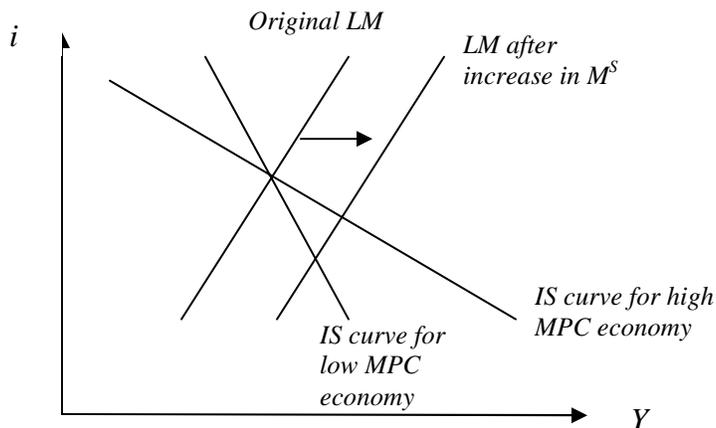**14.02 Quiz 1 Solutions**
Fall 2004

Multiple-Choice Questions (30/100 points)

Please, circle the correct answer for each of the following 10 multiple-choice questions. For each question, only one of the answers is correct. Each question counts 3/100 points.

1) Consider two economies that are identical, with the exception that one has a high marginal propensity to consume (MPC) and one has a low MPC. If the money supply is increased by the same amount in each economy, the high MPC economy will experience

    A) **A larger increase in output and a smaller decrease in the interest rate.**
    B) A smaller increase in output and a smaller decrease in the interest rate.
    C) A larger increase in output and a larger decrease in the interest rate.
    D) A smaller increase in output and a larger decrease in the interest rate.
    E) None of the above.

Answer: A). There is a flatter IS curve in the high MPC economy.

2) Which of the following policy options would simultaneously increase interest rates and decrease output?

    A) **The Federal Reserve Board sells bonds through open market operations.**
    B) The federal government increases its defense purchases.
    C) The Federal Reserve Board expands the money supply.
    D) The federal government increases the tax rate.
    E) Actions described in both A) and D).

Answer A). Selling bonds reduces the money supply in the economy. The lower money supply results in a higher interest rate and lower output level (i.e., an upward shift in the

LM curve); investment unambiguously declines. Option C always increases investment, while options B and D have uncertain implications for investment.

3) Suppose an economy is running a government budget deficit. Assume that $C = c_0 + c_1(Y-T)$. Which one of the following will cause this deficit to become larger?

    A) Expansionary monetary policy.
    B) An increase in exports.
    C) A decrease in equilibrium GDP.
    D) A decrease in taxes.
    E) A decrease in government purchases.

*Answer: **D**). A government budget deficit means that T-G<0. Therefore, lower taxes will imply lower revenues for the government and a higher government budget deficit.*

4) If the interest rate is higher in the US than in the UK, then

    A) The dollar is expected to appreciate with respect to the pound.
    B) The pound is expected to appreciate with respect to the dollar.
    C) The interest rate in the US is expected to increase.
    D) The interest rate in the US is expected to decrease.
    E) Uncertain.

*Answer: **B**). Uncovered interest rate parity implies that:*

$$(1+i^{US}) = (1+i^{UK})\frac{E_{t+1}^e}{E_t} \Leftrightarrow \frac{(1+i^{US})}{(1+i^{UK})} = \frac{E_{t+1}^e}{E_t}. \text{ So if } (1+i^{US}) > (1+i^{UK}), \text{ then } \frac{E_{t+1}^e}{E_t} \text{ has to be}$$

greater than 1. So, we expect the dollar to depreciate, or the pound to appreciate with respect to the dollar.

5) Consider a small economy where the total population is 10,000. The size of the labor force is 8,000, while the number of people employed is 7,000. What is the unemployment rate in this economy?

