

14.02 Fall 99

Quiz 1

Solutions

Problem 1

1. FALSE: Contractionary policy means a decrease in the money supply, i.e. the Fed *sells* bonds in exchange for money. The price of bonds goes down (there is more supply) and the interest rate goes up (remember the inverse relationship between bond prices and interest rates).
2. FALSE: While the parts have already been produced and thus are included in previous year's GDP, the time spent disassembling the parts and making them available to consumers is certainly value-added.
3. FALSE: The effect will be different even in the "very short run" (i.e., before the multiplier effect kicks in): G increases aggregate demand (not output) one in one, while T enters through consumption, hence multiplied by c_1 , the marginal propensity to consume. Unless $c_1 = 1$ (which is highly unrealistic), the effect is different. Once the multiplier starts to work, the ratio of the difference stays the same: all is multiplied by $\frac{1}{1-c_1}$.

Problem 2

1. IS: $Y = 600 - 200i + 0.4Y - 0.4T + 200 - 100i + 100 = 750 - 300i + .4Y$
 $Y = \frac{1}{0.6} (750 - 300i) = 1250 - 500i$
2. $(M/P)^s = 450$
LM: $0.9Y - 450i = 450 \Rightarrow Y = 500 + 500i$
3. $\begin{cases} Y = 1250 - 500i \\ Y = 500 + 500i \end{cases} \Rightarrow Y = 875$
 $i = (Y - 500) / 500 = 0.75;$
 $C = 600 - 200 * 0.75 + 0.4 * 875 - 0.4 * 375 = 650; I = 200 - 100 * 0.75 = 125$
4. Fiscal expansion will shift outward the IS curve, driving both output and interest rate up. Since investment in this economy depends solely on the interest rate, this will imply investment reduction, not expansion.

Consider a monetary expansion. This policy shifts the LM curve, resulting in an increase in output and decrease in interest rate. Lower interest rate leads to investment boom. Thus monetary expansion achieves both objectives.

5. Monetary policy is ineffective in two cases: if IS curve is vertical (investment and consumption are completely unresponsive to interest rate), or LM is flat (liquidity trap, demand for money is unaffected by the interest rate).

There is no case in which fiscal policy is completely ineffective. Sometimes it is weak, as for example, if LM is very steep. Then fiscal policy would lead to huge interest rate swings with a modest effect on output. But the LM curve cannot be completely vertical because it is obtained from the equilibrium equation $M = PYL(i)$, so an increase in income will always have *some* effect as long as $L(i) \neq const$ which we rule out.

Problem 3

1) You are given the behavioral equations for the economy, and you must use them to find the equilibrium in the goods and financial markets (the IS and LM relations). Then the overall equilibrium is when both relations are satisfied at the same time. The IS relation is given by:

$$Y = \{10 + 0.5(Y - 0.1Y)\} + \{0.1Y + 10(1 - i)\} + 10$$

Where the first two terms in brackets are consumption and investment respectively. Solving for output in terms of autonomous spending gives,

$$Y = \frac{1}{1 - .45 - .1} (30 - 10i) = \frac{1}{0.45} (30 - 10i)$$

And the term $\frac{1}{0.45}$ is the multiplier (which is not $\frac{1}{c_1}$ in this case but rather $\frac{1}{1 - c_1(1 - \tau) - I_1}$ where τ is the tax rate, and I_1 is the marginal investment response to income. Then we can get the LM relation as

$$\frac{M}{P} = 29 = 0.05 \frac{Y}{i}$$

from which we can either express income as a function of the interest rate, $Y = 480i$ (or alternatively the interest rate as a function of income $i = 0.0017Y$). Then you replace in the IS relation and solve for the equilibrium interest rate, the answer being 0.11 or 11%. Replacing this in the LM relation gives the equilibrium output, the answer being 64.2.

Finally you have to calculate the government deficit. By definition it is given by

$$G - T = 10 - 0.1(64.2) = 3.58$$

So the government has a deficit and will increase the tax rate to balance its budget.

2) The first part here is the same as before, one has to solve for the IS and LM relations, but we know that the last one is unchanged, so we need only to see what happens to the equilibrium in the goods market. We have

$$Y = \{10 + 0.5(Y - 0.2Y)\} + \{0.1Y + 10(1 - i)\} + 10$$

Solving for output in terms of autonomous spending gives,

$$Y = \frac{1}{1 - .4 - .1} (30 - 10i) = \frac{1}{0.5} (30 - 10i)$$

We see that the multiplier indeed changed and now its value is 2. Finding the overall equilibrium as before we get now that equilibrium interest rate is $i=0.10$ or 10%, and that equilibrium output is $Y=58$. Let's check now if the government succeeded in balancing the budget. The deficit now is

$$G - T = 10 - 0.2(58) = -1.6$$

So we see that the government now runs a surplus, thus has succeeded in balancing the budget. How do the different components of demand react to the tax increase? We know that government expenditure is exogenous and does not change. Also we can say that unambiguously consumption will go down because available income decreases as income goes down and the taxes increase. For investment there are two effects, the decrease in income tends to depress investment, but the decrease in the interest rate tends to boost it, so we must make the calculations to see what effect dominates here. Before the tax increase investment was

$$I = 0.1(64.2) + 10(1 - 0.11) = 15.3$$

After the tax rise is given by

$$I = 0.1(58) + 10(1 - 0.1) = 14.8$$

Therefore investment goes down.

The last point is the graphical representation. You were expected to graph the IS and LM curves representing the equilibriums in the goods and financial markets and show the location of the overall equilibrium as the intersection (A). Then move the IS curve to the left as taxes increase and show how this translates in a lower level of income and interest rate (A').

3) An alternative way to reduce the deficit would be to reduce expenditure (this was an obvious alternative). This will also reduce output because it

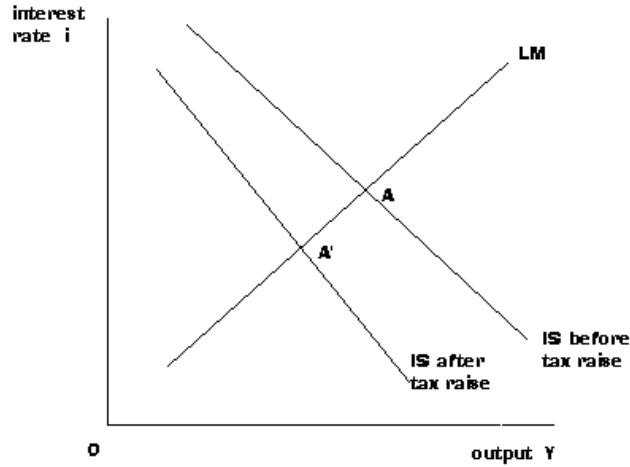


Figure 1:

is reducing aggregate demand and through the multiplier effect output would decrease. An alternative program to reduce the deficit and have a much lower effect on output would be to combine a contractionary fiscal policy (either reducing expenditure and/or increasing the tax rate) with an expansionary monetary policy (increase money supply). This will reduce the interest rate enough to give a boost to investment such that the effect on output is mild (it could even be positive, depending on the strength of the monetary expansion).

There are other ways proposed to achieve this results like simply doing expansionary monetary policy increases tax revenues as output goes up (in reality problematic for the inflationary pressures that this causes), or increasing government expenditure and taxes in such a way that the budget is balanced and output does not change (but this last one might be mathematically correct but not more, who would increase expenditure to balance a budget?).