3. Since \( E(r) = P_1 r_1 + P_2 r_2 + \cdots + P_n r_n \), we have:

\[
E(r) = 0.25 \times 0.40 + 0.55 \times 0.15 + 0.20 \times (-0.08) = 0.1665 \text{ (or 16.65%)}.
\]

5. Along the Risk-Reward Trade-Off Line:

\[
E(r) = r_f + \frac{E(r_s) - r_f}{\sigma_s} \sigma.
\]

So, given \( r_f = 0.05 \), \( E(r_s) = 0.13 \), \( \sigma_s = 0.2 \), and \( \sigma = 0.075 \), we have:

\[
E(r) = 0.05 + \frac{0.13 - 0.05}{0.2} \times 0.075 = 0.08 \text{ (or 8%).}
\]

6. Given that \( E(r) = 0.11 \), we first compute \( w \) from the Risk-Reward Trade-Off Line:

\[
0.11 = 0.05 + 0.09w \quad \Rightarrow \quad w = \frac{0.06}{0.09}
\]

Then multiply \( w \) by the total investment of $100,000 to obtain:

\[
\text{Amount invested in the risky asset} = \frac{0.06}{0.09} \times 100,000 = 66,667.
\]

7. Given that \( E(r) = 0.17 \), we first compute \( w \) from the Risk-Reward Trade-Off Line:

\[
0.17 = 0.07 + 0.12w \quad \Rightarrow \quad w = \frac{0.1}{0.12}.
\]

Then, since \( \sigma = w \times \sigma_s \) and \( w = \frac{0.1}{0.12} \), we have:

\[
\sigma = \frac{0.1}{0.12} \times 0.3 = 0.25
\]

8. Since the Risk-Reward Trade-Off Line is given by:

\[
E(r) = r_f + \frac{E(r_s) - r_f}{\sigma_s} \sigma,
\]

we know that:

\[
\text{Slope of Risk-Reward Trade-Off Line} = \frac{E(r_s) - r_f}{\sigma_s}.
\]

Initially, with \( E(r_s) = 0.13 \), \( \sigma_s = 0.25 \), and \( r_f = 0.06 \), we have:

\[
\text{Slope} = \frac{0.13 - 0.06}{0.25} = 0.28 \text{ (or 28%)}
\]

Then, with \( E(r_s) = 0.14 \), \( r_f = 0.05 \), and keeping \( \sigma_s \) unchanged, we have:

\[
\text{Slope} = \frac{0.14 - 0.05}{0.25} = 0.36 \text{ (or 36%)}
\]
11. Since the Risk-Reward Trade-Off Line is given by:

\[ E(r) = r_f + \frac{E(r_s) - r_f}{\sigma_s} \sigma, \]

and we’re told that \( r_f = 0.04, \) \( E(r_s) = 0.25, \) and \( \sigma_s = 0.30, \) we have:

\[ E(r) = 0.04 + 0.25 - 0.04 \cdot 0.30 \sigma = 0.04 + 0.7\sigma. \]

15. The total market value is $130 million ($40 million + $80 million + $10 million). Then, it’s straightforward to compute:

- Fraction in BB stock = 40/130 = 0.308 (or 30.8%)
- Fraction in REM stock = 80/130 = 0.615 (or 61.5%)
- Fraction in risk-free asset = 10/130 = 0.077 (or 7.7%)

16. In the market portfolio, the total market value of the two risky assets is $120 million ($80 million in REM stock and $40 million in BB stock). Thus, two-thirds (66\(\frac{2}{3}\)% of the risky portion of this portfolio is held in REM stock, and one-third (33\(\frac{1}{3}\)% is held in BB stock. According to the CAPM, the market portfolio is efficient, which implies that all investors will held risky assets in their portfolios in the same relative proportions as in the market portfolio.

