Digital Tools Project-Effect of Interest Rate Changes on Cryptocurrencies.

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Introduction

The goal of this research report is to discover how changes in FED interest rates have an impact on the prices of cryptocurrencies (e.g. Bitcoin)

We will look at multiple methods and see if there are any significant results with an aim to create a strategy we could use to successfully trade cyrptocurrency markets.

Our Code

The code we have developed within Python, we have used a range of python packages as follows:

- Pandas
- Numpy
- matplotlib

The following were used for our data handling, data analysis and our data visualisation.

Analysis Method

We have based our analysis on correlation and trend analysis. The goal of our analysis was to check if there was firstly a directional relationship in the BTC price with respect to the FED rate change and then look to see of there was a relationship between the volatility in BTC and the changed in the FED rate.

Our methods and results are shown in the following slides.

N-day change

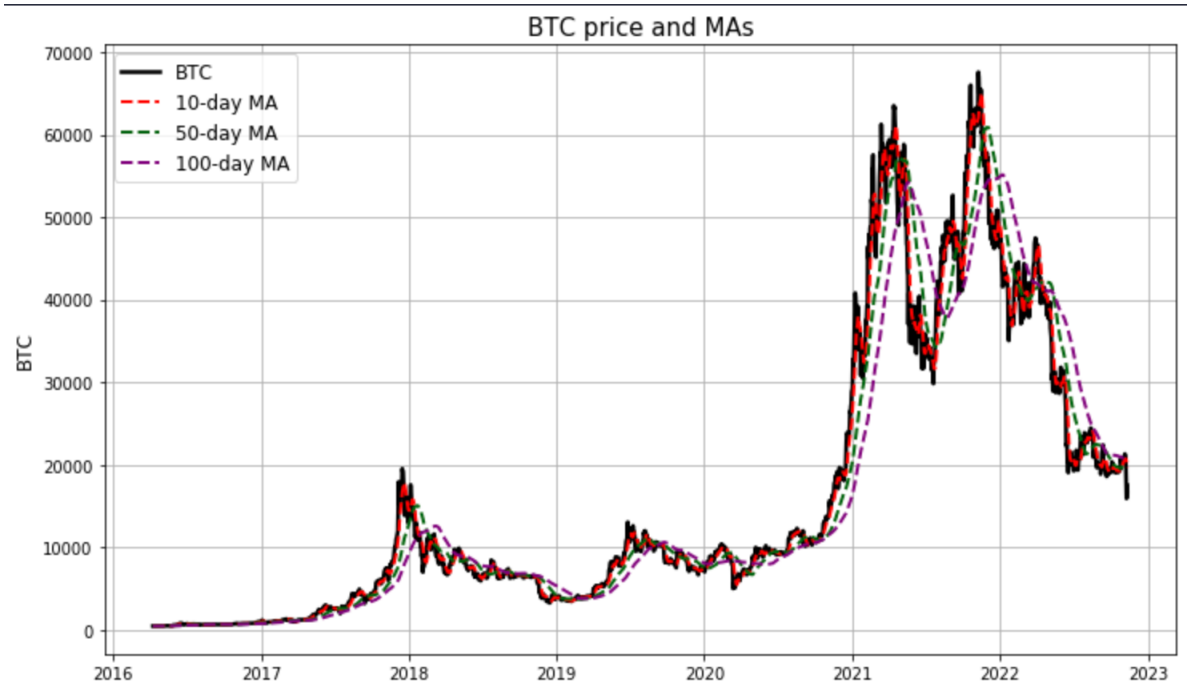
We first checked to see if there was any correlation between the BTC changes n-days after the change the actual change in the FED rate to allow for a possible lagged response.

Change	1 Day	2 Day	3 Day	4 Day	5 Day	6 Day	7 Day	8 Day
FED	-0.122	-0.072	-0.138	-0.22	-0.157	-0.197	-0.273	-0.242

We see no that the correlations are all close to zero and thus we conclude that there does not appear to be any relationship.