    A) 10%
    B) 12.5%
    C) 20%
    D) 30%
    E) 37.5%

*Answer: **B**). Given the labor force of 8,000 people, 1000 people are unemployed. Thus the unemployment rate is (1,000/8,000)*100 = 12.5%. The number of people in the entire population is irrelevant for this question.*

6) Assume that $C = c_0 + c_1(Y-T)$. Suppose that taxes increase and money supply increases in such a way that output is constant in equilibrium (assume $c_1<1$). These policy changes will produce

    A) An increase in investment and a decrease in private consumption.
    B) An increase in investment and a decrease in government spending.
    C) An increase in investment and an increase in private saving.
    D) A decrease in investment and an increase in public saving.
    E) Uncertain.

*Answer: **A**). In equilibrium, Y is constant and i decreases (IS moves to the left and LM shifts down). Recall that investment, given by I(i,Y), depends negatively on the interest rate. So, as the interest rate decreases, <u>investment increases</u>. Also, we know that: $C=c_0+ c_1(Y-T)$, and private saving is given by $Y-T-C = (1- c_1)(Y-T)- c_0$. Therefore, because T increases, <u>private consumption and private saving both decrease</u>. (G is constant, T-G increases.) So, B) is incorrect because government spending is constant; C) is incorrect because private saving decreases; and D) is incorrect because investment increases and public saving decreases.*

7) In 2000, the nominal GDP growth of a country was 8% and the real GDP growth was 4%. What was the rate of inflation for this country?

    A) - 4%
    B) 2%
    C) 4%
    D) 8%
    E) 12%

*Answer: **C**). Nominal GDP growth = real GDP growth + inflation. Thus, inflation = 8% - 4% = 4%.*

8) Suppose the United States has no exports. The only imports of the US are 200 Mercedes Benz cars worth US$50,000 each from Germany. Germany has no imports and only exports those 200 cars to the US. Neither the US nor Germany trade with any other countries or engage in any transactions with other countries. Which one of the following statements must be true?

    A) The US has a capital account deficit.
    B) Germany has a current account deficit.
    C) Germans are buying US assets.
    D) The exchange rate of US Dollars per Euros (the currency in Germany) is bigger than 1.
    E) None of the above.

*Answer: **C**). The US has a current account deficit. In order to finance the current account deficit, they need to have a capital account surplus. Since the US doesn't engage in any*

financial transactions with other countries, having a capital account surplus implies that Germans are buying US assets. In fact, if there is no statistical discrepancy, Germany needs to buy $100 million more in US assets than the US is buying in German assets. These $100 million are like a loan from Germany to the US, and the US uses this money to buy the Mercedes Benzes.

9) Suppose that investment (I) in the goods market is not responsive to the interest rate (that is, I does not depend on the interest rate at all). Then

       A) The IS curve is a vertical line and monetary policy is very effective in raising output.

       B) The IS curve is a horizontal line and monetary policy is very effective in raising output.

       C) The IS curve is a vertical line and monetary policy does not affect output in the IS-LM model.

       D) The IS curve is a horizontal line and monetary policy does not affect output in the IS-LM model.

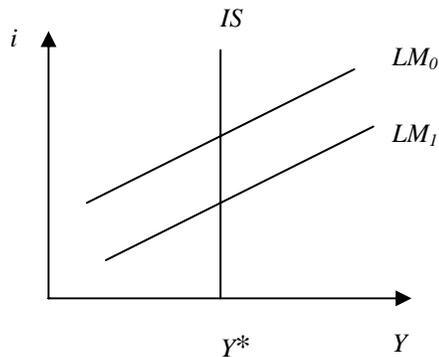   E) The IS curve still has a negative slope, but monetary policy monetary policy does not affect output in the IS-LM model.

