

Exercises for Chapter 8**Factor models and the arbitrage pricing theory**

1. The following information is provided for a stock market in which asset returns respond to two factors:

Asset	b_{j1}	b_{j2}	μ_j
A	1.2	0.4	16%
B	0.8	1.6	26%
r_0	0	0	6%

Notation: b_{j1} and b_{j2} for $j = A, B$ denote the responses of the rates of return on assets A and B to the factors; μ_j is the expected rate of return on each of the assets; and r_0 is the risk-free rate of return.

- (a) If the APT holds in this market, calculate the risk premia corresponding to the two factors.
- (b) Construct a portfolio which gives unit weight to the first factor and zero weight to the second factor. Hence provide an interpretation for the risk premia in the APT.

Hint: If a portfolio P has weights equal to a_A and a_B in assets A and B , respectively, then the proportion in the risk-free asset, a_0 , is equal to:

$$a_0 = 1 - a_A - a_B.$$

Also, the response of the return on P to the factors is given by:

$$\begin{aligned} b_{P1} &= a_A b_{A1} + a_B b_{B1} \\ b_{P2} &= a_A b_{A2} + a_B b_{B2}. \end{aligned}$$

Finally, note that the expected return on P , μ_P , is given by:

$$\mu_P = a_0 r_0 + a_A \mu_A + a_B \mu_B.$$

- (c) Asset C also traded in this market and yields an average return of 12% with $b_{C1} = 1.0$ and $b_{C2} = 0.5$. What inferences would you draw about the asset market from this information?
2. Explain the implications of assuming that asset returns are determined according to a three-factor model in which each factor is the rate of return (in excess of the risk-free rate) on a given portfolio. What considerations should determine how the three given portfolios (factors) are defined?
