Exploratory Research on Investing in Cryptocurrencies

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GitHub
https://github.com/UC-Berkeley-I-School/Project2_Tang_Marion

Presentation
https://github.com/UC-Berkeley-I-School/Project2_Tang_Marion/blob/c01febca77b1360b8d845eb04e74cefbaad481be/Report%20-%20Investing%20in%20Cryptocurrencies.pdf

Target Audience

Our target audience is Individuals interested to learn about potentially investing in cryptocurrencies.

Introduction

In recent years, cryptocurrencies have become a dynamic market. To provide some context, as of today December 13, 2023, The market capitalization of crypto is $1.5 Trillions with a daily trading volume of $68 Billions.

Our exploratory research provides an introduction to beginners interested in investing in cryptocurrencies. It focuses on investing instead of day-trading, and aims to compare potential outcomes for short term, mid term, and long term investments.

Overview

Our research focuses on three prominent cryptocurrencies: Bitcoin (BTC), Ethereum (ETH), and Dogecoin (DOGE). We aim to dissect their market behavior and investment potential, highlighting their significant roles in the shifting landscape of digital currencies.

Our analysis leverages pricing data from Yahoo Finance and Nasdaq from 2005 to 2023. We have employed statistical analysis with Numpy, Pandas, and Plotly to iteratively learn about the market dynamics with data and visuals.

List of Questions

- **Seasonality:** Is there a discernible pattern of seasonality in the cryptocurrency markets, where certain months yield consistently higher returns?

- **Correlation:** Is there correlation between Bitcoin, Ethereum, and Dogecoin in price movement?

- **Investment Horizon:** What are trade offs in potential volatility and return on investment with short-term, mid-term, and long-term investment horizon?

Initial Exploratory Analysis

Data Quality Checks
To ensure a solid foundation for our analysis, we performed several critical checks:

- **Column Consistency:** Cross-verified key columns ('Open', 'Close', 'Volume', 'High', 'Low') between Yahoo Finance and Nasdaq, aligning similar data despite minor naming differences.

- **Data Scope and Availability:** Focused on 'Date' and 'Close' columns from 2015 to December 2023, suitable for long-term investment trend analysis and excluding intra-day data.

- **Chronological Sequence:** Ensured all data were in correct chronological order for consistent time series analysis.

Data Standardization
Standardizing data was crucial for uniform analysis:

- **Reordering Time Series:** Adjusted Nasdaq data to align with Yahoo Finance's ascending chronological order.

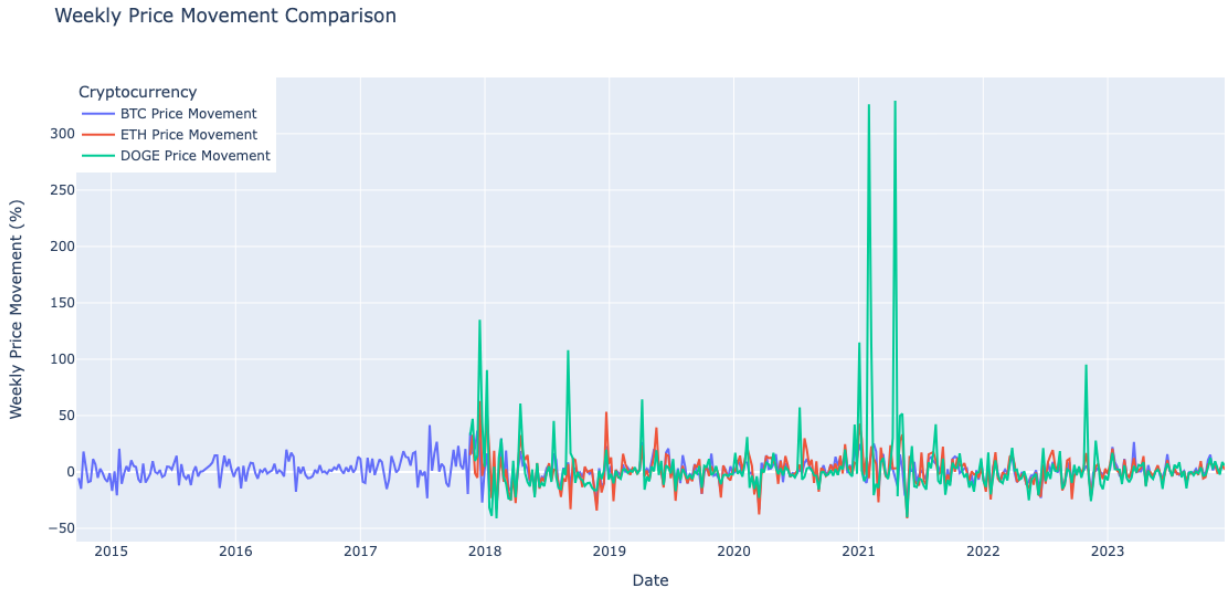
- **Standardization Functions:** Developed functions to streamline Yahoo Finance and Nasdaq data, focusing on 'Date' and 'Close' columns.

