Active Portfolio Management

Book Link
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Chapter 1: Introduction

- "every asset characteristic corresponds to a particular portfolio"
- Want high residual return and low residual risk. "in a mean/variance style through residual return minus a (quadratic) penalty on residual risk (a linear penalty on residual variance)"
- Fundamental law of active management: Sources of investment opportunity are
    1. Ability to forecast asset's residual return — Information coefficient: correlation between forecasts and the eventual returns
    2. Breadth — number of times per year we can use our skill

$$\mathrm{IR} = \mathrm{IC} \cdot \sqrt{\mathrm{breadth}}$$

- "forecasting takes raw signals of asset returns and turns them into refined forecasts". Rule of thumb:

$$\mathrm{Alpha} = \mathrm{volatility} \cdot \mathrm{IC} \cdot \mathrm{score}$$

    - $\mathrm{score} =$ standardised (0 mean and 1 stdev)
    - $\mathrm{Alpha} =$ a forecast of residual return
    - $\mathrm{volatility} =$ residual volatility
    - $\mathrm{IC} =$ correlation b/w scores and returns

Part One: Foundations

Chapter 2: Consensus Expected Returns: CAPM

- "One of the valuable by-products of the CAPM is a procedure for determining consensus expected returns"
- "The active manager can succeed to the extent that his or her forecasts are superior to the CAPM consensus forecasts"
- "CAPM is about expected returns, not risk"
- "historical returns contain a large amount of standard error"
    - "Given returns generated by an unvarying random process with known annual standard deviation σ, the standard error of the estimated annual return will be $\frac{\sigma}{\sqrt{Y}}$, where Y measures the number of years of data"
- APT "is an interesting tool for the active manager, but not as a source of *consensus* expected returns"
- market portfolio = consensus portfolio, and the CAPM leads to the expected returns which market the market mean/variance optimal
- Beta is a forecast of the future.
- "Historical beta is a reasonable forecast of the betas that be realised in the future, although it is possible to do better"
    - "There is a tendency for betas to regress toward the mean"
    - "forecasts of betas based on the fundamental attributes of the company, rather than its returns over the past, say, 60 months, turn out to be much better forecasts of future betas"
- Return and variance of a portfolio:

$$r_p = \beta_p r_M + \theta_p \tag{2.3}$$

$$\sigma_p^2 = \beta_p^2 \sigma_M^2 + \omega_p^2 \tag{2.4}$$

where, ω_p^2 is the residual variance of the portfolio p, i.e. the variance of θ_p

- CAPM states $\mathbb{E}[\theta_p] = 0$. That means $\mathbb{E}[r_p] = \beta_p \mu_M$
  - Implicit: "all investors have the same expectation, and differ only in their tolerance for risk"
- "given any portfolio defined as optimal, the expected returns to all other portfolios will be proportional to their betas with respect to that optimal portfolio"
- "The ability to decompose return and risk into market and residual components depends on our ability to forecast betas"
- "There is no need to forecast the expected excess market return μ_M if you control beta. The manager can focus research on forecasting residual returns"
- **Problems and Appendix:**

APTER 2

ms:

iven, $\beta_A = 1.15$ $\quad \sigma_A = 35\%$

$\beta_B = 0.95$ $\quad \sigma_B = 33\%$

$\sigma_M = 20\%$ $\qquad$ Corr(A, B)? $\quad \omega_A > \omega_B$?

$$\text{Corr}(A,B) = \frac{\text{Cov}(A,B)}{\sigma_A \cdot \sigma_B}$$

$$\text{Cov}(A,B) = \beta_A \beta_B \sigma_M^2 = 0.0437$$

$$\text{Corr}(A,B) = \frac{0.0437}{(0.35)(0.33)} = 0.378$$

$$\sigma_A^2 = \beta_A^2 \sigma_M^2 + \omega_A^2$$

$$0.1225 = (1.3225)(0.04) + \omega_A^2$$

$$\omega_A = 26.38\%$$

$$\omega_B = 26.98\%$$

dix:

↳ Assumptions:

1. Risk-free asset exists
2. All first and second moments exist
3. Impossible to build a fully invested portfolio with zero risk
4. Expected excess return on portfolio C (fully invested with minimum risk) is positive.

↳ Characteristic Portfolios:

→ Assets have attributes — beta, P/E ratio, m-cap, etc.

→ Characteristic Portfolio → uniquely capture the defining attribute

→ $a^T = \{a_1, a_2, \dots, a_N\}$ → vector of asset attributes

h_p = vector of risky asset holding (% weights)

Exposure of portfolio h_p to attribute a: $\quad a_p = \sum_n a_n h_{p,n}$ $\quad$ or $\quad a_p = a_p^T h_p$

1)

→ <u>Proposition 1</u>

1. For any attribute $a \neq 0$, unique portfolio h_a exists that has minimum risk and unit exposure to a.

$$h_a = \frac{V^{-1} a}{a^T V^{-1} a} \qquad (2A.1)$$

V → covariance matrix of excess returns for the risky assets

→ includes long and short positions with leverage.

2. Variance of characteristic portfolio:

$$\sigma_a^2 = h_a^T V h_a = \frac{1}{a^T V^{-1} a} \qquad (2A.2)$$

3. Beta of all assets w.r.t. portfolio h_a is a

$$a = \frac{V h_a}{\sigma_a^2} \qquad (2A.3)$$

β w.r.t. portfolio $p = \dfrac{V h_p}{\sigma_p^2}$

4. Two attributes a and d with char. portfolios h_a and h_d.

a_d → exposure of portfolio h_d to characteristic a : $a^T h_d$

d_a → " " " h_a " " d : $d^T h_a$