

Problem Set V

Chapter 11

Question 1

Tom lives on an island and has 20 coconut trees in the current period, which currently produce 180 coconuts. Tom detests coconuts, but he can trade them with people on other neighboring islands for things that he wants. Further, Tom can borrow and lend coconuts with neighboring islands. In the coconut credit market, a loan of 1 coconut in the current period is repaid with 2 coconuts in the future period. Each period, Tom's trees produce, and then 10% of them die. If Tom plants a coconut in the ground in the current period, it will grow into a productive coconut tree in the future period. At the end of the future period, Tom can sell any remaining coconut trees for 1 coconut each. When Tom plants coconuts in the current period, he plants them in successively less fertile ground, and the less fertile the ground, the less productive is the coconut tree. For convenience, we assume here that fractions of coconuts can be produced by trees. Output in the future period, for given numbers of trees in production in the future period, is given in the following table:

Trees in Production in the Future	Future Output of Coconuts
15	155
16	162
17	168
18	173
19	177
20	180
21	182
22	183.8
23	184.8
24	185.2
25	185.4

- (a) Plot the level of output against the quantity of capital for the future period.
- (b) Plot the marginal product of capital against the quantity of capital for the future period.
- (c) Calculate Tom's present value of profits given each quantity of future trees.
- (d) Calculate the net marginal product of capital for each quantity of future trees.
- (e) Determine Tom's optimal quantity of investment, and explain your results.

Question 2

The government decreases current taxes, while holding government spending in the present and the future constant.

- (a) Using diagrams, determine the equilibrium effects on consumption, investment, the real interest rate, aggregate output, employment, and the real wage. What is the multiplier, and how does it differ from the government expenditure multiplier?
- (b) Now suppose that there are credit market imperfections in the market for consumer credit, for example due to asymmetric information in the credit market. Repeat part (a), and explain any differences in your answers in parts (a) and (b).

Question 3

Determine how the following affect the slope of the output supply curve, and explain your results:

- (a) The marginal product of labor decreases at a faster rate as the quantity of labor used in production increases.
- (b) The intertemporal substitution effect of the real interest rate on current leisure decreases.

Question 4

Suppose that there is a shift in the representative consumer's preferences. Namely, the consumer prefers, given the market real interest rate, to consume less current leisure and more current consumption goods.

- (a) Determine the effects of this on current aggregate output, current employment, the current real wage, current consumption, and current investment.
- (b) Explain your results. What might cause such a change in the preferences of consumers?

Question 5

Suppose that we modify the model of the firm's investment behavior by assuming that any capital the firm has remaining at the end of the period can be sold at the price p'_K (in our model we assumed the capital could be sold at a price of one, in terms of consumption goods).

- (a) Determine how this change affects the optimal investment rule for the firm.
- (b) Suppose that we interpret p'_K as the firm's stock price. If p'_K increases, what effect does this have on the firm's optimal investment schedule? What does this imply about the relationship between investment expenditures and stock prices?