Learning:

Data source standardization was necessary to reproduce the same analysis to different sets of data.

Initial Analysis of Price Movement

Our preliminary analysis revealed notable price volatility within the data, particularly with Dogecoin (DOGE). This observation of weekly price fluctuations set the stage for a more in-depth analysis of market behavior and investment potential of the cryptocurrencies under study.



Seasonality Analysis

Research Question

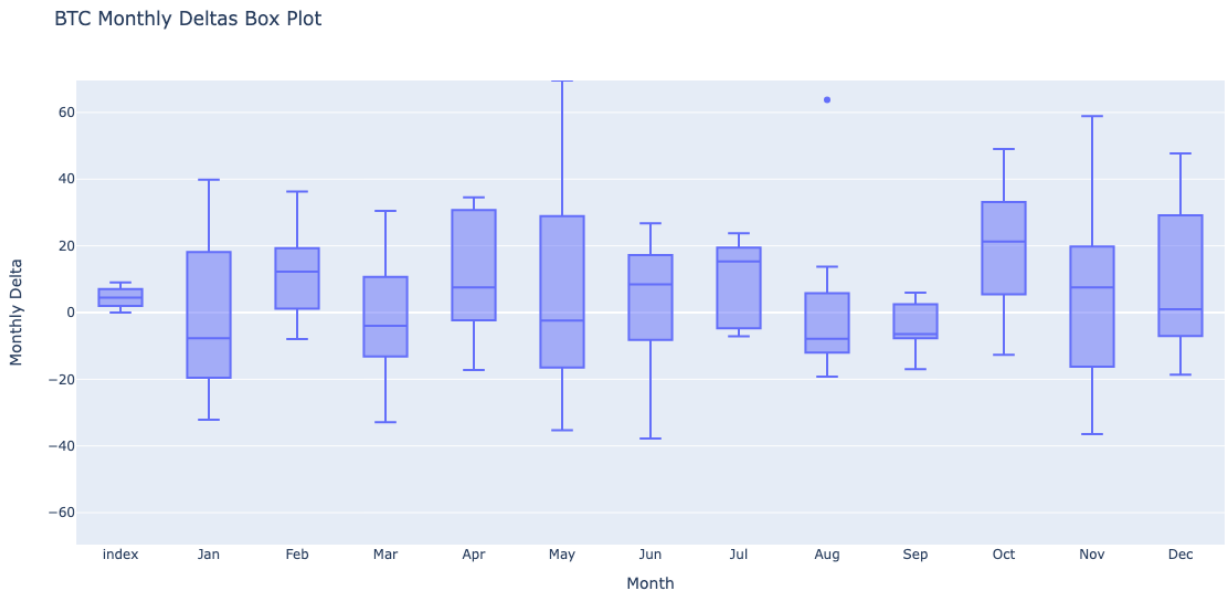
Is there a discernible pattern of seasonality in the cryptocurrency markets, where certain months yield consistently higher returns?

Consideration in Constraint

Given the limited data over an 8-year period (8 data points per month), while some seasonal patterns may emerge, the evidence might not be statistically significant to firmly establish seasonality in the cryptocurrency market.