*Answer: **C**). If we assume that $C = c_0 + c_1 (Y\text{-}T)$ and $I = b_0 + b_1 Y - b_2 i$, then aggregate demand is given by $Z = c_0 + c_1(Y\text{-}T) + b_0 + b_1 Y - b_2 i + G$. In equilibrium $Z = Y$. Solving for Y in equilibrium, we get*

$$Y = \frac{1}{1 - c_1 - b_1}\left[c_0 - c_1 T + b_0 - b_2 i + G\right]$$

Solving this for i so that we can see the equation for the IS curve in the (i,Y) space, we get

$$i = \frac{1}{b_2}\left[c_0 - c_1 T + b_0 + G\right] - \frac{1 - c_1 - b_1}{b_2}Y$$

Now, the assumption that investment is not responsive to the interest rate is equivalent to saying that $b_2 = 0$. You can see that this implies that the slope of the IS curve is infinite and that the intercept is also infinite. Thus, the IS curve is a vertical line. Monetary policy leads to shifts in the LM curve, however, these shifts do not change output at all since the equilibrium point always remains on the vertical IS curve.

10) An increase in the money supply and a drop in consumer confidence will lead to

    A) A decrease in output with an ambiguous effect on the interest rate.
    B) An increase in output and a decrease in the interest rate.
    C) A decrease in output and an increase in the interest rate.
    D) An ambiguous effect on output and an increase in the interest rate.
    E) An ambiguous effect on output and a decrease in the interest rate.

*Answer: **E**). A drop in consumer confidence implies a decrease in c_0 (and therefore, a drop in C.) The IS curve will shift left and the LM curve will shift down.*
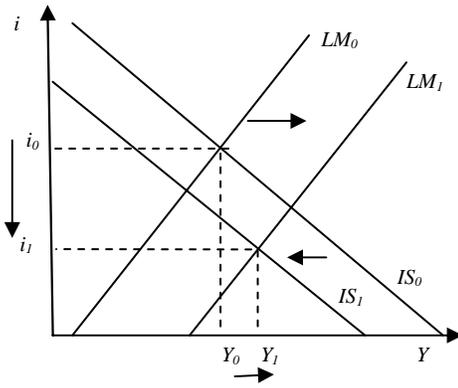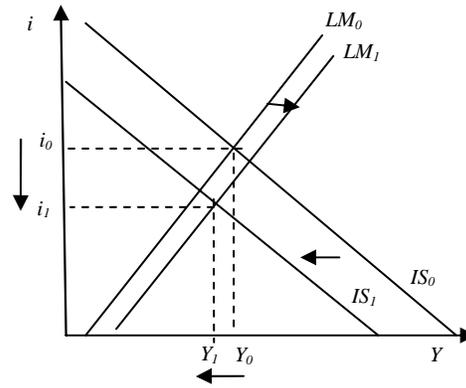
Fig. 1

Fig. 2

For a relatively large shift out of the LM curve, output can increase (as shown in Figure 1). For a relatively small shift out of the LM curve, given the same shift in the IS curve, output can decrease (as shown in Figure 2).

Free Response Question I (50/100 points)

The Republic of Keynesia is a closed economy and obeys our short-run IS-LM model. Assume it starts out in equilibrium in both the goods market and the money market. Keynesia's economy is described by the following set of equations:

Goods market:
- $C = c_0 + c_1(1-t)Y$, where C is consumption; Y is income; t represents a proportional tax; and c_0 and c_1 are positive constants
- $I = b_0 - b_1 i$, where I is investment; i is the interest rate; and b_0 and b_1 are positive constants
- $G = \overline{G}$, where $\overline{G}$ is a positive constant

Money market:
- $M^d = P(m_0 + m_1 Y - m_2 i)$, where M^d is money demand; P is the price level; m_0 (a positive constant) represents exogenous changes to M^d; and m_1 and m_2 are also positive constants
- Let M^s represent money supply

1. Combine the goods market equations to derive an expression for Y as a function of i (i.e. derive the IS curve). Give the definition of the IS relation. (7 points)

Answer: $Y = C + I + G$

$Y = c_0 + c_1(1-t)Y + b_0 - b_1 i + \overline{G}$

$(1 - c_1(1-t))Y = c_0 + b_0 - b_1 i + \overline{G}$

$$Y = \frac{c_0 + b_0 + \overline{G}}{1 - c_1(1-t)} - \frac{b_1}{1 - c_1(1-t)} i$$

Definition of the IS curve: the IS curve gives all the combinations of Y and i that cause the market for goods and services to clear (i.e. to be in equilibrium).

