Portfolio Theory

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Seminar 6

Content:

- CAPM and FF3 estimates comparison
- Long-short portfolios construction

CAPM and FF3 estimates comparison

We switch to "dataset_2.Rdata", which contains 62 stocks from the NASDAQ 100 index, as we need more stocks for a meaningful long-short portfolio.

First we use the entire dataset to compare the expected returns estimated by CAPM and by FF3.

We start with the CAPM.

With a loop we estimate all the betas using the regression

$$\left(R_i - R_f\right) = \alpha_i + \beta_i\left(R_{Mkt} - R_f\right)$$

Then we compute the expected returns as

$$E[R_i] = R_f + \beta_i(E[R_m] - R_f)$$

CAPM and FF3 estimates comparison

Now we use the Fama-French three-factor model.

With a first loop we estimate all the loadings using this regression, which is fitted separately for all the assets

$$R_{it} - R_{ft} = \alpha_i + b_{i1}MKT_t + b_{i2}SMB_t + b_{i3}HML_t$$

Then we estimate the premia with a second loop that for each period fits this regression:

$$R_i - R_f = \gamma_{t0} + \gamma_{t1}\widehat{b_{i1}} + \gamma_{t2}\widehat{b_{i2}} + \gamma_{t3}\widehat{b_{i3}}$$

We now compute the expected return of each asset i as:

$$E[R_i] = R_f + b_{i1}\gamma_{MKT} + b_{i2}\gamma_{SMB} + b_{i3}\gamma_{HML}$$

Long-short portfolios construction

Now we use the Fama-French three-factor model.

We now use the same estimation techniques, but we do it on a 120-month rolling window.

At each period we get an estimate of the expected returns.

We want to go long on the 20 stocks with the highest expected return, and short on the 20 with the lowest.

The function "ls_weights" assigns weight 1/20 to the top 20 stocks, -1/20 to the bottom 20 stocks, and 0 otherwise.

We then compute the portfolio out-of-sample returns.