

## CAPM\*

Consider an economy where only four companies (A, B, C and D) exist. Some of their characteristics are given in the table below.

Company	Expected Return	Standard Deviation	Covariance with market portfolio	Weight in market portfolio
A	6%	15%	0.01131	25.12%
B	8%	25%	0.01697	23.25%
C	10%	30%	0.02263	13.34%
D	12%	25%	0.02829	38.29%

The risk-free interest rate is 2%

1. Calculate the expected return on the market portfolio.
2. Calculate the variance and the standard deviation of the market portfolio.
3. Calculate the beta of each stock. Check your answer by computing the beta of the market portfolio.
4. Is the CAPM verified with this data?
5. Calculate the Sharpe ratio for each stock. Shouldn't they be equal in equilibrium?
6. Suppose that you have invested your money in the market portfolio. What would happen to the expected return and the risk of your portfolio if you were to increase the fraction invested in A (or D) by 1%? Would this be advisable? (See the appendix for the formulas)
7. You have done some calculation and you have computed the expected return and the risk for efficient portfolios. Your results are reported in the table below. Aunt Agatha has come to you for advice. What asset allocation would you recommend if her required expected return is

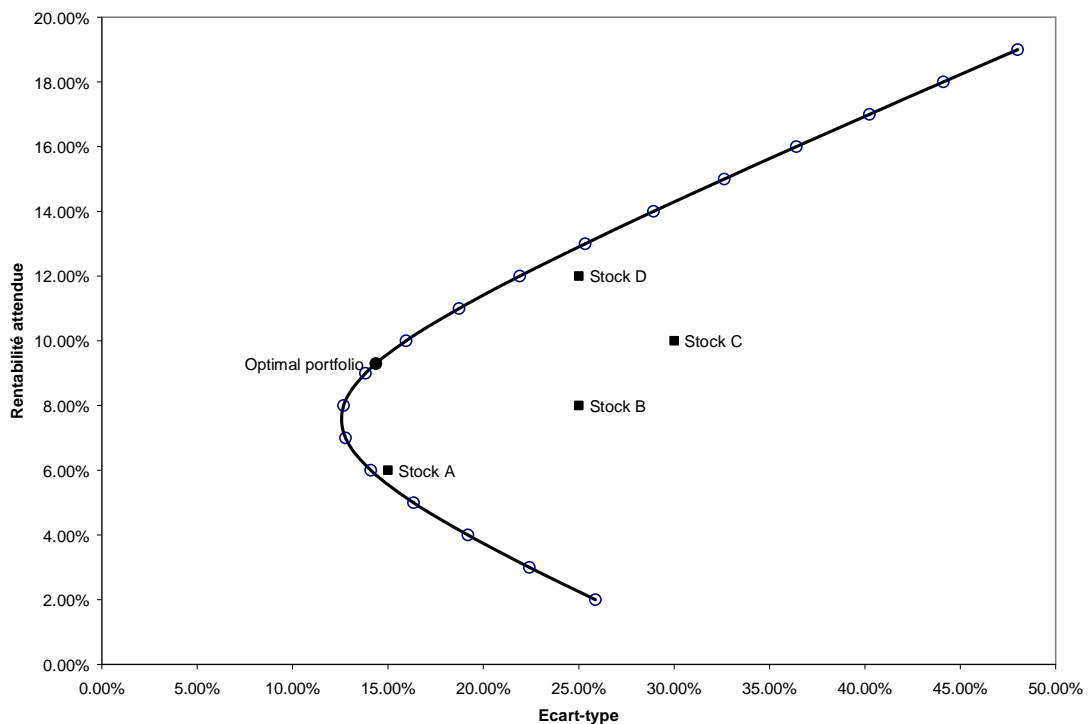
	a. 7%						
	b. 12%						
Expected Return	6.00%	7.00%	8.00%	9.00%	10.00%	11.00%	12.00%
Standard deviation	14.10%	12.78%	12.68%	13.82%	15.95%	18.72%	21.90%

\* André Farber prepared this case as a base for class discussion.

8. COBAM (Corner Bank Asset Management) is considering the creation of a new hedge fund, the Risk Reducer. Hedge funds are allowed to take both long and short positions. The composition of the Risk Reducer would be the following:

Stock	A	B	C	D
Proportions	201.7%	8.8%	-22.7%	-87.8%

Calculate the expected return and the beta of this hedge fund. Why would anyone be ready of invest in this hedge fund?



### Appendix

Consider a small modification of the composition of the market portfolio. The proportion invested in stock  $j$  is increased by  $dX_j$  and the proportion invested in the market portfolio is decreased by the same amount. The variations of the expected return and the standard deviation of the portfolio are given by the following equations:

$$dR = (R_j - R_M) dX_j$$

$$d\sigma = \frac{\sigma_{jM} - \sigma_M^2}{\sigma_M} dX_j$$