

Intermediate Macroeconomics  
Econ 121  
Midterm II  
Solutions

**Short Answer. Each numbered question is worth 5 points.**

1) In the Long Run, if the growth rate of the money supply over time is 5%, what is the growth rate of the price level and of output?

$$\text{LR: } \hat{P} = 5\% \quad \hat{Y} = 0$$

2) In the Short Run, if the growth rate of the money supply over time is 5%, what is the growth rate of the price level and of output?

$$\text{SR: } \hat{P} = 0 \quad \hat{Y} = 5\%$$

3) How are the domestic price level, foreign price level, the nominal exchange rate, and the real exchange rate related, mathematically? In addition, define your exchange rates.

If the exchange rate is written in terms of Foreign Currency to one unit of Domestic Currency, then  $e \left( \frac{P^{\text{Domestic}}}{P^{\text{Foreign}}} \right) = \varepsilon$ , where  $P$  is the price level,  $e$  is the nominal exchange rate, and  $\varepsilon$  is the real exchange rate.

4) If the rate of inflation in the foreign country exceeds the rate of inflation in the domestic country by 5% (holding all else constant), what will happen to the nominal exchange rate and the real exchange rate?

$$\hat{e} + \pi^{\text{Domestic}} - \pi^{\text{Foreign}} = \hat{\varepsilon}$$

$$\hat{e} + \pi^{\text{Domestic}} - \pi^{\text{Foreign}} = 0$$

$$\hat{e} = \pi^{\text{Foreign}} - \pi^{\text{Domestic}}$$

$$\hat{e} = 5\%$$

5) List 2 exogenous events that will lead to both a higher equilibrium level of output in the Keynesian Cross as well as a rightward shift in the IS curve.

Examples are increases in autonomous consumption, increases in investment demand, increases in government spending, decreases in taxes, and so on...

6) List 2 exogenous events that will lead to both a lower prevailing interest rate in the Money Market as well as a downward shift in the LM curve.

Examples are increases in nominal money supply, decreases in price levels, and decreases in money demand.

7) Given your usual assumptions regarding consumption, investment, and government spending, qualitatively show what will happen to the equilibrium level of  $Y$  in the Keynesian Cross when the  $MPC$  increases.

The slope of the expenditure line rises (gets steeper) and so the new intersection of the expenditure function with the 45 degree line is at a higher corresponding level of output, hold all other variables constant.

8) If the rate of job finding increases, what will happen to the steady state level of unemployment in the economy. You must provide a diagram.

I'm too lazy to draw a diagram on the computer...but basically, the upward sloping curve labeled  $fU$  becomes steeper. As a result, the new steady state level of unemployment is lower than before.

9) What is the singular assumption leading to differences in savings and investment in the case of a small open economy? **Briefly** explain your logic.

A fixed world interest rate! Previously, we assumed that the interest rate adjusts to equilibrate the market for savings and investment in a closed economy. However, in an open economy, the level of investment is dependent on the world interest rate whereas, the level of savings is not. Therefore, differences in savings and investment may arise...essentially, capital may flow in to or out of the country.

10)

**I. (25 total points weighted as below)** Consider an economy generalized by the following equations:

$$C = a + c(Y - t)$$

$$I = q$$

$$G = g$$

Where  $Y$  denotes output,  $C$  denotes consumption,  $I$  denotes investment, and  $G$  denotes government spending. All other lower case variables ( $a, c, t, q, g$ ) represent numbers.

- i) **(3pts)** Provide the relevant Expenditure function and determine the equilibrium level of output in this economy.

$$Y = C + I + G$$

$$Y = a + c(Y - t) + q + g$$

$$(1 - c)Y = a + q + g - ct$$

$$Y_{eq} = \frac{a + q + g - ct}{1 - c}$$

- ii) (3pts) Suppose (*for this part only*) that government spending were to increase such that  $G = g + x$ . Determine the change in the new equilibrium level of output.

$$\Delta G = x$$

$$\Delta Y_{eq} = \frac{x}{1 - c}$$

- iii) (4pts) Suppose now that investment is instead given as:

$$I = q - pr$$

where  $p$  is some constant and  $r$  denotes the interest rate. Derive the IS curve where  $r$  is a function of  $Y$ .

$$Y = C + I(r) + G$$

$$Y = a + c(Y - t) + q - pr + g$$

$$pr = a + q + g - ct + (c - 1)Y$$

$$r = \frac{a + q + g - ct}{p} + \left(\frac{c - 1}{p}\right)Y$$

- iv) (3pts) What is the slope of the IS curve derived in the previous part (iii)?

$$\frac{c - 1}{p}$$

Consider the same economy further generalized by the following equations:

$$M_d = Y - \frac{r}{d}$$

$$M_s = m$$

where  $d$  and  $m$  are constants.

