Risk formulas

1. Types of risk

Degree of operating leverage = $DOL = \frac{Q(P-V)}{Q(P-V)-F}$,

Degree of financial leverage = $DFL = \frac{[Q(P-V)-F]}{[Q(P-V)-F-I]}$

Degree of total leverage = $DTL = \frac{Q(P-V)}{Q(P-V)-F-I}$ = DOL x DFL.

Nominal return = Inflation rate + real return

2. Risk measurement

Expected value = $\mathscr{E}(x) = \sum_{n=1}^{N} p_n x_n$

Standard deviation of possible outcomes $= \sigma(x) = \sqrt{\sum_{n=1}^{N} p_n (x_n - \varepsilon(x))^2}$

3. Risk, return, and diversification

Return on a portfolio = $r_p = \sum_{i=1}^{S} w_i r_i$

$\text{Covariance}_{One,Two} = \sum_{i=1}^{N} p_i \left(r_{One,i} - \varepsilon_{One}\right)\left(r_{Two,i} - \varepsilon_{Two}\right)$

Portfolio standard deviation, 2-security portfolio = $\sqrt{w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2cov_{1,2}}$

.

Portfolio standard deviation = $\sqrt{\sum_{i=1}^{N} w_i^2\sigma_i^2 + \sum_{i=1}^{N}\sum_{j=1\ j\neq i}^{N} w_i w_j cov_{ij}}$.

Correlation coefficient $= \frac{\text{covariance of the two assets' returns}}{\left(\text{standard deviation of returns on first asset}\right)\left(\text{standard deviation of returns on second asset}\right)} = \rho_{1,2} = \frac{cov_{1,2}}{\sigma_1\sigma_2}$

Portfolio beta = $\beta_p = \sum_{i=1}^{S} w_i\beta_i$

Return on a security, CAPM = $r_i = r_f + (r_m - r_f)\,\beta_i$