Statistics 434: Homework No. 6
Stationarity, Extremes, and Opportunities

Part 1: Checking Out the Unit Root Tests

- Obtain 500 days of **price and return** data for a stock of your choosing.

- Use the unitroot() function to find the p-values for the augmented Dickey Fuller tests applied to your price and return data. Explore the effect (if any) of changing the "trend" value from "c" to "ct". Similarly explore the effect of changing the "lag" value supplied to unitroot().

- Organize your many (suitably rounded) p-values into an instructive table. Think about its visual impact.

Part II: A Short Experiment with Extremes

- Simulate 1000 realizations of $M = \max_{1 \leq n \leq 100} Z_n$ where the random variables Z_n, $n = 1, 2, ...$ are i.i.d $N(0,1)$.

- Use the inverse probability transform method to simulate 1000 observations from a Gumbel distribution.

- Use qqplots or other tools to compare these samples.

- For comparison, repeat this experiment but now let $M = \max_{1 \leq n \leq 100} C_n$ where C_n, $n = 1, 2, ...$ is a sequence of standard independent Cauchy random variables.

Part III: Comparing Two Logically Related Funds

Explore the returns of one of the leveraged index funds, such as the Rydex "2x SP500" fund (ticker RYTNX). CRSP has the data, but you may need to be careful about some missing values. How do these relate empirically to the corresponding returns on a plain vanilla SP500 ETF, such as SPY? What would you do if the person in charge of your pay check asked for a comparison of the two funds? Basic EDA is the place to start, then you might consider the logical bivariate plots with perhaps a regression line to aid the eye. With some time to play, you might consider some statistical arbitrage questions. Would "two dollars in SPY and one dollar short RYTNX" be a useful asset?

Presentation

Try to condense your experiences and discoveries so that they fit cleanly onto two pages. As usual, you can refer to code or graphs that are placed in the "supplementary material." Still, a review of your lovely table of p-values from Part I should be a key feature of your summary.

QUOTE OF THE DAY

"In theory, theory and practice are equivalent. In practice they are different."
— This is usually attributed to Yogi Berra, but I have my doubts.