14.02 Principles of Macroeconomics
Spring 2014
Problem Set 5
Due: May 5, 2014

1 Consumption and Saving with Uncertain Income

Consider a consumer who lives for three periods: youth, middle age and old age. When young, the consumer earns $20.000 in labor income. Earnings during the middle age are uncertain: there is a 50% chance that the consumer will earn $40.000 and a 50% chance that the consumer earns $100.000. When old, the consumer spends savings accumulated from the previous periods. Assume that inflation, expected inflation, and the real interest rate are equal to zero. Ignore taxes for this problem.

a. What is the expected value of lifetime earnings in the middle period of life? Given this number, what is the present discounted value of the expected lifetime labor earnings? If the consumer wishes to maintain constant expected consumption over her lifetime, how much will she consumer in each period? How will she save in each period?

b. Now suppose that the consumer wishes to maintain a minimum consumption level of $20.000 in each period of her life. To do so, she must consider the worst outcome. If earnings during the middle age turn out to be $40.000, how much should the consumer spend when she is young to guarantee consumption of at least $20.000 in each period? How does this level of consumption compare to the level you obtained for the young in part a?

c. Given your answer in part b, suppose that the consumer earnings during middle age turn out to be $100.000. How much will she spend in each period of her life? Will consumption be constant over the consumer lifetime? (Hint: When the consumer reaches middle age, she will try to maintain constant consumption for the last two periods of life, as long as she can consume at least $20.000 in each period)

2 Ricardian Equivalence and Fiscal Policy

First consider an economy in which Ricardian equivalence does not hold.
a. Suppose the government starts with a balanced budget. Then, there is an increase in government spending, but there is no change in taxes. Show in an IS-LM diagram the effect of this policy on output in the short run. How will the government finance the increase in government spending?

b. Suppose, as in part (a), that the government starts with a balanced budget and then increases government spending. This time, however, assume that taxes increase by the same amount as government spending. Show in an IS-LM diagram the effect of this policy on output in the short run. How does the output effect compare with the effect in part (a)?

Now suppose Ricardian equivalence holds in this economy.
c. Consider again an increase in government spending with no change in taxes. How does the output effect compare to the output effects in parts (a) and (b)?

d. Consider again an increase in government spending combined with an increase in taxes of the same amount. How does this output effect compare to the output effects in parts (a) and (b)?

3 Debt and deficit

Consider an economy characterized by the following facts:
    i. The debt-to-GDP ratio is 40%.
    ii. The primary deficit is 4% of GDP.
    iii. The normal growth rate is 3%. (This is the growth rate of GDP)
    iv. The real interest rate is 3%, and there is no inflation.

a. Using your favorite spreadsheet software, compute the debt-to-GDP ratio in 10 years, assuming that the primary deficit stays at 4% of GDP each year; the economy grows at the normal growth rate in each year; and the real interest rate is constant, at 3%.

b. Suppose the real interest rate increases to 5%, but everything else remains as in part (a). Compute the debt-to-GDP ratio in 10 years.

c. Suppose the normal growth rate falls to 1%, and the economy grows at the normal growth rate each year. Everything else remains as in part (a). Calculate the debt-to-GDP ratio in 10 years. Compare your answer to part (b).

d. Return to the assumptions of part (a). Suppose policy makers decide that a debt-to-GDP ratio of more than 50% is dangerous. Verify that reducing the primary deficit to 1% immediately, and that maintaining this deficit for 10 years, will produce a debt-to-GDP ratio of 50% in 10 years.

4 Time Inconsistency and Monetary Policy

Assume the Philips curve is given by

$$y = y_n + b(\pi - \pi^e)$$

The central bank can control inflation directly. The loss function facing the central bank is

$$L = \frac{1}{2}[a\pi^2 + (y - y_n - m)^2]$$

with a and b being positive parameters.

a). Suppose that the central bank can fully commit to a zero inflation, i.e. $\pi = 0$. As a result, agents' expected inflation is also fixed at zero, i.e. $\pi^e = 0$. What is the value of loss function? Is this optimal?

b). Suppose now that the central bank is not credible, so it cannot make a commitment about future inflation. This implies that central bank cannot fix agents' expected inflation at 0. Suppose that the agents have rational expectations, that is, their expected inflation is exactly equal to actual inflation. What is the optimal choice of inflation in this case? What is the value of the loss function? Compare it to the one you obtained in part (a), which one is larger?

c). Consider the optimal inflation with commitment you obtained in part (a). Given that agents' inflation expectation is fixed at zero, does central bank has the incentive to deviate from this plan?

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