2. Use the money market equations to express i as a function of Y (i.e. derive the LM curve). Give intuition for why the LM curve slopes upward/downward. (7 points)

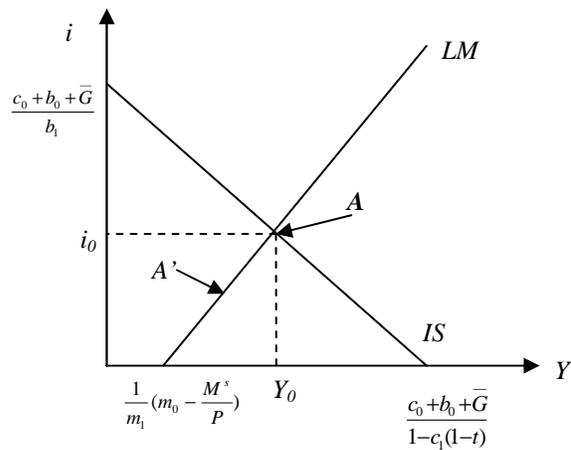*Answer:* $M^s = M^d$
$M^s/P = m_0 + m_1 Y - m_2 i$

$$i = \frac{1}{m_2}\left(m_0 - \frac{M^s}{P}\right) + \frac{m_1}{m_2} Y$$

The LM curve is upward-sloping ($\frac{\partial i}{\partial Y} = \frac{m_1}{m_2} > 0$).

Intuitively, given the level of the money supply, if income (Y) is high, then demand for money will be high (because when output increases, there are more transactions in the economy). For money demand to equal money supply, therefore, interest rates also need to be high in order to reduce money demand. (Recall that when interest rates are high, people don't want to hold much money.) The opposite is true when income is low: for a given level of money supply, demand for money is low. So, in order to equilibrate money demand and money supply, interest rates have to be low to increase money demand.

3. Graph the IS and the LM curves on the same diagram, putting i on the vertical axis and labeling the curves. Label the equilibrium interest rate and output, i_0 and Y_0, respectively. (7 points)
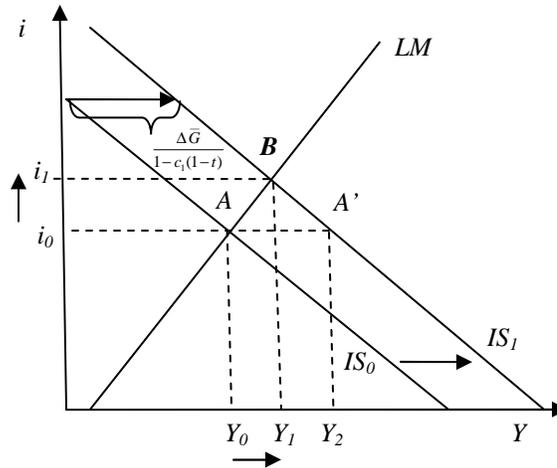
Answer:

Note that the equilibrium is at point A. Suppose we are at a point like A' which is on the LM curve. Even though the money market is in equilibrium, the goods market is not, since we are off the IS curve. At this low interest rate, Y is too low to clear the goods market, so firms increase production and Y rises. As Y increases, i must rise as well in order to maintain money market equilibrium. So, the economy moves toward the intersection point, A.