- v) (4pts) Derive the LM curve for this economy.

$$M_d = M_s$$

$$Y - \frac{r}{d} = m$$

$$r = dY - dm$$

- vi) **(4pts)** Combining your answer from part (iii), determine the level of output in the economy where both the goods market and money market are in equilibrium

$$\frac{a + q + g - ct}{p} + \left( \frac{c-1}{p} \right) Y = dY - dm$$

$$\frac{a + q + g - ct}{p} + dm = dY - \left( \frac{c-1}{p} \right) Y$$

$$\frac{a + q + g - ct + dmp}{p} = \left( \frac{1-c+dp}{p} \right) Y$$

$$\frac{a + q + g - ct + dmp}{1-c+dp} = Y^*$$

- vii) **(4pts)** What will be the corresponding equilibrium interest rate?

$$r^* = d \left( \frac{a + q + g - ct + dmp}{1-c+dp} \right) - dm$$

**II. (15 total points, evenly distributed)** The economy is comprised of two sectors, Sector 1 and Sector 2. Production functions are as follows:

$$Y_1 = A_1 L_1^\beta$$

$$Y_2 = A_2 L_2^\beta$$

where  $Y$  is output,  $A$  is a simple productivity parameter, and  $\beta$  is equal to one-half. The subscripts denote the appropriate sector.

- i) If workers are paid their marginal products of labor, show that when productivity is equal in both sectors, the labor force will be distributed evenly between the sectors.

$$\begin{aligned}
MPL_i &= \beta A_i L_i^{(\beta-1)} \\
MPL_1 &= MPL_2 \\
\beta A_1 L_1^{(\beta-1)} &= \beta A_2 L_2^{(\beta-1)} \\
\left(\frac{A_1}{A_2}\right)^2 &= \frac{L_1}{L_2} \\
\text{so if } A_1 &= A_2, \\
\left(\frac{A}{A}\right)^2 &= (1)^2 = 1 = \frac{L_1}{L_2} \\
\therefore L_1 &= L_2
\end{aligned}$$

- ii) If workers are paid their marginal products of labor, determine how labor will be distributed among the two sectors when productivity in Sector 1 is twice that of productivity in Sector 2. Provide a diagram in addition to a numerical value.

$$\begin{aligned}
\left(\frac{A_1}{A_2}\right)^2 &= \frac{L_1}{L_2} \\
\left(\frac{2A_2}{A_2}\right)^2 &= 2^2 = 4 = \frac{L_1}{L_2} \\
\therefore 4L_2 &= L_1
\end{aligned}$$

- iii) Assume the same as in part (ii) except that productivity in Sector 1 is four times that of productivity in Sector 2. What will be new allocation of labor between the two sectors?

$$\begin{aligned}
\left(\frac{A_1}{A_2}\right)^2 &= \frac{L_1}{L_2} \\
\left(\frac{4A_2}{A_2}\right)^2 &= 4^2 = 16 = \frac{L_1}{L_2} \\
\therefore 16L_2 &= L_1
\end{aligned}$$

**III. (10 total points weighted as below)** For the following questions, answer using graphs and show the qualitative changes in the appropriate variables. The format is:

*Event*

*i) Time Period; Model; Variables to Consider*

**(3 pts)** Government Spending Decreases:

i) Short Run; Keynesian Cross;  $Y$

$Y$  falls as Expenditure shifts down parallel

ii) Short Run; IS-LM;  $r$

$r$  falls as the IS curve shifts to the left

iii) Short Run; AD; *AD curve*

The AD curve shifts left because the eq output level has fallen in the ISLM

**(5 pts)** Fed Increases the Nominal Money Supply

i) Short Run; Money Market;  $r$

Money Supply shifts out and lowers  $r$

ii) Short Run; IS-LM;  $Y$

LM shifts down and  $Y$  increases

iii) Short Run; AD; *AD curve*

The AD curve shifts right because the eq output level has risen in the ISLM

iv) Long Run; Quantity Theory;  $P$

In the LR, prices move, one-to-one with money supply, so  $P$  rises

v) Long Run; Fisher;  $i$

In the LR, nominal interest moves, one-to-one with inflation, so  $i$  rises

**(2 pts)** Price Levels Rise

i) Short Run; Money Market;  $r$

Real Money Supply falls and so  $r$  rises

ii) Short Run; IS-LM;  $Y$

LM shifts up and so the level of  $Y$  falls