

EE431 Economics of Financial Markets and Institutions

Homework 4: CAPM and APT

Please submit at the BE office, 5th floor department of Economics building.

Deadline of submission : Thursday 30 March, 2017, before 15.00 hrs.

1. Let $R_i = a_i + \beta_i R_m + \epsilon_i$ and $\sigma_i^2 = \beta_i^2 \sigma_m^2 + \sigma_{\epsilon_i}^2$. Use the information given. Explain the two components of risk. Which type of risk can be reduced through diversification? According to CAPM, what is the measure of risk for individual asset i ?

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2. Investors have mean-variance preferences and seek to maximize their utility. There are many risky assets available in the financial market. There is one risk-free asset. Assume that all assumptions of CAPM hold.

- asset A has $\sigma_a = 0.05$;
- asset B has $\sigma_b = 0.08$
- market portfolio M has $\sigma_m = 0.10$

- (a) Since investors are compensated for holding risk and $\sigma_b > \sigma_a$, is it true that expected return on security B should be greater than expected rate of return on security B at equilibrium?

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- (b) r_{ij} = correlation coefficient between return on asset i and return on asset j. Let us have more information as follows.

- asset A has $r_{am} = 0.9$, $\sigma_a = 0.05$;
- asset B has $r_{bm} = 0.01$, $\sigma_b = 0.08$
- market portfolio M has $\sigma_m = 0.10$, $E(R_m) = 0.13$
- risk free rate is 1%

- i. Write down CAPM equation.

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ii. Calculate β_i and β_j .

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iii. What are expected rates of return on asset A and asset B in equilibrium?

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3. $ER_A = 0.05 + 0.5F_1$; asset A has $\beta_{A1} = 0.5$.

$ER_B = 0.02 - 0.25F_1$; asset B has $\beta_{B1} = -0.25$.

Notation: β_{j1} and β_{j1} for $j = A; B$ denote the responses of the rates of return on assets A and B to the factor 1 (F_1).

(a) Determine the portfolio weights you need to place on A and B in order to construct a portfolio which has zero exposure to the factor 1 (F_1) (a risk-free portfolio). What is the expected return of the risk-free portfolio?

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(b) From (a), is there any abritrage opportunity exist if the market risk-free interest rate is 1%? If yes, explain how an investor can make an arbitrage profit.

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(c) Determine the portfolio weights you need to place on A and B in order to construct a portfolio which has a unit exposure to the factor 1 (F_1). What is the expected return of the portfolio which has a unit exposure to the factor 1?

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(d) Suppose $ER_A = 0.05 + 0.5F_1$ and $ER_B = 0.02 - 0.25F_1$ hold true at equilibrium. Derive an equation for the equilibrium expected rate of return of an asset K which has $\beta_{K1} = b_K$. Write down the general equation.

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$$ER_A = 0.02$$

$$ER_C = 0.07 + F_2$$

- $$E(R_p) = w_a E(R_a) + w_b E(R_b) + w_c E(R_c)$$

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