17. In the market portfolio, the total market value of the three risky assets is $170 million ($50 million in BB stock, $40 million in REM stock, and $80 million on ACX stock). Thus, in the risky portion of the market portfolio, we have:

- Fraction in BB stock = 50/170 = 0.294 (or 29.4%)
- Fraction in REM stock = 40/170 = 0.235 (or 23.5%)
- Fraction in ACX stock = 80/170 = 0.470 (or 47.0%)

Then, since the trader in question invests $60,000 of a $300,000 portfolio in the riskless security, $240,000 of this portfolio is invested in the risky assets. The composition of the risky portion of this portfolio is computed, using the fractions from above, as:

- Investment in BB stock = \( \frac{5}{17} \times 240,000 = 70,588 \)
- Investment in REM stock = \( \frac{4}{17} \times 240,000 = 56,471 \)
- Investment in ACX stock = \( \frac{8}{17} \times 240,000 = 112,941 \)

19. First, note that we’re given the “standard deviation,” not the variance, of the market portfolio. So, we compute:

\[ \sigma_M^2 = (\sigma_M)^2 = (0.15)^2 = 0.0225 \]

Then, since \( A = 1.5, \) we have:

\[ E(r_M) - r_f = A\sigma_M^2 = 1.5 \times 0.0225 = 0.034 \]

20. First, recall that:

The slope of the CML = \( \frac{E(r_M) - r_f}{\sigma_M}. \)

Second, the risk premium on the market portfolio is given by:

\[ E(r_M) - r_f = A\sigma_M^2 = 1.5 \times (0.15)^2. \]
So:

\[ \text{The slope of the CML} = 1.5 \times 0.15 = 0.225 \]

21. Along the Security Market Line:

\[ E(r_j) - r_f = \beta_j [E(r_M) - r_f] \]

Given that \( \beta_j = 2 \) and \( [E(r_M) - r_f] = 0.07 \), we have:

\[ E(r_j) - r_f = 2 \times 0.07 = 0.14 \Rightarrow E(r_j) = r_f + 0.14 \]

22. Along the Security Market Line:

\[ E(r_j) - r_f = \beta_j [E(r_M) - r_f] \]

Since the “required rate of return for the security” is \( E(r_j) \), and given that \( \beta_j = 1.25 \), \( E(r_M) = 0.13 \), and \( r_f = 0.06 \), we have:

\[ E(r_j) - 0.06 = 1.25 \times (0.13 - 0.06) \Rightarrow E(r_j) = 0.1475 \text{ (or 14.75\%)} \]

23. To compute the price of a share of ZB stock, we need to apply the constant-growth-rate DDM, according to which:

\[ P_0 = \frac{D_1}{k - g}, \text{ where} \]

\( P_0 \) is the current price/value of a share of stock, \( D_1 \) is the expected dividend payment next period, \( k \) is the market capitalization rate, and \( g \) is the expected growth rate of dividends. Since the current dividend, \( D_0 \), is $1.80, and \( g = 0.06 \), we can compute:

\[ D_1 = $1.80 \times 1.06 = $1.908 \]

In order to compute \( P_0 \), we need to determine the value of \( k \). This is supplied by the CAPM Security Market Line relation:

\[ E(r_j) - r_f = \beta_j [E(r_M) - r_f], \]

by which we equate \( k \) with \( E(r_j) \). Since \( r_f = 0.085 \), \( \beta_j = 1.1 \), and \( [E(r_M) - r_f] = 0.05 \), we have:

\[ E(r_j) - 0.085 = 1.1 \times 0.05 \Rightarrow E(r_j) = 0.14. \]

Then, setting \( k = E(r_j) = 0.14 \), we have:

\[ P_0 = \frac{D_1}{k - g} = \frac{1.908}{0.14 - 0.06} = $23.85 \]

24. For a put option:

Tangible Value (Intrinsic Value) = Max \((\text{Strike Price} - S_T, 0)\), where

\( S_T \) is the current price of a share of the stock. Since \( \text{Strike Price} = $110 \) and \( S_T = $109\frac{3}{4} \), we have:

\[ \text{Tangible Value} = \text{Max} \((110 - 109\frac{3}{4}, 0)\) = \text{Max} \((0.25, 0)\) = $0.25. \]
25. For a call option:

\[
\text{Tangible Value (Intrinsic Value)} = \max (S_T - \text{Strike Price}, 0), \text{ where}
\]

\( S_T \) is the current price of a share of the stock. Since \( \text{Strike Price} = \$107 \) and \( S_T = \$109 \frac{3}{4} \), we have:

\[
\text{Tangible Value} = \max (\$109 \frac{3}{4} - \$107 , 0) = \max (\$2.75, 0) = \$2.75.
\]

Since the tangible (intrinsic) value of this option is positive, the option is “in the money.”

26-50. These problems appeared on the first two midterms. Solutions to many of these problems are available in the solutions for those exams.