

HOMWORK - PART 2 - USING MACROSIM2

Now run **Macrosim2** by typing **ms2** at the system prompt. Answer yes when asked if you want to display the model, then read the section below before going on the the simulation.

Macrosim2 is a more refined model that includes a financial sector. The financial sector is represented in equations (5) through (8) below:

$$(1) Y = C + I + G \quad \text{where only } G \text{ is autonomous now;}$$

$$(2) C = a + b(YD)$$

$$(3) YD = (1 - t)Y$$

$$(4) \text{Def} = G - tY$$

$$(5) \text{MSI} = (\text{MSGR}) * \text{MS}$$

$$(6) I = h - dR$$

$$(7) S = e + k + fR$$

$$(7a) S = YD - C$$

$$(7b) k = \text{MS}(t) - \text{MS}(0)$$

$$(8) S + \text{MSI} = I + D \quad \text{where}$$

Y: GNP

G: Government purchases

YD: Disposable Income

h: Investment intercept

f: Savings slope

k: Savings coefficient

MSI: Increase in the money supply

C: Consumption

a: Autonomous consumption

t: Income tax rate

d: Investment slope

MS: Money supply

MSGR: Money Supply Growth Rate

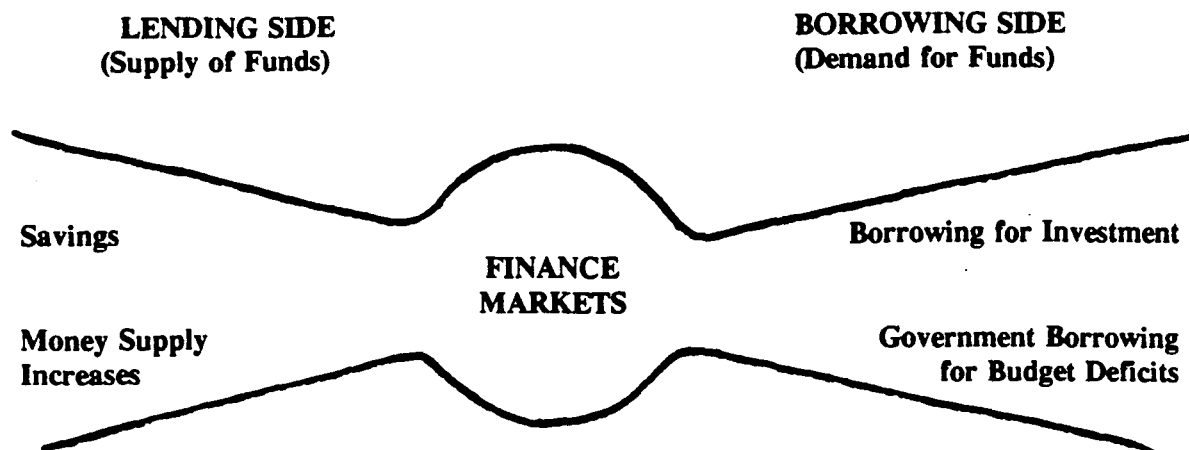
I: Investment

B: MPC

Def: Deficit

e: Savings intercept

Equations (5), (6), (7) and (8) are a mathematical expression of the **Loanable Funds Model**. The **Loanable Funds Model** is used to determine the equilibrium interest rate and volume of credit in the finance markets and, hence, the equilibrium level of savings and investment. The model works by evaluating the intermediation between the **supply of funds** to the credit markets (savings and increases in the money supply) and the **demand for funds** from the credit markets (investment and the government budget deficit). The model treats the finance markets as a conduit for matching funds flowing in from suppliers to funds flowing out to borrowers.



The intermediating "price" that matches the two sides of the flow is the flexible interest rate. When the supply of funds exceeds the demand for funds, this interest rate will fall to discourage lending and encourage borrowing. When the demand for funds exceeds the supply of funds, the interest rate will rise to discourage borrowing and encourage lending.

