

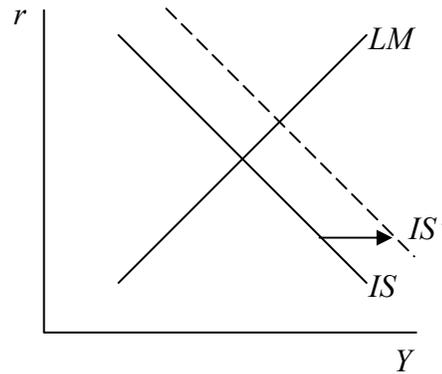
Midterm Exam No. 2 - Answers
April 1, 2004

Answer all questions, on these sheets in the spaces provided (use the blank space on page 8 if you need more). In questions where it is appropriate, **show your work**, if you want a chance of partial credit for an incorrect answer. Point values for the questions are shown; there are a total of 62 points possible.

1. (15 points) For each of the following, draw into the diagram provided how the curve or curves should shift in the IS-LM model of a closed economy with fixed prices, and explain in a sentence or two the reason(s) for the shift(s).

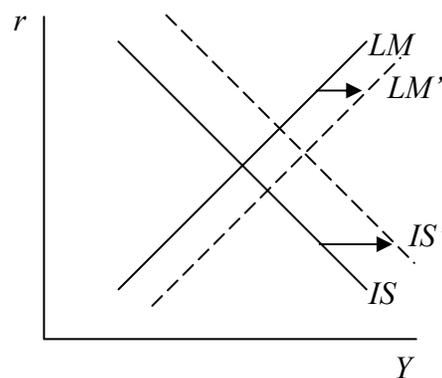
- a. An increase in government purchases financed by borrowing.

Ans: Government purchases are themselves part of aggregate demand, so the increase shifts IS to the right. (That is, for given r the rise in G raises equilibrium Y , not only to meet the increase in G itself but also to meet the increased consumption that occurs as income rises, through the multiplier process.)



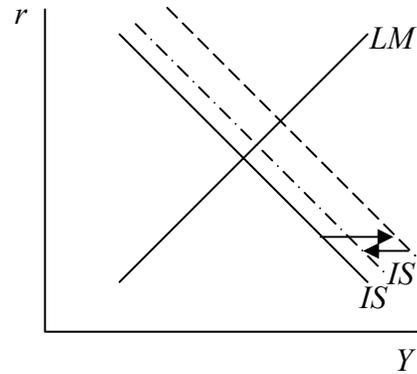
- b. An increase in government purchases financed by printing money.

Ans: ΔG shifts IS right as in part (a). In addition, the rise in money supply shifts LM to the right (or down) as demand for money must be increased by a fall in r or a rise in Y .



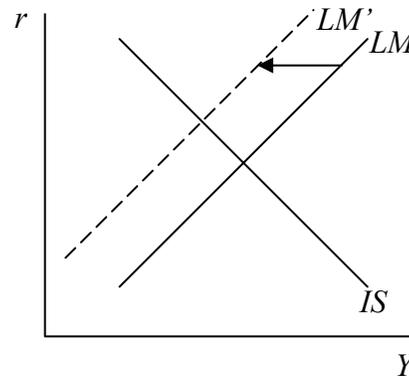
- c. An increase in government purchases financed by increasing taxes by the same amount.

Ans: ΔG shifts IS right as in part (a). ΔT shifts IS left, but by a smaller amount, since the tax multiplier is smaller than the multiplier for government purchases. So it ends up to the right of the initial IS curve.



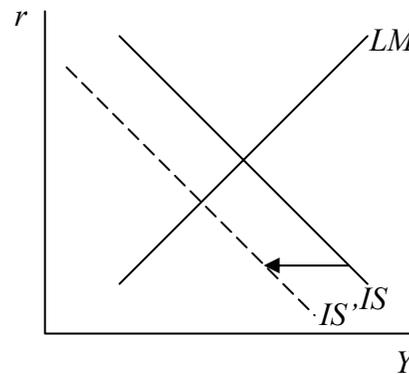
- d. An increase in the reserve requirement of commercial banks.

Ans: For an unchanged level of reserves, this reduces the amount of deposits that commercial banks can have, thus reducing the money supply. Money market equilibrium requires that demand for money fall, through a rise in r and/or a fall in Y .



- e. Consumers, becoming fearful that the government will not provide for them in their retirement, decide to save more out of their disposable incomes.

Ans: Saving more means that they consume less, and consumption is part of aggregate demand, so IS shifts left.



