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Chapter 14.1.1

The breakdown of liquidity insurance

- A key property of bank was that they transformed short-term deposits into long-term loans; a process also known as liquidity insurance
- We will here investigate a situation in which such liquidity insurance will breakdown and depositors withdraw their funds from the bank.
- Such a situation is known as a bank run.

Loan sales to finance deposit withdrawals

- Deposits can be withdrawn at any time, while loans are given for longer fixed terms
- If a bank faces a withdrawal of deposits, it might not have the amount of cash reserves to pay these depositors
- If not enough cash reserves are held, banks will need to sell loans to generate cash reserves
- Such sales will cause losses as loans often cannot be sold at full value

Loan sales to finance deposit withdrawals

→ We will first at how deposit withdrawals are met by banks.

- In most cases, deposits can be withdrawn without any notice and the bank has to find the necessary cash reserves to repay these deposits.
  - Banks cannot easily raise cash reserves as the loans they provide are mostly long-term and cannot be called in to raise the required cash.
- While banks hold some cash reserves to meet the demand of those depositors they expect to withdraw, for any larger withdrawals they need to find means to raise the additional cash.
- One way to raise this additional cash is to sell the loans they have given to companies to outside investors. Selling loans is different to calling loans in; companies do not have to repay the loan, they merely repay it to the purchaser of the loan.
- As there is a limited market for loans, principally banks, hedge funds, pension funds, insurance companies, the sale might not be effected at the full value of the loans, but banks will have to sell quickly and at a loss.

→ If banks face the sudden and unexpected withdrawal of deposits, they need to raise cash by selling their loans, which can only be afforded making a loss.

Return to depositors not withdrawing

- Banks retain some cash by not lending out all deposits
- Deposits are withdrawn, representing a fraction of these loans, γL
- Banks can sell loans and obtain a fraction of its face value, which needs to balance the deposit withdrawal
- $\gamma L = \lambda \hat{L}$
- Assume that $\lambda \geq \gamma$ and the bank can raise sufficient cash to repay all withdrawn deposits
- Depositors retaining deposits will receive the loan repayment on the outstanding loans and share this with all depositors that have not withdrawn
- $1 + \hat{r}_D = \pi \left(1 + r_L\right) \frac{L - \hat{L}}{D - \gamma L}$

Return to depositors not withdrawing

→ In such a situation where some depositors withdraw, we first look at the return those depositors obtain that are retaining their deposits with the bank.

- We know that banks retain some cash to meet the demands of depositors withdrawing early for consumption; the remainder of the deposits is lent out.
- We assume that deposits in excess of the cash reserves are withdrawn; these additional withdrawals represent a fraction γ of the loans the bank has provided.
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  - To meet this additional demand for cash reserves due to the deposit withdrawals, banks can sell loans and obtain a fraction λ of their face value.
  - They sell enough loans such that the revenue of these sales covers the additional demand from withdrawn deposits.
- *Formula*
- We assume that the bank obtains sufficient funds from selling loans to cover the deposit withdrawal. This requires that they obtain sufficient amounts from selling their loans.
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  - In order to pay the remaining depositors, the bank can use the repayment they obtain from the loans they have given.
  - As they have sold some loan, they only receive the revenue of those loans they have retained.
  - This amount is then distributed among the deposits that have not been withdrawn.
- *Formula*. The resulting amount paid to depositors can be interpreted as their return, thus the implied deposit rate.

→ Having determined the return to depositors not withdrawing, we can now ascertain the incentives for depositors to withdraw early.

Early withdrawal of deposits

- When withdrawing deposits, we assume no interest is payable, hence $r_D = 0$
- Depositors would not withdraw if $\hat{r}_D \geq r_D$

$\Rightarrow \lambda \geq \frac{\gamma\pi(1+r_L)}{\pi(1+r_L)-(1-\gamma)} > \gamma$

- If sales are not causing too much losses, depositors do not withdraw early

Early withdrawal of deposits

→ If depositors withdraws early, it must be profitable for them to do so.

- We assume that when withdrawing deposits early, the bank only repays the original deposits without interest for simplicity.
- If retaining deposits gives a higher return than withdrawing them, depositors would not withdraw early. Note here that we are only considering deposits that are not needed for consumption purposes, thus depositors would face no detriment if retaining the deposit.
- [⇒] We can solve this condition and see that if the bank can sell loans at a sufficiently high price, depositors would not withdraw early.
- In other words, if when raising cash reserves banks are not suffering too large losses, there is no incentive for depositors to withdraw early.

