Investing with Statistics

Mengyu Jackson

There are many different ways to make money (or try to make money) in the stock market. You can bet that stocks will go up, or down. You can bet for very short times (seconds, minutes, or days) or very long times (months, years, decades). You can bet on one or a few stocks, or bet on index funds and diverse portfolios.

One thing almost all of them have in common though: you're trying to predict which direction the stock (or set of stocks) you invest in will move in the future.

A few strategies do not follow this trend, and aim to be "market neutral". Whether the market goes up or down doesn't affect your return in these strategies. One market-neutral strategy that's easy to understand is Pair Trading.

Pair Trading is when you bet against one stock, and bet on another stock at the same time. This "pair" of bets means if both stocks rise by the same amount, you don't gain or lose any money (other than fees). If both stocks fall by the same amount, you don't gain or lose any money. The way you make money is by correctly picking which stock will go up by more (or go down by less). If the stock you bet for goes up more than the stock you bet against, you make money, otherwise, you lose.

It is possible to do this with any two stocks, but this strategy is best at minimizing risk when you pick two "Cointegrated" stocks. The simple explanation of cointegration is that two stocks are cointegrated if the ratio of their prices is relatively constant over the medium term. This is often the case for two stocks in the same industry (such as space launch companies like SpaceX and Blue Origin) because most news that affects one (such as Congress increasing or decreasing funding for space exploration) affects both equally.

The goal with Pair Trading is to identify when two Cointegrated stocks have an unusually high (or low) ratio between their prices and bet that the ratio will return to average. Bet against the one that's relatively high, and bet for the one that is relatively low. These times often follow great (or terrible) news for one company that doesn't directly affect the other, but whose effect is likely to be temporary. Launch failures for SpaceX are one example that might dip stock prices briefly without affecting Blue Origin, and whose effect will largely be forgotten after a few more launches.

A market-neutral approach for making money sounds like it would be very attractive for many people, so what's the catch? Well, stocks in the same industry are more likely to be cointegrated than two random stocks, but to be sure you need to perform statistical analysis such as an Augmented Dickey-Fuller test (https://en.wikipedia.org/wiki/Augmented_Dickey%E2%80%93Fuller_test). Even if you look up cointegrated stocks or a friend does the analysis for you, determining when to buy or sell requires knowing what deviations from the average price ratio are large enough to be worth betting on. This requires more analysis, such as computing Bollinger Bands (https://en.wikipedia.org/wiki/Bollinger_Bands) every day, for every pair of stocks you're watching.

This interesting and intuitive trading strategy is only possible (efficiently) by combining statistics with computing, and is one of the many interesting algorithms I enjoy learning about on my Data Science journey.