2. (12 points) Suppose that investment, in addition to depending on the interest rate as we normally assume, also depends positively on a government policy, D , that is designed to encourage investment. (I call it D since I'm thinking of it as a "depreciation allowance," but you need not worry about that, nor about any implications it might have for the government budget, which you should assume is unaffected.) Thus $I=I(r,D)$, where $I_D>0$. Using whatever analytical tools you prefer (graphs and/or equations), use the IS-LM model of a closed economy with fixed prices to analyze the effect of an **increase in D** on the following variables (being sure to justify your answers):
- Real GDP
 - The interest rate
 - The level of investment
 - The level of consumption
 - The level of national savings
 - The demand for money

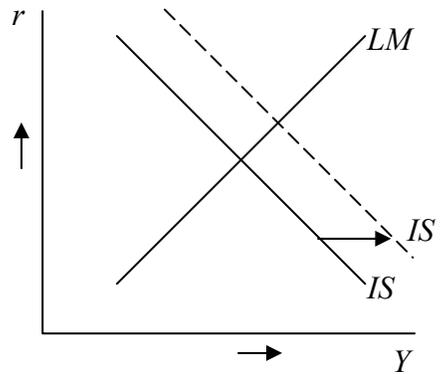
Ans: Using the graph:

*The increase in D increases the level of investment for any r , since I is part of aggregate demand. This shifts the IS curve to the right, leading to a new equilibrium at **higher Y** and **higher r** , as shown.*

The effect on I at first appears to be ambiguous, since the rise in D increases I , while the rise in r decreases it. But I'll come back to it after I've analyzed savings, since I know that in equilibrium savings equals investment ($Y-C-G=I$).

*Consumption and private savings both depend positively on Y , since the marginal propensity to consume is positive but less than one, so **consumption rises** and private savings also rises. Since we haven't changed government purchases or taxes, government savings is unchanged. (Or it would rise if we had assumed an income tax.) So **national savings rises**. We therefore now know that **investment rises**.*

*Finally, the demand for money must equal the money supply in equilibrium. Since the money supply has not changed, therefore **demand for money is unchanged**.*



Ans: Using equations:

$$Y = C(Y - \bar{T}) + I(r, D) + \bar{G}$$

$$\bar{M} / \bar{P} = L(r, Y)$$

Differentiating:

$$dY = C'dY + I_r dr + I_D dD$$

$$0 = L_r dr + L_Y dY$$

Substituting:

$$dY = C'dY + I_r (-L_Y / L_r) dY + I_D dD$$

Solving:

$$dY = \frac{I_D}{1 - C' + (I_r L_Y / L_r)} dD > 0$$

$$dr = \frac{-I_D L_Y / L_r}{1 - C' + (I_r L_Y / L_r)} dD > 0$$

$$dI = I_r dr + I_D dD = I_D \left[1 - \frac{I_r L_Y / L_r}{1 - C' + (I_r L_Y / L_r)} \right] dD = I_D \left[\frac{1 - C'}{1 - C' + (I_r L_Y / L_r)} \right] dD > 0$$

$$dC = C'dY = \frac{C'I_D}{1 - C' + (I_r L_Y / L_r)} dD > 0$$

$$dS = d(Y - C - \bar{G}) = (1 - C')dY = \frac{(1 - C')I_D}{1 - C' + (I_r L_Y / L_r)} dD > 0$$

$$dL = L_r \frac{-I_D L_Y / L_r}{1 - C' + (I_r L_Y / L_r)} dD + L_Y \frac{I_D}{1 - C' + (I_r L_Y / L_r)} dD = \frac{I_D L_Y - I_D L_Y}{1 - C' + (I_r L_Y / L_r)} = 0$$

3. (15 points) Suppose that the central bank increases the money supply by 10%. Derive and compare the effects of this policy on
- i. real GDP,
 - ii. real domestic investment, and
 - iii. the nominal exchange rate
- in the following contexts:
- a. A closed economy in the short run (for which you can ignore the exchange rate).
 - b. A small open economy with a floating exchange rate in the short run.
 - c. A small open economy with a floating exchange rate in the long run (by which I mean the models of Mankiw’s chapters 4 “Money and Inflation” and 5 “The Open Economy”).

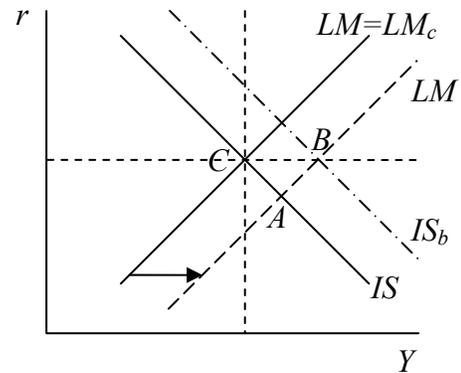
Note: The instruction “and compare” means that for each of the variables (i), (ii), and (iii) you should indicate how its change differs across these three contexts.

Ans: *The expansion of the money supply shifts the LM curve to the right, to LM', causing a rise in Y and fall in r in a closed economy in the short run (the IS-LM model). The fall in r increases domestic investment.*

If the economy is small and open, however, any fall in the interest rate would cause a capital outflow, reducing demand for the country’s currency on the foreign exchange market and forcing it to depreciate. The short-run equilibrium therefore has enough of a depreciation of the nominal exchange rate, and resulting increased aggregate demand through net exports, to push the IS curve out to IS_b, where it intersects LM' at the initial interest rate, thus causing a larger increase in Y and eliminating the change in domestic investment.

