ECON106V:
Lab Project 1

Aaron Chien, Ashley Lu, Yingyin Tan

Exercise 1

NASDAQ (^IXIC):

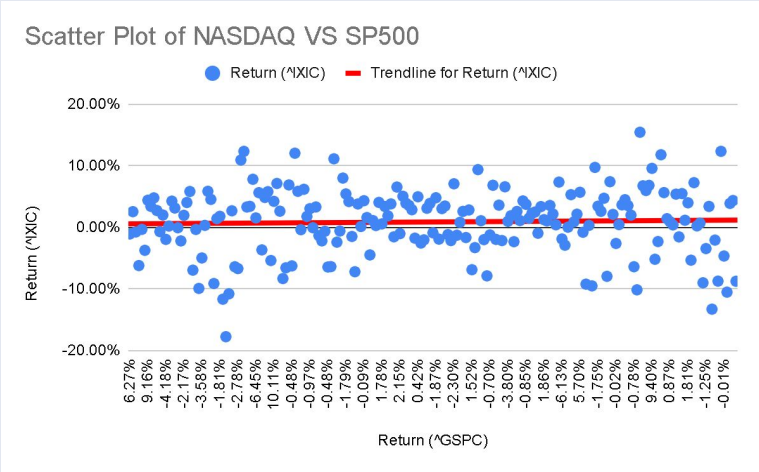
- Mean of returns: 0.89%
- Standard Deviation of returns: 0.05246892396

SP500 (^GSPC):

- Mean of returns: -0.44%
- Standard deviation of returns: 0.04612961519

Which one is the most variable, the stock or the SP500? Why should we expect the SP500 to be less variable than the stock?

NASDAQ is more variable than the SP500 because it has a higher standard deviation, therefore it varies more and has a wider spread, including more risk. NASDAQ is 101 equity securities issued by 100 of the largest non-financial companies listed on the Nasdaq stock exchange while SP500 is made up of 500 of the largest companies traded on either the NYSE, Nasdaq, or Cboe. We should expect SP500 to be less variable because it consists of 500 large companies, meaning that it diversify its portfolio and reduce its risk, but this is also the same method for NASDAQ.



Correlation: 0.1370849359 ^IXIC/^GSPC

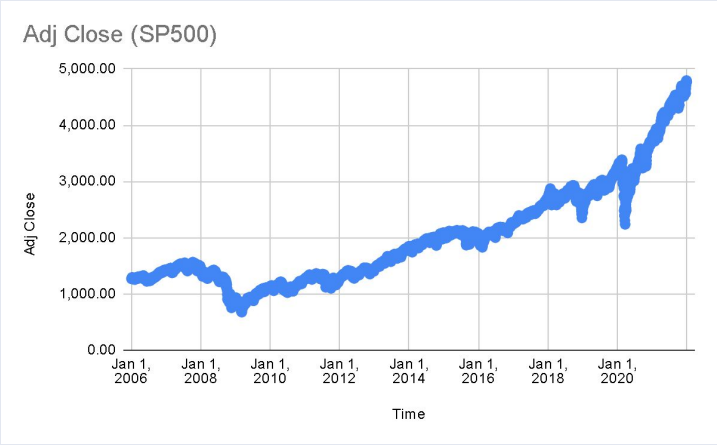
What is the sign of the correlation? Is this what you expected and why? How does the sign of the correlation appear on the scatter plot?

The correlation is positive, which does match our expectations since SP500 does include NASDAQ, but the correlation is very low. The scatter plot also shows a small, slight correlation.

How does the sign of the correlation appear on the scatter plot?