In this model, both investment and savings are determined by the interest rate:

$$(6) I = h - dR \quad ;$$

$$(7) S = e + + k + fR \quad .$$

Since government spending and the tax rate are policy-determined (autonomous in the model) the deficit is treated as the difference between government spending and income tax collections:

$$(4) \text{Def} = G - tY \quad .$$

The model assumes that the monetary authorities determine the Money Supply Growth Rate (MSGGR) for policy purposes, and, given the size of the existing money supply (MS), this determines the amount of the increase in the money supply (MSI):

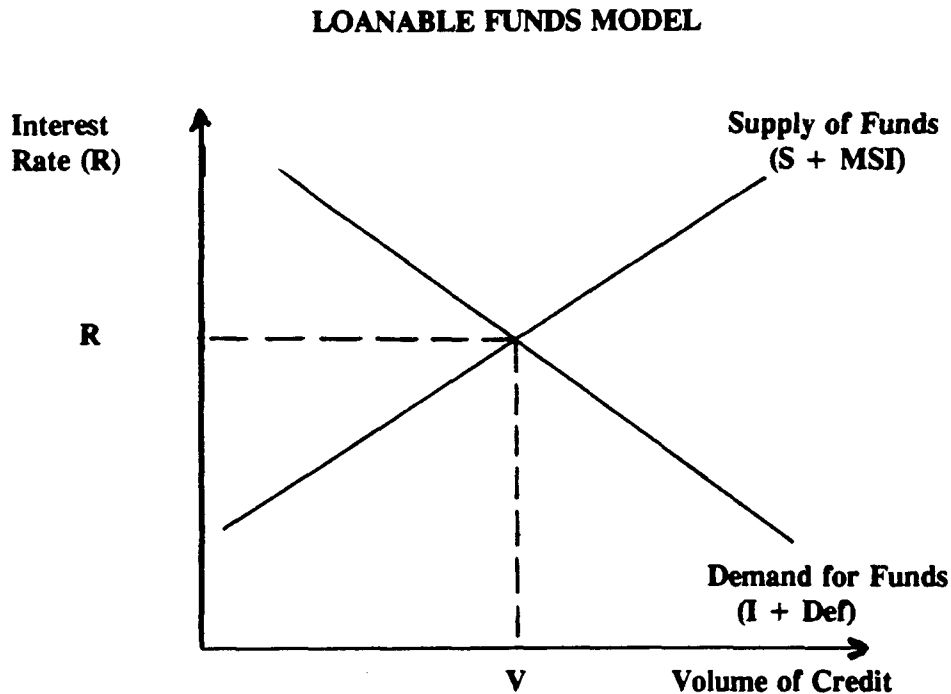
$$(5) \text{MSI} = (\text{MSGGR}) * \text{MS} \quad .$$

It is very important to understand that it is the increase in the money supply, rather than the level of the money supply, that increases the supply of funds to the finance markets.

Finally, the finance market equilibrium equation,

$$(8) S + MSI = I + Def,$$

tells us that the **Supply of Funds (S + MSI)** must equal the **Demand for Funds (I + Def)**. Graphically, the Loanable Funds Model is represented below:



As can be seen, any shift in the supply or demand line will cause the equilibrium interest rate and volume of credit to change, also causing a change in the level of savings and the level of investment.

The purpose of this homework is to evaluate the effect of adding a financial market to the model. In **Macrosim2**, deficit-financed government spending and investment are no longer independent. Now, because of the role played by the interest rate, a higher deficit may affect investment. In fact, we are here going to introduce the possibility of an economic phenomenon called **crowding out**.

In **Macrosim2** original default values are the same as they were in **Macrosim1**. (Compare the default values between **Macrosim2** and **Macrosim1**). So we are assuming essentially the same starting point. In this simulation, we are going to do more than four trials. Therefore you will want to do the first four, get a hard copy, then clear the screen to continue.

In these first seven trials, we are going to leave the money supply unaltered. The point here is to evaluate changes in taxes and government spending upon the economy without the use of offsetting monetary policy.

TRIAL 1

In TRIAL 1 and TRIAL 2 below, we are going to do the same thing we did in our simulation of **Macrosim1**. What was the increase in GNP in **Macrosim1 TRIAL 1** and TRIAL 2 when we increased government purchases and investment by \$3?

