Day 3

Applications of LFM's

- Multivariate estimation <u>Chapter 12</u>
- Asset pricing theory <u>Chapter 13</u>
- Risk modeling <u>Section 15.1</u>
- Portfolio optimization <u>Section 15.2</u>

LFM's case studies

- Swap market: PCA and Fourier basis <u>Section 12.3</u> (Subsection 12.3.2)

Factor modeling pitfalls <u>Chapter 16</u>

- Returns vs. invariants vs. P&L <u>Section 16.2</u>
- The idiosyncratic myth <u>Section 16.5</u>
- CAPM vs. APT vs. LFM's <u>Section 16.8</u>
- Time-horizon beta <u>Section 16.6</u>

Estimators

- General definitions <u>Section 2b.3</u> (Subsection 2b.3.1, Subsection 2b.3.2)
- Evaluation: bias, inefficiency, error <u>Section 2b.3</u> (Subsection 2b.3.2.1)
- Stress-testing <u>Section 2b.3</u>
- Generalized p-values, generalized t-statistics <u>Section 2b.3</u> (Subsection 2b.3.7)

Multivariate non-parametric estimators

- Sample quantile and order statistics <u>Section 2a.2</u> (Subsection 2a.2.3)
- Sample mean/covariance and best-fitting ellipsoid <u>Section 2a.2</u> (Subsection 2a.2.2)
- Sample factor loadings, betas, and OLS <u>Section 12.1.1</u>

Multivariate maximum-likelihood estimators

- Normal hypothesis: sample estimators <u>Section 2a.3</u> (Subsection 2a.3.2)
- Non-normal hypothesis: fat tails and outlier rejection <u>Section 2a.3</u> (Subsection 2a.3.2)

Shrinkage estimators <u>Section 2b.1</u>

- Stein mean <u>Section 2b.1</u> (Subsection 2b.1.1)
- Ledoit-Wolf covariance <u>Section 2b.1</u> (Subsection 2b.1.2)

Robust estimators <u>Section 2a.5</u>

- Assessing robustness: the influence function <u>Section 2a.5</u> (Subsection 2a.5.1.2)
- Huber's "M" robust estimators: location, scatter and betas <u>Section 2a.5</u> (Subsection 2a.5.1.3)
- Outlier detection and high-breakdown estimators <u>Section 2a.5</u> (Subsection 2a.5.2.2)
- Minimum-volume ellipsoid and minimum covariance determinant <u>Section 2a.5</u> (Subsection 2a.5.2)

Missing data <u>Section 2a.6</u>

- EM algorithm <u>Section 2a.6</u> (Subsection 2a.6.1)
- ML marginalization <u>Section 2a.6</u> (Subsection 2a.6.2)