

## 9. Investment and Real Business Cycles

### Exercise 9.1.

In our model people live for only one period. In fact, there is just one person each period, but this person has a child that is around in the next period, and so on. The person cares about consumption  $c_t$  and the bequest of capital  $k_{t+1}$  to her child. The utility function is:

$$\ln c_t + A \cdot \ln k_{t+1}$$

where  $A > 0$  is a parameter. The Person uses the capital she got from her mother to produce consumption  $c_t$  and investment  $i_t$ , according to the resource constraint:

$$c_t + i_t = \sqrt{B \cdot k_t} + \varepsilon_t$$

where  $B > 0$  is a parameter, and  $\varepsilon_t$  a random shock to the production function. The shock takes different values in different periods. The Person knows  $\varepsilon_t$  once she is born, so for her it is just a constant. The capital that is left to the daughter is determined by:

$$k_{t+1} = (1 - \delta)k_t + i_t$$

where the parameter  $\delta$  the depreciation rate, is a number between zero and one.

Compute the decision of consumption and investment as a function of the parameters  $k_t$  and  $\varepsilon_t$ .

Assume now that  $B=0.1$ ,  $\delta=0.5$  and  $A=4$ . Using these Parameters, compare the reactions of  $c_t$  and  $i_t$  to changes in  $\varepsilon_t$

How does this compare to the RBC facts?

### Exercise 9.2. (Barro 9.8. Inventory Investment)

Businesses hold inventories of goods, partly as finished products and partly as goods- in process and raw materials. Suppose that we think of inventories as a type of capital, which enters into the production function. Then changes in these stocks represent investment in inventories. ( Typically, economists assume that the rate of depreciation on inventories is near zero)

a) How does an increase in the real interest rate affect the quantity of inventories that businesses want to hold? What happens, therefore, to inventory investment?

b) Consider a temporary adverse shock to the production function. What happens to the amount of inventory investment? What do we predict, therefore, for the behaviour of inventory investment during recessions?

### Exercise 9.3. (Barro 9.12: Investment Opportunities for Robinson Crusoe)

In the market economy we found that investment takes the brunt of shocks to the production function. Suppose that we introduce opportunities for investment into the model of Robinson Crusoe, which we constructed in Chapter 2. How would Robinson Crusoe's investment and consumption respond to shocks to the production function? Are the results basically similar to those for the market economy?