Banks as Patient Fixed-Income Investors

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What Makes Commercial Banks "Special"?

1. **Liability-centric: Creation of safe, "money-like" claims.**
   - Gorton and Pennacchi (1990).
2. **Asset-centric: Lending to information-intensive borrowers.**
   - Diamond (1984).
3. **Some synergy between banks' assets and liabilities.**
   - Diamond and Dybvig (1983).

- **<u>Goal</u>: Understand essence of commercial banking in a modern setting where traditional banks co-exist with "shadow banks."**
  - Our theory is in synergy bucket, while embracing money-creation view

- **<u>Ask</u>: What kinds of assets will be held by traditional commercial banks vs. shadow banks in equilibrium?**
  - Want to understand banks' assets generally: not just loans, but also securities.

Co-existence of Traditional and Shadow Banks

- **Traditional and shadow banks use different strategies to create money-like claims that are valued by households.**
- **Traditional banks create safe claims by relying on government deposit insurance and access to lender-of-last resort.**
  - Allows depositors to remain "sleepy" → Banks have stable funding.
  - But access to safety net is costly: required to issue more equity capital.
- **Shadow banks create safe claims through an early exit option: investors can liquidate collateral at the first sign of trouble.**
  - Allows shadow banks to economize on costly equity capital.
  - But fire-sales temporarily push asset prices below fundamental value.
- **Traditional banks' stable funding enables them to ride out transitory valuation shocks, but this stability comes as a cost.**

Co-existence of Traditional and Shadow Banks

- **Fire-sale discount is greater when shadow banks hold more of a risky asset, so trade-off pins down equilibrium holdings of traditional vs. shadow banks.**
  - If both hold the asset:

    Expected loss to shadow bank from fire-sale liquidations

    = cost traditional bank pays to obtain stable funding.

- **<u>Punch-line</u>: Issuing stable money-like claims is complementary w/ investing in fixed-income assets w/ little fundamental risk, but that are illiquid and exposed to interim fire-sale risk.**
  - <u>Traditional banks as patient fixed income investors</u>.
  - Synergy between funding stability and asset choice at heart of modern commercial banking.

