Equivalent taxable yield: $\frac{r_{\text{muni}}}{1-t}$, where r_{muni} is the rate on tax-free municipal debt and t is the federal plus state combined tax rate

Cutoff tax rate (for indifference to taxable versus tax-free bonds): $1 - \frac{r_{\text{muni}}}{r_{\text{taxable}}}$

Figure 1: Chapter 2

Arithmetic average of n returns: $(r_1 + r_2 + \cdots + r_n) / n$

Geometric average of n returns: $[(1 + r_1)(1 + r_2)\cdots(1 + r_n)]^{1/n} - 1$

Continuously compounded rate of return, $r_{cc} = \ln(1 + \text{Effective annual rate})$

Expected return: $\sum$ [prob(Scenario) × Return in scenario]

Variance: $\sum$[prob(Scenario) × (Deviation from mean in scenario)^2]

Standard deviation: $\sqrt{\text{Variance}}$

Sharpe ratio: $\frac{\text{Portfolio risk premium}}{\text{Standard deviation of excess return}} = \frac{E(r_P) - r_f}{\sigma_P}$

Real rate of return: $\frac{1 + \text{Nominal return}}{1 + \text{Inflation rate}} - 1$

Real rate of return (continuous compounding): $r_{\text{nominal}} - \text{Inflation rate}$

Figure 2: Chapter 5

Utility score: $U = E(r) - \frac{1}{2} A\sigma^2$

Expected return on complete portfolio: $E(r_C) = yE(r_C) + (1 - y)r_f$

Standard deviation of complete portfolio: $\Sigma_C = y\Sigma_P$

Optimal allocation to risky portfolio: $y^* = \frac{E(r_P) - r_f}{A\sigma_P^2}$

Figure 3: Chapter 6

Expected portfolio return: $E(r_p) = \sum_{\delta=1}^{n} \Pr(s)\, r_p(s)$ [with n scenarios, indexed by s]

The expected rate of return on a two-asset portfolio: $E(r_p) = w_D E(r_D) + w_E E(r_E)$

Variance of portfolio return: $\text{Var}(r_p) = \sum_{\delta=1}^{n} \Pr(s)\left[r_p(s) - E(r_p)\right]^2$

Covariance between portfolio returns: $\text{Cov}(r_E, r_D) = \sum_{\delta=1}^{n} \Pr(s)\,[r_E(s) - E(r_E)]\,[r_D(s) - E(r_D)]$

Covariance and correlation: $\text{Cov}(r_E, r_D) = \rho_{ED}\sigma_E\sigma_D$

The variance of the return on a two-asset portfolio: $\sigma_P^2 = (w_D\,\sigma_D)^2 + (w_E\,\sigma_E)^2 + 2(w_D\,\sigma_D)(w_E\,\sigma_E)\rho_{DE}$

Variance of n-asset portfolio: $\text{Var}(r_p) = \sum_{i=1}^{n}\sum_{j=1}^{n} w_i\, w_j\, \text{Cov}\left(r_i, r_j\right)$

The Sharpe ratio of a portfolio: $S_p = \frac{E(r_p) - r_f}{\sigma_p}$

Sharpe ratio maximizing portfolio weights with two risky assets (D and E) and a risk-free asset:

$$\begin{aligned} w_D &= \frac{[E(r_D) - r_f]\,\sigma_E^2 - [E(r_E) - r_f]\,\sigma_D\sigma_E\rho_{DE}}{[E(r_D) - r_f]\,\sigma_E^2 + [E(r_E) - r_f]\,\sigma_D^2 - [E(r_D) - r_f + E(r_E) - r_f]\,\sigma_D\sigma_E\rho_{DE}} \\ w_E &= 1 - w_D \end{aligned}$$

Optimal capital allocation to the risky asset: $y = \frac{E(r_p) - r_f}{A\sigma_p^2}$