(1) Change in GNP in TRIALs 1 and 2 of **Macrosim1**: _____

Let us begin by increasing investment first. In **Macrosim2** investment is no longer autonomous. Here we must shift the intercept value of the investment function (the "h" in equation (5) above) from its default value of 45.98 to 52.85. Raise "h" from its default value to 52.85 and leave all other values at their defaults. Run the simulation. 25

(2) Did investment rise by \$3? _____

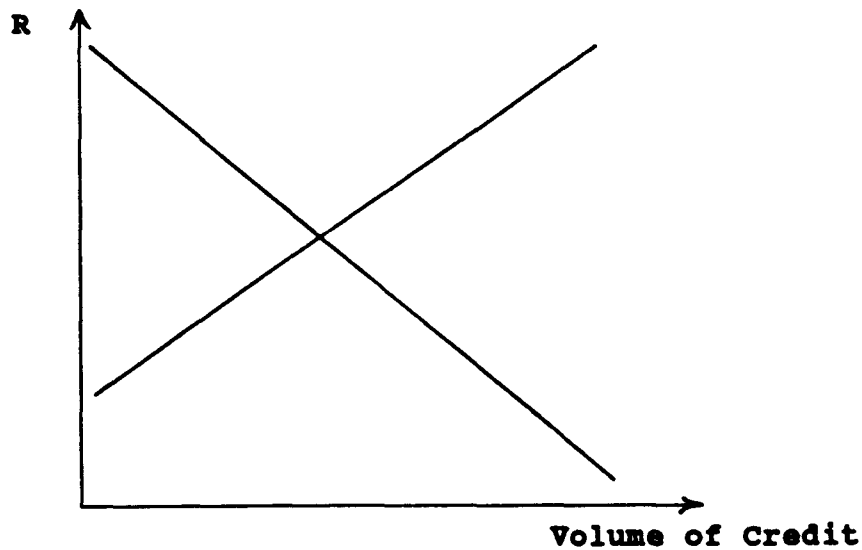
(3) By how much did GNP rise? _____

(4) Is this the same result as **Macrosim1**? _____

(5) What happened to the interest rate? _____

(6) Use the Loanable Funds Model to explain why this happened to the interest rate.

LOANABLE FUNDS MODEL
Increase in Investment



TRIAL 2

Now we are going to increase government spending by \$3. Return the investment intercept to its default value of 45.98 and increase government spending from \$40 to \$43. Keep all other values at their default values. Run the simulation. Compare the results of this to DEFAULT (not TRIAL 1).

- (1) By how much did GNP rise this time? _____
- (2) What happened to the deficit? _____
- (3) What happened to the interest rate? _____
- (4) What happened to investment? _____
- (5) Why was the increase in GNP less than it was when we did the same trial in **Macrosim1 TRIAL 1** and above in **Macrosim2 TRIAL 1**? Give a detailed logical answer. Use the information from the previous three questions.

TRIAL 3

In this trial, we are going to evaluate the effect of a tax cut, just like we did in **Macrosim1**. Return government spending to its default value (from 43 to 40) and make sure that everything else except the tax rate is also at its default value. Lower the income tax rate from .25 to .22. Once again, compare the results to **DEFAULT**.

- (1) What happened to GNP? _____
- (2) What happened to the budget deficit? _____
- (3) Why did the interest rate rise? _____
- (4) What happened to investment? _____

(5) Obviously the tax cut caused GNP to rise, even though the deficit rose, interest rates rose, and, hence, investment fell. What rose more than enough to offset the fall in investment?

(6) Why did consumption rise? _____

As can be seen from Trial 3, the components of aggregate demand interact when there is a policy change. The net effort was as follows:

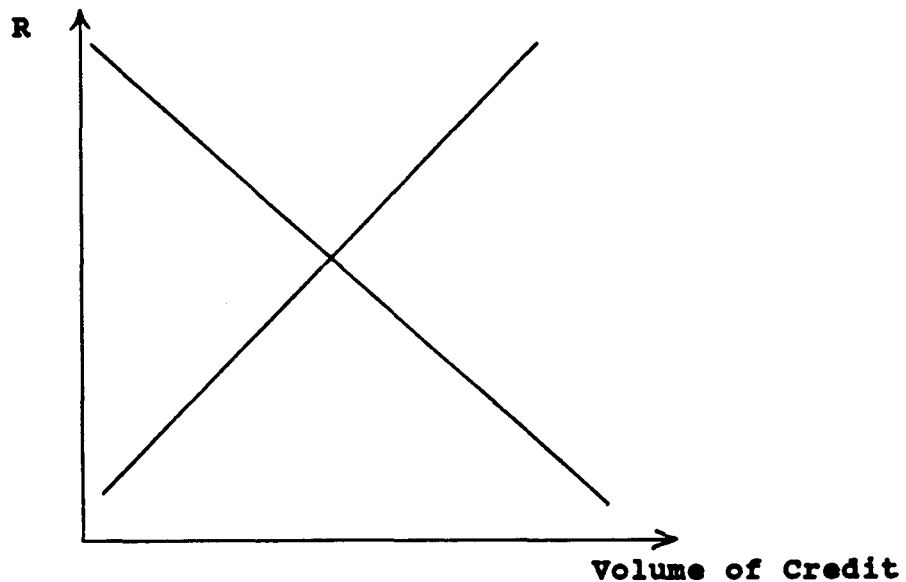
$$\begin{array}{rcccc}
 Y & = & C & + & I & + & G \\
 (+1.27) & & (+4.63) & & (-3.36) & & (+0)
 \end{array}$$

