

Georgia Institute of Technology
Advanced Macroeconomics, Econ 3120
Spring 2008
Midterm Exam Key

1. [10 points] An opened economy is in equilibrium, the investment function of this economy is given by

$$I = 2900 - 100r,$$

where r is the annual real interest in percentage form. If the private and public savings of this economy are respectively equal to 2000 and -300, and net exports equals -400, find real the interest rate.

$$S = S_p + S_{pub} = 2000 - 300 = 1700$$

Equilibrium condition

$$I + NX = S$$

$$I = S - NX$$

$$2900 - 100r = 1700 + 400 = 2100$$

$$100r = 800$$

$$r = 8\%.$$

2. [10 points] In an economy, the national income equals=7200, transfer payments equals=600; income earned but not received equals=800; personal income taxes equals=1200; and households consumption equals=5200. Find the private saving for this economy.

$$PI = NI + F - IEBNR$$

$$PI = 7200 + 600 - 800 = 7000$$

$$PI = C + S_p + T$$

$$7000 = 5200 + S_p + 1200$$

$$S_p = 600.$$

3. The product market of a closed economy is described by the following equations

$$C = 300 + 0.75(Y - T)$$

$$I_p = 2000, \quad T = 1200. \quad \text{and } G = 1000.$$

- a. [5 points] Find the product market equilibrium real income.
This a reduced or simple model.

$$AE = a + I_p + G - mpc \times T = 300 + 2000 + 1000 - 0.75 \times 1200 = 2400.$$

Equilibrium income

$$Y^e = \frac{AE}{mps} = \frac{2400}{0.25} = 9600.$$

- b. [5 points] Find the private saving at the equilibrium output, and show that sum of private and public saving equals planned investment.

$$S_p = Y - T - C = 9600 - 1200 - 300 - 0.75 \times (9600 - 1200) = 1800.$$

$$S_{pub} = 1200 - 1000 = 200$$

$$S = 1800 + 200 = 2000 = I_p.$$

c. [5 points] Now suppose the government of this economy increases its spending by 100. Show that at new equilibrium income, the private saving increases by the same amount of increase in government spending and the national saving remains the same.

When government spending G goes up by 1000 ($\Delta G = 100$), AE will go up by 100, Y will go up ΔY , which you need to figure it out.

$$\Delta Y = \frac{\Delta G}{mps} = \frac{100}{0.25} = 400.$$

Therefore, your new equilibrium income

$$Y = 9600 + 400 = 10000.$$

At this income,

$$S_p = Y - T - C$$

$$S_p = 10000 - 1200 - 300 - 0.75 \times (10000 - 1200)$$

$$S_p = 1900$$

100 more than the previous saving of 1800

$$S_{pub} = 1200 - 1100 = 100 \quad 100 \text{ less than the previous saving}$$

$$S = S_p + S_{pub} = 1900 + 100 = 2000 = I_p.$$

Lesson learnt: For this simple (I call it most unrealistic model, which is very good for some unrealistic propositions), the reduction in public saving equals increase in private saving.

4. [10 points] In an economy, the size of the unemployed labor-force equals 1.8 million, the size of the working labor-force equals 14.2 million. If the labor-force participation rate for this economy equals 80%, find the size of the adult population that are not in the labor-force.

$$L = L_e + L_u = 14.2 + 1.8 = 16.$$

$$L_{pt} = L + L_{nlf}$$

Where L_{nlf} =adults that are not in the labor force.

$$LFPR = \frac{L}{L_{pt}}$$

$$0.80 = \frac{16}{16 + L_{nlf}}$$

$$16 + L_{nlf} = \frac{16}{0.8} = 20$$

$$L_{nlf} = 4 \text{ million}$$

5. [10 points] In an economy the nominal money supply equals 60 billion, demand deposit D equals 50 billion, the reserve ratio equals 5%, excess reserve ratio equals 2%, find the money multiplier of this economy.

