ECN 506

Liquidity Risk and Bank Panics

Here we consider the role of clearinghouses in facilitating the settlement of private debt in the economy. Consider an OLG economy with an infinite horizon where individuals live for two periods. There are two types of individuals in the economy: debtors and creditors. In each period there are N debtors born and N creditors born. There is a constant stock of fiat money in the economy equal to M.

Debtors and creditors are born on different islands and there are a large number of each type of island. Each young debtor is endowed with y^d units of a debtor good that they have no interest in consuming. Similarly, each young creditor is endowed with y^c units of a creditor good that they have no interest in consuming. Preferences are as follows. Each debtor wants to consume the creditor good when young and nothing when old. Conversely, each creditor wants to consume the debtor good when old and nothing when young. The initial old creditors receive the entire money stock M that is split evenly among them.

There is a central island that has a clearinghouse that can help settle debt. The clearinghouse is purely a facilitator, has no costs and does not try to maximize profits.. The clearinghouse is able to take IOU's and hold them until they are repaid, take repayment from individuals and keep track of what debts have been repaid.

Consider a generation of young debtors and creditors. The timing is described as follows:

(i) Debtors travel to a creditor island, borrow the good they want to consume, issue an IOU to be repaid when old and then travel home. At this point young creditors all hold an IOU and all young debtors hold both goods. Young debtors consume the creditor good they just borrowed.

(ii) While young, each young debtor is visited by an old creditor who holds money. The young debtor sells the debtor good to the old creditor for money.

(iii) When old, creditors and debtors all travel to the central island to trade. The debtors hold fiat money and the creditors hold an IOU. If trade takes place then the creditor travels to a debtor island on their way home and acquires the debtor good for fiat money.

1. Money is used in two ways in this economy. What are they? Explain.

Money is used to: (i) acquire goods, and (ii) to repay debt. The use of money to acquire goods is used between generations (i.e. old creditor uses fiat money to acquire the consumption good), and when money is used to repay debt it is done within a generation (i.e. old debtors repay old creditors for the debt they incurred when young.

2. Why do creditors demand the debtor good when old and not young? What happens if they want to consume the debtor good when young instead?

If old creditors want to consume the debtor good when young then there is no role for private debt in the economy. That is, when young debtors travel to the creditor island, they will simply exchange debtor goods for creditor goods. This would be similar to the barter economy studied in the first part of the course. There would also be no demand for fiat money.

Here we consider different frictions in terms of the timing of arrivals at the central island.

3. First, suppose all old individuals arrive at the same time. How can settlement take place (hint: there are two ways)? Are these two methods of settlement different? Explain.
Settlement can happen directly or indirectly. Direct settlement means that each pair that entered into a private debt contract will settle with each other. The debtor will pay for the IOU they issued in the previous period with the fiat money they came to the island with. The creditor receives the money and gives the debtor their IOU, which is torn up. Indirect settlement occurs through the clearinghouse. The debtor gives the clearinghouse fiat money, which records that they repaid their debt. The creditor gives the IOU to the clearinghouse in exchange for fiat money, which the clearinghouse tears up as they record that the debt has been paid. The two forms of settlement are equivalent here.

4. Suppose that old creditors and debtors arrive in pairs. However, each pair is not the pair that entered into the private debt arrangement when young. How does trade take place? Explain using a diagram and/or by clearly explaining the steps. Is there a liquidity problem? Explain the role of the clearinghouse in this case.
Here direct settlement is not possible. Settlement occurs indirectly through the clearinghouse. Debtors give the clearinghouse fiat money and the clearinghouse records the debt as repaid. The clearinghouse buys IOU's from creditors with fiat money and tears up the IOU when the issuer of the IOU arrives at the island and repays their debt. There is no liquidity problem here. In fact there would be a liquidity problem without the clearinghouse as direct settlement is not possible in this case.

5. Suppose that debtors and creditors now arrive and leave sequentially with a debtor arriving first. That is, suppose an old debtor arrives at the central island and leaves, before the first creditor, who arrives and leaves before the next debtor arrives, and so on. How does settlement take place? Explain using a diagram and/or by clearly explaining the steps. Is there a liquidity problem? Explain the role of the clearinghouse in this case.
Settlement occurs indirectly exactly as in the previous part but the individuals arrive sequentially with a debtor arriving first. There is no liquidity problem. Again there would be a liquidity problem without the clearinghouse as settlement cannot take place directly as no two individuals ever meet face-to-face on the island.

