

Midterm Exam 2 — 6 questions. All sub-questions carry equal weight.

1. (20%) Assume that Hall's PIH-model holds. Assume that the rate of interest is 10% and that labor-income follows the ARMA-process

$$\Delta y_t = 50 - 0.2\Delta y_{t-1} + u_t ,$$

where u_t is white noise.

- a) Give the correct formula for calculating the change in consumption in year t in response to an innovation u_t .
b) Calculate (this time I want the number) the change in consumption in year t in response to a 100\$ innovation u_t .

2. (24%) For Hall's PIH-model:

- a) What is meant by Excess Sensitivity of Consumption? (Please show some equations and explain carefully).
b) What is meant by Excess Smoothness of Consumption?
c) Explain the rule-of-thumb consumer model (don't derive it) and explain its relation (if any) to Excess Sensitivity, and (separately) the relation to Excess Smoothness.

Please turn over

3. (24%) A consumer lives for 3 periods and earns 1\$, 2\$, and 3\$ in period 1, 2, and 3 respectively. The consumer maximizes

$$U(C_1) + \frac{1}{1.1}E_1U(C_2) + \frac{1}{1.21}E_1U(C_3) ,$$

where

$$U(C) = C - .01 C^2 .$$

The consumer can freely borrow and lend at a known interest rate. The rate of interest in period 1 (interest from period 1 to period 2) is 10 percent and the consumer expects that to last forever.

a) Find the consumer's period 1 consumption and his/her expected consumption in period 2 and period 3.

However, when period 2 comes along, it turns out that the rate of interest has changed and now the rate of interest from period 2 to period 3 is 20 percent.

b) Find the level of consumption in period 2 and period 3.

c) Discuss your findings in terms of the growth rate of consumption from period 1 to period 2 and from period 2 to period 3 and the level of consumption in period 2 compared to what the consumer planned it to be before he knew that the interest had changed. Don't derive any formulas, but the discussion has to build on what we did in class.

4. (20%) Consider the CAPM-model.

a) Let X be an asset whose payout PO_X is 100 with probability 0.6 and 0 with probability 0.4. Assume that PO_X has a covariance with the market return (measured in percent) of 10 and that the variance of the market return is 5 (measured in percent). The expected rate of return of the market is 5 percent. Assume that the safe rate of interest is 2 percent.

a) What is the expected return (ER_X) to an investment in X ?

b) What are the possible returns R_X and their probabilities (in other words, what is the distribution R_X).

5. (12%) Assume that agents possess logarithmic utility functions and have access to a safe asset with return R_F and that agents can invest in an asset with a random return of R_i .

Show that the expected return to asset i will be higher than R_F if the correlation of R_i with the consumption growth rate is positive. (You may *not* use the C-CAPM, you are supposed to derive the equations that show this implication.)