Everything is given except the cash-holding ratio c , you need to find it out first.

$$\begin{aligned}
 M &= C + D \\
 60 &= (c + 1)50 \\
 1 + c &= 1.2 \\
 c &= 0.2 \\
 mm &= \frac{1 + c}{rr + e + c} \\
 mm &= \frac{1 + 0.2}{0.05 + 0.02 + 0.2} = 4.44
 \end{aligned}$$

6. [5 points] The product market of an economy is described by the following equations

$$\begin{aligned}
 C &= 1000 + 0.7(Y - T) \\
 T &= -400 + 0.12Y, \quad NX = -120 - 0.07Y,
 \end{aligned}$$

The planned investment and government spending are not given but are lump-sum. Now if the government of this economy proposes a contractionary fiscal policy of reducing its spending by \$75 million. Find the resulting change in real output of this contractionary policy. Your answer should be correct to three decimal places.

$$\begin{aligned}
 MLR &= 1 - mpc(1 - t) + \eta \\
 MLR &= 1 - 0.7(1 - 0.12) + 0.07 = 0.454 \\
 \Delta G &= -75 \\
 \Delta Y &= \frac{\Delta G}{MLR} = \frac{-75}{0.454} = -165.20 \\
 &\text{real income will go down by 165.20}
 \end{aligned}$$

7. The IS and LM equation of an economy are respectively given by

$$\begin{aligned}
 IS : \quad Y &= 10000 - 50r \quad \text{and} \\
 LM : \quad \frac{M}{P} &= 0.2Y - 100r,
 \end{aligned}$$

where Y is real output and r is the annual real interest rate in percentage form.

a. [5 points] If the nominal money supply $M=1595$ and the price level equals 1.1(=P), find the equilibrium real income and interest rate.

$$\begin{aligned}
 \frac{M}{P} &= 0.2Y - 100r \\
 1450 &= 0.2Y - 100r \\
 1450 &= 0.2(10000 - 50r) - 100r \\
 1450 &= 2000 - 10r - 100r \\
 110r &= 550 \\
 r &= 5\% \\
 Y &= 10000 - 50 \times 5 = 9750.
 \end{aligned}$$

Question 8 continues

b. [7 points] Assume that the given IS is derived from a reduced model where except household consumption everything is independent of real income Y and mpc for this economy equals 0.9. Now if the government of this economy decides to conduct an expansionary fiscal policy and increases its spending by 22, find the new equilibrium income and interest rate that will result after the policy goes into effect (note that horizontal shift of IS is $\Delta y = \Delta G/mps$)

Increased government spending will shift the IS to the right by $\frac{22}{0.1} = 220$, the intercept of the new IS is 10220

$$\begin{aligned}\frac{M}{P} &= 0.2Y - 100r \\ 1450 &= 0.2Y - 100r \\ 1450 &= 0.2(10220 - 50r) - 100r \\ 1450 &= 2044 - 10r - 100r \\ 110r &= 594 \\ r &= 5.4\% \\ Y &= 10220 - 50 \times 5.4 = 9950.\end{aligned}$$

c. [3 points] Find the crowded amount of income.

In absence of money market, the product market equilibrium should be $9750 + 220 = 9970$, we infact got 9950. therefore, 20 units of output crowded out.

8. A simple economy is described by

$$\begin{aligned}C &= 1500 + 0.8(Y - T) \\T &= 1000, \quad G = 1500, \quad NX = -100 \\I &= 2000 - 40r \\LM &= \frac{M}{P} = 0.5Y - 100r.\end{aligned}$$

a. [15 points] Find the expression for the aggregate demand in terms of M and P (i.e., your Y should be function of M and P).

Derive the IS equation first

$$AE_0 = a + I_0 + G + NX - mpc \times T = 1500 + 2000 + 1500 - 100 - 0.8 \times 1000 = 4100$$

$$IS: \quad Y = \frac{AE_0 - br}{mps} = \frac{4100 - 40r}{0.2} = 20500 - 200r$$

$$r = 102.5 - \frac{Y}{200}$$

$$\frac{M}{P} = 0.5Y - 100 \left(102.5 - \frac{Y}{200} \right)$$

$$\frac{M}{P} = 0.5Y - 10250 + 0.5Y$$

$$\frac{M}{P} = Y - 10250$$

$$Y = 10250 + \frac{M}{P}$$

Equation for AD.

b. [5 points] For a nominal money supply of 10000 and aggregate price level of 2, find the quantity demanded.

$$Y = 10250 + \frac{10000}{2} = 15250.$$

One extra problem that I put up initially and removed finally. 4. [5 points] Prove that

$$MLR = 1 - mpc(1 - t) + \eta$$

equals

$$mps(1 - t) + t + \eta.$$

Here all you need is to replace $mpc=1-mps$

$$MLR = 1 - mpc(1 - t) + \eta$$

$$MLR = 1 - (1 - mps)(1 - t) + \eta$$

$$MLR = 1 - (1 - t) + mps(1 - t) + \eta$$

$$MLR = mps(1 - t) + t + \eta$$

QED.