→ We can turn this result around and state that if the withdrawal rate is sufficiently low, then other depositors should not withdraw early/

High withdrawal rates

- If loan sales are not able to generate sufficient cash to repay all early withdrawals, $\lambda < \gamma$, those retaining deposits will receive no repayment

$\Rightarrow 1 + \hat{r}_D = 0$

- Withdrawing depositors obtain the cash generated after selling all loans and share this among those withdrawing deposits
- $1 + r_D = \frac{D-(1-\lambda)L}{D-(1-\gamma)L} > 0$

$\Rightarrow \gamma > \gamma^* = \lambda \frac{\pi(1+r_L)-1}{\pi(1+r_L)-\lambda}$

- If sufficient depositors withdraw early, it is optimal for all depositors to withdraw early

High withdrawal rates

→ We can now turn our attention to a situation where the withdrawal rate is high.

▶
- We consider the case where the withdrawal rate is so high that the bank cannot generate sufficient cash reserves to meet the demand from withdrawals, even if selling all loans.
- In this case those deposits that are retained cannot be repaid at all.

▶ [⇒] This is the same situation as if the return to depositors is zero.

▶
- Depositors that are withdrawing early will not receive all their deposits back as the bank cannot generate sufficient cash. They will obtain their deposits less the losses banks make on selling these loans.
- These proceeds are shared among all depositors not having withdrawn.

▶ *Formula.* This expression will be positive and in this case withdrawing early would yield the higher return.

▶ [⇒] The condition that depositors not withdraw early from above can be inverted to obtain the condition that they withdraw early. The resulting expression can then be transformed into this *formula*.

▶ We see that is sufficient depositors withdraw early, then all depositors should withdraw early.

→ We have thus seen that if sufficient depositors withdraw early, then all depositors should withdraw; but if only a small fraction of depositors withdraw early, then no additional withdrawals should be observed.

Self-fulfilling prophecies

- If depositors belief early withdrawals are sufficiently high, they will also withdraw early
- This represents a bank run
- If depositors belief early withdrawals are sufficiently low, they will not withdraw early
- Their behaviour aligns with their belief and what they expect to occur, will happen

Self-fulfilling prophecies

→ Early withdrawals can only be observed ex-post, but then it is too late to withdraw early, hence depositors will base their decisions on their expectations of early withdrawals.

- If depositors belief that many other depositors will withdraw early, it will be optimal for them to withdraw also early; this is to prevent the bank not having any funds left to repay those retaining their deposits.
- Such a situation is commonly referred to as a bank run. Depositors are withdrawing early not because the bank is insolvent due to losses on loans, but due to the expectation of other depositors withdrawing early.
- On the other hand, if depositors belief that only a few other depositors will withdraw early, it will be optimal for them to not withdraw early as this would give them the benefits of a higher return. In this case no early withdrawals should be observed.
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  - The decision of depositors is identical to their beliefs of what other depositors are doing; if a depositor expects others to withdraw early, he will do so; if he expects other to retain their deposits, he will do so.
  - It is therefore that what depositors expect, will happen. If they expect a bank run, they will withdraw early and contribute to a bank run; if they expect no bank run, they will retain their deposits and no bank run emerges.

→ Such an equilibrium is characterised by self-fulfilling expectations; the expectations of depositors, however formed, are fulfilled.

Summary

- Bank runs are based on expectations about the behaviour of other depositors, not information about the bank
- A swing in expectations can cause bank runs and it is optimal to join the bank run
- If expectations are such that no bank run occurs, it is rational to not withdraw deposits early

Summary

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- We have seen that bank runs emerge not because of any insolvency of the bank, but the expectation of depositors about the behaviour of other depositors.
- These expectations do not have to be based on information about the bank, it can be formed on any basis.

- A bank run can be caused by expectations suddenly changing, and these changes do not have to be based on information, they can be based purely on rumours spreading.
- A depositor should join the bank run, even if he knows that it is not based on a fundamental reason.

- If the expectations are such that a run is not to occur, then a depositor should not withdraw early.

→ Banks are fragile in that a shift in expectations can cause a bank run.

This presentation is based on
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