14.02 Principles of Macroeconomics
Fall 2005
Quiz 1 Solutions

Short Questions (30/100 points)

Please, circle the correct answer for each of the following 4 multiple-choice questions. For each question, only one of the answers is correct. Each question counts 5/100 points.

1) GDP can be defined in different ways. Which sentence is correct?

   A) GDP is the value of final and intermediate goods produced in the economy during a given period.
   B) GDP is the sum of labor income, capital income and indirect taxes during a given period.
   C) The production side definition of GDP is equivalent to the income side one if and only if we are assuming that the firms do not hold inventories.
   D) GDP is equivalent to the population wealth.
   E) Both B) and C).

   Solution: B)
   (Note: the identity output = income holds always as a matter of definition and national accountancy conventions.)

2) In the goods market model with a marginal propensity to consume of .75, a decrease in taxes (T) by 100 billion causes an increase in output by:

   A) 100 billion
   B) 200 billion
   C) 300 billion
   D) 400 billion
   E) Can't say since there is not enough information

   Solution: C)

   The multiplier in front of T is $\frac{c_1}{1-c_1}$ *where* c_1 *is the marginal propensity to consume.*

   With c_1*=.75, the multiplier is 3, so Y increases by 3*100 billion = 300 billion.*

3) Consider a closed economy where T=G, I>0. Then, private saving is:

A) Equal to public saving.
B) Cannot answer this question with the available information.
C) Bigger than public saving.
D) Bigger than investment.
E) Smaller than public saving.

Solution: C)
T-G+S=I. Thus, S=I>0=T-G.

4) The money multiplier

A) May be equal to 1 if and only if people decide not to deposit their money in banks.
B) May be equal to 1 if and only if banks put in reserves all the deposits they get.
C) May be equal to 1 if and only if people decide to have all their money in currency or banks don't lend or buy bonds with the deposits they get.
D) Must always be greater than 1.

Solution: C)

The money multiplier is $\frac{1}{c+\vartheta(1-c)}$. *It can be equal to 1 if and only if c=1 or (given* $c \neq 1$) $\vartheta = 1$.

Please state whether the following two statements are TRUE or FALSE with a short explanation (3 or 4 lines). Each question counts 5/100 points.

1) The growth rate of nominal GDP is always greater than the growth rate of real GDP because changes in nominal GDP reflect both price and quantity changes.

FALSE.
Growth in nominal GDP reflects growth of real GDP and changes in the price level. This implies that the growth rate of nominal GDP is smaller than the growth rate of real GDP if the price level decreases (that is if there is deflation).

2) A mix of a fiscal contraction and a monetary expansion increases investment unambiguously.

FALSE.
A fiscal contraction leads to decreases in both equilibrium output and the interest rate. A monetary expansion, on the other hand, raises equilibrium output but decreases the interest rate. Even though the interest rate decreases unambiguously, we are not sure whether equilibrium output increases or decreases. Since investment depends positively on output, the uncertainty of the change in output implies uncertainty of the change in investment also.

Long Question I (30/100 points)
Money Market

Assume that the economy is described by the following facts.

Money Demand: $M^d = \$Y(0.1 - i)$

Nominal Income: $\$Y = 20000$

The central bank requires a reserve ratio of $\vartheta = 20\%$.

People keep $\frac{1}{6}$ of their money demand as currency and the rest as deposits.

The supply of central bank money is $H^s = 500$.

1) Calculate the money multiplier, CU^d, D^d, R^d, H^d (the demand for central bank money) and the equilibrium *i*. (12 points)

Money multiplier: $\frac{1}{c + \vartheta(1-c)} = \frac{1}{\frac{1}{6} + \frac{1}{5} * \frac{5}{6}} = \frac{6}{2} = 3$

$M^d = M^s$

$cM^d + \vartheta(1-c)M^d = H^s$

$[c + \vartheta(1-c)]M^d = H^s$

$[c + \vartheta(1-c)] * 20000 * (0.1 - i) = H^s$

$\frac{1}{3} * 20000 * (0.1 - i) = 500$

$20000 * (0.1 - i) = 1500$

$2000 - 20000i = 1500$

$500 = 20000i$

$i = 0.025$

$i = 2.5\%$

$M^d = 20000(0.1 - 0.025)$

$M^d = 1500$

$CU^d = \frac{1500}{6} = 250$

$D^d = \frac{5}{6} * 1500 = 1250$

$R^d = \vartheta D^d = \frac{1}{5} * \frac{5}{6} * 1500 = 250$

$H^d = CU^d + R^d = 250 + 250 = 500$

2) Now assume that the central bank announces an increase of *i* by 1.5% from the level you calculated in part 1). Keep nominal income and the other parameters (c, ϑ) constant. What does the central bank have to do in order to obtain what was announced? Calculate and explain. (6 points)

