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**14.02 Principles of Macroeconomics**  
**Problem Set 4**  
**Fall 2005**

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Posted: Wednesday, October 26, 2005  
Due: Wednesday, November 2, 2005

Please write your name AND your TA's name on your problem set. Thanks!

**Exercise I. True/False? Explain**

- 1) The more indexed wages are, the lower is the sacrifice ratio.
- 2) In the medium run equilibrium the economy reaches its natural inflation level.
- 3) A change in inflation expectations does not have any effect in the medium run.
- 4) Inflation per se does not affect investment choices.
- 5) The Fisher Hypothesis can be interpreted as a restatement of the neutrality of money.
- 6) For the Central Bank, committing to keeping a low nominal interest rate or committing to keeping a low inflation rate is equivalent.

**Exercise II. Inflation, Activity, and Nominal Money Growth**

Assume that the economy is described by the following equations:

$$u_t - u_{t-1} = -0.5(g_{yt} - \bar{g}_y) \text{ (Okun's Law)}$$

$$P_t = P_t^e (1 + \mu)(1 - 2u_t + z) \text{ (Aggregate Supply relation)}$$

$$g_{yt} = g_{mt} - \pi_t \text{ (Aggregate Demand relation)}$$

- 1) Derive the Phillips curve  $\pi_t - \pi_t^e = -\alpha(u_t - u_n)$  from the Aggregate Supply relation.

Assume  $\mu = z = 0.04$ . What is the value for  $\alpha$ ? Calculate the natural level of unemployment  $u_n$ .

Consider the case where  $\pi_t^e = \pi_{t-1}$ . Assume  $\bar{g}_y = 0.04$  and  $g_{mt} = \bar{g}_m = 0.14$  is constant over time.

- 2) Calculate the medium run equilibrium for the economy ( $g_{yt}$  and  $\pi_t$ ).

The Central Bank decides to decrease inflation by 2 percentage points. To achieve this goal, they plan to do a monetary contraction as follows: The nominal money supply is announced to be decreased by 2 percentage points at  $t=1$ , increased by one percentage point at  $t=3$ , decreased again by one percentage point at  $t=4$ . Then it will stay constant.

Note: For the following problems, you should submit a printout of your spreadsheet and the graph.

- 3) Use a spreadsheet to describe the dynamics to the new medium run equilibrium. That is, find  $g_{mt}$ ,  $g_{yt}$ ,  $u_t$ ,  $\pi_t$ , and the sacrifice ratio for each year from  $t=1$  on until  $t=5$ . Start from the equilibrium for  $t=0$  which you calculated in part 2). Graph all the variables over time.
- 4) (Lucas Critique) Consider now the case where  $2/3$  of the wage setters take the monetary policy into account when they form their expectations and set  $\pi_t^e = \pi_t$ . The remaining  $1/3$  of wage setters keep  $\pi_t^e = \pi_{t-1}$ . Use a spreadsheet to calculate the dynamics to the new medium run equilibrium as in part 3). Compare the sacrifice ratios you obtained in the two scenarios and comment.
- 5) (Nominal rigidities, wage indexation). Imagine that each year  $2/3$  of the wage contracts are adjusted for inflation ( $\pi_t^e = \pi_t$ ) and the remaining  $1/3$  keep  $\pi_t^e = \pi_{t-1}$ . Use a spreadsheet to calculate the dynamics to the new medium run equilibrium as in part 3) and 4). Compare your results to the ones you obtained in part 4). What are the differences between the two scenarios?
- 6) Now assume that  $\pi_t^e = \pi_{t-1}$  always and for everybody. Imagine that at  $t=1$  the economy becomes more competitive forcing  $\mu$  to drop to 0.02. Assume that this changes  $u_n$  and  $\bar{g}_y$  in the same proportion. The Central Bank does not become aware of this change and keeps to its initial plan (the one described above). How does the new medium run equilibrium change? Use a spreadsheet to calculate the new dynamics from  $t=1$  on until  $t=8$ , again starting with the numbers for  $t=0$  from part 2).

### Exercise III. Financial Markets

Consider an economy where two different stocks and one bond are the only financial instruments. The bond pays \$10 each year forever starting from next year. Its price is \$40. The first stock is expected to pay a constant dividend of \$5, until  $t=4$ . The second stock is expected to pay a constant dividend of \$10, until  $t=3$ .

- 1) Assume that the nominal interest rate in the economy is constant and that the arbitrage law holds. Calculate the ex dividend prices of the two stocks.
- 2) Imagine that in the market there is one trader with more information. She is a small trader which means that her trades don't change the market price. At  $t=1$  she gets insider information that the second stock will pay a higher dividend, namely \$20.5 at  $t=3$ . At  $t=2$  the information is released to the whole market. The insider information should allow the small trader to earn extra money. If she owns \$640 at  $t=1$  and cannot borrow, how much money can she end up with at  $t=2$  if she exploits her information advantage? How much money would she have had at  $t=2$  if she didn't get the insider information?
- 3) Now assume that the scenario in part 2) never happened and that all traders share the same information. At  $t=1$  the economy is hit by a positive shock in consumer confidence. The market immediately makes the prediction that at  $t=2$  the Central Bank will intervene by increasing the nominal interest rate by 2 percentage points. How do the prices of the three financial assets change at  $t=1$ ? (Be careful: do you have enough information to calculate exact amounts? What is missing?) Use IS-LM graphs in explaining your reasoning.
- 4) Imagine that at  $t=2$  the Central Bank intervention happens to be less severe than was expected. Draw and explain three yield curves that can help you describe the evolving situation at  $t=0$ , at  $t=1$  and  $t=2$ .