CryptoCurrency and Stock Market Analysis

From January 1, 2020 to March 31, 2021

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May 16, 2021

Executive Summary

Overview

We explored Stock Market and CryptoCurrency Market data to investigate the COVID-19 Crash at the end of March 2020, growth rates and ROI, and the volatility of the two different investment options. Our analysis relied heavily on time series data, as we investigated data from January 1, 2020 to March 31, 2021.

Return on Investment

Many investors saw the COVID-19 Crash as an opportunity of a lifetime. Traditional stocks plummeted more than 30%, putting investors in a fantastic position to buy stocks at a heavily discounted rate. We analyzed the return on investment (ROI) of choosing to invest in a Stock Market Index (DJI or GSPC) or one of the top five CryptoCurrencies (BTC, ETH, LTC, ADA, or XRP) by market cap. We found Cardano (ADA) to be the highest performer, resulting in a yield of 3633.33% ROI after purchasing during the Crash for $0.03 and holding for 1 year to resell at $1.12.

Volatility

We explored market volatility through two metrics, the daily percent change in price and the percent change in closing price from day to day. We found CryptoCurrency to be more than twice as volatile than the Stock Market indices. The DJI and GSPC had standard deviations in percentage change of closing prices from day to day of 1.995% and 2.115% respectively. Meanwhile, BTC and ETH, the two most popular Cryptos had standard deviations of 4.480% and 5.581% in day-to-day value. We visualized this volatility using both scatter plots and line charts.

Conclusion

We confirmed the adage, “The greater the risk, the higher the reward”. By investing in the novel and much more volatile CryptoCurrency Market in 2020, investors were rewarded with ROIs several orders of magnitude beyond their stock counter-parts. Likewise, the COVID-19 Market crash was a rare opportunity to buy low and only a year later sell high.

Motivation

The COVID-19 Crash

As a result of COVID-19, the world witnessed one of the most dramatic stock market crashes in history. Over the span of just four days, the The Dow Jones Industrial Average (DJI) plunged and lost roughly 26% of its value. Investors with the financial means used this opportunity to expand their investment portfolios at a fraction of the price that they could have otherwise. Only a month later, most stocks had returned to their previous value prior to the crash. We wanted to explore the potential return on investment (ROI) of investments made during the crash and sold a year later (as is commonly done to avoid owing short-term capital gains taxes).

Emergence of Crypto

In the short span of six months, the value of a single Dogecoin rocketed over 26,000%. As a result of this unprecedented growth, young people around the globe have flocked to invest. For example, in South Korea the daily volume of CryptoCurrency transactions exceeds the daily volume of trades in the KOSPI (Korean Stock Trade Market). Despite growing popularity, CryptoCurrencies are still an emerging market built atop untested technologies. These factors lead to a highly volatile marketplace with no ability to predict or truly know how the technology will evolve. For these reasons, investors face the constant risk of losing everything even faster than they gained it.

Crypto vs. Stocks

In our analysis, we explored how the CryptoCurrency Market and Stock Markets were affected by the COVID-19 pandemic. Furthermore, we wanted to see if the time-tested stock market would prove to be more resilient to global crises in comparison to the novel CryptoCurrency market? Which market was hurt the most by the crash and which market managed to recover the fastest? Although many Stock trades are considered speculative, the Crypto market is even more uncertain; is it actually possible the CryptoCurrency Market was more resilient during the COVID-19 crash than the traditional Stock Market?

Data Sources

Our first five datasets each contain historical data related to a single CryptoCurrency and the second pair of datasets contain historical data for the two most popular US Stock Market Indices from Jan 1, 2020 to March 31, 2021.

Columns: Date, Open price, Daily High, Daily Low, Closing Price, Adjusted Closing Price, and Trade Volume

Crypto Market

CoinMarketCap

We chose Bitcoin (BTC), Ethereum (ETH), Litecoin (LTC), Ripple (XRP), and Cardano (ADA) for our analysis due to being the Cryptos with the largest market caps.

1. BTC Data Source: Link
2. ETH Data Source: Link
3. LTC Data Source: Link
4. XRP Data Source: Link
5. ADA Data Source: Link

All data were downloaded as individual CSV files, each approximately 50KB in size.

Stock Market

yahoo! finance

We chose the Dow Jones Industrial Average (DJI) and the S&P 500 (GSPC) indices to represent the Stock Market as a whole.

1. S&P 500 Data Source: Link
2. Dow Jones Industrial Data Source: Link

The data was scraped from HTML tables on Yahoo Finance and converted into JSON files each approximately 57KB in size.