Stylized Fact #1: Homogeneous Liabilities

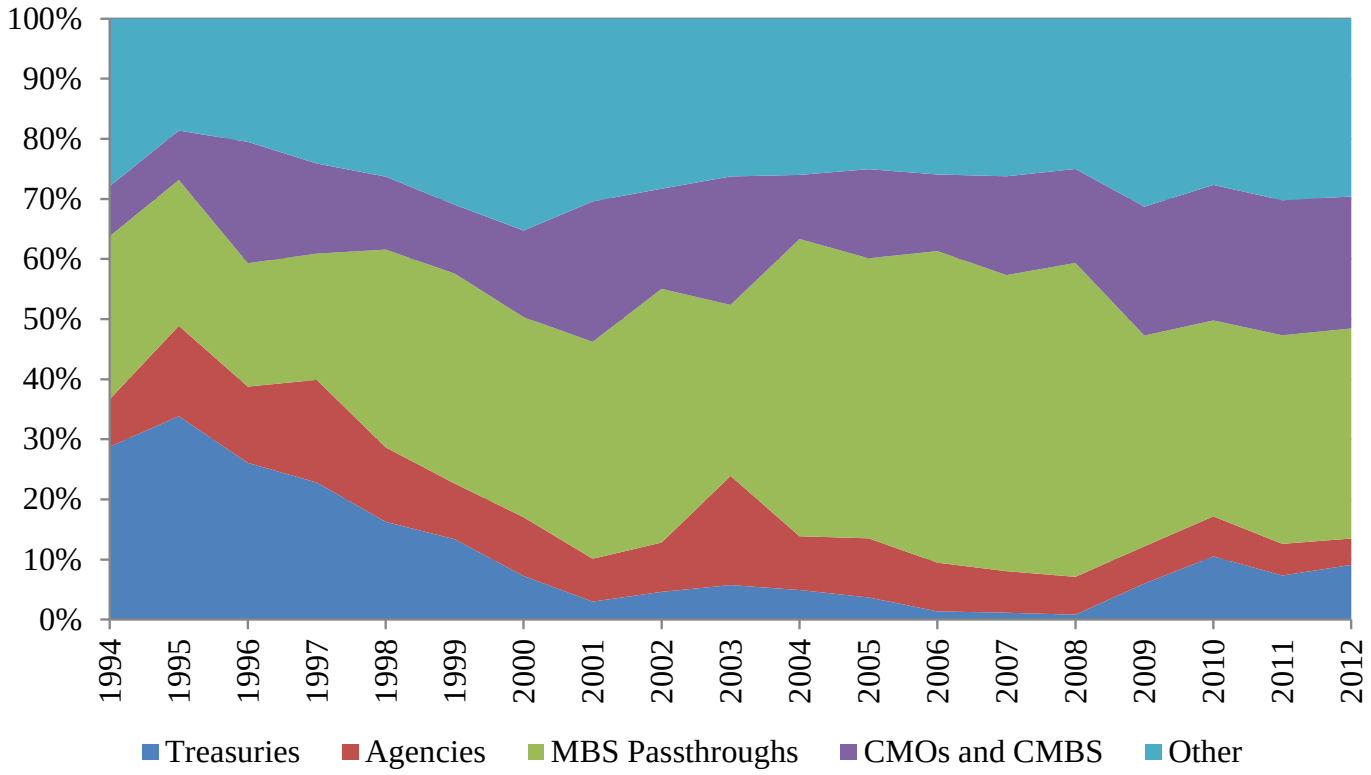
- **Banks are always heavily deposit financed.**
- **In 2012 cross-section (banks > $1B in assets):**
  - Average bank (value-weighted): deposits/assets = 75.6%.
  - Bank at 10th percentile of deposits/assets: 73.6%.
  - Bank at 90th percentile of deposits/assets: 88.9%.
- **In time series:**
  - Over last 115 years, deposits average 80% of bank assets, with standard deviation of only 8%.
- **Suggests banks create significant economic value on liability side of the balance sheet via deposit-taking.**

Stylized Fact #2: Heterogeneous Assets

- **In addition to information-intensive lending, banks also invest heavily in securities.**
  - Average bank: securities/assets = 20.8%.
  - Average bank: loans/assets = 52.9%.
- **Far more heterogeneity on asset side, particularly in mix between loans and securities.**
  - Bank at 10th percentile of securities/assets: 6.9%.
  - Bank at 90th percentile of securities/assets: 40.7%.
- **Contrary to pure monitoring view, bank balance sheets not necessarily pinned down by lending opportunities.**
  - Taking deposits as given, how should a bank invest them?

Stylized Fact #3: Preferences within Securities

- **Banks have well-defined preferences within securities.**
  - Treasuries/Agencies = only 13% of securities.
  - Mortgage-linked securities (MBS, CMOs, and CMBS) = 58%.
  - Other securities (corporates, ABS, and municipals) = 29%.



Stylized Fact #3: Preferences within Securities

- **Clear desire to hold securities with some duration, prepayment, or credit risk and so offer some spread.**
  - Average spread on bank securities over bills from ‘84-‘12 = 1.73%.
  - Surprising if securities are a liquid buffer against deposit outflows.
- **Isn’t this just deposit-insurance-induced moral hazard?**
  - If focus on banks with highest capital ratios—where government put is least relevant—securities holdings look the same.
  - Something deeper than deposit-insurance-induced moral hazard.
- **<u>Our take: an important clue as to the business of banking.</u> Defining feature of commercial banks is investing in fixed income assets that are not too boring, and so offer some spread**
- **Makes sense once recognize that taking deposits is expensive.**
  - Far higher labor and bricks-and-mortar expenses (≈ 1.30% of deposits) than running an money market fund.
  - As a result, “narrow banking” not profitable for traditional banks.

So What's The Story?

