Department of Economics
Carleton University
ECON 2103A/B: Intermediate Macroeconomics II
Solutions: Problem Set #3

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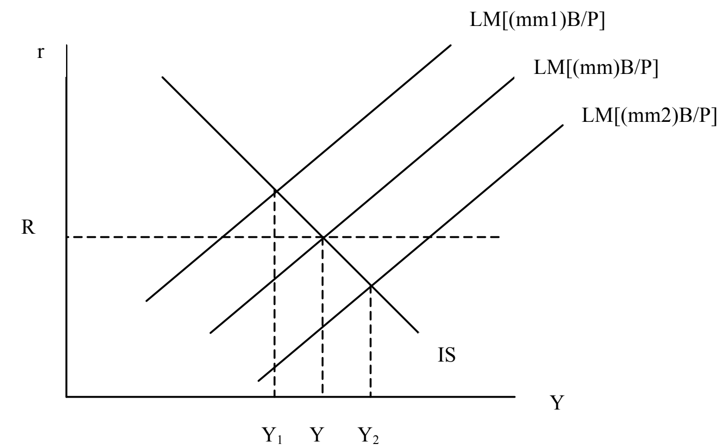
1. Identify the market actors who control each of the following variables, and state whether the money supply is positively related or negatively related to each variable:
   a. The monetary base.
   b. The reserve-deposit ratio.
   c. The currency-deposit ratio.
   a) The monetary base (B) is positively related to the money supply (M). An increase in the monetary base will increase the money supply. The monetary base is under the control of the Bank of Canada.
   b) The reserve-deposit ratio (re) is negatively related to the money supply; an increase in the reserve-deposit ratio reduces the money multiplier and thus reduces the money supply. The Bank of Canada sets the minimum reserve requirement ratio on bank deposits, but commercial banks can change the reserve-deposit ratio by changing their holdings of excess reserves.
   c) The currency-deposit ratio (cu) is negatively related to the money supply; an increase in the currency-deposit ratio reduces the money multiplier and hence reduces the money supply. The public controls the currency-deposit ratio by deciding how much of their money they want to retain as currency, rather than as deposits in banks.

2. One major development in the past thirty years is the increased use of credit cards. How does this affect the demand for money and the velocity of money? Explain.

   Credit cards tend to reduce the quantity of money we must hold for transactions and increase the velocity of money. Credit cards allow the consumer to spend money that will be received in the future. Credit cards can also increase money velocity, because usually when the income arrives, a good portion of it is already spent. Thus instead of a gradual decrease in money held, a large part of it is paid out relatively soon after income is acquired.

3. Explain the circumstances under which it would be better for the variability of output in Canada for the Bank of Canada to set the rate of interest rather than the level of high powered money.

   Consider a fixed-price IS-LM model. Suppose that the source of variability in the economy comes through the demand for money, and specifically through how much individuals want to hold money in the form of currency rather than bank deposits. This means that the money multiplier is not constant but varies from mm1<mm2.



In this case, if the Bank of Canada sets the monetary base at B, we may end up with two possible LM curves, LM[(mm1)B/P] or LM[(mm2)B/P], and two possible levels of output Y_1 and Y_2. However if the Bank of Canada sets the interest rate at R, this will give us a fixed point on the IS curve and one level of output at Y. Thus, setting the interest rate minimizes output variation when shocks arise exclusively through the LM curve.

4. Answer the following:
   a) The money supply is $6,000,000, currency held by the public is $2,000,000, and the reserve deposit ratio is 0.25. Find deposits, bank reserves, the monetary base, and the money multiplier.
   DEP=M-CU=6-2=4
   *RES=rr*DEP=0.25*4=1*
   BASE(B)=CU+RES=2+1=3
   Multiplier(mm)=M/B=6/3=2 or mm=(cr+1)/(cr+rr)=(0.5+1)/(0.5+0.25)=2

5. Define money multiplier. What is the value of the money multiplier in a system of 100% reserve banking? What is the value of the money multiplier in a system of fractional reserve banking, if all the money is held in form of deposits? Why is the money multiplier higher under fractional reserve banking than under 100% reserve banking? Explain.
   The money multiplier is the number of dollars of the money supply that can be created from each dollar of the monetary base. In class we derived the formula as:

   $$mm=(cr+1)/(cr+rr)$$

   where cu is the currency-deposit ratio and re is the reserve-deposit ratio. In a system of 100% reserve banking, the reserve deposit ratio is one and the money multiplier is one. Under fractional reserve banking, with all money held as deposits, the currency-deposit ratio (cu) is equal to zero. The money multiplier is then equal to 1/re. The multiplier is higher under fractional reserve banking, because banks hold only part of the monetary base as reserves and create money in the form of deposits with their excess reserves. Under 100% reserve banking, deposits simply substitute for the currency that is held by banks as reserves-no new money is created by banking. In that case banks would merely *act as safe keepers.*

