A Theory of Bank Liquidity Requirements

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The curious case of liquidity requirements

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- Unless there is the risk of default by banks

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- How to counter credit risk?
- Cash deposits help risk-management incentives and reduce information asymmetries
  - Margins in derivatives trading, Biais, Heider and Hoerova (2011)
  - Cash is safe and observable (reserves), not as in Myers and Rajan (1998)

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- Citibank had regulatory capital ratio of 11% when bailed out, Dexia had 12% on July 15, 2011, bail-out on 10th October

Cash has a prudential history

- Publicly required by regulators
  - Cash, not capital, ratio requirement in National Banking System (1863-64) and Federal Reserve Act (1913) (Calomiris and Mason, 2008)
- Privately demanded by banking coalitions
  - 25% reserve requirement for members of New York Clearing House (Wicker, 2000)
- Banks increased cash- to loans-ratios during Great Depression to address default risk and depositor runs (Calomiris and Wilson, 2004)
- Cash requirements in prudential regulation in developing countries (e.g., Brazil)

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- Bank's balance sheet at $t = 0$

$$C + L = D + E_0$$

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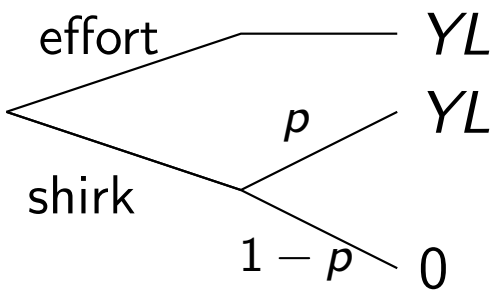
- Banker can exert unobservable risk-management effort



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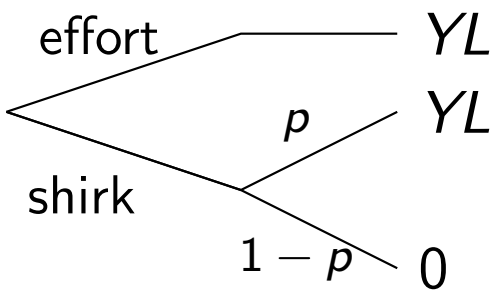
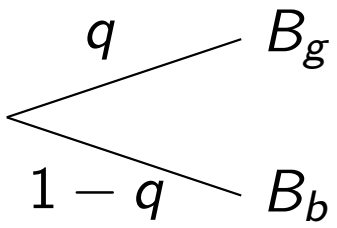


- Shirking carries private benefit BL
- Protected by limited liability $\rightarrow$ moral hazard
- With risk-management, loans are profitable $Y > 1$

Risk-management more difficult in some states

- Two aggregate states s, good or bad: $s = g, b$



- Risk-management more difficult in bad state: $B_b > B_g$
- Without risk-management in bad state, loan making is socially wasteful

$$1 > qY + (1-q)(pY + B_b)$$

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- After the banker's liquidation decision, depositors decide whether to run and obtain

$$(1 - v)L_2(s) + C(s)$$

Sequence of events

t=0	t=1	t=2	t=3	t=4
E_0 and D invested in L_0 and C_0. Contract promises R.	Depositors choose whether to pay m to observe s. State s observed by the banker.	Cash can be increased to $C_2(s)$ by liquidating loans at cost *l*. Depositors choose whether to run and force bank into bankruptcy (liquidation cost v).	Banker chooses whether to exert effort.	Loans return Y or 0

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- Hence, we assume: $v \geq \frac{E_0}{\bar{D} + E_0}$

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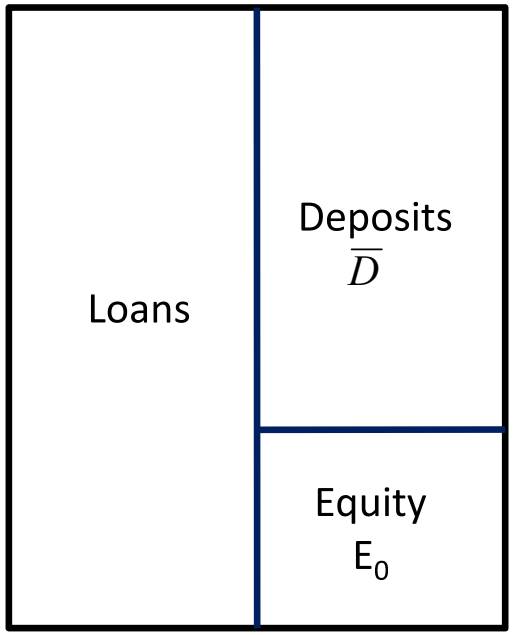