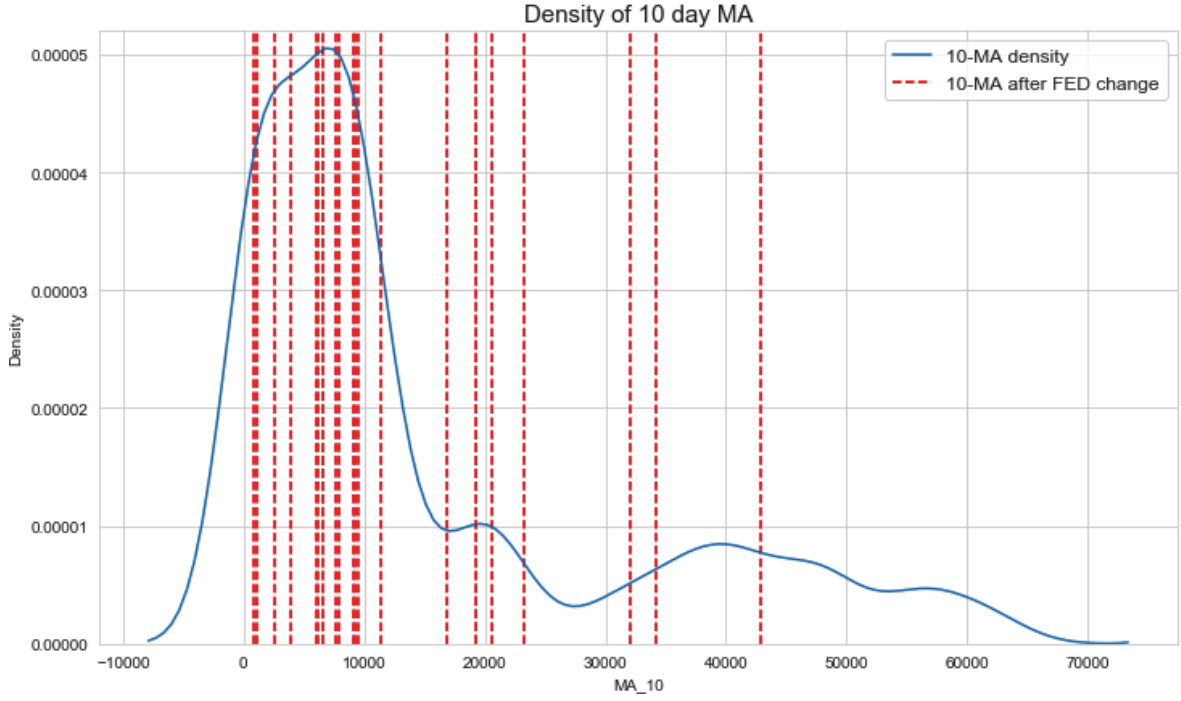
Moving Average

In the following graph we can see how different moving averages evolve for BTC compared to its price path.
We now look to see if after a FED rate change, can we detect a significant change in the MA.



Moving Average

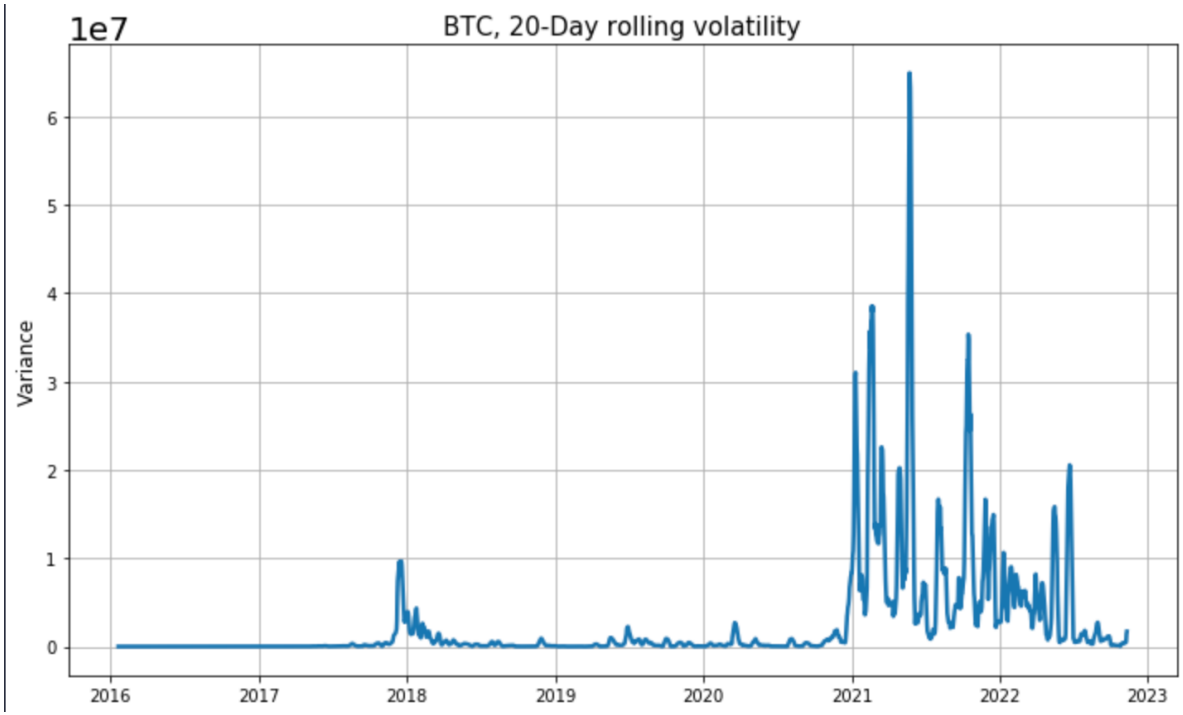
In the graph below we plot the density of the 10-day MA values for BTC and mark the values in red, just after a FED rate change.



