7 MONEY AND INFLATION IN THE LONG RUN

1. One should never quarrel about definitions. Anybody has the right to define "money" as he or she wants. The question here is whether these assets have the four characteristics that "money" has in our model.

Gold was used as means of payment long ago but it is not used for this purpose in modern economies.

Dollar bills are generally accepted to make payments (in the USA), prices and wages are set in the same units as dollar bills, and dollar bills yield no interest. From this point of view they fit our definition of money. However, the central bank does not directly control the quantity of dollar bills in circulation. Banks are free to convert money on their accounts in the payment system to dollar bills. The monetary base, i.e. bills and coins in circulation plus banks' claims in the payment system (reserves) is more directly controlled by the central bank.

Money on a savings account cannot be used directly to make payments and deposit holders get interest on their account. Also the amount of money on the savings accounts is not really controlled by the central bank. Therefore, money on savings accounts does not correspond well to "money" as we have defined it in our model.

A credit card allows you to make payments in a convenient way, but the payment is always made from one account to another using monetary base. Therefore, it is the monetary base that is money, not the credit card itself.

In some countries, foreign currency (e.g. dollars or euros) are accepted as payments in transactions. If most transactions are made with dollars and prices and wages are also set in dollars, the situation is similar to that of a country with an irrevocably fixed exchange rate or in a monetary union, which we will analyse in Chapter 13. Dollars function as money but the central bank cannot control the quantity of money.

As discussed above, banks' claims in the payment system (reserves) can be seen as part of the money supply. All payments are ultimately made with bills or banks' claims in the payment system.

2.

a) If people start to use foreign currency for large payments, the demand for monetary base will decrease.

b) If people go on vacation, we can imagine that they use more cash for their transactions. On the other hand, firms have fewer transactions, so the net effect is unclear.

c) If banks start to hold more money on their accounts in the payment system, the demand for monetary base increases.

d) If it becomes possible to pay with credit card on busses and trains, people will carry less cash around and since payments with credit card imply faster circulation of the monetary base, the demand for monetary base should decrease.

3. The inflation rate is 7 percent per year:10-3=7.

4. The growth rate of the money supply is 5 percent: 3+2=5.

5. In the long run, high inflation is a tax on people who save only if they save in the form of cash. If they lend their money in some form, they should get a nominal interest rate that compensates for inflation: $i = r + \pi$ where r is determined by real factors. The real return should be unaffected by inflation.

6. The inflation tax brings in some revenue, but normally only a fraction of a percent of GDP, so it is not much of an alternative to explicit taxation of income.

7. For a given nominal interest rate, higher expected inflation will reduce the real interest rate so consumption and investment will increase. If production increases above the natural level, this will lead to wage increases and higher inflation. But if the central bank raises the interest rate, demand and inflation need not increase.

8. In 2004 GDP in the USA was 11876 billion dollars and in 2005 it was 12718 billion dollars. The monetary base was 759 billion in 2004 and 787 billion in 2005.

a) The velocity for the monetary base was 15.6 in 2004 and 16.2 in 2005.

b) Seignorage was (787-759)/12718=0.0022 or approximately 0.2 percent of GDP.

c) If velocity is constant, seignorage as a percent of GDP is is the growth rate of nominal GDP divided by velocity:

$$\frac{\Delta M}{PY} = \frac{\text{nominal growth of GDP}}{\text{velocity}} = \frac{\frac{12718}{11876} - 1}{\frac{11876}{759}} \approx \frac{0.0709}{15.6} \approx 0.0045 \approx 0.5 \text{ percent of GDP.}$$

d) Since velocity increased, the monetary base increased less than it would have done if velocity had remained constant. For this reason, seignorage was lower.

9.

a) $\frac{\Delta M}{PY} = \frac{\text{nominal growth of GDP}}{\text{velocity}} = \frac{0.03+0.02}{20} = 0.0025 = 0.25$ percent of GDP.

b) $\frac{\Delta M}{PY} = \frac{\text{nominal growth of GDP}}{\text{velocity}} = \frac{0.08+0.02}{20} = 0.005 = 0.5$ percent of GDP.

c) $\frac{\Delta M}{PY} = \frac{\text{nominal growth of GDP}}{\text{velocity}} = \frac{0.03+0.07}{20} = 0.005 = 0.5$ percent of GDP.

d) In the short run it may be unchanged, but if people expect higher inflation, the nominal interest rate will increase and velocity will also increase, reducing the seignorage in case c.

e) The assumption that velocity remains unchanged leads to an overestimation of the increase in seignorage received from an increase in inflation.

10.

a) $\frac{\Delta M}{PY} = \frac{(g+\pi)M}{PY} = \frac{g+\pi}{V} = \frac{g+\pi}{V^0 e^{bi}} = \frac{g+\pi}{V^0} e^{-b(r+\pi)}.$

b) Taking the derivative with respect to inflation we get

$$\frac{e^{-b(r+\pi)}}{V^0} - \frac{g+\pi}{V^0} b e^{-b(r+\pi)} = 0 \quad 1-(g+\pi)b = 0 \qquad \pi = \frac{1}{b} - g.$$

As you increase inflation, seignorage first increases but then velocity increases so much that seignorage falls. The more sensitive velocity is to the interest rate (higher *b*) the lower is the rate of inflation that maximizes seignorage. As seen from the equation in a) a high real growth rate (*g*) generates seignorage in proportion to the real money supply. With a higher real growth rate, seignorage is maximized if the real money supply is higher, that is, inflation is lower.

c) $\pi = \frac{1}{b} - g = \frac{1}{0.5} - 0.02 = 1.98.$
The inflation rate that maximizes seignorage is 198 percent.

d)

π	$\frac{\Delta M}{PY} = \frac{0.02+\pi}{19.6 \cdot e^{0.5(0.03+\pi)}}$
0.02	0.002
0.06	0.004
1.00	0.031
2.00	0.037

3.00	0.034

As inflation goes from 2 to 6 percent, seignorage increases. Note that inflation is three times larger but seignorage is about twice as large. There are two reasons why seignorage increases less than proportionally. First, seignorage comes partly from increasing money supply in line with real growth. Second, velocity increases as the inflation increases and this counteracts the increase in seignorage.

e) See table above. As inflation increases above 200 percent, seignorage goes down because of the increase in velocity (decrease in real money demand). As we saw above, seignorage is maximized for an inflation rate of 198 percent.