- **High-cost, stable deposits give traditional banks a comparative advantage relative to shadow banks at holding assets where short-term price volatility high but long-run cash flow risk low.**

- **General view: transitory non-fundamental moves in asset prices central to financial intermediation, especially connection between asset and liability sides of intermediary balance sheets.**

- **In model, transitory price risk is due to fire sales.**
  - Could be due to sentiment and arbitrage frictions which generate non-fundamental movements in asset prices.

- **In model, cost of stability is that banks must issue enough equity to satisfy government deposit insurer.**
  - Could be bricks & mortar costs of attracting sticky retail deposits.

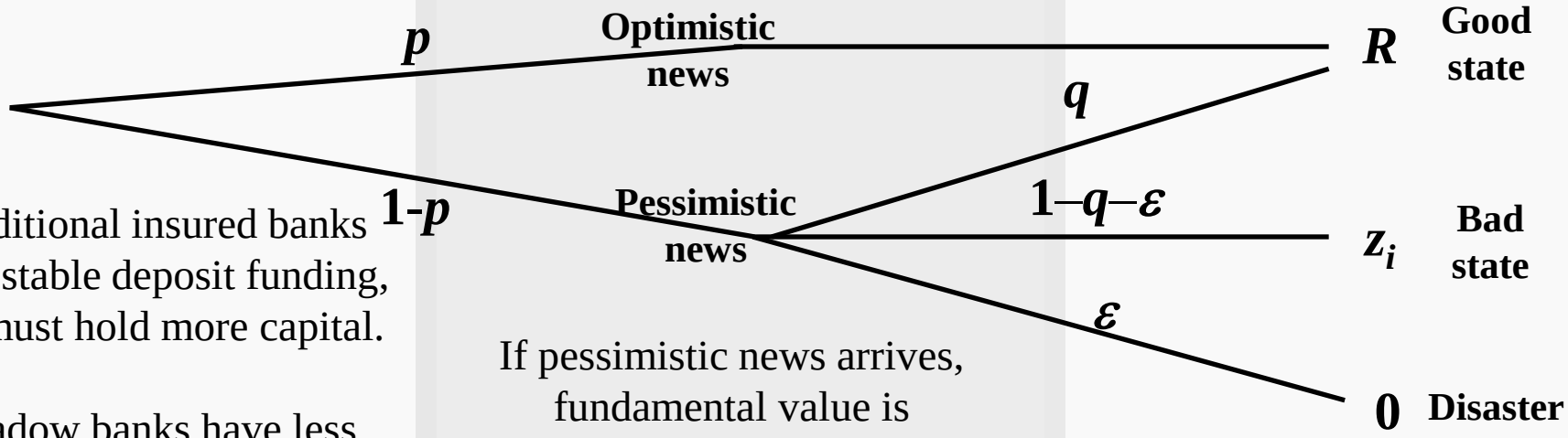
Model

- **Long-lived risky assets (indexed by *i*) with different liquidity and fundamental risks. Payoffs perfectly correlated for simplicity.**
- **Households want safe, money-like claims. Traditional banks and shadow banks compete to create safe claims backed by risky assets.**

Time $t = 0$
Intermediaries purchase risky asset and issue safe and risky claims to households.

Time $t = 1$
If pessimistic news arrives, shadow banks forced to liquidate. Traditional banks can hold on.

Time $t = 2$
Payoffs revealed.



Traditional insured banks have stable deposit funding, but must hold more capital.

Shadow banks have less capital, uninsured ST debt that runs if bad news arrives.

If pessimistic news arrives, fundamental value is $F_i = qR + (1-q-\varepsilon)z_i$, but market price is $k_iF_i < F_i$.

Uninsured funding cannot be both stable and safe b/c of tail risk.