6. Suppose that debtors and creditors now arrive and leave sequentially with a *creditor* arriving first. That is, suppose an old creditor arrives at the central island and leaves, before the first debtor, who arrives and leaves before the next creditor arrives, and so on.

(a) How does settlement take place? Explain using a diagram and/or by clearly explaining the steps.

The first creditor presents their IOU but there is no fiat money on the central island to pay them. As a result the first creditor does not give their IOU to the clearinghouse and must sell it in a secondary market (it can do this on the debtor island when they leave). After the first creditor leaves, settlement takes place as above with a debtor arriving first. When the last debtor arrives, they have fiat money that they give to the clearinghouse but is not used to pay a creditor in that period. This fiat money can be used to pay the first creditor at the start of the next period.

(b) Is there a liquidity problem? Explain the role of the clearinghouse in this case.
Yes. The liquidity problem is described in the previous part.

(c) What happens to the first creditor if the money supply is inelastic (i.e. cannot be adjusted)?
If the money supply is inelastic then the first creditor receives nothing for their IOU and must sell it in a secondary market. They will have to sell the IOU for a lower price.

(d) What happens after the first creditor leaves? Is there a liquidity problem for the rest of the individuals?
No there is not. This is explained above and looks like a problem where debtors and creditors arrive sequentially with an old debtor arriving first.

(e) What happens to the first creditor in the next period?
The first creditor in the next period can be paid using the fiat money the clearinghouse did not have to use to buy an IOU in the previous period. As a result in the next period there is no liquidity problem.

(f) Now suppose the central bank wants to solve the liquidity problem by increasing the money supply. That is, when the first creditor arrives, if the clearinghouse does not have enough fiat money to pay them, then the central bank creates the necessary fiat money to pay them. How does this solve the liquidity problem? Has the money stock changed? Explain.
Now the clearinghouse has fiat money to pay the first old creditor who leaves the island with it. The money stock has only temporarily increased. When the last debtor arrives and repays their debt with fiat money then there are no more IOU's to buy from creditors. This fiat money can be removed by the central bank before the next period. The money stock has only been temporarily increased to solve the liquidity problem. This is similar to the extension of overnight repo facilities by the Federal Reserve in September and October of 2019.

(g) Now suppose the clearinghouse issues inside money instead of fiat money being created. How does this solve the liquidity problem? Explain the flow of the inside money in the economy (i.e. who receives it, how do they use it, how does it return to the clearinghouse?). Has the money stock changed? Explain.
Now the clearinghouse pays the first creditor with the inside money. This creditor take the

money to a debtor island to buy the debtor good from a young debtor. Now instead of holding fiat money, this debtor holds inside money. This is not a problem for them. In the next period, the young debtor gives the money to the clearinghouse as settlement for their debt. Why does this satisfy their debt? The inside money is an obligation of the clearinghouse, which it repays to the old debtor with the extra fiat money it held at the end of the previous period (remember, at the end of the previous period the last debtor gives the clearinghouse fiat money, which it does not have to use as there are no more creditors arriving). The old debtor then gives this fiat money directly back to the clearinghouse to repay their debt. The money stock is increased across periods in this place because the new money, which is inside money, is not held at the central island. It is held by a young debtor on the debtor island until they are old and travel to the central island.

(h) This situation is similar to what happened during the 2007 financial crisis except that of just one creditor arriving first, all the creditors arrived first (actually all creditors were also debtors who could not repay their obligations until they were paid as a creditor...clearly this created a liquidity problem). To solve this problem the Federal Reserve increased the monetary base by five times. Using our model explain how this action may have mitigated the effects of the crisis.

The basic idea is described in the previous parts. All the creditors require payment for the debt they hold. Unfortunately the person that must repay the debt is also waiting to be repaid. By increasing the monetary base, the central bank can inject liquidity into the market so that these debts can start to settle. When the monetary base is increased, some creditors can be repaid, who can then start to repay some of their obligations under issued debt. You can see that there is somewhat of a “snowball” effect after liquidity is supplied by the central bank.