Fama-French Model

MGMT 675: AI-Assisted Financial Analysis

Outline

- Does the CAPM work?
- Fama-French 3-factor model
- Fama-French 5-factor model
- Momentum factor
- Cost of equity capital with Fama-French model

CAPM

Does the CAPM work?

- learn-investments.rice-business.org pulls from French's data library (and other things)
- Industry betas do not match average returns
- Size and book-to-market sorted portfolios

What could be wrong?

- CAPM regression for stock i:

$$r_i - r_f = \alpha_i + \beta_i(r_m - r_f) + \varepsilon_i$$

- Are ε_i truly idiosyncratic (firm-specific)?

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- So, maybe there are other systematic risks for which stocks should earn risk premia based on their exposures. But what risks?

Fama-French-Carhart Factors

Fama-French 3-factor model

- Fama-French (1993) said we don't know, but we do know that small stocks beat big stocks on average and high book-to-market (value) stocks beat low book-to-market (growth) stocks on average.
- Maybe because they have different exposures to important risks. So if small beats big then the risk must have turned out one way and if big beats small it turned out the other.

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- Use the small minus big (SMB) and high-minus-low (HML) returns as proxies for the unknown risk factors.

Other factors

- Fama-French (2015): slow-growing companies beat fast-growing companies (growth in terms of assets) and profitable companies beat unprofitable companies (ROE or similar).
  - CMA = conservative minus aggressive (slow-growing minus fast-growing)
  - RMW = robust minus weak (profitable minus unprofitable)
- Carhart (1997): momentum factor (past winners minus past losers) called UMD or MOM
  - Evidence on momentum returns

Cost of Equity Capital

Cost of Equity with Fama-French 5-factor model

- Let's not use momentum and stick with the Fama-French 5-factor model.
- Steps:
  - Estimate the factor risk premia -
    - get longest possible data history on monthly factor returns and compute means.
  - Estimate the factor exposures over ten-year window:
    - Get monthly stock prices from yfinance 0.2.54 and compute returns
    - Fix date formats and decimal/percentage and merge with factor returns
    - Filter to last ten years for which everything is available
    - Run multivariate regression of stock return on factors
  - Get the 3-month or 10-year Treasury yield
  - Compute

$$r_f + \beta_{\text{Mkt-RF}}\overline{\text{Mkt-RF}} + \beta_{\text{SMB}}\overline{\text{SMB}} + \beta_{\text{HML}}\overline{\text{HML}} + \beta_{\text{CMA}}\overline{\text{CMA}} + \beta_{\text{RMW}}\overline{\text{RMW}}$$

Is the Fama-French model used?

- Morningstar uses it to validate its quantitative ratings
- Institutional investors use it to evaluate fund managers (next class)
- But firms predominantly use the CAPM (see Corporate Finance and Reality)