Risk and the Required Rate of Return

1.   The standard deviation of the market portfolio is 4%. The risky asset S shows a correlation coefficient with the market of 0.75 and a standard deviation of 8%. Compute the beta of asset S.

Answer:
$\beta_s = [\ 8\ *\ 4\ *\ 0.75\ ] / 16\ = 1.5$

2.   The beta of the market portfolio itself is 1. Why?

Answer:
The correlation of the market with the market is of course 1, so:
$\sigma_m * \sigma_m * 1 / \sigma^2_m = 1$

3.   The stock of an important food retail company has a beta of 1.2. The expected return on the market portfolio is 12% and the risk-free rate 6%. What is the expected or required rate of return on that stock?

Answer:
$E\ (r_{frc}) = 6\% + (12\% - 6\%) * 1.2 = 13.2\%$

4.   The standard deviation of the market portfolio described in problem 3 is 4%. That of the stock of the food retailer is 8%. How can you explain this, given the beta of 1.2? Hint: draw a CML (Capital Market Line) and a SML (Security Market Line) on the same scale next to each other and compare the two.

Answer:
Determine the correlation coefficient => $\beta = 1.2 = (\ 4\ \%\ *\ 8\ \%\ *\ \rho\ )/ 16 => \rho = 0.6.$
The *systematic* risk is 0.6 * 8% = 1.2 * 4% = 4.8%, being $\rho_{jm} * \sigma_j$ or $\beta_{jm} * \sigma_m.$

Answers of study exercises
Risk and the Required Rate of Return

5. In a certain capital market characterised by CAPM-equilibrium, two risky stocks, P and Q are traded amongst a multitude of other financial assets. In this market the risk-free rate of return is 6% and the market risk premium is 4%. The risk of the market portfolio (as σ) is 8%. The characteristics of P and Q are:

Stock	P	Q
Expected return	8%	12%
σ of return	7%	12%

a. Compute the non-diversifiable risk (market risk) for P and Q.

Answer:
Two categories of risk
1) *Systematic risk* **(equivalent to non-diversifiable risk)**
2) *Non-systematic risk* **(equivalent to diversifiable risk firm *or* firm-specific risk)**

Calculate the beta's with the help of the formula:

$$E\ (r_j) = r_f + [\ E\ (r_m) - r_f\ ] * \beta_j$$

Beta P   => 8% = 6% + Beta * (10% -/- 6%)   => 0.5
Beta Q   => 12% = 6% + Beta * (10% -/- 6%)   => 1.5
Beta M   => 10% = 6% + Beta * (10% -/- 6%)   => 1

Calculate systematic risk with the help of the beta:

Stock P
Systematic risk   = 4.0% (8.0% * 0.5 = 4.0%).

Stock Q
Systematic risk   = 12.0% (8.0% * 1.5 = 12%)

b. Depict in a graph the security market line (SML) and the capital market line (CML) applicable to these data and plot the market portfolio, and stock P and Q (diversified & non-diversified).

Answer:
Information needed to plot a *security market line*:
   ▪ **Beta of stock**
   ▪ **Expected return of stock**

Information needed to plot a *capital market line***:**
- **Standard deviation**
- **Expected return of stock**

c. Suppose that in the market described above also a stock R is traded with a β of 1.25. This non-growth stock is expected to pay a yearly dividend of €7.70. What is the value of that stock according to the CAPM?

Answer:
Calculate the expected return with the help of the formula:

$$E(r_j) = r_f + [E(r_m) - r_f] * \beta_j$$

Expected return stock R = 6% + [(10% -/- 6%) * 1.25] = 11%.
Stock value = €7.70 dividend / 0.11 = €70.