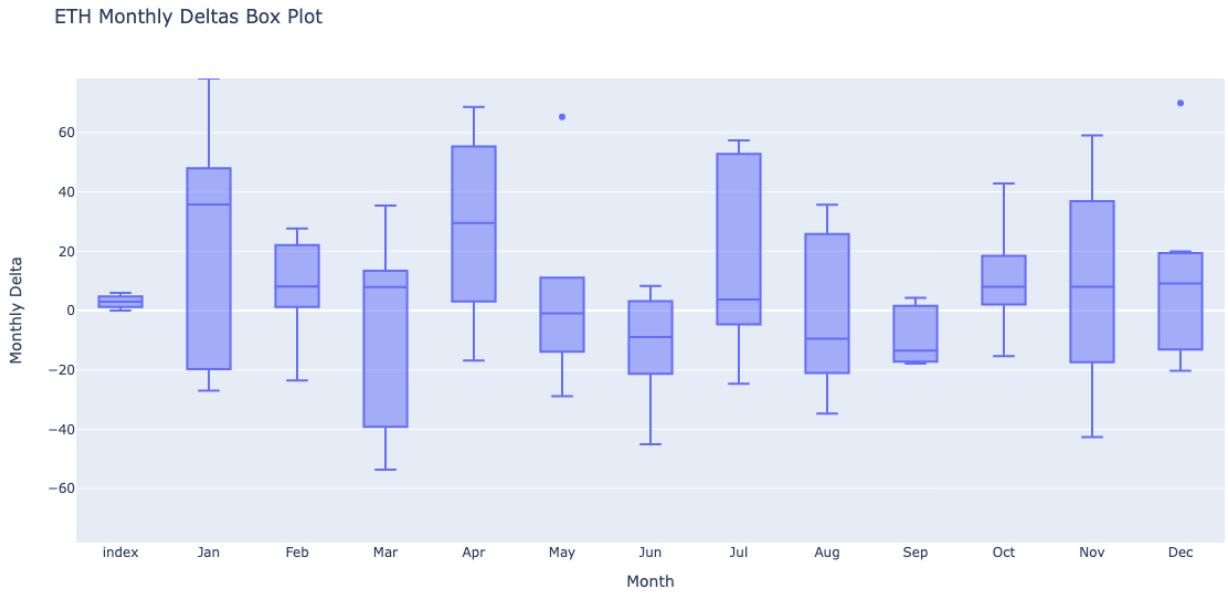
Bitcoin (BTC) Seasonality Pattern

- **Positive Months:** We observe a pattern for higher returns in April, October, November, and December.



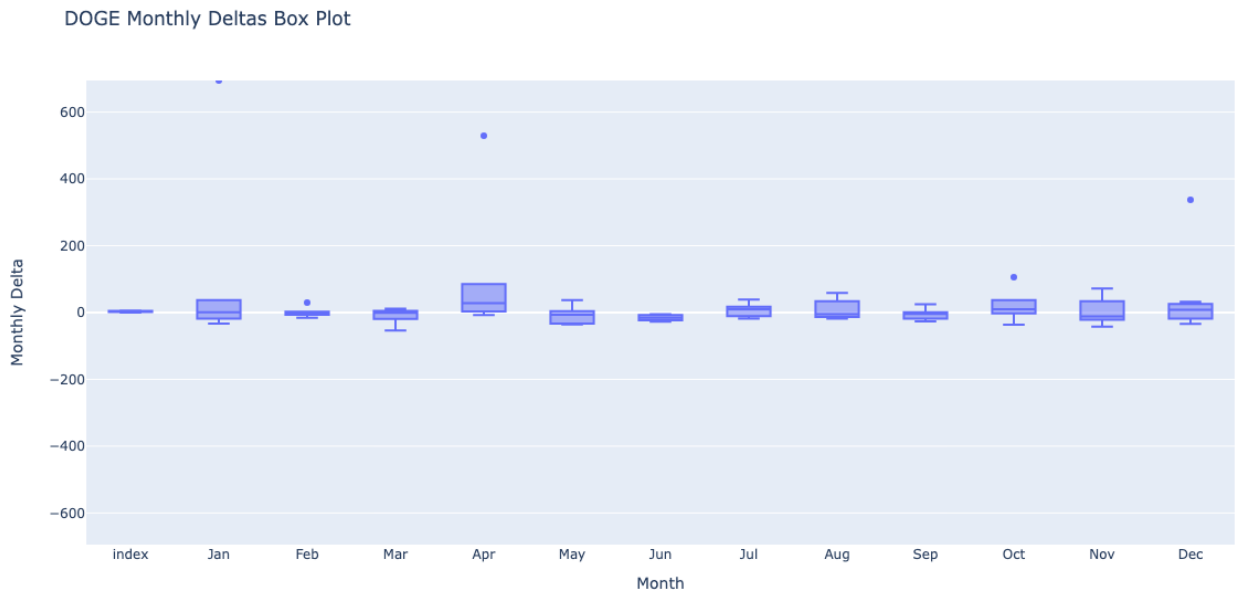
Ethereum (ETH) Seasonality Analysis

- **Positive Months:** We observe a pattern for higher returns in April, May, October, November, and December.



