`Asset Pricing - Empirical Project (2025/2026)`

Follow the instructions below and work on the empirical project presented, applying the Fama and MacBeth (1973) approach. Use `R` to do the stock pricing project.

Submit your results in pdf document containing sufficiently detailed slides and your `R`-code the not later than January 31st, 2026.

- Presentation of empirical project (attendance obligatory):
  Tue, 09.12.2025 17:00-18:00 D4.0.039 Seminar room.
  Fri, 09.01.2026 12:30-14:00 D4.0.127 Seminar room.

1 Fama and MacBeth (1973) Project

Create your own data set: (i) Download stock market data, i.e. S&P 500 stocks, DAX, etc. (ii) Download interest rate data to be used as the "risk-free rate" $r_{rt} = R_{ft} - 1$. Notation: R_{it} return of asset i from period $t-1$ to t, then the rate of return is $r_{it} = R_{it} - 1$. (iii) create or download factors $\mathbf{f}_t \in \mathbb{R}^k$, $k \geq 1$. See, e.g., `https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html`. $t = 1, \ldots, T$ denotes the time series dimension, $i = 1, \ldots, n$ the cross-sectional dimension.

Apply a Fama and MacBeth (1973) analysis to your data.

a) Step 1: Step 1: Estimate the time series regression

$$r_{it} - r_{ft} = \alpha_i + \beta_i^\top (\mathbf{f}_t - r_{ft}\iota_k) + \varepsilon_{it}$$

for $i = 1, \ldots, n$.

b) Step 2: Use the estimates $\widehat{\beta}_i$, $i = 1, \ldots, n$, now written as $\widehat{\beta}_{it}$ to run the following cross sectional regression for each period t for the whole time span as well as some intervals, e.g. [1995-2008], [2008-2019], etc. or use different factors:

$$r_{it} - r_{ft} = \alpha_{0t} + \lambda_t^\top \widehat{\beta}_{it} + u_{it}$$

The estimates $\widehat{\lambda}_t$, $t = 1, \ldots, T$, are called the *realized risk premia* at a given date t and $\widehat{\alpha}_{it} = \widehat{\alpha}_{0t} + \widehat{u}_{it}$ are called pricing errors.

c) Step 3: Derive the expected risk premia $\widehat{\lambda}$ and pricing errors $\widehat{a}_i$ as well as their variances.

d) Step 4: Follow the three steps and derive risk premia, pricing errors and their variances for the two sub-periods stated above. Comment on statistical and economic characteristics of the empirical results.

Further readings Fama and French (1988), Petersen (2009), Cochrane (2005), Campbell et al. (1997), etc.

References

Campbell, J. Y., Lo, A. W., and MacKinlay, A. C. (1997). *The Econometrics of Financial Markets*. Princeton University Press, Princeton.

Cochrane, J. (2005). *Asset Pricing*. Princeton University Press, revised edition.

Fama, E. F. and French, K. R. (1988). Permanent and temporary components of stock prices. *Journal of Political Economy*, 96(2):246–273.

Fama, E. F. and MacBeth, J. D. (1973). Risk, return, and equilibrium: Empirical tests. *Journal of Political Economy*, 81(3):607–636.

Petersen, M. A. (2009). Estimating standard errors in finance panel data sets: Comparing approaches. *Review of Financial Studies*, 22(1):435–480.