

MIT SLOAN SCHOOL OF MANAGEMENT

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Problem Set 8: Portfolio Choice

Due: December 2, 2003

1. (BKM) Are the following true or false?
 - (a) Stocks with a beta of zero offer an expected rate of return of zero.
 - (b) The CAPM implies that investors require a higher return to hold highly volatile securities.
 - (c) You can construct a portfolio with a beta of 0.75 by investing 0.75 of the investment budget in bills and the remainder in the market portfolio.

2. (BKM-revised) IN 1999 the rate of return on short-term government securities (perceived to be risk-free) was about 5%. Suppose the expected rate of return required by the market for a portfolio with a beta of 1 is 13%. According to the CAPM:
 - (a) What is the expected rate of return on the market portfolio?
 - (b) What would be the expected rate of return on a stock with $\beta = 0$?
 - (c) Suppose you consider buying a share of stock at \$100. The stock is expected to pay \$5 dividend next year and you expect it to sell then for \$108. You calculated the β of the stock to be 0.5. Is the stock overpriced or underpriced?

3. (UW) You are given the following information:
 - the covariance matrix of the rate of return on stock 1, stock 2, and the market portfolio is:

	r_1	r_2	r_m
r_1	0.160	0.020	0.064
r_2	0.020	0.090	0.032
r_m	0.064	0.032	0.040

- $\bar{r}_m = 0.12$ and $r_f = 0.04$.

Consider forming a portfolio p that has 75% invested in asset 1 and 25% invested in asset 2.

- (a) What is the variance of portfolio p ?
- (b) What are the betas of 1, 2, and p relative to the market, β_{1m} , β_{2m} , and β_{pm} , respectively?

- (c) What are the R^2 values in regressions of the return on 1, 2, and p on the market portfolio? (Here you can define $R^2 = \text{systematic risk} / \text{total risk}$)
- (d) According to CAPM, what are the expected returns on asset 1, asset 2, and portfolio p ?
4. (BM) Some true or false questions about the APT:
- (a) The APT factors cannot reflect diversifiable risks.
- (b) The market rate of return cannot be an APT factor.
- (c) Each APT factor must have a positive risk premium associated with it; otherwise the model is inconsistent.
- (d) There is no theory that specifically identifies the APT factors.
- (e) The APT model could be true but not very useful, for example, if the relevant factors change unpredictably.
5. (BM) The following question illustrates the APT. Imagine that there are only two pervasive macroeconomic factors. Investment X , Y , and Z have the following sensitivities to these two factors:

Investment	b_1	b_2
X	1.75	.25
Y	-1.00	2.00
Z	2.00	1.00

We assume that the expected risk premium is 4 percent on factor 1 and 8 percent on factor 2. Treasury bills obviously offer zero risk premium.

- (a) According to the APT, what is the risk premium on each of the three stocks?
- (b) Suppose you buy \$200 of X and \$50 of Y and sell \$150 of Z . What is the sensitivity of your portfolio to each of the two factors? What is the expected risk premium?
6. Case study - Bemus Investment Management

Download the trading game document from the class website. Study the case and follow the instructions, write up a 2-page report and hand it in along with the problem set. Enter the trades before December 5.