A Theory of Bank Liquidity Requirements

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The views expressed are solely those of the authors, although they should be everyone's.

History of Bank Liquidity Regulation

- **National Banking Era:** Macro-Prudential approach, uses cash reserves (interbank deposits) where ratio depends on position in the network.
- **Founding of Fed** continues this approach.
- **Reserve rations remain important in many countries** (Vegh), but were cut in U.S. after disintermediation of 70s in U.S., and capital ratios were instituted in 1981 (reserve interest would have avoided disintermediation.

Bank regulation is changing

- Liquidity regulation prominent part of post-crisis regulation overhaul
- Basel Committee proposed two new standards (LCR and NSFR)

> *"The objective of the LCR is to promote the short-term resilience of the liquidity risk profile of banks. It does this by ensuring that banks have an adequate stock of unencumbered high-quality liquid assets that can be converted easily and immediately in private markets into cash to meet their liquidity needs for a 30 calendar day liquidity stress scenario"*

What is the economic rationale?

- LCR limits roll-over risk, penalizing short-term liabilities
- But:
  - isn't the creation of short-term liabilities what banks do?
  - don't we have interbank markets to deal with idiosyncratic liquidity shocks?
  - don't we have the lender-of-last resort to deal with dysfunctional interbank markets and aggregate shocks?
- Markets malfunctioned and central bank intervention has limits...why?
- Credit and counterparty risk

The role of risk-taking

- Liquidity crises in banking almost always caused by increases in credit risk (Calomiris and Gorton, 1991)
- This crisis was no exception
  - Gorton and Metrick (2012), Covitz, Liang and Suarez (2013), Afonso, Kovner and Schoar (2011)
- Risk-management of banks important
  - importance of strong CROs (Ellul and Yerramilli, 2013)
  - banks with losses in 2008 = banks with losses in 1998 (Fahlenbrach, Prilmeier and Stulz, 2012)

Cash as a prudential tool

- Focus on on the asset side of banks
- Constrain risk-taking by requiring them to hold reserves
  - like a margin call by counter-parties in derivative trading (Biais, Heider and Hoerova, 2010)
- Properties of cash held at central bank
  - observable
  - not subject to moral hazard by bankers
  - opportunity cost of not investing in high-return (risky) assets
- Incentive role of cash *requires* liquidity risk
  - how to ensure that banks hold sufficient cash at the right time?
  - make senior outside claim withdrawable (expose banks to liquidity risk)
  - insurance against liquidity risk → cash must be regulated

Capital as a prudential tool is problematic

- Usually equity (capital) is taken to controls credit risk
- But equity is assets minus liabilities
- Since assets are opaque and risky, so is equity
  - costly to issue (Myers and Majluf, 1984)
  - debt/deposits save on verification costs (Gale and Hellwig, 1985; Calomiris and Kahn, 1991)
  - deposits avoid hold-up problem by banker (Diamond and Rajan, 2001)
  - debt can be traded (Gorton and Pennacchi, 1990)
- Citibank had regulatory capital ratio of 11% when bailed out, Dexia had 12% on July 15, 2011, bail-out on 10th October

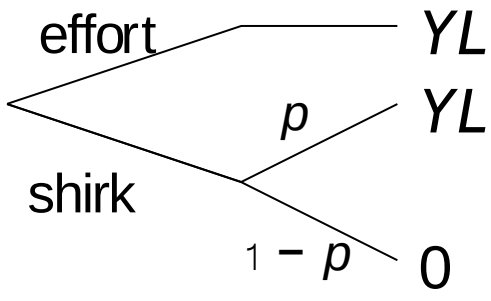
Banking

- Risk-neutrality, no discounting, storage available
- Banker endowed with loan making ability Banker
- endowed with own (inside) equity E_0 Takes in
- deposits D and pays R to depositors Deposits
- are in elastic supply up to D
- Banker invests in risky loans L_0 (return Y or 0) and safe cash C_0
- Bank's balance sheet at $t = 0$

$$C_0 + L_0 = D + E_0$$

Moral-hazard in bank's risk-management

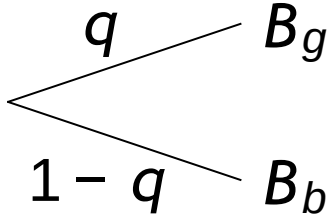
- Banker can exert unobservable risk-management effort



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

Risk-management more difficult in some states

- Two aggregate states s, good or bad: $s = g, b$
  - observable but not contractible



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

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

Loans are illiquid

- After observing the aggregate state, banker can liquidate loans at a cost to increase cash holdings

$$\Delta C(s) = (1 - l)\Delta L(s)$$

- Increasing cash ex-post reduces the value of (inside) equity

$$E_2 = E_0 - \lambda \Delta C(s) \quad \text{where} \quad \lambda = \frac{l}{1 - l}$$

Sequence of events

E_0 and D invested in L_0 and C_0.

Contract promises (R,R_f).

Exogenous liquidity withdrawals μD with probability k

(k=0 for most of present-a@on)

State s reavealed

Cash can be increased to $C_3(s)$ by liquida@ng loans at cost l

Depositors choose whether to withdraw

Banker chooses whether to exert effort

Loans return Y or 0

Depositor is paid R or R_f

Deposit insurance

- Deposit insurance scheme motivated by information externality
  - when bad state occurs a fraction α of banker shirks on risk-management effort
  - deposit insurance optimal when depositors are risk averse
- 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

Implications for regulation

- Liquidity (reserves) as risk prevention (ex ante) rather than risk insurance (ex post)
  - resolves ”Goodhart’s Paradox” of liquidity regulation
- Need for reserve accounts
- Assets and liabilities are jointly determined
  - capital and liquidity regulation must be joint
- Deposit insurance, bail-outs or interbank markets all undermine control-right of depositors
  - stable deposits make matters worse, and yet lower LCR

Concluding remarks

- Reserves as a prudential tool
- Benefits of reserves: observable, safe and liquid
- Reserves can improve risk-management incentives
- Threat of withdrawal ”imposes” reserve holding
- Deposit insurance eliminates liquidity risk but also threat of withdrawal → regulate reserves
- Share liquidity risk in an interbank market allows to free-ride on others’ reserves → regulate reserves