- **Fire-sale discount ($1-k_i$) is larger when shadow banks hold more of *i*.**

Households

- **Required return on safe claims = $1/(\beta + \gamma)$**
  $\leq$ Required return on risky claims = $1/\beta$
  - **γ = Premium on safe, money-like claims.**

- Household utility is

$$U = C_0 + \beta E[C_2] + \gamma M.$$

  - M = "money-like" claims, guaranteed to pay off at time 2

Traditional Banks

- **Use deposit insurance and a hold-to-maturity strategy for making safe claims:**
  - Required to hold enough equity against asset *i* so deposit insurer never suffers losses in the bad (as opposed to the disaster) state.
  - Can only make z_i of deposits, finances rest with equity (more costly).
  - Banks must pay a fair deposit insurance premium = $(1-p)\varepsilon\beta z_i$
  - But insured funding is stable, so can ride out fire-sale at t=1.

- **Value of claims bank can issue using risky asset *i* as backing:**

$$V_i^B = \overbrace{(\beta+\gamma)z_i}^{\text{Value of bank deposits}} - \overbrace{(1-p)\varepsilon\beta z_i}^{\text{Insurance premium}} + \overbrace{\beta(p+(1-p)q)(R-z_i)}^{\text{Value of bank equity}}$$

$$= \overbrace{\gamma z_i}^{\text{Money premium}} + \beta\overbrace{[pR+(1-p)F_i]}^{\text{Expected cash flows}}.$$

Shadow Banks

- **Chains of transactions involving market-based intermediaries**
  - Simple chain: highly leveraged intermediary + money market fund
  - HL buys risky asset, issues short-term repo against asset to MMF.

- **More aggressive strategy for making safe claims:**
  - Issue $k_i F_i > z_i$ of safe-funding that is <u>unstable</u> and less equity
  - If bad news arrives at time 1, MMF deposits made safe by liquidating collateral $\rightarrow$ exposed to transitory fire-sale risk.

- **Value of claims shadow bank can issue using asset *i* as backing:**

$$V_i^S(k_i) = \overbrace{(\gamma+\beta)k_i F_i}^{\text{Value of MMF deposits}} + \overbrace{\beta p(R - k_i F_i)}^{\text{Value of HL equity}}$$

$$= \overbrace{\gamma k_i F_i}^{\text{Money premium}} + \beta\overbrace{[pR + (1-p)k_i F_i]}^{\text{Expected cash flows}}.$$

Determination of Fire-Sale Discount

- **Market shares in risky asset *i***
  - μ_i = fraction of asset *i* held by shadow banking sector
  - $1 - \mu_i$ = fraction of asset *i* held by traditional banking sector
- **For any asset *i*, fire-sale discount $k_i = k(\mu_i, \varphi_i)$**
  - φ_i is an index of asset illiquidity
- **Assume $\partial k_i / \partial \mu_i < 0$: greater shadow-banking share results in a lower fire-sale price**
- **Assume $\partial^2 k_i / \partial \mu_i \partial \varphi_i < 0$: price-pressure greater for more illiquid assets**

Equilibrium market share of shadow banks, μ_i^*

- **Highly illiquid assets that are extremely vulnerable to fire-sale discounts held entirely by traditional banks (small C&I loans).**
  - $V_i^B > V_i^S(k(0,\varphi_i)) \quad \Rightarrow \mu_i^* = 0$
- **Highly liquid assets with minimal fire-sale discounts will be held entirely by shadow banks (Treasury bonds).**
  - $V_i^B < V_i^S(k(1,\varphi_i)) \quad \Rightarrow \mu_i^* = 1.$
- **Interior equilibrium:** $V_i^B = V_i^S(k(\mu_i^*,\varphi_i)) \quad \Rightarrow \mu_i^* \in (0,1)$

$$\overbrace{(1-p)\beta \times \left[1-k(\mu_i^*,\varphi_i)\right] \times F_i}^{\text{Marginal benefit of stable funding: avoiding fire-sale liquidations}} = \overbrace{\gamma \times \left[k(\mu_i^*,\varphi_i) \times F_i - z_i\right]}^{\text{Marginal cost of stable funding: reduced money creation}}.$$

  - Endogenous fire-sale discount impacts both benefits and costs of traditional banks vs. shadow banks.

