

ECG703  
Problem Set #7 - Answers

1. (Barro, 4.7).

a. We hitherto have omitted from the household budget constraint the costs associated with making financial transactions. If we now include them, they would enter either as a reduction in sources or as another use. In either case, introducing them would reduce wealth below what it otherwise would have been.

b. If  $\gamma/P$  rises, household wealth falls, implying an increase in work effort, a reduction in consumption, and no change in saving (no change has occurred in the interest rate or in marginal rates of return across time periods.)

c. An increase in  $\gamma/P$  makes leisure cheaper relative to consumption. Therefore, households are induced to reduce consumption and increase leisure, implying a reduction in work effort. This substitution effect reinforces the wealth effect on consumption but opposes the wealth effect on work effort. As a result, the net effect on consumption is an unambiguous decrease; the net effect on labor is unclear.

2. (Barro, 4.11).

a. Let's suppose income or consumption doubles. If the doubling arises because the population doubles, then aggregate money demand doubles, too. Each individual faces the same combination of personal income, transactions costs, and interest rate after the doubling as before, so everyone makes the same decisions. There just are twice as many people making those decisions. In contrast, if the doubling arises because each existing person's income or consumption doubles, then the number of people has not changed at all but each person faces a new combination of income, transactions cost, and interest rates. According to our theory, each person will increase his money demand by the square root of 2, so aggregate money demand will increase by the square root of 2, as well.

b. Economic development means an increase in income per person, so we should expect to see aggregate money demand rise by a smaller proportion than aggregate income, implying an increase in velocity. Nothing need happen to either  $R$  or  $\gamma/P$ .

3. (Barro, 5.13).

a. A temporary downward shift in income induces everyone to borrow more to maintain consumption in the face of virtually unchanged permanent income but temporarily lower current income. However, everyone cannot be a borrower, so the interest rate rises until aggregate borrowing is restored to its equilibrium value of zero. With saving at zero, consumption must equal current income, so the ratio of aggregate consumption to income is one.

b. The theory (at this point at least - things will be different once we introduce capital accumulation) predicts that there will be no relation between interest rates on the one hand and either the ratio of consumption to income or the amount of aggregate saving on the other hand. The problem with trying to infer individual behavior from the aggregate data here is that aggregate saving always must equal zero, so that there can be no observable relation between interest rates and saving.

c. If we think about the experiment in question, we see that in both periods consumption equals income and that income is higher in the second period than in the first. Therefore, we see that a high interest rate in the current period is associated with a rise over time in consumption, implying that the ratio  $C_{t+1}/C_t$  exceeds one. This observation on the intertemporal pattern of consumption is consistent with what our theory predicts about how individuals respond to changes in the interest rate.

d. Clearly, we might learn something by looking at the changes that take place over time, whereas we are likely to learn nothing by looking at contemporaneous relations between interest rates and other variables.

4. (Barro, 5.16).

a. The presence of credit markets are irrelevant to this kind of shock. Everyone wants to work more and consume less, with no change in intertemporal patterns. The results are therefore identical to those in the Crusoe

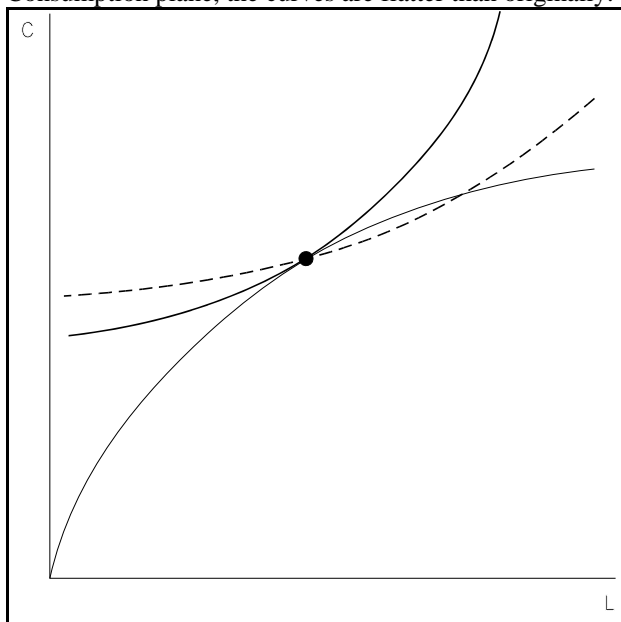
case.