The Central Bank has to make a contractionary open market operation: it has to sell bonds in order to decrease the supply of money.

$$[c + \vartheta(1-c)]M^d = H^s$$

$$\frac{1}{3} * 20000 * (0.1 - 0.04) = H^s$$

$$H^s = 400$$

$$\Delta H^s = -100$$

3) Suppose now that after the monetary policy operation the people decide to hold a smaller part of their income as currency: $c = \frac{1}{16}$. Keeping $\$Y$ at 20000, what happens to equilibrium *i*? Explain. (6 points)

Money multiplier: $\frac{1}{c + \vartheta(1-c)} = \frac{1}{\frac{1}{16} + \frac{1}{5} * \frac{15}{16}} = 4$

$$\frac{1}{4} * 20000 * (0.1 - i) = 400$$

$$20000 * (0.1 - i) = 1600$$

$$2000 - 20000i = 1600$$

$$400 = 20000i$$

$$i = 0.02$$

$$i = 2\%$$

The decrease in the parameter c leads to a bigger multiplication of central bank money through the money multiplier. The decrease in central bank money is more than compensated by the increase in the multiplier. The final result is an increase in money supply and a decrease of the interest rate.

4) Imagine that the central bank anticipates the behavior described in part 3), that is the decrease in c, and takes it into account when increasing *i* by 1.5% (as described in part 2). How does your answer to part 2) change? Calculate and explain. (6 points)

$$\frac{1}{4} * 20000 * (0.1 - 0.04) = H^s$$

$$H^s = 300$$

$$\Delta H^s = -200$$

Taking into account the change in the money multiplier which increases the money supply, the Central Bank has to decrease the supply of central bank money more in order to obtain the announced effect on the interest rate.

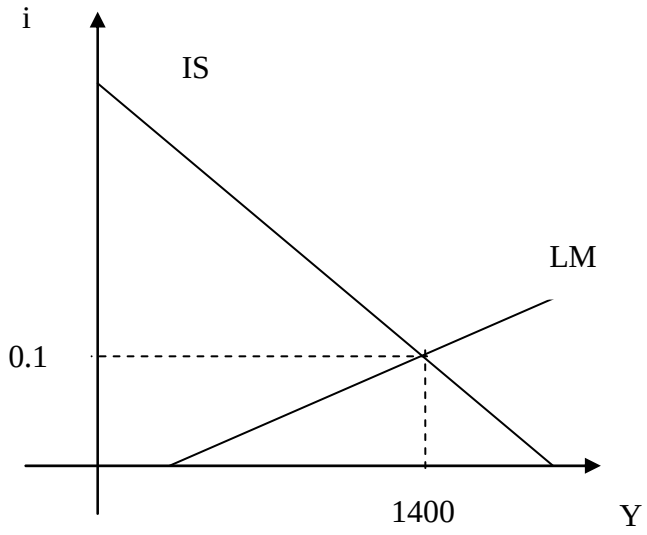
Long Question II (40/100 points)
IS-LM

Assume that the economy is described by the following equations:

$C = 650 + 0.1 * Y_D$
$I = 400 + 0.1 * Y - 800i$
$T = 500$
$G = 200$
$P = 1$
$\left(\frac{M}{P}\right)^s = 1800$
$\left(\frac{M}{P}\right)^d = 2Y - 10000i$

1) Solve for equilibrium real output, the interest rate, C and I. Graph the IS and the LM relations and label the equilibrium. (10 points)

IS relation:
$Y = 650 + 0.1 * (Y - 500) + 400 + 0.1Y - 800i + 200$
$Y = 1200 + 0.2Y - 800i$
$Y = 1500 - 1000i$
$i = (1500 - Y)/1000$
LM relation:
$M^s = M^d$
$\left(\frac{M}{P}\right)^s = \left(\frac{M}{P}\right)^d$
$1800 = 2Y - 10000i$
$Y = 900 + 5000i$
$i = (Y - 900)/5000$
$\begin{cases} Y = 900 + 5000i \\ Y = 1500 - 1000i \end{cases}$
$900 + 5000i = 1500 - 1000i$
$6000i = 600$
$i = 0.1$
$i = 10\%$
$Y = 1400$
$C = 650 + 0.1 * (1400 - 500)$
$C = 740$
$I = 400 + 0.1 * 1400 - 800 * 0.1$
$I = 460$



Read the following excerpt from a Financial Times article.