Equilibrium Market Shares in Cross-Section

- **Assets that can experience short-run price volatility but have little long-run cash flow risk complement banks' high-cost stable deposit franchise**
- **$\partial(1 - \mu_i^*)/\partial\varphi_i > 0$: traditional banks hold a larger share of more illiquid assets**
  - More valuable to be able hold illiquid assets to maturity
- **$\partial(1 - \mu_i^*)/\partial z_i > 0$: traditional banks hold a larger share of assets with less fundamental cash-flow risk**
  - Money-creation disadvantage smaller when fundamental risk is low.
- **"Assets that are boring, but not too boring"**
  - Banks avoid Treasuries: too liquid.
  - Banks avoid equities: too much fundamental risk to back stable deposits.
  - Banks drawn to GSE MBS: insured against default, but less liquid / more transitory price volatility than Treasuries.

Equilibrium Market Shares over Time

- **Predictions for "migration" between traditional and shadow banking over time**
- **Traditional banks lose market share to shadow banks during economic booms:**
  - $\partial(1-\mu_i^*)/\partial p < 0$
- **Traditional banks lose market share when money demand is strong:**
  - $\partial(1-\mu_i^*)/\partial \gamma < 0$
- **2003-2007 as a perfect storm for migration?**
  - Economic boom and increased money demand.

Policy Implications

- **Normative implications of our model fit into current debate about macro-prudential policy:**
  1. Private equilibrium features "too little" stable traditional banking and too much unstable shadow banking because of fire-sale externalities.
  2. Regulator can implement social optimum by imposing an additional haircut (capital) requirement on shadow banks.
     - Larger requirements for illiquid (high φ) assets
     - Larger requirements for safer (high z) assets.

- **Caveat: No cost to over-relying on traditional insured banks.**
  - Can add moral hazard, limited fiscal capacity, etc. to obtain a more balanced normative analysis

Other Model Implications

- **Bank accounting: Implicitly assumes many market-to-market gains/losses are temporary and that banks can ride them out.**
  - Hard to understand in a world in which changes in asset prices primarily reflect changes in expected future cash flows.

- **Operational costs of bank deposit-taking are quite high:**
  - We estimate 1.30% to 1.61% of deposits on average.
  - Perhaps in part an attempt to enhance stickiness, e.g., by creating customer switching costs (a.k.a., "loyalty").
  - Makes sense if this stickiness helps to serve the asset-side strategy. E.g., money funds (true "narrow banks") don't spend nearly as much on deposit-taking.

Evidence from Banking History

- **Prior to introduction of lender of last resort and federal deposit insurance, U.S. commercial banks followed a strategy that more closely resembled that of today's shadow banks.**
- **A commercial bank in 1880 was in the business of creating money-like claims (demand deposits).**
- **However, in the absence of a federal backstop, the safety of deposits depended more heavily on the early exit option.**
- **Relative to present-day banks, banks tended to hold assets with much shorter maturities that were easier to liquefy in a stress scenario, just like today's uninsured shadow banks.**

Contemporary Evidence

- **Key comparative static $\partial(1 - \mu_i^*)/\partial\varphi_i > 0$:**
  - Traditional banks have higher market share in more illiquid assets
  - More generally, intermediaries w/ more stable funding structures have more illiquid assets
- **High-level evidence using Flow-of-Funds data.**
  - Synthesis of facts about the aggregate structure of intermediation as opposed to a true out-of-sample test.
- **Let *j* index intermediary types, *i* index asset/liability types**
  - Let A_{ji} and L_{ji} denote intermediary type *j*'s assets/liabilities of type *i*.
  - 8 financial intermediary types.
  - 12 asset classes.
- **Use Basel III work on Liquidity Coverage Ratio and Net Stable Funding Ratio to construct measures of <u>asset illiquidity</u>, <u>liability stickiness</u>, and <u>liability maturity</u>.**

Contemporary Evidence

- **<u>Asset Illiquidity Index</u> for intermediary type *j***

$$A\_ILLIQUID_j = \sum_i (A_{ji} / A_j) \times ILLIQUID_i.$$

  - E.g., *ILLIQUID* = 0 for Treasuries, 0.15 for GSE MBS, 0.5 for corporate bonds, 0.8 for home mortgages, and 1 for C&I loans

