

SOE & WISE, Xiamen University, SEM II, AY2022-2023

Financial Economics/Asset Pricing

Homework 4

1. Suppose there are four securities: Oz stock, Xanadu stock, Ragtime stock, and a risk-free asset. The total market values of each at current prices are \$30 billion of Oz stock, \$50 billion of Xanadu stock, \$90 billion of Ragtime stock, and \$30 billion of the risk-free asset.
- (a) Determine the composition of the market portfolio.
- (b) If an investor has a \$500,000 portfolio with \$90,000 invested in the risk-free asset, determine the holdings of the three risky assets.

Answer:

- (a) *The total market value of all assets is \$200 billion.
The composition of the market portfolio is therefore 15% Oz stock, 25% Xanadu stock, 45% Ragtime stock, and 15% of the risk-free asset.*
- (b) *The investor has $(\$500,000 - \$90,000) = \$410,000$ in the risky assets.
Investment in Oz, Xanadu, and Ragtime stocks are in the proportion of $(15\%:25\%:45\%) = 3:5:9$
 $(\$410,000 \times 3/17) = \$72,352.94$ in Oz stock, $(\$410,000 \times 5/17) = \$120,588.24$ in Xanadu stock and $(\$410,000 \times 9/17) = \$217,058.82$ in Ragtime stock.*
2. Consider a market portfolio that has a standard deviation of 0.30. The average degree of risk aversion is 2. If the expected return on the market portfolio is 0.25, what is the equation for the Capital Market Line?

Answer:

$$\begin{aligned} E(r_M) - r_f &= 2 \times (0.3)^2 \\ &= 0.18 \end{aligned}$$

$$\begin{aligned} r_f &= 0.25 - 0.18 \\ &= 0.07 \end{aligned}$$

The equation for CML:

$$E(r) = 0.07 + 0.60\sigma$$

3. Consider a portfolio exhibiting an expected return of 22% in an economy where the riskless interest rate is 7%, the expected return on the market portfolio is 14% and the standard deviation of the return to the market portfolio is 0.18. Assuming that the portfolio is efficient, determine:
- (a) its beta
- (b) the standard deviation of its return

Answer:

$$\begin{aligned} (a) \quad E(r_i) - r_f &= \beta[E(r_M) - r_f] \\ 0.22 - 0.07 &= \beta[0.14 - 0.07] \\ 2.14 &= \beta \end{aligned}$$

$$\begin{aligned} (b) \quad \text{Use CML:} \\ .22 &= 0.07 + [(0.14 - 0.07)/0.18]\sigma \end{aligned}$$

$$0.39 = \sigma$$

4. The market portfolio has a variance of return of 0.16 and the expected return on the market portfolio is 21%. Calculate the market degree of risk aversion if the risk-free rate of return is 10%.

Answer:

$$\begin{aligned} E(r_M) - r_f &= A\sigma^2 \\ 0.21 - 0.10 &= A \times 0.16 \\ 0.68 &= A \end{aligned}$$

5. During the most recent 3-year period, Tartar Inc. earned an average annualized rate of return of 14% and had an annualized standard deviation of 20%. The average risk-free rate was 4.5% per year. The average rate of return in the market index over that same period was 10% with a standard deviation of 15%. How well did Tartar Inc. perform on a risk-adjusted basis?

Answer:

Compare their reward-to-risk ratios:

<i>Tartar Inc.</i>	<i>Market</i>
$(0.14 - 0.045)/0.2 = 0.475$	$(0.10 - 0.045)/0.15 = 0.367$

On a risk adjusted basis, Tartar performed better than the market index.

6. Barramundi Inc. stock is currently selling at \$40 per share (its equilibrium price). The firm's long-term growth is expected to remain 7% per year forever. Last year's EPS were \$4, and the dividend payout ratio is 50%. The risk-free rate is 8%, and the market risk premium is 6%. If beta increases by 50%, by how much will the stock price change? (Assume all other factors remain constant).

Answer:

First solve:

$$\begin{aligned} P_o &= D_o(1 + g)/(k - g) \\ 40 &= 2.14/(k - 0.07) \\ k &= 12.35\% \end{aligned}$$

$$\begin{aligned} \text{Solve SML for } \beta: 12.35\% &= 8\% + \beta(6\%) \\ \beta &= 0.725 \end{aligned}$$

$$\begin{aligned} \text{New } \beta &= 0.725(1.5) \\ &= 1.0875 \end{aligned}$$

$$\begin{aligned} \text{New } k &= 8\% + 1.0875(6\%) \\ &= 14.525\% \end{aligned}$$

$$\begin{aligned} \text{New } P_o &= 0.5(\$4)(1.07)/(0.14525 - 0.07) \\ &= \$28.44 \end{aligned}$$

The price would drop by approximately \$11.56