[Note: Rounding errors explain the minor discrepancies in these figures.]

The tax cut caused consumption to rise and investment to fall.

(7) Knowing from MACROS1M2 that this reduction in taxes increases the budget deficit, use the Loanable Funds Model below to explain why this increase in the budget deficit (a) increases the interest rate, (b) reduces the level of investment, and (c) raises the level of savings.

LOANABLE FUNDS MODEL
Reduction in Tax Rates



TRIAL 4

The previous two trials, (TRIALS 2 and 3), demonstrated an economic phenomenon called "partial crowding out." In both cases, a change in fiscal policy resulting in a larger budget deficit. The budget deficit caused an increase in interest rates, which in turn caused investment to fall. "Crowding out" implies that the growth of the deficit "crowds out" some private investment. In these two cases the effect was "partial" because the net effect was positive - the increase in government spending more than offset the decline in investment in TRIAL 2, and the increase in consumption due to the tax cut more than offset the decline in investment in TRIAL 3.

Part of the reason that crowding out was only partial is because the increase in the interest rate caused savings to rise a little (look at the graph you have drawn in answering question (7) of Trial 3).

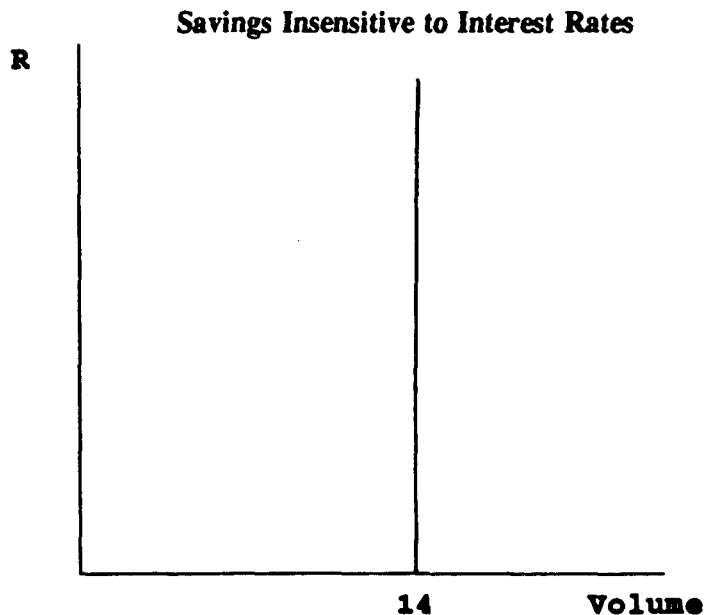
In the next four trials we are going to assume that savings is insensitive to the interest rate. This implies a perfectly vertical savings line in the loanable funds model. In this trial we are going to adjust certain values to give us results very similar to default values, except that now we will have a vertical savings function.

Get a hard copy of your present screen and clear the screen.

Make sure everything except the savings slope and intercept is set to default values. Set the savings intercept value at 14 (from the DEFAULT value of 3) and the savings slope value to 0.0 (from the default value of .86).

In terms of the Loanable Funds model, we are assuming a savings line that looks like the one below. As you can see, savings is fixed at 14 and will not vary with changes in the interest rate.

- (1) Compare the values you get to DEFAULT. As you can see, they are identical to default values.



TRIAL 5 [Note: This will appear in the column for **TRIAL 2**]

Keeping all other values the same, raise the level of government spending from **40** to **43**, as we had done in **TRIAL 1** above.

- (1) Compared to **TRIAL 4**, [now in the **TRIAL 1** column on your screen] what happened to GNP?

- (2) By how much did the deficit rise? _____

- (3) By how much did investment fall? _____

- (4) See if you can use the graph above to explain why investment fell by as much as the deficit rose.

