Topic 8. Asset Pricing Models

- Arbitrage Pricing Theory (APT) (80s)

- An alternative to CAPM, a multifactor model

Assumptions:

- Stock returns are generated by n-factor model:

$$r_i = \alpha_i + \beta_{1i} F_1 + \beta_{2i} F_2 + ... + \beta_{ni} F_n + \varepsilon_i$$

$$E[\varepsilon_i] = 0 \quad Cov[\varepsilon_i, F_k] = 0 \quad Cov[\varepsilon_i, \varepsilon_j] = 0$$

- There is no arbitrage
- Financial markets are frictionless

APT: An asset's expected return is proportional to its factor betas:

$$\boxed{E[r_i] = r_f + \beta_{1i}\lambda_1 + \beta_{2i}\lambda_2 + ... + \beta_{ni}\lambda_n}$$

where λ – factor risk premiums

Arbitrage Pricing Theory (APT)

- The APT has multiple betas rather than one beta as in CAPM
- APT betas measure sensitivity to multiple risk factors, not just the market factor
- APT does not specify the factors, so we must identify them statistically or economically

Fama-French three factor model

- Fama and French developed a three-factor version of the APT with a good fit
- Factor 1: The return on the market index minus the risk-free return
- Factor 2: The return on a portfolio of "small" stocks minus the return on a portfolio of "large" stocks
- Factor 3: The return on a portfolio of "value" stocks minus the return on a portfolio of "growth" stocks

Four factor model

+ Factor 4: The return on a pfl of past winners minus the return on a pfl of past loosers - *momentum* (Jegadeesh, Titman, 1993)

Asset Pricing Models: Summary

$$P_i = \sum_{t=0}^{T} \frac{E[CF_{it}]}{(1+E[r_i])^t}$$

where r – required (fair) return
given the level of risk of CF

CAPM:

$$E(r_i) = r_f + \beta_i [E(r_M) - r_f]$$

where $$\beta_i \equiv \frac{Cov(r_i, r_M)}{Var(r_M)}$$

APT:

$$E[r_i] = r_f + \beta_{1i}\lambda_1 + \beta_{2i}\lambda_2 + ... + \beta_{ni}\lambda_n$$