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cs521 Final Project Report

Introduction:

In today's world, with the development of cultural diversity, more and more factors will affect our lives. My interest in stocks is very high because the stock market has returned 3 or 4 times in the past two years. So I want to study, for example, the impact of war on the US stock market. Wars were also fought in the United States and overseas. These two things have a huge impact on stocks.

How does the impact of a major war on THE U.S. stock market. Study the impact of the location of the war on the US stock market.

I will analyze the impact of the following two events on the American stock market.

Black swan events within the US: Sep, 2001, 9/11

Black swan events outside the US: Mar, 2003, Iraq War

Those steps including:

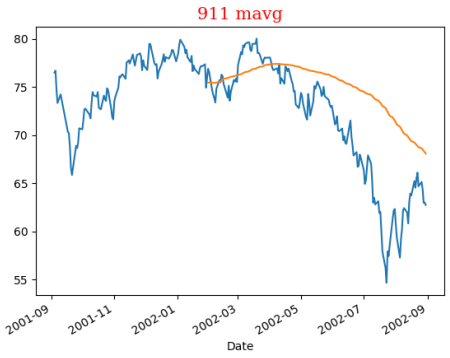
1. Download the dataset
2. Explore moving averages and returns for stocks
3. Correlation analysis: QQQ, DIA and SPY influence each other? Because the three represent American technology, energy, and real industries
3. Returns and risks of the three indices
4. Three machine learning models can be used to predict stocks in the future: simple linear Analysis, Quadratic Discriminant Analysis (QDA) and K Nearest Neighbor (KNN).

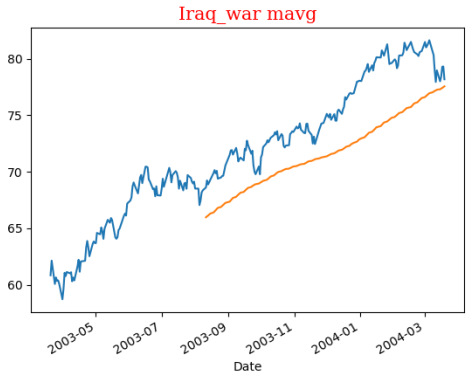
Downloading the Dataset:

In order to download the dataset, the user needs to run the get_data.py script. The script will write a csv file to your working directory that will contain all the stock data.

Explore moving averages and returns for stocks:

Analyze stocks using moving averages and return metrics. Moving averages (MA) help reduce the "noise" in price lists by smoothing out price data by constantly updating average prices. In addition, this moving average may act as "resistance", representing the stock's downtrend and uptrend, from which you can anticipate its future trend, which is unlikely to deviate from the resistance point.





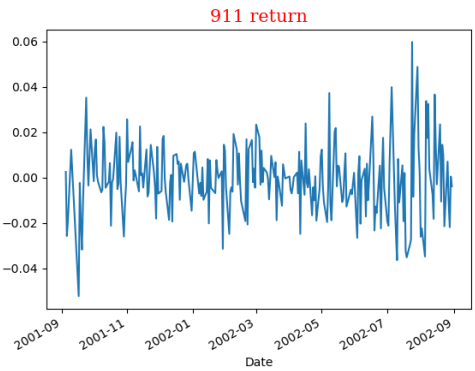
And you can see on the left the performance of SPY during 9/11, from September 2001 to September 2002, there was a significant drop in the index. It can be seen that the fear from the us domestic war has seriously affected the confidence of investors in the US market, and they sold off sharply. On the right is the performance of SPY during the Iraq War, from May 2003 to May 2004. The index has risen sharply. The war outside the US gave confidence to the US capital market and investors returned to the US market. The yellow resistance line is very stable between the two. Moving averages show the trend of stock prices rising or falling. Logically, you should buy when stocks are down and sell when they are up.

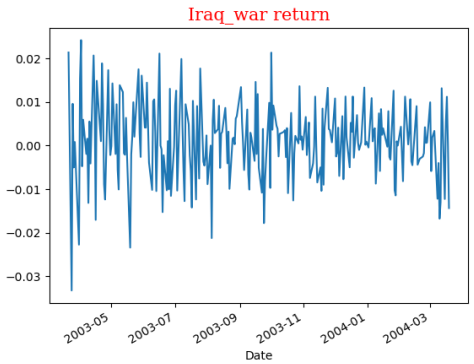
Correlation analysis: QQQ, DIA and SPY influence each other?