- **<u>Liability Stickiness Index</u> for intermediary type *j***

$$L\_STICKY_j = \sum_i (L_{ji} / A_j) \times STICKY_i.$$

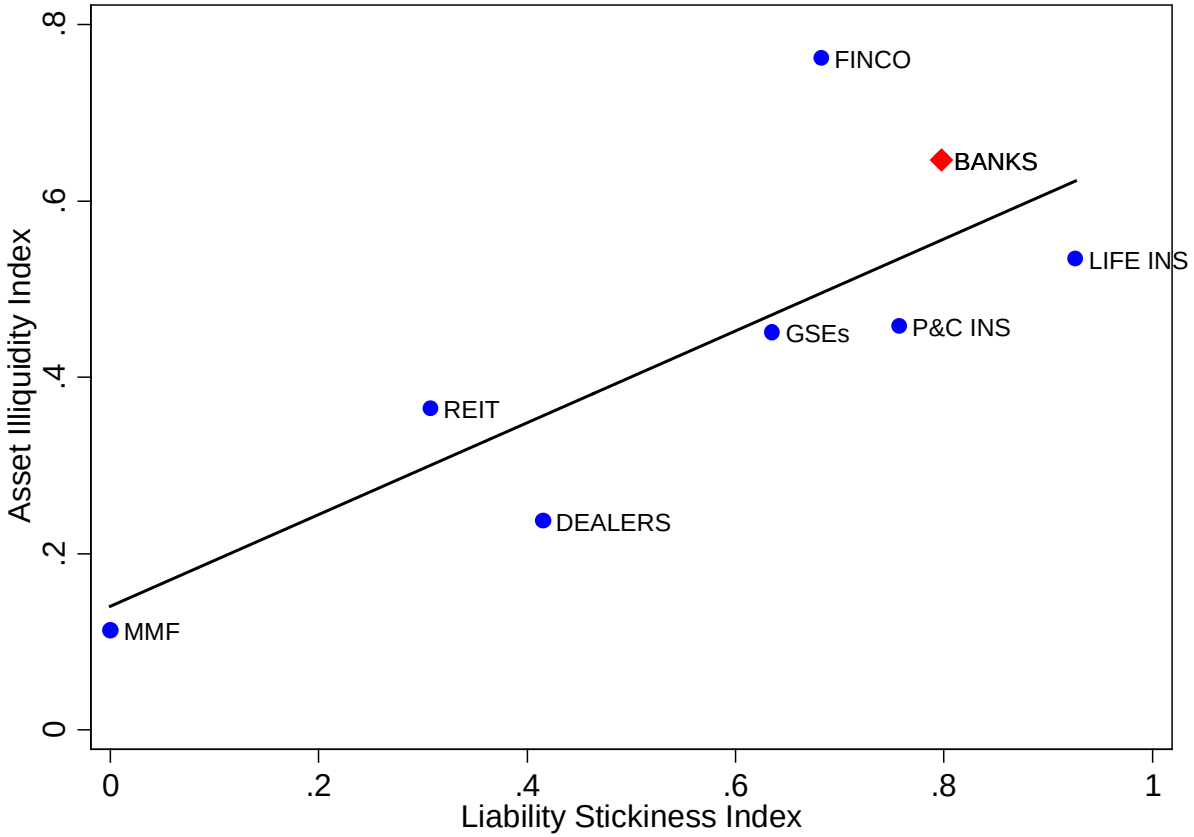
  - Sticky = opposite of runny, tendency to withdraw after bad shock
  - E.g., *STICKY* = 1 for equity capital, 0.9 for checking deposits, 0.7 for wholesale deposits, and 0 for non-deposit short-term funding