We see that the values are not significant and fall in with other values. To make sure this observation was correct, we approximated a 95% confidence interval for a 10,20 and 50 day MA and found that all values after a FED rate change lied in their respective intervals.

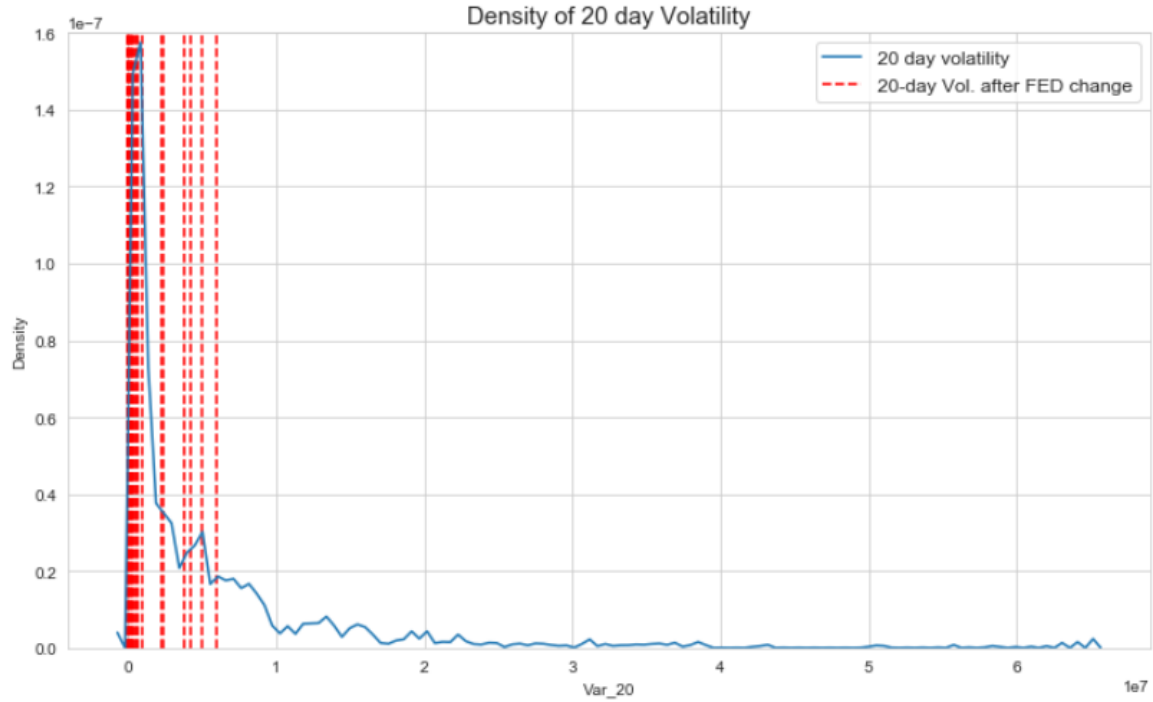
Rolling Volatility

The rolling volatility takes a period of time, a window, in the below its 20 days, we than determine the volatility of the coin over that period. We then shift this window 1 day at a time through the data and recalculate the volatility each step. We can see below the results for a 20-day window:



