

Professor Christiano
311, Spring 2000

Final Exam

IMPORTANT: 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.
- Explain your answers carefully. Make liberal use of diagrams.
- Write neatly and label all diagrams. We cannot give you credit if we cannot read your answer.
- Write your name and TA section on this exam and use the space 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 in the short and medium run is summarized by the following equations:

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

Aggregate demand is Z :

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

where

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

The asset markets are summarized by:

$$\begin{aligned} i & = i^* + \frac{E^e - E}{E}, \\ M^d & = P \times Y \times L(i), \\ L(i) & = \bar{L} - L_1 i, \\ M^s & = \bar{M}, \end{aligned}$$

where $c_0, c_1, b, L_1 > 0$ 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’. No superscript on a variable means actual. 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.

1. (10) Suppose you observe unemployment rising and output falling as the economy falls into a recession. Suppose that the interest rate and price level are falling too. What shocks could account for this? (I can think of at least four.) Explain carefully, using graphs. What additional data would you need to determine which of the possible shocks is the one that is responsible for the recession? Explain. For this question, you can ignore the foreign sector (i.e., $NX = 0$).

2. (10) Explain why it is that if the central bank adopts a policy of fixing the exchange rate, then it must set the domestic rate of interest equal to the foreign interest rate. In terms of the variable it controls directly, what must the central bank do to make this happen?

3. (35) Suppose there is a temporary drop in foreign income, Y^* . That is, it falls in the short run, and is back to its old value in the medium run. You may assume that the price level, P , is fixed throughout your analysis.
- (a) What actions could a central bank take to insulate output and unemployment from the effects of this shock? Illustrate your argument clearly using graphs. Explain what happens, over time, to the exchange rate, the interest rate, the money stock, consumption and investment.
 - (b) Consider a central bank that is committed to following a fixed exchange rate policy. Explain why a drop in Y^* would bring the bank under pressure to abandon its fixed exchange rate policy. Here, you should give the short and medium run implications for output, consumption, unemployment of the fall in Y^* under the fixed exchange rate policy, and compare it to what you found in part (a) of this question.
 - (c) Consider again a central bank that has committed itself to a fixed exchange rate. Explain why a fall in foreign income, Y^* , might trigger an attack on the domestic currency. Explain what a central bank has to do, to defend itself against a currency attack. (Note: by *defend*, I mean preserve the targeted value of the exchange rate.) What is the impact on domestic output, consumption and investment of a defense against a currency attack?
 - (d) Is it possible that a currency attack after a fall in Y^* might cause a central bank to devalue its exchange rate, even in the absence of the attack it would not devalue? (Note: by *devalue*, I mean change the targeted value of E to a higher value.)

(here is an extra blank page for your answer)

4. (35) Suppose that the technology of a particular country is defined by the following equation:

$$Y = AK^\alpha L^{1-\alpha},$$

where $0 < \alpha < 1$ and $A > 0$. Suppose, too, that consumption is determined by $C = (1 - s)Y$, where s is a constant and Y is income. Also, suppose that the stock of capital evolves according to:

$$\Delta K = (1 - \delta)K + I,$$

where I denotes investment, Δ means ‘the change in’, and δ denotes the rate of depreciation on capital, $0 < \delta < 1$. Finally, suppose that population, L , is a constant. Let per capita output, capital and investment be denoted by $y = Y/L$, $k = K/L$, $i = I/L$. This model applies over a time frame longer than the short and medium run of business cycle analysis.

- (a) Explain why $i = sy$. Write the production function relating per capita output to the per capita stock of capital. Explain why $\Delta k = (1 - \delta)k + i$.
- (b) Show, in a graph, how the long-run equilibrium stock of capital is determined. Explain why k eventually converges to that value, regardless of whether it initially starts above or below that point. (Assume A is constant.)
- (c) Derive and justify formulas for the wage rate and rental rate of capital.
- (d) Suppose a war results in a fall in *both* capital and labor. Suppose the capital stock drops by 20% and the population drops by 30%. Explain what happens over time to the wage rate, the rental rate on capital, output and the stock of capital. (Assume A is constant.)

(here is an extra blank page for your answer)

5. (10) Consider again the model in the previous question. Suppose you observe two countries, each having the same rate of growth in per capita output over an extended period. Suppose total factor productivity growth for one country is positive, but for the other country it is zero. Which country do you think has the better long-run growth prospects? Explain carefully. (Hint: total factor productivity growth is computed as follows. Let $A_t = Y_t / [K_t^\alpha L_t^{1-\alpha}]$, for each year, t . Total factor productivity growth is the average growth rate of A_t , that is, the average value of $(A_t - A_{t-1}) / A_{t-1}$.)