The sign appears positive, but does not show strong correlation

Exercise 2: SP500 and ^GSPC

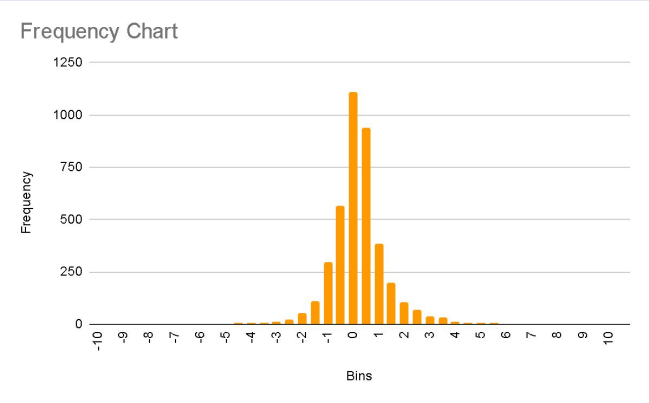


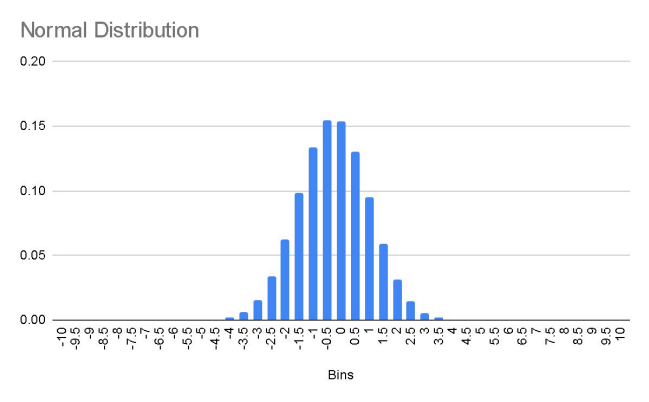
The mean of the returns is -0.49% and the standard deviation of the returns are 0.06346475275

Briefly describe the broad historical evolution of the SP500 since 2006.

There is an upward historical trend with some minor falls but the major falls we see are in 2008, 2019, and 2020 (recessions).

Frequency and Normal Distribution Frequency Table for SP500





How do the two distributions differ?
They are both uniformed and very similar, but the frequency one is a bit more skewed to the left.

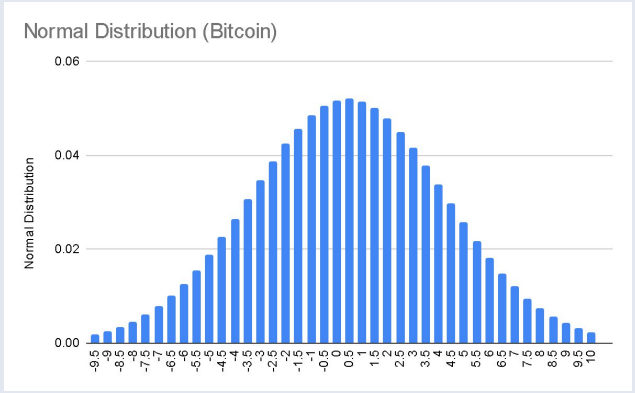
What is the ratio of the true probability and of the normal probability of observing a daily return less than -5%?
The ratio of the true probability and of the normal probability is 71.768.

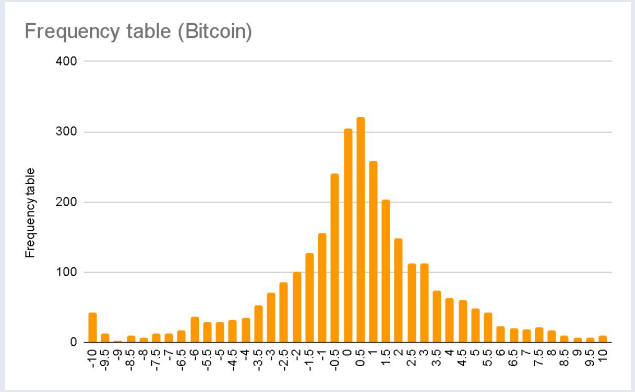
What is the true probability and the normal probability of observing at least one daily return of less than -5% over a year assuming IID?
The true probability is 28.52% and the normal probability is 0.00397%.

Do you conclude that the two distributions assign similar probabilities to extreme events?
No, based on the two graphs, it is evident that they follow a similar distribution, but the normal distribution is more widely spread.

Is the normal distribution appropriate for a Value at Risk calculator?
No, not every stock will follow a normal distribution and you cannot assume it will so unless you can verify that it is normally distributed, do not use it.

Bitcoin Returns





Mean: 0.1994364981

Standard Deviation: 3.827848379

The empirical distribution is more jagged and features more peaks than a normal distribution.