The net change to GNP was as follows:

$$\begin{array}{ccccccc} Y & = & C & + & I & + & G \\ (+0) & & (+0) & & (-3.0) & & (+3.0) \end{array}$$

This is called "full crowding out." As can be seen, in this model, full crowding out happens when savings is insensitive to the interest rate.

TRIAL 6 [Note: This will appear in the column for **TRIAL 3**]

Now return the level of government spending to **40**. Lower the tax rate from **.25** to **.22** and run the simulation.

- (1) What happened to GNP when we did this above in **TRIAL 3**?

- (2) What happened to GNP this time?

TRIAL 7 [Note: This will appear in the column for **TRIAL 4**]

Raise the tax rate to .28, leaving everything else the same. Run the simulation.

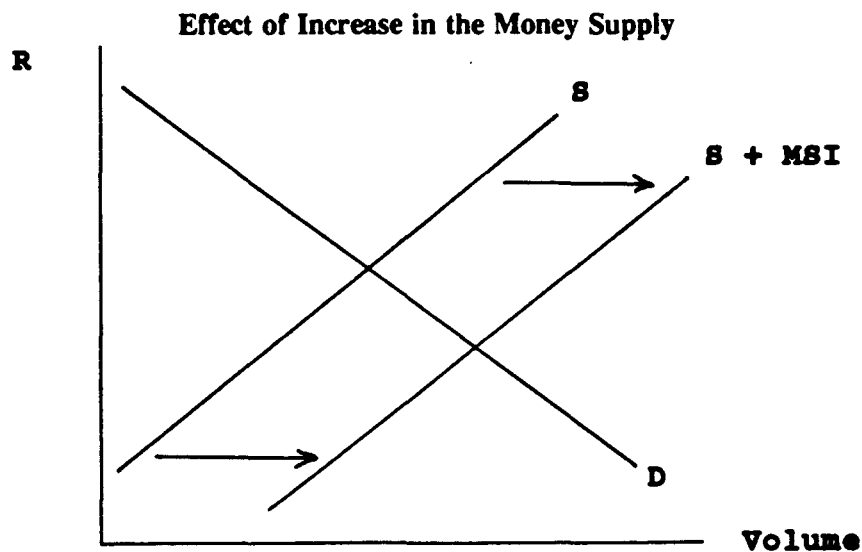
- (1) What happened to GNP this time? _____
- (2) Given the results that we now have from TRIALS 3,6, and 7, what can we say about the fiscal effects of tax changes?

Print your screen and clear your screen.

You may have noticed in MACROS1M2 that we are able to set the money supply growth rate. So far we have not used that option. The money supply growth rate enters into the model through the supply-of-funds line in the Loanable Funds model. As seen in equation (8) of MACROS1M2, the supply of funds is equal to savings plus the increase in the money supply:

$$(8) S + MSI = I + D$$

Therefore, when the money supply is increased, it has the effect of moving the supply-of-funds line to the right, as shown below. This will have the tendency to lower the interest rate and raise the level of investment, which in turn will raise the level of aggregate demand (GNP).



To demonstrate this, we will run two more trials. Suppose our policy objective is to lower the tax rate. We want to do this, however, without raising interest rates or lowering the level of investment.

TRIAL 8 - [This will appear in the column of **TRIAL 1**]

Our policy objective is to lower the tax rate from .25 to .22. Do this first without changing any other variables and run the simulation.

- (1) GNP has grown, but what has happened to the budget deficit, the interest rate, and investment? (By now you should understand why this has happened.)

TRIAL 9 [This will appear in the column for **TRIAL 2**]

Obviously our full policy objective has not been met. Interest rates are higher and investment is lower. In this trial, leave the tax rate at .22 but increase the money supply growth rate from 0.0 to 0.06. Run the simulation. Compare the results to default.

- (1) What has happened to the money supply?

- (2) What has happened to investment and the interest rate? Why?

- (3) The budget deficit has not grown, even though taxes have been cut! Why has this happened?

You will note in this final trial that GNP has taken a big leap, from 160.00 to 171.78, a growth in GNP of 9%. This seems like an optimal policy mix. There is one major concern, however, that we must worry about - this policy might be inflationary. **MACROS1M2**, which only measures nominal GNP, can't tell us anything about the rate of inflation. For that we need to run **MACROS1M3**, which divides normal GNP into two components: real GNP and inflation.

END OF HOMEWORK 2