In the long run, on the other hand, Y must return to its initial level through a rise in the price level, and indeed the quantity theory of money tells us that the price level rises by the same 10% that the money stock increased, thus returning the real money supply (and the LM curve) to its initial level. The interest rate is determined in the loanable funds market, where both supply and demand are unaffected by this purely nominal event. So the interest rate and investment are both unchanged. The real exchange rate is also unchanged, but since the price level has risen, the nominal exchange rate must depreciate. We know the size of this depreciation (10%), but we don’t know how large a depreciation was needed in the short run (part b) to push the IS curve out to IS_b. So we don’t know which depreciation is larger.

To summarize these results, letting subscripts “a” be the closed economy in the short run, “b” the open economy in the short run, and “c” the long run, we have $\Delta Y_b > \Delta Y_a > \Delta Y_c = 0$, $\Delta I_a > \Delta I_b = \Delta I_c = 0$, and for the nominal exchange rate, e , $\Delta e_b < 0$, $\Delta e_c < 0$, and $\Delta e_b > , = , \text{ or } < \Delta e_c$.



4. (6 points) Explain any **two** of the mechanisms that lead to a positive relationship between the aggregate price level and aggregate real output in the short run.

Ans: Any two of the following:

Sticky wage: *If the nominal wage is set before prices are known, then a rise in the actual price level will reduce the real wage, causing firms to demand more labor and produce more output.*

Incomplete Information: *If producers know their own price but not all other prices in the economy, then they do not know, when they observe an increase in their own price, whether it is an increase relative to other prices or not. An increase in the aggregate price level is therefore regarded by each producer as being, with some probability, an increase in each of their own prices alone, and they respond to that perceived possibility of an increase in their relative price by increasing output.*

Sticky price: *Suppose some firms set prices in advance, while others have market power and set prices in response to market conditions. A rise in aggregate output increases demand for all firms, and the firms that are able to set prices respond by increasing their prices relative to the expected price that is charge by the other firms. This increases the aggregate price level.*

5. (6 points) An economy starts in a long-run equilibrium with all real and nominal variables remaining constant over time. The central bank then begins to increase the money supply at a constant rate of 5% each year. Describe in words how you would expect the rates of inflation and unemployment to respond to this change in policy – first in the short run and then over time – under each of the following two assumptions about how expectations are formed?

a. Adaptive expectations (expecting in the future what has just been observed in the past.

Ans: Because the public will at first continue to expect stable prices, prices will rise relative to expectations, causing an increase in output and reduction in unemployment in the short run. Over time, expectations will be revised upward and the public will gradually come to expect the 5% inflation that actually occurs. No longer surprised by the higher prices, output and unemployment will revert to their initial long-run levels, while prices will continue to rise at 5% a year indefinitely.

b. Rational expectations (here assuming that the change in monetary policy is announced and credible.)

Ans: Here people correctly anticipate the price increases that will occur, and therefore they are not induced to increase output or reduce unemployment. Both variables remain at their previous long-run levels even in the short run, and the economy simply switches immediately to the new long-run equilibrium in which prices are rising at 5% a year.

6. (8 points) The lists below show, on the left, things that may or may not have been reported in the assigned Wall Street Journal articles during the last few weeks. On the right is a list of reasons, some of which were reported as at least partially explaining some of the happenings on the left. Identify (by circling the "T") those items on the left that are true. Then, for those only, write in the blank next to it the letter labeling the (single) associated reason on the right. (You will not use all of the reasons.)

What Happened?		Why?
<p><u>T</u> 1. OPEC considered increasing output of oil.</p>	<u>h</u>	a. Company-paid health plans are not subject to taxation.
<p>T 2. John Kerry said that, if elected, he would print more money.</p>	___	b. The purpose was to prevent deflation.
<p>T 3. The Fed raised its target for the federal funds rate.</p>	___	c. The natural rate of unemployment increased.
<p><u>T</u> 4. U.S. tax collections are below expectations.</p>	<u>a</u>	d. They were discouraged by the slow growth of employment.
<p><u>T</u> 5. U.S. exports fell from December to January.</p>	<u>f</u>	e. The U.S. budget deficit is at a record level.
<p>T 6. The U.S. imported more barrels of oil in January than before.</p>	___	f. A case of mad cow disease had been found in the U.S.
<p><u>T</u> 7. The "Core CPI" rose by less than the CPI.</p>	<u>k</u>	g. The winter was unusually cold.
<p>T 8. More workers aged 55 and over are leaving the labor force.</p>	___	h. They had been hurt by depreciation of the dollar.
		i. The purpose was to stimulate the economy.
		j. Prices of essential inputs fell.
		k. Prices of food and energy rose by more than other goods.

This extra page is to use in case you run out of room on one of the questions. Label clearly which question(s) you are writing about here.