- **<u>Liability Maturity Index</u> for intermediary type *j***

$$L\_MATURITY_j = \sum_i (L_{ij} / A_j) \times MATURITY_i.$$

Across Intermediaries: Asset Illiquidity vs. Liability Stickiness

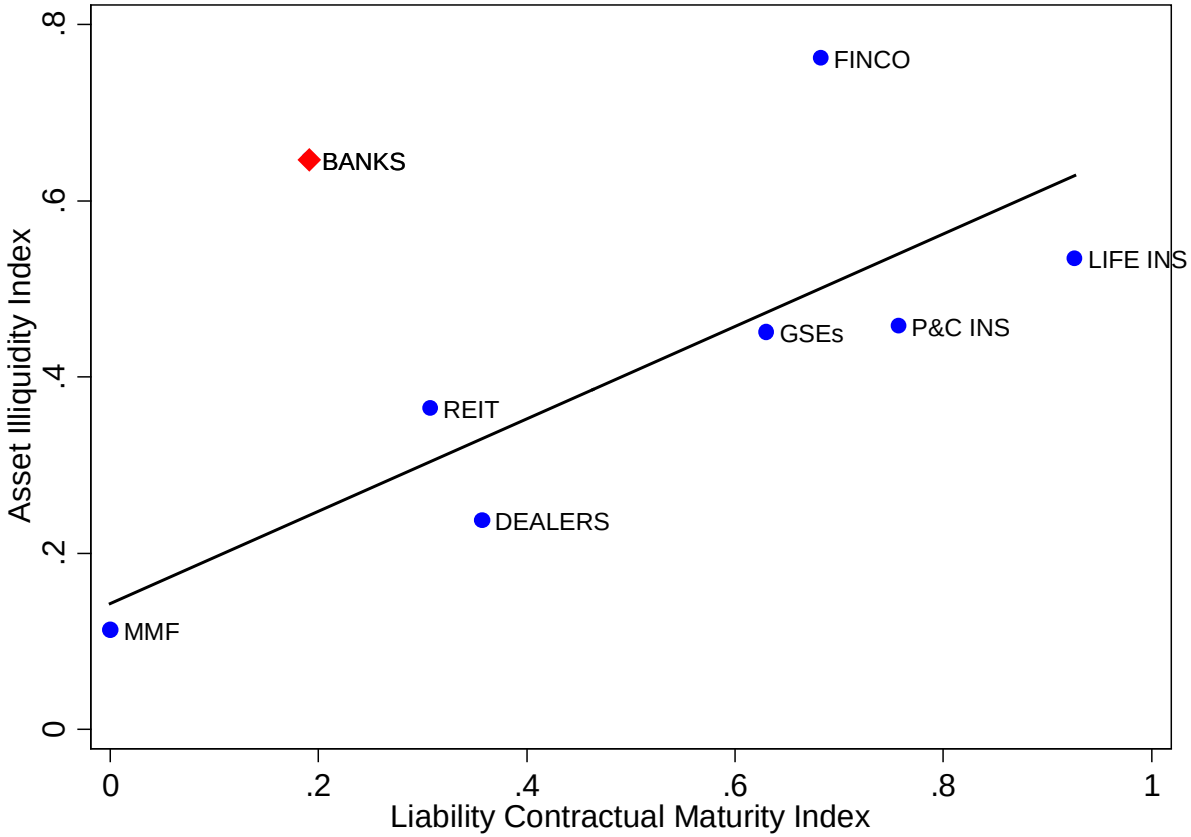
Prediction: *Looking across intermediaries, those with more stable funding should have asset portfolios that are more illiquid.*



$$A\_ILLIQUID_j = 0.13 + \underset{(t=5.02)}{0.55} \times L\_STICKY_j, \quad R^2 = 0.64.$$

Stickiness ≠ Contractual Maturity

Prediction: *Banks are an outlier in terms of liability contractual maturity given their asset illiquidity.*



$$A\_ILLIQUID_j = 0.27 + \underset{(t=1.59)}{0.36} \times L\_MATURITY_j, \quad R^2 = 0.29.$$

