Analysis

# Global Financial Systems Chapter 8 Bank Runs and Deposit Insurance

#### Jon Danielsson London School of Economics © 2023

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Diamond–Dybvig

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# Book and slides

# **Global Financial Systems** Stability and Risk Jon Danielsson DEADSO

 Updated versions of the slides can be downloaded from the book web page www.globalfinancialsystems.org

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illusionofcontrol.org

# Bank Runs and Crises

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• SVB and CS

• We discuss in Chapter 21 after we had a chance to discuss regulations and bailouts

# Bank runs and deposit insurance

- Banks suffer from *maturity mismatches*
- Deposits are short term assets (loans) are long term
- A bank does not have liquid funds to meet all deposits
- If every depositor in a bank wants their money, the bank goes bust
- We saw this with the *Great Depression*
- Bank runs can develop into bank panics
- Two forms of contagion: *adverse information* and *cross-held assets*. See next 2 slides

Analysis

# Adverse information

- The depositors have less information about the quality of bank loans (assets) than the bank
- So long as they trust the bank there is no problem
- If, however, they lose that trust they will want their money back
- Which may trigger a bank run
- The trust may not be confined to each bank individually
- Instead, depositors may lose trust in the entire banking system

Analysis

## Cross-held assets

- Banks don't operate in isolation
- They may be exposed to each other or exposed to the same assets
- Therefore, a problem with one bank may cause a problem with all the banks

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# Bank failure rate 1920–1939 in the United States



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# It's a wonderful life (1946)

https://www.youtube.com/watch?v=OTJCI1FNBfA

#### Analysis



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# Case — Northern Rock

- The first bank run in the UK since the Overend & Guerney run in 1866 (prevented in 1914 only due to extreme preventative measures)
- The immediate bank run seems to have been triggered by an announcement by the Bank of England that it was providing emergency liquidity support for Northern Rock
- The underlying cause was its funding structure
- The bank run that was shown on TV screens was only the endgame in a bank run that started months earlier in the international asset markets

# **Business plan**

- 1/3 of UK mortgage market
- Old-school banking, people deposit money in banks that then make mortgages
- Northern Rock got short-term loans, made mortgages, sold them off and repaid the loan
- Simplified example
  - 1. Borrow £100 million for three months from the wholesale markets,
  - 2. Make 1,000 mortgages
  - 3. Structure the mortgages sold on to investors (discuss securitization in a later Chapter)
  - 4. Repay the three-month  $\pounds100$  million loan
- Hidden liquidity risk

Analysis

# **TED** spread Zoomed on next slide



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# TED spread 2007

#### Interbank loan rate - t-bill rate



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### Northern Rock



# Hidden liquidity risk

- What if it can't sell the mortgages?
- Investors "went on strike" in the summer of 2007
- Bank was walking dead by late summer of 2007
- Wholesale investors knew immediately
- Took some time for the Financial Services Authority to learn
- Tried to resolve the crisis behind the scenes
- BoE announced liquidity support in October 2007
- Run started the following day
- Recall the Reconstruction Finance Corporation

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# Two waves of bank runs

- Sophisticated wholesale investors in July 2007
- Unsophisticated retail investors in October
- UK deposit insurance scheme was quite bad, one that was an invitation to a bank run
- The only sensible strategy for depositors was to run the bank.
- With the benefit of hindsight is clear that the failure of Northern Rock was inevitable given time

Analysis

# "To stop the Duke, go for gold"

- Many attempts to get people to cause bank runs for political reasons by withdrawing money from banks
- E.g. some "occupy" groups
- All unsuccessful, except
- 1832
- Parliamentary reform in the UK
- Run on BoE to force Duke Wellington to support reform
- $\bullet\,$  Over £1 million was withdrawn from the Bank

# Deposit Insurance and Diamond–Dybvig

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# Diamond–Dybvig (1983)

- Banks issuing demand deposits can provide better risk-sharing
- The demand deposit contract will introduce an undesirable equilibrium (a bank run)
- Deposit insurance provided by governments can prevent bank runs
- The bank is assumed to be *mutually* owned
- Individual uncertainty about the desired time profile of consumption
- Sequential service constraint

Analysis

# Diamond–Dybvig (1983)

- Three periods, t = 0, 1 and 2
- \$1 deposited in t = 0
  - yielding 1 if withdrawn at t = 1
  - yielding R > 1 if withdrawn at t = 2
- Agents are identical and have a wealth of \$1 in t = 0. There are 2 types of agents:

**Early** Prefer to consume  $c_1$  in t = 1, getting  $U(c_1)$ Late Prefer to consume  $c_2$  in t = 2, getting  $U(c_2)$ 

- Agent does not know if she is early or late at t = 0, but learns it at t = 1
- Fraction  $\lambda$  are early, and  $1 \lambda$  late

#### Autarky No trade

- Suppose there are no means to shift consumption, i.e. *autarchy*
- And since the agent does not know if she is late or early
- At t = 0 her expected utility is

$$egin{aligned} \mathsf{E}(U) =& \lambda U(c_1) + (1-\lambda) U(c_2) \ &= \lambda U(1) + (1-\lambda) U(R) \end{aligned}$$

• The late agent will have higher eventual utility than the early agent

Diamond–Dybvig

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# **Optimal social insurance**

- Suppose there are two agents, one is late, the other is early, with  $\lambda = 0.5$ , is there a way for the agents to insure against the unlucky outcome of being an 'early' agent?
- At t = 0 they make the following agreement:
  - At t=1 the late agent will pay the early agent some amount  $\pi$
  - The *early* will have consumption  $\tilde{c}_1 = 1 + \pi$  and the *late*  $\tilde{c}_2 = R(1 \pi)$
- If  $\pi$  is chosen correctly, it will increase expected utility