4. Suppose the government increases its spending by $\Delta \bar{G}$. Which curve will shift, if any? Calculate by how much it will shift and draw a diagram that shows the impact of this policy. (9 points)

Answer: *The IS curve will shift to the right.*
                   Note that the multiplier in this case is $1/(1 - c_1(1-t))$. It tells us that a unit increase in government spending will increase output by $1/(1 - c_1(1-t))$, holding interest rate constant. Thus, in our case, the IS curve will shift out

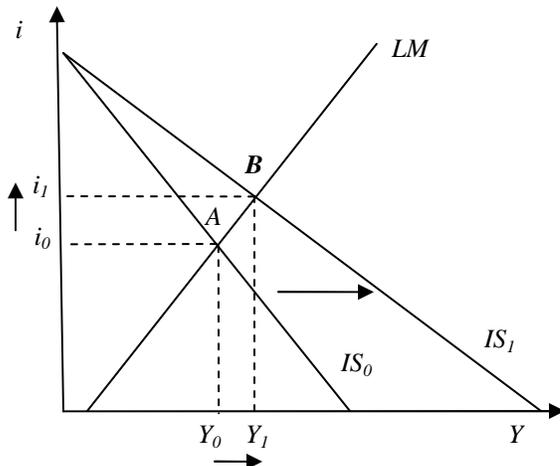   *by* $\dfrac{\Delta \bar{G}}{1 - c_1(1-t)}$.

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The new equilibrium is at point B. Note that it is not at A' (i.e. output does not increase all the way to Y_2), because interest rates are not constant in the IS-LM model. (See the answer to part 5 for more on this.)

5. What will happen to investment as a result of the government policy described in part 4? (You do not need to calculate anything, just give intuition.) (5 points)

Answer: The increase in exogenous government purchases increases i which in turn reduces investment, I, because the interest rate enters into the expression for I negatively. This decreases the overall positive effect of increased government spending.

6. Suppose that the government decides to cut taxes instead of increasing spending. Analyze the effects of this expansionary fiscal policy using a diagram. (You do not need to calculate anything, just draw the diagram.) (5 points)
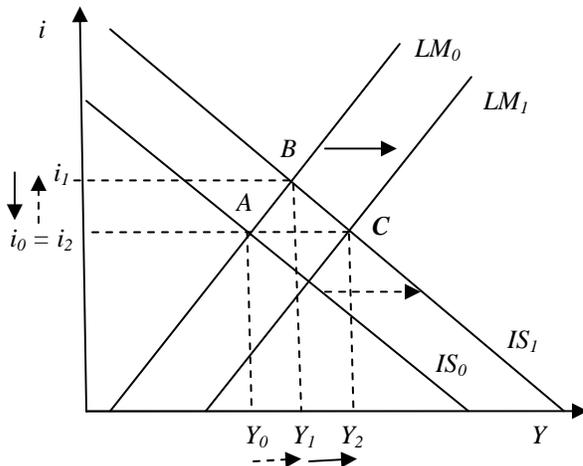
Answer:

A tax cut is represented in this model by a reduction in t. Smaller t increases C. But note that the IS curve does not shift out in a parallel fashion in this case. This is because t enters into the slope of the IS equation. A smaller t tilts the curve, making it flatter. (Recall from part 1 that, once we rearrange the IS equation such that i is on the left-hand side, the coefficient on Y becomes $-\dfrac{1-c_1(1-t)}{b_1}$, which is the slope of the IS curve.)

The new equilibrium is at point B.

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7. Using the IS-LM model, explain what can be done to offset the changes in the interest rate caused by increased government spending and, at the same time, keep output from declining. (In other words, suggest a way to bring the interest rate back to the level it was at before the policy in part 4 took place without causing a reduction in output). (10 points)

Answer:　　*Expansionary monetary policy:*

By enacting expansionary monetary policy, the government can bring interest rates down, while at the same time increasing output. The equilibrium is at C. Note that a fiscal contraction would also do the job of reducing the interest rate. However, it would also reduce output.

(Note that a potential flaw of the IS-LM model is the prediction that monetary policy is always superior: the Fed should increase money supply all the time because it only leads to higher output and lower interest rates. In reality, however, the Fed is careful about increasing money supply during booms, because that would cause inflation. In this simple IS-LM framework prices are not determined within the model.)