Figure 4: Chapter 7

Market risk premium: $E(R_M) = \overline{A}\sigma_M^2$

Beta: $\beta_i = \dfrac{\text{Cov}(R_i,\ R_M)}{\sigma_M^2}$

Security market line: $E(r_i) = r_f + \beta_i[E(r_M) - r_f]$

Zero-beta SML: $E(r_i) = E(r_Z) + \beta_i[E(r_M) - E(r_Z)]$

Multifactor SML (in excess returns): $E(R_i) = \beta_{iM} E(R_M) + \sum_{k=1}^{K} \beta_{ik} E(R_k)$

Figure 5: Chapter 9

Single-factor model: $R_i = E(R_i) + \beta_i F + e_i$

Multifactor model (here, 2 factors, F_1 and F_2): $R_i = E(R_i) + \beta_{i1} F_1 + \beta_{i2} F_2 + e_i$

Single-index model: $R_i = \alpha_i + \beta_i R_M + e_i$

Multifactor SML (here, 2 factors, labeled 1 and 2):

$$\begin{aligned} E(r_i) &= r_f + \beta_{i1}\left[E(r_1) - r_f\right] + \beta_{i2}\left[E(r_2) - r_f\right] \\ &= r_f + \beta_{i1} E(R_1) + \beta_{i2} E(R_2) \end{aligned}$$

where β_{i1} and β_{i2} measure the stock's typical response to returns on each factor portfolio and the risk premiums on the two factor portfolios are $E(R_1)$ and $E(R_2)$.

Figure 6: Chapter 10

$$\begin{aligned} \text{Abnormal return} &= \text{Actual return} - \text{Expected return given the return on a market index} \\ &= r_t - (a + b r_{Mt}) \end{aligned}$$

Figure 7: Chapter 11

First-pass regression equation: $r_{it} - r_{ft} = a_i + b_i\left(r_{Mt} - r_{ft}\right) + e_{it}$

Second-pass regression equation: $\overline{r_i - r_f} = \gamma_0 + \gamma_1 b_i$

Fama-French three-factor model: $E(r_i) - r_f = a_i + b_i\left[E(r_M) - r_f\right] + s_i E[R_{SMB}] + h_i E[R_{HML}]$

Figure 8: Chapter 13

Value of a coupon bond:

$$\begin{aligned} \text{Value} &= \text{Coupon} \times \frac{1}{r}\left[1 - \frac{1}{(1+r)^T}\right] + \text{Par value} \times \frac{1}{(1+r)^T} \\ &= \text{Coupon} \times \text{Annuity factor}(r,\ T) + \text{Par value} \times \text{PV factor}(r,\ T) \end{aligned}$$

Figure 9: Chapter 14

Forward rate of interest: $1 + f_n = \dfrac{(1+y_n)^n}{(1+y_{n-1})^{n-1}}$

Yield to maturity given sequence of forward rates: $1 + y_n = [(1+r_1)(1+f_2)(1+f_3) \cdots (1+f_n)]^{1/n}$

Liquidity premium = Forward rate − Expected short rate

Figure 10: Chapter 15

Geometric time-weighted return: $1 + r_G = [(1+r_1)(1+r_2)\cdots(1+r_n)]^{1/n}$

Sharpe ratio: $S_P = \dfrac{r_P - r_f}{\sigma_P}$

M^2 of portfolio P given its Sharpe ratio: $M^2 = \sigma_M(S_P - S_M)$

Treynor measure: $T_P = \dfrac{r_P - r_f}{\beta_P}$

Jensen's alpha: $\alpha_P = \overline{r}_P - \left[\overline{r}_f + \beta_P\left(\overline{r}_M - \overline{r}_f\right)\right]$

Information ratio: $\dfrac{\alpha_P}{\sigma(e_P)}$

Morningstar risk-adjusted return: $\text{MRAR}(\gamma) = \left[\dfrac{1}{T}\sum_{t=1}^{T}\left(\dfrac{1+r_t}{1+r_{ft}}\right)^{-\gamma}\right]^{\frac{12}{\gamma}} - 1$

Figure 11: Chapter 24