b. The results for the economy with credit will be the same as for Robinson Crusoe. We can see this by looking at the representative household, for which bond holdings must be zero. Having zero bond holdings, the representative household will act the same as Crusoe.

c. For Crusoe, the response does not depend in any way on the permanence of the shock. He has no way to move goods across time periods, so he takes one period at a time with no regard to preceding or subsequent periods.

d. Putting together these results, we see that the response of the representative household in the economy with credit is the same whether the shock is permanent or temporary. The important thing to notice here is that, in the economy with credit, the typical household tries to behave differently than Crusoe but the resulting movement in the interest rate induces it to end up doing just what Crusoe would do.

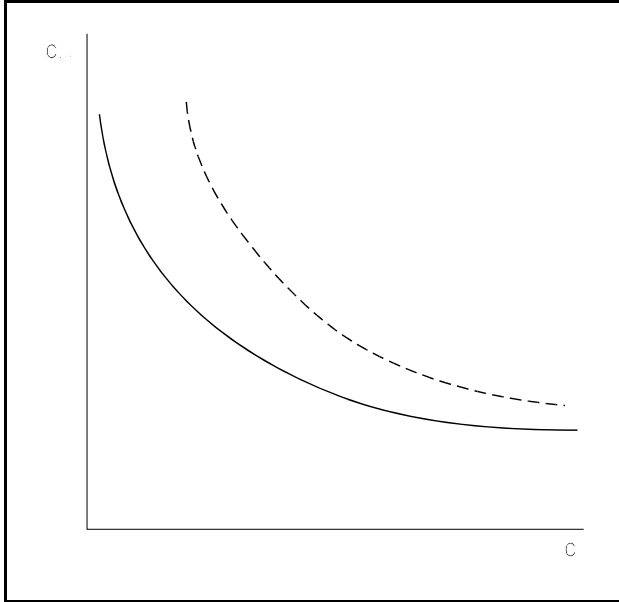
5. The hypothesized shift in preferences leads to a shift of the indifference curves so that, at any point in the Labor-Consumption plane, the curves are flatter than originally.



As a result, the new equilibrium occurs at a combination of more labor and more consumption. Because there are no changes in intertemporal preferences or in the marginal product of labor in one period relative to another, the intertemporal patterns of labor and consumption are unchanged. As a result, the original interest rate remains the equilibrium value and so does not change. Because there is more output, the demand for money rises, requiring the price level to fall in order to restore equilibrium between money demand and money supply.

One obvious event that might elicit such a change in behavior is a war that the population supports.

6. a. An increase in the rate of time preference implies that, at any combination of current and future consumption, the household has a greater preference for current consumption over future consumption than formerly, implying that the intertemporal indifference curves in the  $C_t$ - $C_{t+1}$  plane become steeper.



At the original interest rate, the household prefers more consumption in the present relative to the future than it did before the change in  $\rho$ . To see the change in indifference curves formally, note that the slope of the intertemporal indifference curve is

$$\frac{dc_{t+1}}{dc_t} = -(1+\rho) \frac{u'(c_t)}{u'(c_{t+1})}$$

so that an increase in  $\rho$  makes the indifference curve's slope more negative.

b. Labor and therefore income are fixed in all periods. Therefore, when households decide to increase current consumption at the expense of future consumption, aggregate demand rises above aggregate supply, creating excess demand in the commodity market. What happens in the money market depends on whether income or consumption is the measure of the volume of transactions. If the measure is income, nothing happens to either money demand or supply; if the measure is consumption, money demand increases. The excess commodity demand pushes up the interest rate, restoring commodity market equilibrium by reducing consumption demand until it returns to its original value, at which it equals output. With no change in  $Y$  or  $C$  and an increase in  $R$ , money demand is lower than before the shock. The resulting excess supply of money requires an increase in  $P$  to restore equilibrium in the money market.

Thus  $Y$ ,  $C$ , and  $L$  end up unchanged,  $R$  is higher,  $H$  is lower, and  $P$  is higher.