

14.02 - Problem Set 3 Solutions

1. High Powered Money

a) $H = Cu + R = cM_d + zD = cM_d + (1 - c)zM_d$

$$H = M_d[c + z(1 - c)]$$

$$M_d = \frac{1}{c+z(1-c)} H$$

b) $\frac{1}{c+z(1-c)} = \frac{1}{0.05+0.05(1-0.05)} = 10.25$

(c) if $c = 0$ then $\frac{1}{c+z(1-c)} = \frac{1}{z} = \frac{1}{0.05} = 20$

This could happen if checking deposits were extremely liquid (maybe, as ATM cards can be used for everything), or if the number of transaction were infinitely low

(d) if $c = 1$ then $\frac{1}{c+z(1-c)} = \frac{1}{1} = 1$

This could happen if checking deposits were not liquid, or if it were necessary to pay transactions in cash. Another possibility is if no one kept Dollars in banks (bank crisis).

(e) if $z = 0$ then $\frac{1}{c+z(1-c)} = \frac{1}{c} = \frac{1}{0.05} = 20$

The reason why there is still a money multiplier is that even though there are no reserve requirements on deposits, people hold a part of their money demand in currency. The rest is put in deposits and the banks can now use all of that money to buy bonds/make loans, and so on, as usual. Also, if $c \rightarrow 0$, then the multiplier would tend to infinity: with $z = 0$ all demand deposits can be loaned out by banks.

(f) A central bank would never set $z = 0$, because it is important that private banks provide liquidity to the economy. Banks have to hold reserves against a sudden withdrawal of deposits; this reduces the probability of a bank run.

(g) If $H = 800$, then $M_d = 10.25 * 800 = 8,200$

2. Money Demand

(a) $\frac{\partial M_d}{\partial i} = -\frac{Y}{i^2} \leq 0$

The derivative could never be positive. In the extreme case, if $i \rightarrow \infty$ then $\partial M_d / \partial i \rightarrow 0$.

(b) $\frac{\partial M_d}{\partial Y} = \frac{1}{i} > 0$

When income goes up, demand for goods and services goes up. Therefore, the demand for money goes up (as you need money to pay for these additional goods and services).

(c) If prices double on all goods produced in the economy, this would not alter the relationships described, as both money demand and money supply are in real terms.

(d) Two possible interpretations:

(i) Foreign narcotics producers sell narcotics to Americans. In order to buy narcotics Americans need currency (they cannot buy drugs with checks). However, by definition $M_d = Y/i$. Y and i remain unchanged. Therefore, M_d stays unchanged. However, $M_d = Cu + D$. As M_d does not change, and Cu increases, it must be true that D decreases by the same amount of the increase in Cu .

(ii) We focus of the behavior of narcotics producers. They want to hold value in US dollars. Therefore money demand goes up.

3. Financial Markets Equilibrium

(a) Money demand is $M_d = \frac{Y}{i}$

Money supply is $M_s = \frac{1}{c+z(1-c)}H$

In equilibrium $M_d = M_s$

$$\frac{Y}{i} = \frac{H}{c+z(1-c)}$$

$$i = \frac{Y}{H} [c + z(1 - c)]$$

see figure 1 attached.

(b) From part (a), if $Y = 10,000$ then $i = \frac{10,000}{800} [c + z(1 - c)] = 1.218$

if $Y = 10,500$ then $i = \frac{10,500}{800} [c + z(1 - c)] = 1.279$

If income increase the interest rate goes up. See figure 2 attached.

(c) From part (a), if $H = 800$ then $i = \frac{10,000}{800} [c + z(1 - c)] = 1.218$

if $H = 1,200$ then $i = \frac{10,000}{1,200} [c + z(1 - c)] = 0.81$

If the supply of high powered money increases the interest rate goes down. See figure 3 attached.

(d) From part (a), if $z = 0.10$ then $i = \frac{10,000}{800} [c + z(1 - c)] = 1.81$

If z goes up the supply of money decreases, and the interest rate increases. The increase of the interest rate decreases the probability of a bank run because it decreases the willingness to hold money.

(e) c is the share of money that people want to hold in the form of currency. If a bank run begun we would expect c to increase. This would decrease the money supply, and eventually increase the interest rate. See figure 4 attached.

4. The Bond Market

(a) $B = Wealth - M = Wealth - \frac{H}{c+z(1-c)} = 12,000 - 800 * 10.25 = 3,794.87$

(b) As $M = Y/i$, and $M = Wealth - B$, then $Y/i = Wealth - B$, or $B = Wealth - Y/i$.

An increase in H would cause a decrease in the interest rate, and in the demand for bonds. In particular,

$$\text{If } H = 800 \text{ then } B = Wealth - \frac{H}{c+z(1-c)} = 12,000 - \frac{800}{0.0975} = 3,794.87$$

$$\text{If } H = 1,200 \text{ then } B = Wealth - \frac{H}{c+z(1-c)} = 12,000 - \frac{1,200}{0.0975} = -307.69$$

We have to conclude that a value like 1,200 does not make sense for H . A more plausible value for H would be 1,000:

$$\text{If } H = 1,000 \text{ then } B = Wealth - \frac{H}{c+z(1-c)} = 12,000 - \frac{1,000}{0.0975} = 1,743.58$$

If the high powered money supply increases then the demand for bonds goes down. See figure 6 attached.

(c) If Wealth increases then the demand for bonds increases. Nothing happens to the demand for money: the money demand is a function of income and interest rate, not of the wealth. Therefore, the increase in wealth would totally go into higher demand for bonds. See figure 7 attached.

PLEASE NOTE: To see the figures attached to this problem, start the program “Xfig” (select Text-Graphics in the Dash menu, Graphics, Xfig), click the mouse on 'file' and load the files ps3.fig and ps33.fig that are in the locker).