6. According to the Ricardian view of government debt, how does a debt financed tax cut affect public saving, private saving, and national saving?
According to the Ricardian view, a debt financed tax cut does not stimulate consumption because it does not raise permanent income. Forward-looking consumers understand that government borrowing today means higher taxes in the future, Because the tax cut does not change consumption, households save the extra disposable income to pay for the future tax liability that the tax cut implies: private saving increases by the full amount of the tax cut. The increase in private saving exactly offsets the decrease in public saving associated with the tax cut. Therefore, the tax cut has no effect on national saving.

7. Using the Baumol-Tobin model, explain in words and with the equations how the introduction of computerized bond trading that effectively reduces transaction costs would affect the transaction demand for money.
Recall the formula derived in class. The transaction demand for money can be expressed as:

$$M = \sqrt{\frac{t_c Y}{2r}}$$

The introduction of computerized trading effectively reduces transaction costs in the sense that now it is less inconvenient to reallocate wealth from bonds to money. This is equivalent to a reduction in our cost parameter t_c. It is straightforward to see that this means a reduction in optimal average money holdings.

8. Suppose that the demand for investment is given by:

$$I=s(K^*-K_{t-1})$$

Where K^* is the desired stock of capital given by

$$K^*=0.1(Y/R)$$

Where Y is output and R is the interest rate. Assume that there is no depreciation, and that R=0.05. Let s=0.25 to start.

a. Calculate the desired capital stock in year 1 if output is \$200. Calculate the level of investment in the first year if the capital stock was 400 at the beginning of the first year.
b. Suppose that output rises to \$250 in year 2 and remains at this new level forever. Calculate the level of investment and the capital stock in years 2, 3, 4. What are the new long-run levels of investment and capital stock? Explain why investment reacts with a lag to the increase in output.
c. Repeat the calculations in parts a, and b for s=1, and comment on the difference in your answers.

a. *The desired capital stock $K^*=0.1(200/0.05)=\$400$, $I_0=0.25(400-400)=0$*

b. $K^*=500$

Year	*K_{-1}*	*I*	*K*
2	*400*	*25*	*425*
3	*425*	*19*	*444*
4	*444*	*14*	*458*

Long-run levels: $K^*=500$, $I=0$
Investment reacts with a lag because the value of $s<1$.
c.

Year	*I*
1	*0*
2	*100*
3	*0*
4	*0*

$s=1$ means that investment takes capital immediately to the desired level. No adjustment costs.

9. Multiplier-Accelerator interaction: Consider a macro model that has both a consumption function that depends on lagged income (like Friedman's permanent-income hypothesis) and an investment equation that depends, with a lag, on changes in income. Ignore interest rate effects. In particular assume that the following equations describe the economy:

$$Y = C + I + G$$
$$C = 220 + 0.63Y_P$$
$$Y_P = 0.5Y + 0.5Y_{-1}$$
$$I = 900 + 0.2(Y_{-1} - Y_{-2})$$
$$G = 1200$$

a. Using substitutions, obtain a single expression for Y in terms of Y_{-1} and Y_{-2}.
b. Calculate the constant level of Y that satisfies all the relationships in the model.
c. This part and the following are best answered by using an Excel spreadsheet. Suppose that Y has been equal to the value you calculated in part b for the past 2 years (years 1 and 2). Now suppose that government spending increases by $50 billion (in year 3). Calculate the effect on output in year 3. Calculate Y in years 4 to 10. Be sure to use the correct values of Y_{-1} and Y_{-2}.
d. Plot the values with Y on the vertical axis and the years on the horizontal axis. Do you notice any cyclical behaviour?

a. $Y=C+I+G$
$Y=\{220+0.63[0.5(Y+Y_{-1}]\}+[900+0.2(Y_{-1}-Y_{-2})]+1200$
$Y=3240.88+0.7518Y_{-1}-0.292Y_{-2}$
b. *Equating $Y=Y_{-1}=Y_{-2}$ gives the constant level of Y=$6000 billion.*
c. $Y=1635.0356+0.7518Y_{-1}-0.2920Y_{-2}+1.4599G$

Year	*G*	*Y*
1	*1200*	*6270.27*
2	*1200*	*6270.276*
3	*1250*	*6343.26*
4	*1250*	*6398.14*
5	*1250*	*6418.09*
6	*1250*	*6417.06*
7	*1250*	*6410.47*
8	*1250*	*6405.81*
9	*1250*	*6404.23*
10	*1250*	*6404.40*
LR	*1250*	*6405.41*

d.