Banks as Patient
Fixed-Income Investors

Samuel G. Hanson
Andrei Shleifer
Jeremy C. Stein
Robert W. Vishny

April 2015
What Makes Commercial Banks “Special”?


2. Asset-centric: Lending to information-intensive borrowers.

3. Some synergy between banks’ assets and liabilities.

- **Goal:** 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

- **Ask:** 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.

- **Punch-line:** 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.
  - Traditional banks as patient fixed income investors.
  - 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.

- Our take: an important clue as to the business of banking. 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 ($\approx 1.30\%$ 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.

<table>
<thead>
<tr>
<th>Time $t = 0$</th>
<th>Time $t = 1$</th>
<th>Time $t = 2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermediaries purchase risky asset and issue safe and risky claims to households.</td>
<td>If pessimistic news arrives, shadow banks forced to liquidate. Traditional banks can hold on.</td>
<td>Payoffs revealed.</td>
</tr>
</tbody>
</table>

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.

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

\[
F_i = qR + (1-q-\varepsilon)z_i, \text{ but market price is } k_iF_i < F_i. \]
**Households**

- Required return on safe claims \( = 1/(\beta + \gamma) \)
  \[ \leq \text{Required return on risky claims } = 1/\beta \]
  - \( \gamma \) = 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 $= (1-p)\epsilon \beta z_i$
  - 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:

\[
V_i^B = \underbrace{(\beta + \gamma)z_i}_{\text{Value of bank deposits}} - \underbrace{(1-p)\epsilon \beta z_i}_{\text{Insurance premium}} + \underbrace{\beta(p + (1-p)q)(R - z_i)}_{\text{Value of bank equity}}
\]

\[
= \underbrace{\gamma z_i}_{\text{Money premium}} + \underbrace{\beta[pR + (1-p)F_i]}_{\text{Expected cash flows}}.
\]
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 $k_iF_i > z_i$ of safe-funding that is unstable and less equity
  ◦ If bad news arrives at time 1, MMF deposits made safe by liquidating collateral → exposed to transitory fire-sale risk.

• Value of claims shadow bank can issue using asset $i$ as backing:

$$V_i^S(k_i) = \left(\gamma + \beta\right)k_iF_i + \beta p(R - k_iF_i)$$

$$= \gamma k_iF_i + \beta \left[pR + (1-p)k_iF_i\right].$$
Determination of Fire-Sale Discount

- **Market shares in risky asset** $i$
  - $\mu_i$ = 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 $k_i = k(\mu_i, \varphi_i)$
  - $\varphi_i$ 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, $\mu^*_i$

- Highly illiquid assets that are extremely vulnerable to fire-sale discounts held entirely by traditional banks (small C&I loans).
  \[ V^B_i > V^S_i (k(0, \varphi_i)) \Rightarrow \mu^*_i = 0 \]

- Highly liquid assets with minimal fire-sale discounts will be held entirely by shadow banks (Treasury bonds).
  \[ V^B_i < V^S_i (k(1, \varphi_i)) \Rightarrow \mu^*_i = 1. \]

- Interior equilibrium:
  \[ V^B_i = V^S_i (k(\mu^*_i, \varphi_i)) \Rightarrow \mu^*_i \in (0,1) \]
  - Marginal benefit of stable funding: avoiding fire-sale liquidations
  - Marginal cost of stable funding: reduced money creation
  \[
  (1 - p) \beta \times \left[ 1 - k(\mu^*_i, \varphi_i) \right] \times F_i = \gamma \times \left[ k(\mu^*_i, \varphi_i) \times F_i - z_i \right].
  \]
  - 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
  \[ \partial (1 - \mu_i^*) / \partial \varphi_i > 0: \text{traditional banks hold a larger share of more illiquid assets} \]
  - More valuable to be able hold illiquid assets to maturity

- \[ \partial (1 - \mu_i^*) / \partial z_i > 0: \text{traditional banks hold a larger share of assets with less fundamental cash-flow risk} \]
  - 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 $\varphi$) 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 $\frac{\partial (1 - \mu_i^*)}{\partial \phi_i} > 0$:
  - Traditional banks have higher market share in more illiquid assets
  - More generally, intermediaries with 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 asset illiquidity, liability stickiness, and liability maturity.
Contemporary Evidence

- **Asset Illiquidity Index** for intermediary type $j$
  \[ A_{\text{ILLIQUID}}_j = \sum_i (A_{ji} / A_j) \times ILLIQUID_i. \]
  - 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

- **Liability Stickiness Index** for intermediary type $j$
  \[ L_{\text{STICKY}}_j = \sum_i (L_{ji} / A_j) \times STICKY_i. \]
  - 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

- **Liability Maturity Index** for intermediary type $j$
  \[ L_{\text{MATURETY}}_j = \sum_i (L_{ij} / A_j) \times MATURITY_i. \]
Across Intermediaries: Asset Illiquidity vs. Liability Stickiness

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

\[
A_{ILLIQUID,j} = 0.13 + 0.55 \times L_{STICKY,j}, \quad R^2 = 0.64.
\]
**Prediction:** Banks are an outlier in terms of liability contractual maturity given their asset illiquidity.

\[
A_{ILLIQUID,j} = 0.27 + 0.36 \times L_{MATURITY,j}, \quad R^2 = 0.29.
\]
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 $i$

$$AV\_STICKY_i = \frac{\sum_j A_{ji} \times L\_STICKY_j}{\sum_j A_{ji}}.$$
**Prediction:** More illiquid assets should be held by intermediary types with greater funding stability.

\[ AV_{\text{STICKY}}_i = 0.59 + 0.23 \times ILLIQUID_i, \quad R^2 = 0.41. \]
Conclusions

• Modern commercial banks use deposit insurance and costly equity capital to create stable 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.