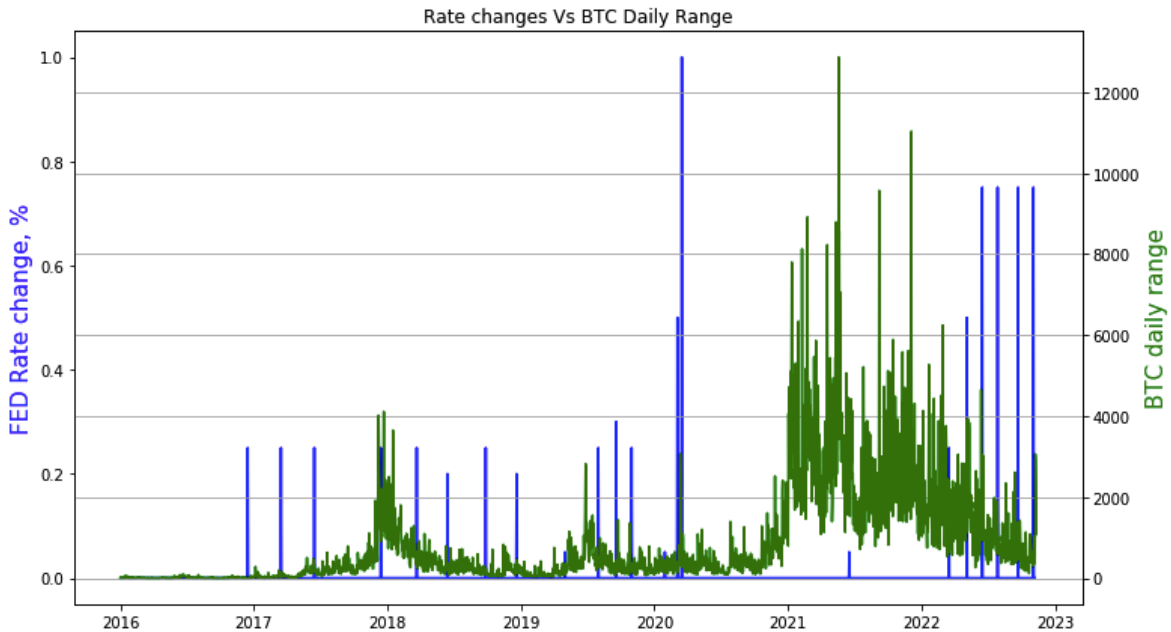
Rolling Volatility

Performing a similar analysis as we did for the moving averages. We can see in the figure below that the observed volatility after a FED rate change was not abnormal for what has been observed over the course of the data.



Daily Range

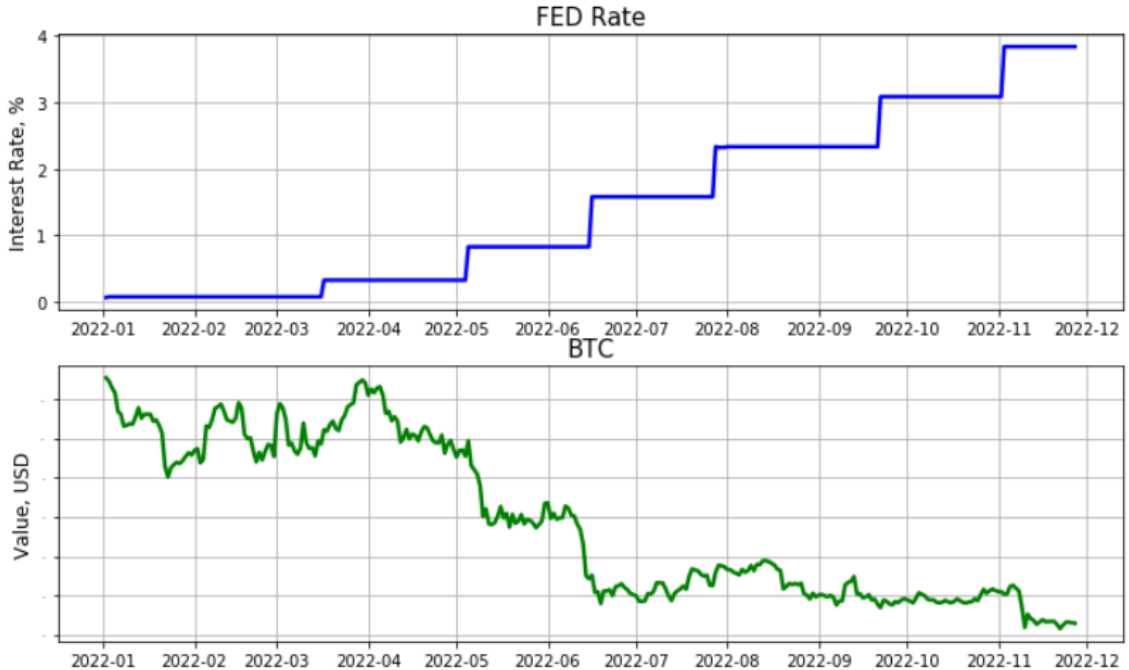
Another metric we have decided to look at was the daily change, the daily high minus the daily low of the day, this is another metric for volatility but will be more sensitive day-to-day. In the figure below, we can see how the BTC daily range evolves respective to the FED rate change.



The correlation between these two values was 0.012. So again, we could not find any significant relationship.

Spurious Correlation

Looking at the data for the past year, we see what looks to be a strong negative relationship.



Spurious Correlation

Measuring the correlation here, we got a very strong negative value of -0.8914. This would most likely be the result of spurious correlation and not causation as the behaviour of the FED and most central banks has been to increases the interest rates quite rapidly to fight high inflation rates. Whether or not these decisions have been one of the drivers behind the decline in BTC can only be determined with time as we do not usually see such directional moves in a central banks monetary policy.

Conclusion

In conclusion, while it is possible that changes in the FED rate could influence the demand for Bitcoin, there are also a number of other factors that can impact the cryptocurrency's price. These include things like global economic conditions, investor sentiment, regulatory developments, and technological advances. As a result, it is difficult to draw a direct causal relationship between the FED rate and Bitcoin price.