Dogecoin (DOGE) Seasonality Analysis

- **High Volatility:** Marked by sharp fluctuations, significant returns were noted in April and December of 2021, and October of 2022. The irregularity of data points year-over-year hinders establishing a clear seasonal trend for DOGE.



Learning:

There is a visible pattern of seasonality for some months for BTC, ETH, and DOGE.

Correlation Analysis

Research Question

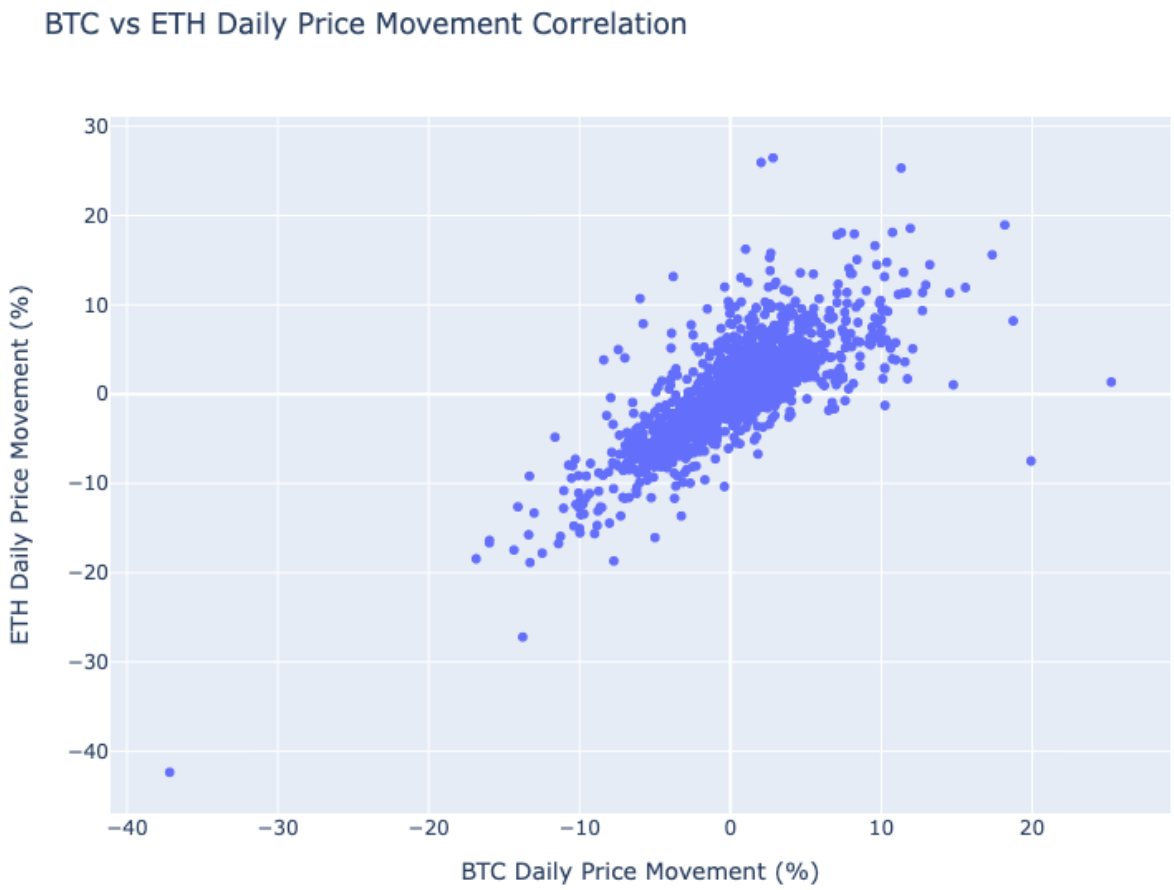
Is there correlation between Bitcoin, Ethereum, and Dogecoin pricing in the market?

