Professor Christiano
311, Winter 2004

Final Exam
QUESTIONS.

DO NOT open the exam unless you're told so, you will be penalized by 10 points otherwise.

Read the following notes:

- You may not use calculators, notes, or aids of any kind.
- Note the points each question is worth and plan your time accordingly. The total number of points possible is 100, and the number of points per question is indicated in parentheses.
- The exam lasts 2 HOURS.
- Write neatly, we cannot give you credit if we cannot read your answer.
- Use the ANSWER SHEET provided for your answers.

Here are some basic economic relationships and notation that are useful for working this exam. The supply-side of the economy is summarized by the following equations:

$$\begin{aligned} \text{Price setting} &: P = (1+\mu)W \\ \text{Wage setting} &: W = P^e F(u,z) \\ \text{Unemployment-Output Link} &: u = 1 - N/L \\ \text{Production Function:} &\quad Y = N, \end{aligned}$$

where N denotes total employment. Aggregate demand is Z:

$$Z = C^d + I^d + G^d + NX^d,$$

where

$$\begin{aligned} C^d &= c_0 + c_1 (Y - T), \\ I^d &= \bar{I} - bi, \\ NX^d &= NX(\varepsilon, Y, Y^*), \\ G^d &= \overline{G}, \\ T &= \overline{T}, \\ \varepsilon &= \frac{EP^*}{P}. \end{aligned}$$

The asset markets are summarized by:

$$\begin{aligned} \text{UIP:} &\quad i = i^* + \frac{E^e - E}{E}, \\ \text{Money Demand:} &\quad M^d = P \times L(i, Y), \\ \text{Clearing in Money Market:} &\quad M^s = \bar{M}, \end{aligned}$$

where $c_0, c_1, b > 0$ and $c_1 < 1$. Also, F is a decreasing function of u, and z captures other influences on the bargaining power of workers. A superscript d means 'desired'. A '*' superscript means foreign. Finally, P^e and E^e are the expected future values of the price level, P, and the exchange rate, E, respectively. You may assume that NX is an increasing function of ε. The variables, P^* and Y^*, are exogenous.

1. (15 pts) Replace the production function in the above system with:

$$Y = aN,$$

where $a > 0$ is a measure of technology.

(a) (1 pt) With a introduced in this way, it is natural to modify the price markup equation as follows:

$$P = (1 + \mu)W/a.$$

Explain why this is a sensible way to modify the pricing equation.

(b) (1pt) When a is introduced in this way, it is natural to modify the bargaining equation as follows:

$$W = aP^e F(u, z).$$

Explain why this is so.

(c) (2 pts)Show that an increase in a has no impact on the natural rate of unemployment.

(d) (2 pts) Show what happens to the AS curve with a rise in a.

(e) (6 pts) In the provided $IS - LM$ and $AS - AD$ diagrams, label the old medium run equilibrium with a '1', the new short run equilibrium with a '2' and the new medium run equilibrium with a '3'.

(f) (3 pts) What happens to unemployment in the short and medium run equilibrium as a result of an increase in a.

2. (20pts) Suppose T falls by $\Delta T > 0$. Consider the short run and medium run effects of this shock in the AD-AS model. Assume that the production function is again $Y = N$, and that the economy starts in a medium run equilibrium.

   (a) (2pts) What happens to the natural rate of unemployment and to the natural level of output?

   (b) (2pts) In the short run, which curve shifts, AS or AD, and by how much?

   (c) (6pts) In the provided $IS - LM$ and $AS - AD$ diagrams, label the old medium run equilibrium with a '1', the new short run equilibrium with a '2' and the new medium run equilibrium with a '3'.

   (d) (5pts) Display a formula indicating the horizontal distance of the shift in the IS curve.

   (e) (5pts) Display a formula showing the magnitude of the medium run change in i in terms of ΔT. Explain how you derived the formula.

3. (30 pts) Suppose there is a temporary rise in the foreign interest rate, i^*. You may assume that the price level, P, is fixed throughout your analysis and use the open economy IS-LM model.

   (a) Assume the exchange rate is flexible.

      i. (4pts) In your analysis, you should assume that E^e does not change. Why is this a reasonable assumption?

      ii. (6pts) Explain which curve shifts and the direction of the shift. Use the diagram provided. Also indicate what happens to i and Y using the diagram.

   (b) Suppose the central bank is committed to a fixed exchange rate. In your answer, use the graphs provided.

      i. (10pts) Provide the short run implications for output, consumption, and unemployment of the rise in i^* under the fixed exchange rate policy. Indicate the initial and short run equilibria in the diagram provided, with a '1' and '2', respectively. Compare equilibrium '2' with what you found in part (a) of this question. Use this comparison to explain why a rise in i^* would bring the central bank under pressure to abandon its fixed exchange rate policy.

      ii. (10pts) Explain why a rise in the foreign interest rate, i^*, might trigger an attack on the domestic currency (you may think of an 'attack' as a rise in E^e). What does a central bank have to do to i, to defend itself against a currency attack. (Note: by *defend*, I mean preserve the targeted value of the exchange rate.) Using the same diagram used in (i) above, indicate by a '3' the equilibrium that occurs when there is a jump in i^*, an attack on the currency, and the central bank defends.

4. (35pts) Suppose that traders suddenly become less interested in holding US assets. You may assume that the price level, P, is fixed.

   (a) (2pts) Explain why this can be represented as a jump in ρ by $\Delta\rho > 0$ in a modified version of the UIP relation:
   $$i = i^* + \frac{E^e - E}{E} + \rho.$$

   (b) (5pts) Explain how the IS curve shifts with the jump in ρ. In particular, explain why the vertical distance of the shift is smaller than the jump in ρ.

   (c) (9pts) Show that i, Y and E rise in short run equilibrium. Establish your result using the open economy IS-LM diagram provided. Indicate on the axes the location of the old equilibrium values of the variables and the new equilibrium values of the variables. Also indicate the location of $i_1 + \Delta\rho$, where i_1 is the old equilibrium value of the interest rate.

   (d) Suppose that people making money demand decisions also dislike US assets. We capture this effect by supposing that ρ enters the money demand relation as follows:
   $$M^d = P \times L(i - \rho, Y).$$

      i. (2pts) Explain why this modified money demand relation captures the idea that people holding US money dislike US assets. (Hint: think of the implications of L for what happens to people's preference for money versus US assets when ρ increases.)

      ii. (3pts) Use the diagram provided to explain why it is that the LM curve rises by precisely $\Delta\rho$ when ρ jumps.

      iii. (9pts) Consider a version of the open economy IS-LM model with the modified UIP relation and the modified money demand equation. Explain why it is that in the short run after a jump in ρ, the interest rate rises and output falls. How big is the rise in the interest rate, by comparsion with the magnitude of the jump in ρ. What happens to the nominal exchange rate and to net exports? Establish your results using the diagram provided.

   (e) Newspaper commentators report being worried that foreigners will dump US assets. They are concerned that this will produce a fall in US asset prices, and that the resulting rise in the interest rate will produce a big recession in the US.

      i. (3pts) In light of the above analysis, under what conditions might the commentators be justified in their fears? (Hint: refer to your answers in (c) and (d) above.)

      ii. (2pts) Is there anything US monetary policy can do to ensure that there is no recession?