Data Manipulation

Data Types

CryptoCurrency data sets had to be converted from string to float values. Furthermore, the strings contained currency symbols ($) and commas that had to be cleaned before type conversion was possible.

Since our data relied heavily on time series, we had to convert different date formats into datetime objects that could be accurately joined and plotted. The datetime string format for the CryptoCurrencies followed the pattern “25-Dec-2020”, while the Stock Market data datetime strings were formatted as “2020-12-25”.

Joining Data Sets

Every CryptoCurrency was saved as its own individual CSV file. Likewise, each Stock Index was saved as its own JSON file. Column names and types had to be normalized in order to merge everything into a single Pandas DataFrame for analysis.

Excluding Outliers

Due to the COVID-19 crash, prices of both Stocks and CryptoCurrencies spiked and plunged to historic highs and lows. To avoid dwarfing regular values, outliers sometimes had to be removed.

Inconsistent Trading Times

The Stock Market is only open Monday through Friday from 9:30 a.m. to 4 p.m. EST while CryptoCurrencies are traded 24/7 year around. These gaps in trading hours complicate comparative analyses.

Normalizing Prices

The scale of the pricing varied drastically between all of the investment options. For example, Cardano (ADA) was valued at $0.03 per unit at one point while Bitcoin (BTC) was valued at $54738.94. With such difference in scale, smaller values were dwarfed by larger ones in visualizations.

Analysis and Visualization - Return on Investment

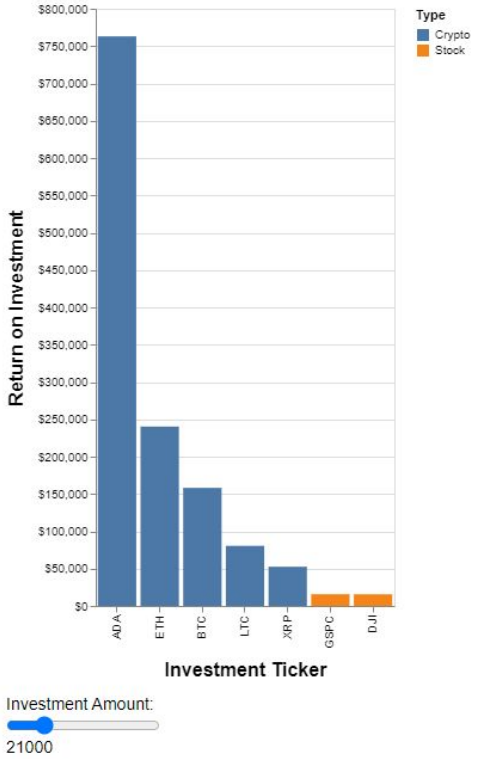
2020 COVID-19 Market Crash

Both CryptoCurrency and traditional stock prices dropped dramatically during the COVID-19 crash at the end of March. By purchasing on March 23, 2020 and holding for a year, investors reaped very high returns. To explore the return percentages of our five selected CryptoCurrencies and the two primary Stock Market Indices, we created an interactive chart with a slider at the bottom to choose an investment amount. The y-axis scales based on how much was invested and the bars show the return on the investment after waiting a single year. As seen in the still bar chart, an investment of $21,000 in Cardano (ADA) would have produced more than a $750,000 return.

Ticker	Buy	Sell	ROI %
ADA	$0.03	$1.12	3633.33%
ETH	$134.91	$1678.65	1144.27%
BTC	$6416.31	$54738.94	753.12%
LTC	$38.77	$187.39	383.34%
XRP	$0.16	$0.56	250%
GSPC	$2237.40	$3910.52	74.78%
DJI	$18591.93	$32423.15	74.39%

Data Source: Yahoo Finance (Stocks) & CoinMarketCap (Cryptos)

Across the board, top CryptoCurrencies had higher ROI than traditional Stocks, greatly rewarding risk-takers who invested in this new and uncharted marketplace.