QQQ represents the American technology market and DIA represents the American industrial market. Spy reflects the health and stability of the U.S. economy. So I started to explore the relationship between these three indices in the case of different black swan events

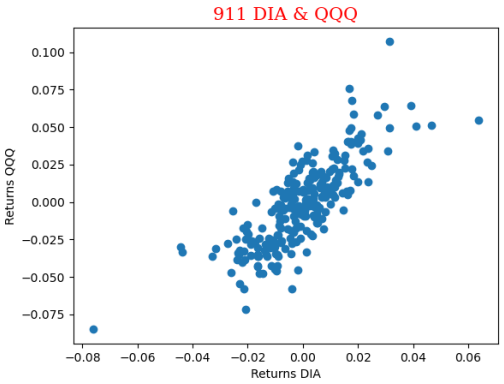
$$r_t = \frac{p_t - p_{t-1}}{p_{t-1}} = \frac{p_t}{p_{t-1}} - 1$$

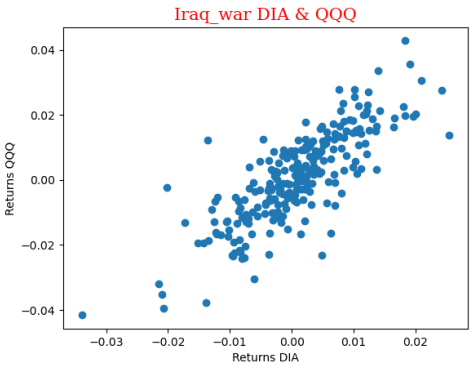
use this revenue formula to help



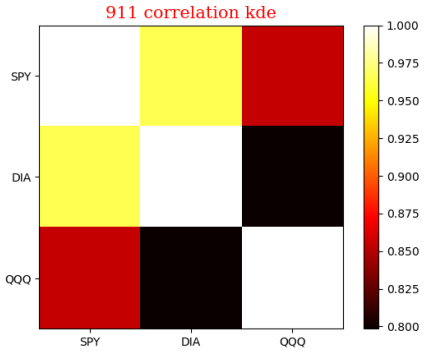


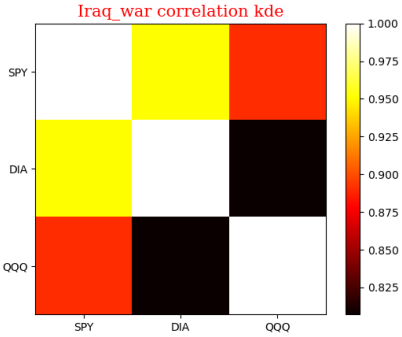
Next, we analyze the interaction between the three indices





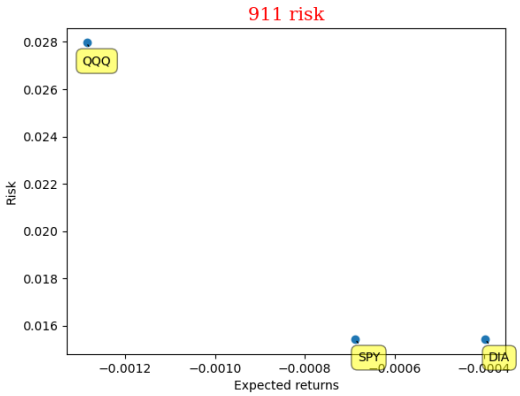
Through the scatter chart of DIA and QQQ, it can be seen that there is a positive correlation between them, and QQQ's income is always higher than DIA's in most of the time. There is more enthusiasm for technology stocks than industrials

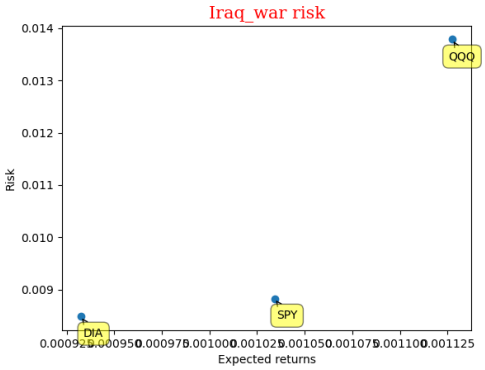




Note that the lighter the color, the stronger the correlation. It can be seen from the scatter matrix and heat map that there is a strong correlation between them. However, this may not show much cause and effect, only that the tech industry is growing so much that QQQ falls the most during a black swan, as well as during a panic

Returns and risks of the three indices:





This risk chart shows that DIA and SPY are much less risky than QQQ. Although QQQ's returns are much higher than DIA and SPY, investors need to take a very high risk.

Three machine learning models can be used to predict stocks in the future: simple linear Analysis, Quadratic Discriminant Analysis (QDA) and K Nearest Neighbor (KNN).

Through simple machine learning, we can easily predict the economic trend. No matter what kind of black swan event happens, the American economic market will always return to normal in the next 1-2 years. So, we can choose to buy stocks when the economy is down and sell stocks when the economy is back to normal, so that investors can protect their principal and make some profits

Conclusion:

Through this project, I have come to the conclusion that when the Us mainland suffers from a black swan event, the market will react violently and basically fall sharply. When the US is at war with other countries, there is a certain confidence in the market to invest, many arms stocks will soar, as well as technology stocks have done very well. Among the three major U.S. indexes DIA, QQQ and SPY, the overall direction of SPY is upward, but changes in the U.S. mainland will temporarily affect the market, such as 911 incident and COIVD-19 Events, etc. Using some data models, I think people can make decent profits if they buy properly during a market crash and sell at a future peak. Of course, the uncertainty of the future always affects the changes in the market.