Results

BTC and ETH: Correlation Coefficient 0.77. Strong positive correlation, indicating closely aligned price movements.

BTC and DOGE: Correlation Coefficient 0.36. Moderate positive correlation, showing some degree of influence from BTC on DOGE's price.

ETH and DOGE: Correlation Coefficient 0.33. Moderate positive correlation, but weaker than BTC-ETH, reflecting Ethereum's lesser influence on Dogecoin.



Learning:

There is strong positive correlation between BTC and ETH, and weak positive correlation with DOGE.

Analyze Historical Return with Different Investment Horizons

Research Question

Which investment horizon (5 year, 2 year, less than 1 year) has historically yielded a more consistent and profitable return for investing in crypto?

Initial Hypothesis

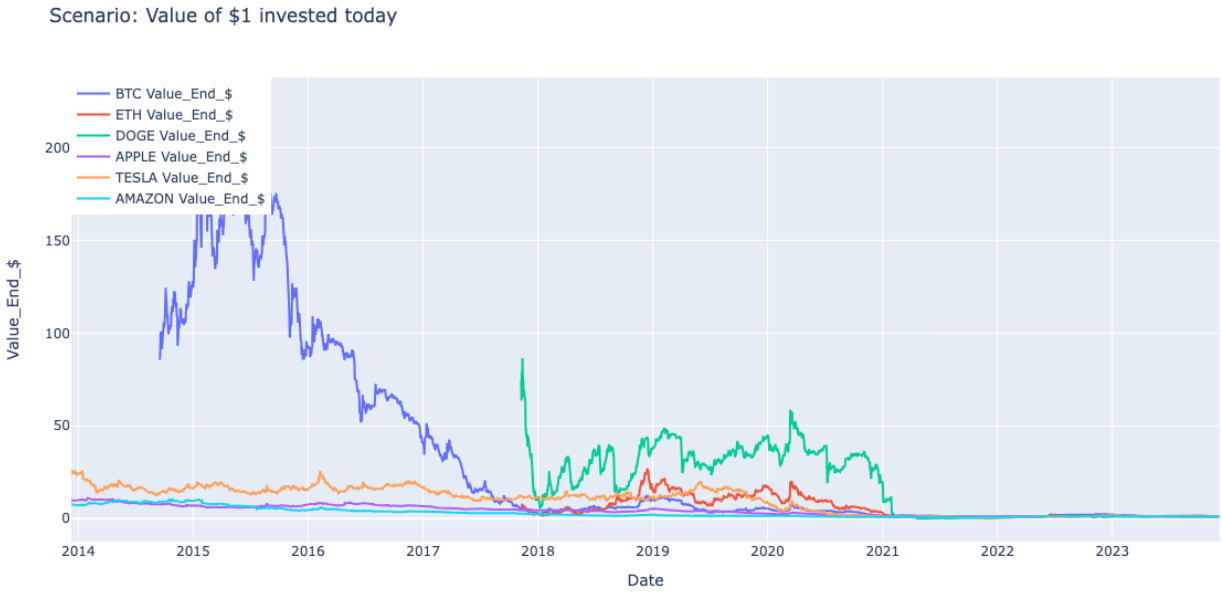
Investing early in cryptocurrencies is hypothesized to offer higher returns compared to established tech stocks, subject to market volatility and growth phases.

Methodology

Simulate return on investment with 1$ on a specific Day: This analysis uses a function (simulate_investment_on_day_x) to calculate the historical outcome of investing $1 on any given day in the past. It calculates the asset units bought, the end value, and the ROI percentage. This approach evaluates the performance of a single-day investment over time.