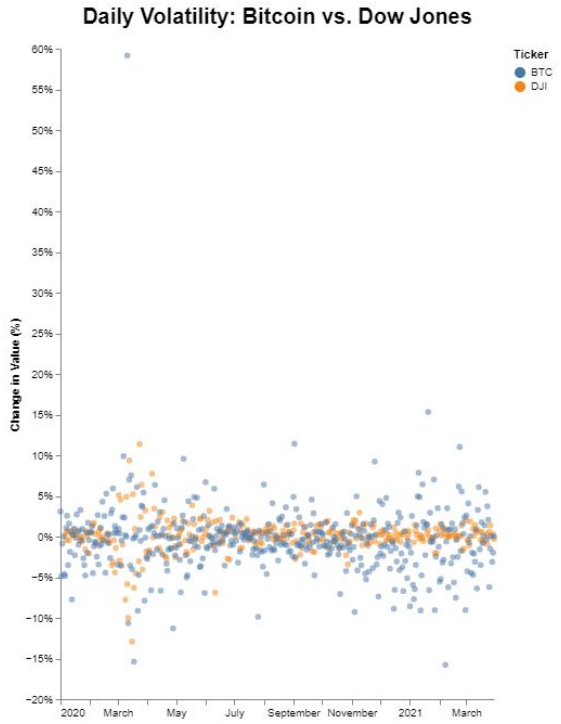


Analysis and Visualization - Volatility

The two most popular Cryptos, Bitcoin (BTC) and Ethereum (ETH) represented by blue dots experience much larger fluctuations in value on a day-to-day basis than the two major Stock Market Indices, the Dow Jones Industrial Average (DJI) and the S&P 500 (GSPC). Aside from the Crash in March, the orange dots remain much closer to 0% than their Crypto counter-parts.

Standard Deviation in % Change

BTC	4.480%
ETH	5.871%
DJI	2.115%
GSPC	1.995%

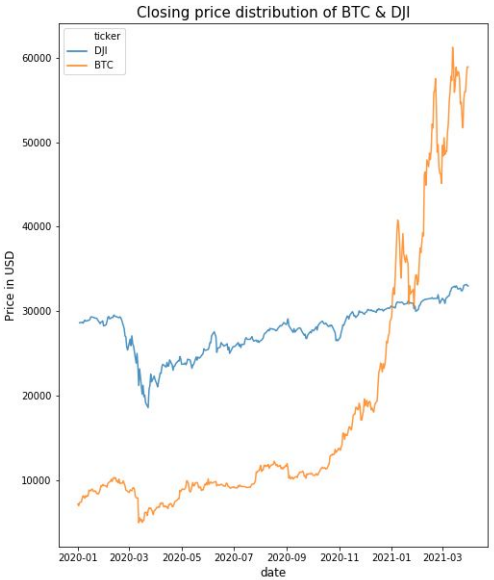


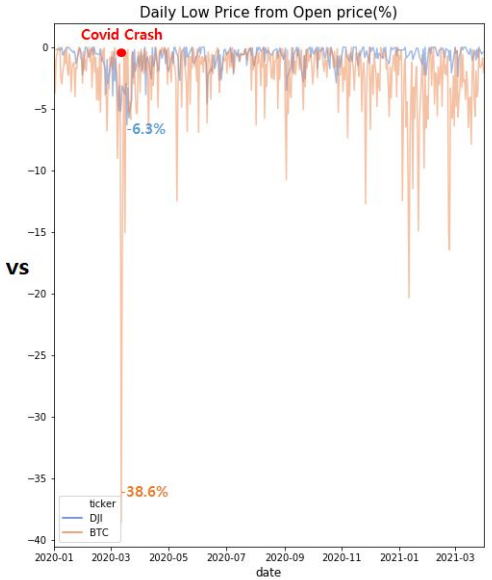
Summary of Results (and future works)

High returns come with high risk. By analyzing the volatility of Dow Jones and Bitcoin, we found Bitcoin twice as volatile, often changing dramatically in the course of a single day.

When it comes to CryptoCurrency, there are options even more volatile than Bitcoin. During periods of sharp value increases, investing in CryptoCurrency is highly profitable; however, profits can disappear as quickly as they are made.

For future research, we would recommending expanding the time period and comparing additional stocks and cryptocurrencies to see if our findings remain consistent without the influence of COVID-19.





Statement of Work

The work for this project was divided between both members and the member listed in this statement of work shouldn't be interpreted as the sole member responsible for the component.

Project Idea

Junkyeong Lee

Project Proposal

Sections 1-2: Junkyeong Lee

Sections 3-9: Dylan Kinder

Datasets

CryptoCurrencies: Junkyeong Lee

Stock Market Indices: Dylan Kinder

Data Cleaning

Joining Datasets: Dylan Kinder

Final Report

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Volatility Analysis & Visualization

Dylan Kinder

ROI Analysis & Visualization

Dylan Kinder

Summary of Results

Junkyeong Lee

References

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