Housing starts slowed in August
By Andrei Postelnicu in New York
Published: September 20 2005 15:12 | Last updated: September 20 2005 15:12

Housing starts in the US eased back by 1.3 per cent in August but were still expected to exceed last year's overall number, itself the highest in more than 25 years.

Work began on 2.009m homes at an annualised rate in August, with construction of single-family homes outpacing the decline in multi-family units.

2) How would the increase in housing starts from last year to this year affect the equilibrium you just computed in part 1)? Assume that the increase in new houses is exogenous and worth $48 billion. Calculate the new equilibrium. Graph and explain. (10 points)

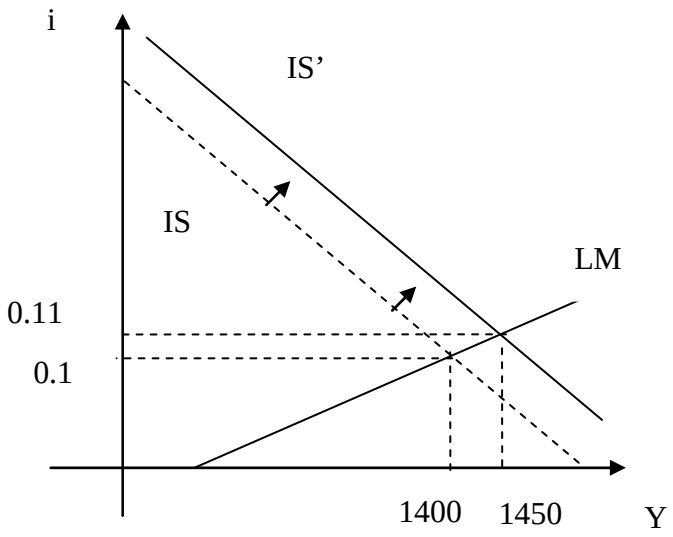
The increase in housing starts represents an increase in I (residential investment) for every level of the interest rate

$I' = 448 + 0.1 * Y - 800i$

$Y = 1248 + 0.2Y - 800i$

$Y = 1560 - 1000i$

IS shifts right, output goes up.

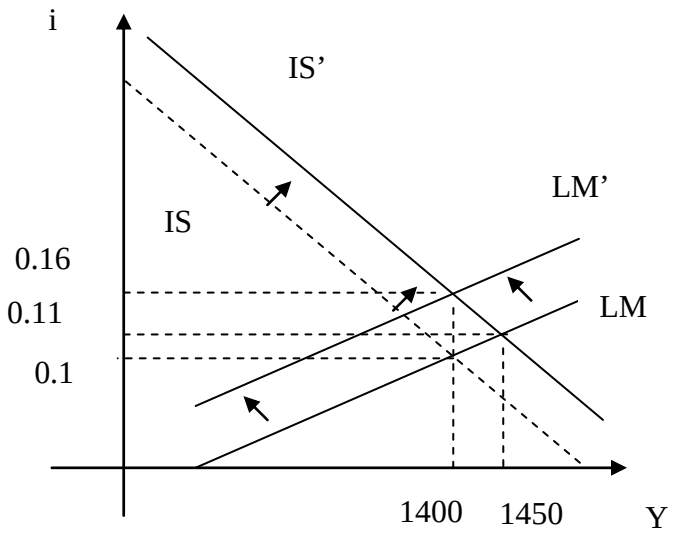


$$\begin{cases} Y = 900 + 5000i \\ Y = 1560 - 1000i \end{cases}$$
$$900 + 5000i = 1560 - 1000i$$
$$6000i = 660$$
$$i = 0.11$$
$$i = 11\%$$
$$Y = 1450$$

3) How if at all might the Federal Reserve react to the increase in housing starts in order to keep *Y* constant at the level of part 1)? Calculate and draw a graph. (10 points)

$$Y = 1560 - 1000i$$
$$1400 = 1560 - 1000i$$
$$1000i = 160$$
$$i = 16\%$$
$$\frac{M^s}{P} = 2Y - 10000i$$
$$\frac{M^s}{P} = 2800 - 1600 = 1200$$
$$\Delta\left(\frac{M^s}{P}\right) = -600$$

The Federal Reserve can decrease the money supply by 600 through a contractionary open market operation.



4) Starting from the situation in part 2), how could the government restore the equilibrium obtained in part 1) through fiscal policy operations (assuming that the Federal Reserve does not react at all)? Calculate. (10 points)

The government can decrease G by 48 or increase T by 480.