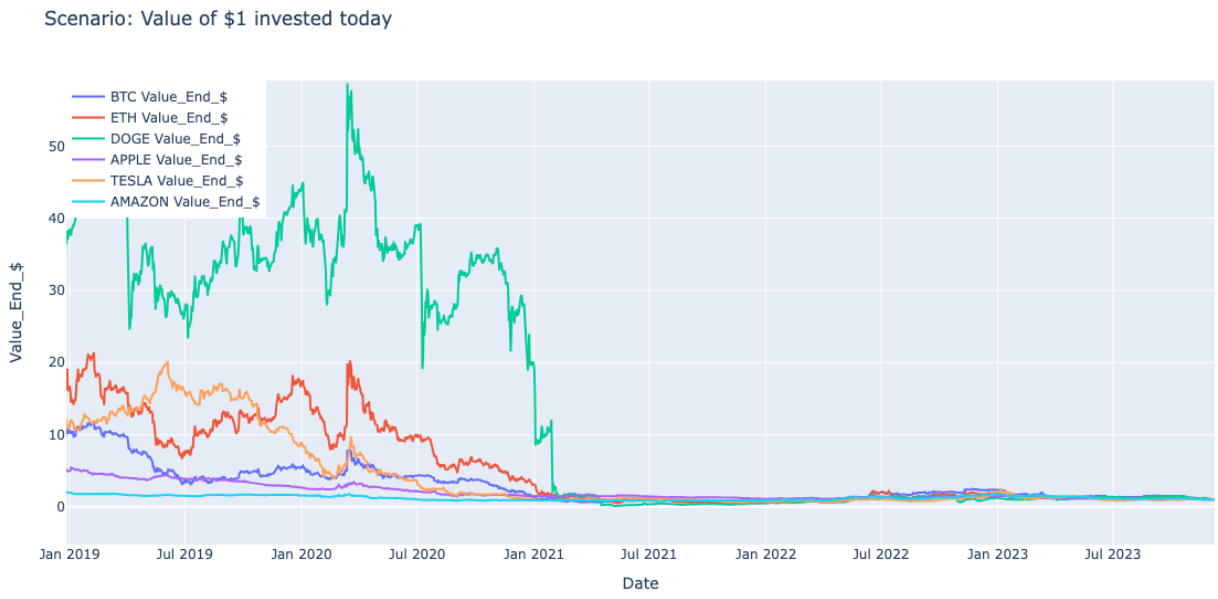
Long-Term Scenario with time horizon of 5 to 10 years:

- Bitcoin (BTC): Shows the highest potential gains for early adopters of upward of 100x to 200x.
- Ethereum (ETH) and Dogecoin (DOGE): Exhibit growth but to a lesser extent than BTC.
- As a benchmark reference, tech Stocks (Apple, Tesla, Amazon) offer more stability and steady growth, yet with lower potential returns compared to BTC.



Mid-Term Investment Scenario with Time Horizon of 1 to 5 years:

- **Dogecoin (DOGE):** As a newer cryptocurrency, it shows the highest ROI of 20x to 50x depending on when an investment is made, indicating the potential of newer crypto assets.
- **Bitcoin, Ethereum, and Tech Stocks:** Demonstrate comparable ROIs, reflecting their established nature and earlier growth phases.



Short-Term Investment Scenario:

- **Cryptocurrencies:** High price volatility and high potential return of 0.4X to 2.5X returns
- **Tech Stocks:** High price volatility and high potential return of 0.5X to 2.3X returns
- **Timing:** Timing the

Learning:

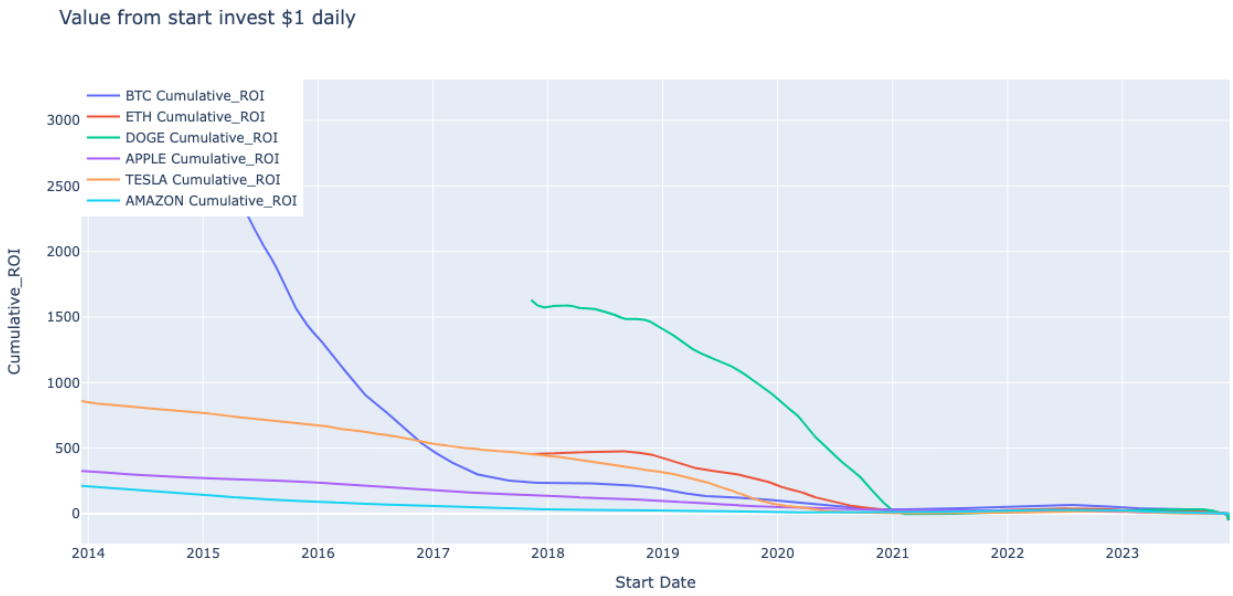
- For long-term horizon, Being an early investor yields the highest upside of 20x to 100x returns.
- For mid-term horizon, there is significant potential upside of 10x to 50x returns.
- For short term investment, there is still high potential returns of - 0.4x to 2.5X with high volatility, if investors can time the local tops and bottoms on a monthly basis.

