their performance varied widely depending on the specific coin and the time considered.

Here, we are not trying to predict which stock price is going to skyrocket and which’s going to crash, but we are trying to analyze the previous existing data and leaving the investor to make an informed decision about their investment plans for the future.

Based on the results we got, it doesn’t seem to be a good time to invest in any cryptocurrencies among the five.

Overall, this project demonstrates the potential of data-driven techniques and simulations in the cryptocurrency market, but also highlights the challenges and limitations of such approaches. Future work could explore more sophisticated models and algorithms, as well as incorporate external factors and news events that can affect the prices of cryptocurrencies.