Free Response Question II (20/100 points)

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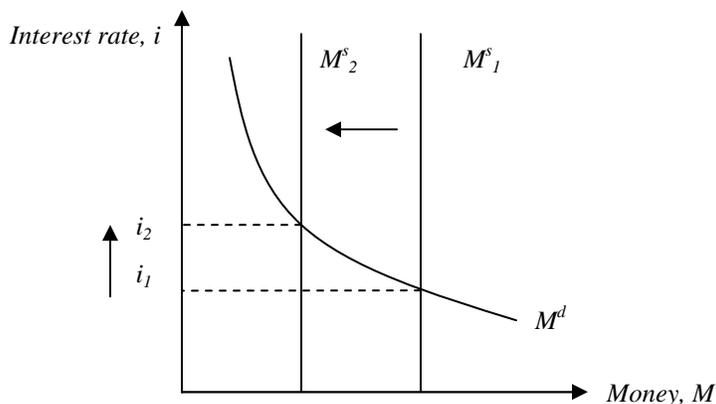
Please see

Fed boosts interest rates a quarter-point.
Central bank says economy has 'regained some traction'
By Martin Wolk. Chief economics correspondent. MSNBC.
Updated: 6:41 p.m. ET Sept. 24, 2004.

This article is available at: http://www.msnbc.msn.com/id/6064674/

For the following 3 questions, please use the information above.

1. How does the central bank (the Fed in the US) raise the interest rate? (You should
    limit your answer to no more than two sentences) (6 points)

Answer: *When the central bank sells bonds,it removes from circulation the money*
                it receives in exchange for the bonds. (See pages 72-74) When the money
                supply decreases, it raises the interest rate. (Graph is just FYI. You did
                not need to draw this.)

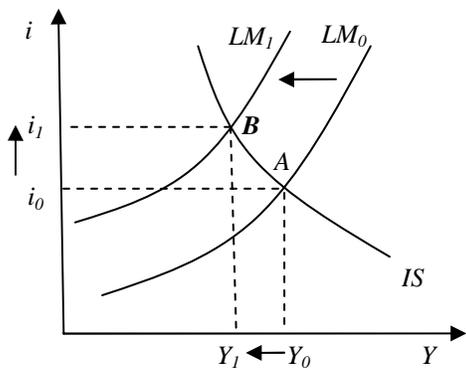Interest rate, i — Money, M diagram with $M^s{}_2$, $M^s{}_1$, M^d, i_2, i_1

2. When the Fed raises the interest rate, what happens to the price of bonds? Why?
    (You should limit your answer to no more than two sentences) (7 points)

Answer: *The price of a one-year bond today is equal to the final payment divided by 1 plus the interest rate. So, when the interest rate increases, the price of bond falls.*
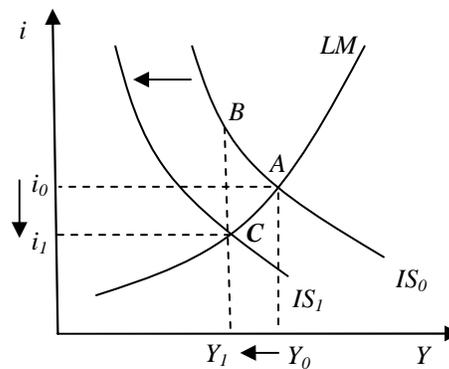
$$\$P_B = \frac{\$100}{1+i}$$ ← *If the final payment is $100 (See pages 74-75)*

3. If lowering output was the main objective of the Fed when it raised the interest rate, can fiscal policy achieve the same objective?   How? (You should limit your answer to no more than two sentences) (7 points)

Answer: *Yes. Contractionary fiscal pdicy can achieve the same objective of lowering output.   Fiscal contraction occurs when the government either decreases G (government spending) or increases T (taxes).   (Note: Even though the level of output is the same at B and C, equilibrium interest rate is different.)*

Monetary Contraction

Fiscal Contraction

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