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# Solving

We are maximizing for both agents, so the intertemporal budget constraint is

$$\tilde{c}_2 = R(2 - \tilde{c}_1)$$

so the problem is

$$\begin{split} \max_{\tilde{c}_1} \mathsf{E}(U) = & U(\tilde{c}_1) + U(\tilde{c}_2) \\ = & U(\tilde{c}_1) + U(R(2 - \tilde{c}_1)) \end{split}$$

Differentiating w.r.t.  $\tilde{c}_1$  gives the standard result

$$rac{U'( ilde{c}_1)}{U'( ilde{c}_2)}=R$$

i.e., the marginal rate of substitution equals the marginal rate of transformation

$$c_2^* \ge c_1^* \iff R \ge 1$$

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# Utility under optimal social insurance $c_2$ autarchy R $C_1$ N

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## A bank

- Suppose there is a large number of agents
- Diamond-Dybvig show that the same solution is obtained if a financial institution (a bank) creates a bank account that pays the optimal amounts  $1 + \pi$  in t = 1 and  $R(1 \pi)$  in t = 2
- This shows the role of *financial intermediation* in increasing welfare

Diamond–Dybvig

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# What about bank runs?



# Fractional reserve banking

- Fractional reserve: collect the endowments of consumers and invest a fraction of them in the long-term investments
- Will the bank be able to fulfill the contractual obligation?
- R < 1, late investors will always withdraw early
- $R \ge 1$ , two equilibria good and bad
- (see 2 slides down)

Diamond–Dybvig

Analysis



- Suppose there are *N* depositors
- The amount the bank has on hand at t = 1 is N
- But the total value of deposits is  $N(1 + \pi)$
- So the bank *does not have enough cash* to pay off all depositors at t = 1

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# Bank run

- The *first* person to demand the money at t=1 will get the full amount  $1+\pi$
- Up to the fraction  $1/(1+\pi)$
- That *last*  $\pi/(1 + \pi)$  get *nothing*
- Hence agents want to be the first and *run* the bank

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# Two equilibria — good and bad

No run 
$$E(U) = \lambda U(\tilde{c}_1) + (1 - \lambda)U(\tilde{c}_2)$$

**Run** 
$$\mathsf{E}(U) = \frac{U(\tilde{c}_1)}{1+\pi} < \lambda U(\tilde{c}_1) + (1-\lambda)U(\tilde{c}_2)$$

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# Deposit insurance

- Government makes the agents that were *first in the queue* and get  $1 + \pi$  pay a *tax* of  $\pi$
- Which is enough to pay the unlucky ones late to the queue
- That is, the government guarantees that every agent can get \$1 at t = 1
- So agents always know they get their initial deposit back regardless of whether there is a run or not
- So long as the probability of a run is not 100% *late* agents are better off not running since they have a chance of getting  $\tilde{c}_2 > 1$
- This in turn makes the good equilibria *unique*, so there will be no run

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# Deposit insurance

- Who should carry out the deposit insurance scheme, *government* or a *insurance company*?
- Power of taxation
- Deposit insurance law

# Analysis

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# Moral hazard

- Deposit insurance can perform a variety of roles, most importantly, preventing bank runs
- It has been criticized for generating moral hazard and incentives for excessive risk-taking by banks
- Both bank depositors and bank managers may contribute to moral hazard

# Pros of deposit insurance

- Protects unsophisticated depositors in the event of closure
- Levels the playing field for large financial institutions of systemic relevance and small ones
- Acts as a speedy source of funds for the resolution of institutions
- Prevents bank runs

# Cons of deposit insurance

- Generats moral hazard
- Creates incentives for excessive risk-taking by banks
- By guaranteeing deposits, market incentives to monitor banks and to demand an interest payment commensurate with the risk of the bank are diminished
- Insurance premium charged cannot always fully internalize the cost of risk, which creates an incentive for banks to take on more risk
- Who should pay for it? The government? Other banks? Insurance premiums?
- Raises difficult questions in Europe

# Misguided views on deposit insurance

- Before the crisis there was the view that because deposit insurance was not used, it was not needed
- This is wrong
- The central conclusion from the DD model is that a deposit insurance scheme that works will never be needed
- The absence of runs does not mean deposit insurance is useless or worse

Diamond–Dybvig

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# Wholesale markets

- Banks increasingly rely on wholesale market
- Northern Rock's experience indicates that bank runs can come in two waves
  - first sophisticated institutional investors
  - then by unsophisticated retail depositors

# Argentina

- Before 1991, deposit insurance
- In 1991 and 1992, Argentina reversed this policy intending to convince financial markets that it would not under any circumstances rescue a failing bank
- In 1995, in the face of a forthcoming election and a severe economic crisis sparked by the Mexican peso devaluation of December 1994, the Argentine government reinstituted a form of deposit insurance in an effort to stave off an all out bank panic
- Suggests it is not credible to forswear deposit insurance



## 2007

- Triggered a reconsideration of the effectiveness of insurance arrangements in the UK
- After the first £2,000, legislation only protected 90% savings of up to £33,000 — guaranteeing a maximum payout of £31,700
- The time it could take for depositors to get their money back was far too long
- On 1 October 2007, Chancellor Alistair Darling announced that the scheme to protect savers with money deposited in UK banks was expanded to guarantee *100%* of savings

Analysis

# Cyprus and deposit insurance

- Slow run on Cypriot banks from second part to lesson 2012
- Crisis in March 2012
- Government insists on hitting depositors with insured deposits (below  $\in 100,000$ )
- Undermines the entire deposit insurance scheme in Europe
- Quick backtracking