Analyze Historical Return with Dollar Cost Average Strategy

Methodology

Simulate Daily Dollar-Cost Averaging (DCA) Investment: We leverage a function (simulate_investment_dca_every_day) to simulate daily $1 investments from each asset's start date.

This dollar-cost averaging strategy assesses the cumulative asset bought, total investment, cumulative value, and ROI over time, showcasing how regular, small investments fare in the long run.



Learning:

- **Early Market Entry:** Initiating investments in cryptocurrencies early can lead to significant long-term gains.
- **Asset Maturity:** As cryptocurrencies (and tech stocks) mature, the exceptional growth opportunities seen in early stages tend to diminish.
- **Investment Horizon:** Dollar cost averaging strategy provides a good solution to reduce volatility impact, yielding high returns of 800% to 3000% over the long term horizon for growth assets, without the need to " time the market ".

Key Learning

Seasonality in Cryptocurrencies: Bitcoin, Ethereum, and Dogecoin exhibit seasonal patterns, with certain months consistently showing higher returns, though this varies across different cryptocurrencies.

Correlation Among Major Cryptos: Strong positive correlation exists between Bitcoin and Ethereum, with moderate correlations between Bitcoin-Dogecoin and Ethereum-Dogecoin, indicating both shared and independent price influences.

Investment Horizons: Long-term investments (5-10 years) offer the highest returns, especially for early Bitcoin adopters. Mid-term investments (1-5 years) show good potential, particularly for newer cryptos like Dogecoin, while short-term investments are highly volatile but potentially rewarding.

Dollar-Cost Averaging (DCA) Strategy: Consistent, long-term DCA investment in cryptocurrencies yields high returns, effectively reducing volatility impact and eliminating the need for precise market timing.

Crypto vs. Traditional Investments: Cryptocurrencies generally offer higher potential returns compared to traditional investments like tech stocks, albeit with greater risk and volatility. Early crypto investments lead to significant gains, but as the market matures, this growth potential tends to decrease.

Future Potential Research

Evaluation and Participation of 'Pump and Dump' Schemes: This research area would combine psychological analysis with advanced machine learning techniques to understand and predict 'pump and dump' events. By examining the tactics of major players, spikes in trading volumes, and social media activity, it aims to identify early indicators of market manipulation. The development of predictive models would then assist in forecasting these events, enabling investors to make more informed decisions regarding market entry and exit points based on the identified patterns and movements.

References

Crypto currency historical data

- https://finance.yahoo.com/quote/BTC-USD/history?p=BTC-USD
- https://finance.yahoo.com/quote/ETH-USD/history?p=ETH-USD
- https://finance.yahoo.com/quote/DOGE-USD/history?p=DOGE-USD

Tech stock historical data

- https://www.nasdaq.com/market-activity/stocks/amzn/historical
- https://www.nasdaq.com/market-activity/stocks/tsla/historical
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Crypto currency market context

- https://coinmarketcap.com/
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