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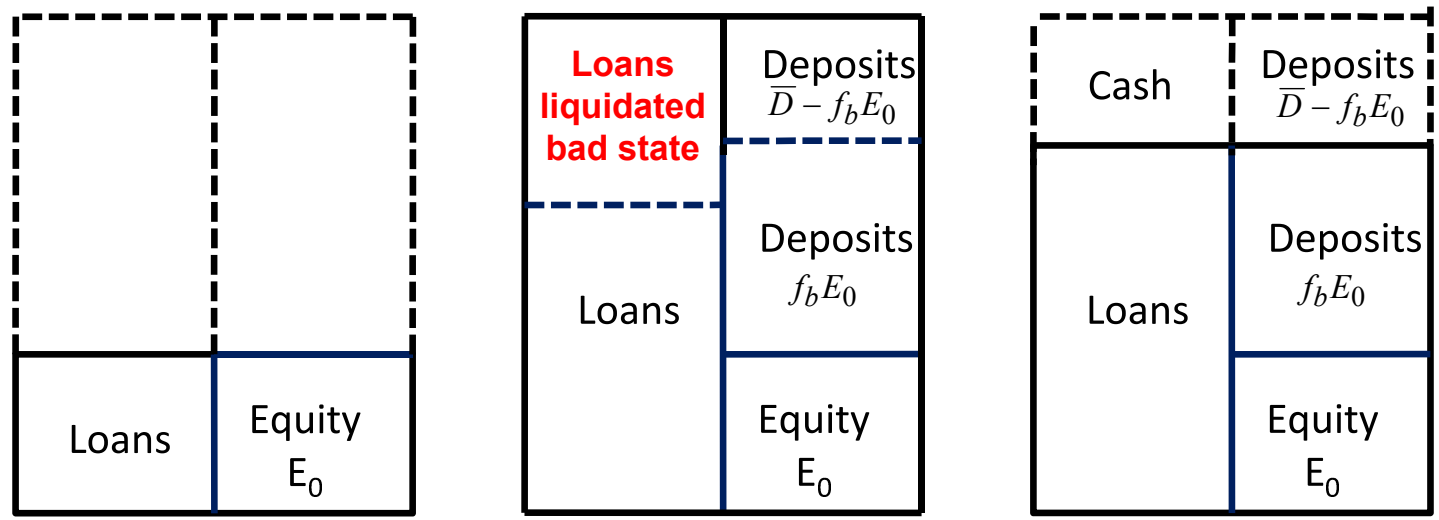
Aggregate state observable by depositors

outside financing capacity $f_b = \dfrac{P_b}{1 - P_b}$



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- Ex-post cash $C_0 + \Delta C(s)$
  - Has financing capacity of less than 1 (liquidation cost), flexible
  - Banker forgoes more surplus

Aggregate state not observable by depositors

- Incentive compatibility requires more cash in bad state
- Banker just claims it is the good state and holds no cash
- Depositors anticipate no risk-management by banker and do not deposit
- Banker has to hold cash ex-ante

Mutual liquidity insurance

- We add idiosyncratic liquidity shocks
- Autarkic banks must hold sufficient buffers
- A coalition of banks can diversify them (interbank market) $\longrightarrow$ no buffers needed
- Liquidity insurance by coalition creates free-riding
  - A bank could borrow (claiming it had a withdrawal) instead of liquidating loans
- To counter such free-riding, the coalition imposes state-contingent liquidity requirements

Deposit insurance

- When deposits are insured, depositor no longer impose higher liquidity via the threat of a run
- Banker shirks on risk-management in bad state and banking becomes socially wasteful
- Regulator imposes liquidity requirement despite no liquidity risk
- When regulator cannot assess aggregate state in time, then the requirement is uniform (wasteful in good state)

Concluding remarks

- Reserves as a prudential tool
- Benefits of reserves: observable, safe and liquid
- Reserves can improve risk-management incentives
- Sound risk-management allows banks to share liquidity risk in an interbank market
- Deposit insurance eliminates liquidity risk but necessitates a reserve requirement