Contemporary Evidence Across Assets

- **Bank's Market Share in risky asset *i***

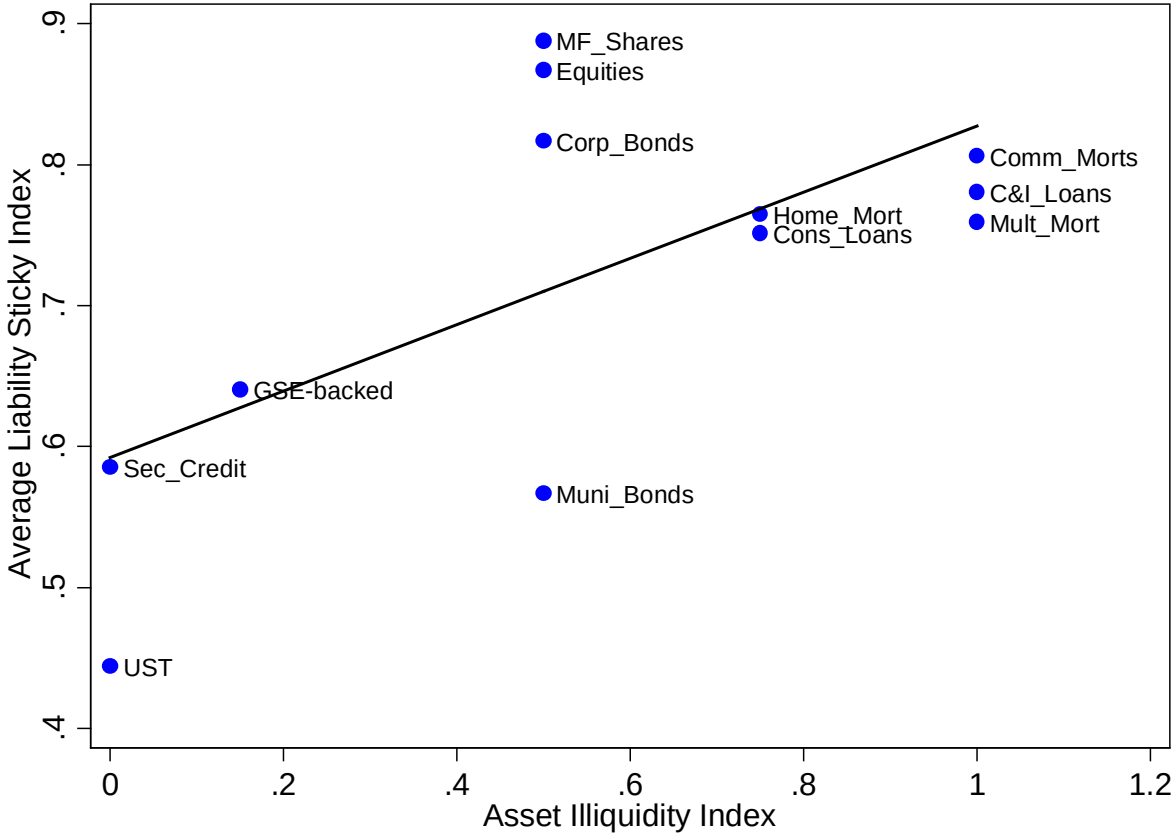
$$BANK\_SHR_i = \frac{A_{bank,i}}{\sum_j A_{ji}}.$$

- **Average liability stickiness of intermediaries holding asset *i***

$$AV\_STICKY_i = \frac{\sum_j A_{ji} \times L\_STICKY_j}{\sum_j A_{ji}}.$$

Holder Liability Stickiness vs. Asset Illiquidity

Prediction: *More illiquid assets should be held by intermediary types with greater funding stability.*



$$AV\_STICKY_i = 0.59 + \underset{(t=3.40)}{0.23} \times ILLIQUID_i, \quad R^2 = 0.41.$$

Conclusions

- **Modern commercial banks use deposit insurance and costly equity capital to create <u>stable</u> money-like claims**
- **Shadow banks create money-like claims with less equity capital and rely on early exit option which exposes them to fire-sale risk**
- **Synergy between: (i) bank's stable funding model and (ii) investing in assets that have modest cash flow risk but that can trade far below fundamentals in a bad state of the world.**
- **Synergy yields a unified account of commercial bank deposit taking and of their preferences across different types of assets.**