Empirical Asset Pricing:
Problem Set - Mutual Fund

April 2, 2024

0. Data Documentation: We have prepared two datasets for you. In Data/fund_return.csv you will find data on the after-fee returns earned by investors in actively-managed equity mutual funds in the U.S. between Jan 1980 and Mar 2019. In Data/8_factors.csv you will find a time-series of the risk-free rate as well as several equity market factors, including the value-weighted stock market excess return, the SMB return, HML return, etc. [1]

1. Please compute the summary statistics for this sample: mean, 5%, 10%, 25%, 50%, 75%, 90%, 95% percentiles in the cross-section of:

   (a) mean return

   (b) mean return in excess of the vw stock market return

   (c) stdev of the return

   (d) stdev of the return in excess of the vw stock market return

   (e) Sharpe ratio

   (f) CAPM beta

   (g) CAPM alpha

   (h) idiosyncratic volatility (time-series stdev of the CAPM residual)

   (i) Information ratio (CAPM alpha divided by idiosyncratic volatility)

   (j) FF-3factor model alpha

   (k) FF-Carhart 4-factor model alpha

   (l) FF 5-factor model alpha

[1] Here we provide you with the SMB return in the 5-factor model instead of the one in the 3-factor model, you can assume that they are the same for simplicity.

(m) idiosyncratic volatility (time-series stdev of the FF 5-factor model residual)

Comment on these descriptive statistics. What do you conclude about the risk and the abnormal (i.e., risk-adjusted) return of active U.S. mutual fund managers?

How have these statistics changed since the end of the sample in Fama and French (2010)? Focus on the measures of skill.

2. Following the paper by Fama-French (2010), please simulate artificial returns for the same number of firms as in the actual data and for a similar time series under the null hypothesis that the CAPM is right (all funds have zero gross CAPM alpha). Preserve the cross-sectional correlation in the residuals when you simulate the sample. [2] Estimate the CAPM alpha in each simulated sample. It is recommended to bootstrap at least 2,500 times to get a reliable result.

   (a) How does the empirical distribution of the CAPM alpha compare to the simulated distribution? Report $t(\alpha)$ in simulation and in the actual data as well as the percent of simulations that where the t-stat is below the t-stat in the actual data.

   (b) What do you conclude about fund skill on average and in the tails of the distribution?

   (c) Have the results changed compared to FF (2010)?

[2] Specially, for each month you should draw a row of de-alphaed fund returns. You shouldn't draw independently for each fund. Also note that here we have implicitly assumed that returns are i.i.d. across time.