The Past, Present, and Future of Bank Runs

Richard Shockley

Indiana University
Kelley School of Business

The Goldsmith

Petrus Christus, “A Goldsmith In His Shop”, 1449.
Metropolitan Museum of Art, New York

The Goldsmith as a Safekeeper

- As a part of his job, the goldsmith needed to hold an inventory of gold.
  - ➢ The goldsmith invested in safekeeping technology.
- The safekeeping technology became a valuable business asset.
  - Wealthy individuals who owned gold needed protection from thieves.
  - ➢ For a fee, the goldsmith would take a *deposit* of gold and hold it. The goldsmith would give a *warehouse receipt* to the depositor, who could come retrieve his or her gold at any time.

The Goldsmith's Balance Sheet

Assets	Liabilities and Equity
Gold Held as Deposits	Gold Warehouse Receipts, *Redeemable On Demand*
Gold Held for Business Purposes Jewelry, etc.	Equity

- Why would a "depositor" ever want to redeem his/her gold?
  1. A normal (predictable) need for gold in trade.
  2. An unusual (unpredictable) need for gold.
  3. Concern about the goldsmith.

A New Business Opportunity

- Eventually, the goldsmiths learned that only a fraction of the "deposit gold" was withdrawn on any day, and that the amount of "deposit gold" in the vault became quite stable.
- The clever goldsmiths saw this as another valuable business asset.
  - For a fee, the goldsmith would lend you some gold for a short period of time. Eventually, the maturities got longer and longer.

The Goldsmith's New Balance Sheet

Assets	Liabilities and Equity
Gold Held as Deposits Gold Loans	Gold Warehouse Receipts, *Redeemable On Demand*
Gold Held for Business Purposes Jewelry, etc.	Equity

- This was the origin of *fractional reserve banking*: the quantity of warehouse receipts exceeds the quantity of gold actually in the vault.
  - The goldsmith's tradeoff: greed vs. fear.
  - The goldsmith's new tools: *reserves, equity, and risk management (including credit risk)*.

A Third Business Opportunity

- As people developed trust in the goldsmith, they started using the warehouse receipts as money in trade. The receipts were "good as gold".
- A very clever goldsmith saw this good reputation as yet another valuable business asset.
  - Instead of simply lending out deposited gold, the goldsmith could print extra receipts and lend these out against future payments of gold.

The Goldsmith's New Balance Sheet

Assets	Liabilities and Equity
Gold Held as Deposits Gold Loans Warehouse Receipt Loans	Original Gold Warehouse Receipts, *Redeemable On Demand* Extra Gold Warehouse Receipts, *Redeemable On Demand*
Gold Held for Business Purposes Jewelry, etc.	Equity

- This was the origin of *money creation*.
  - By printing and lending extra receipts, the goldsmith has expanded investment in the economy.

This is Traditional Banking

Individuals and firms who:
- Have investment project opportunities,
- Would like to exploit them,
- Need cash and time

Individuals and firms who:
- Have excess cash,
- Would like to invest it,
- Need liquidity

- The bank's reason for existence is *asset transformation*: turning long-term, illiquid investments (projects) into very short term, liquid investments (deposits).
- The bank's functions include loan origination, loan funding, and risk management.

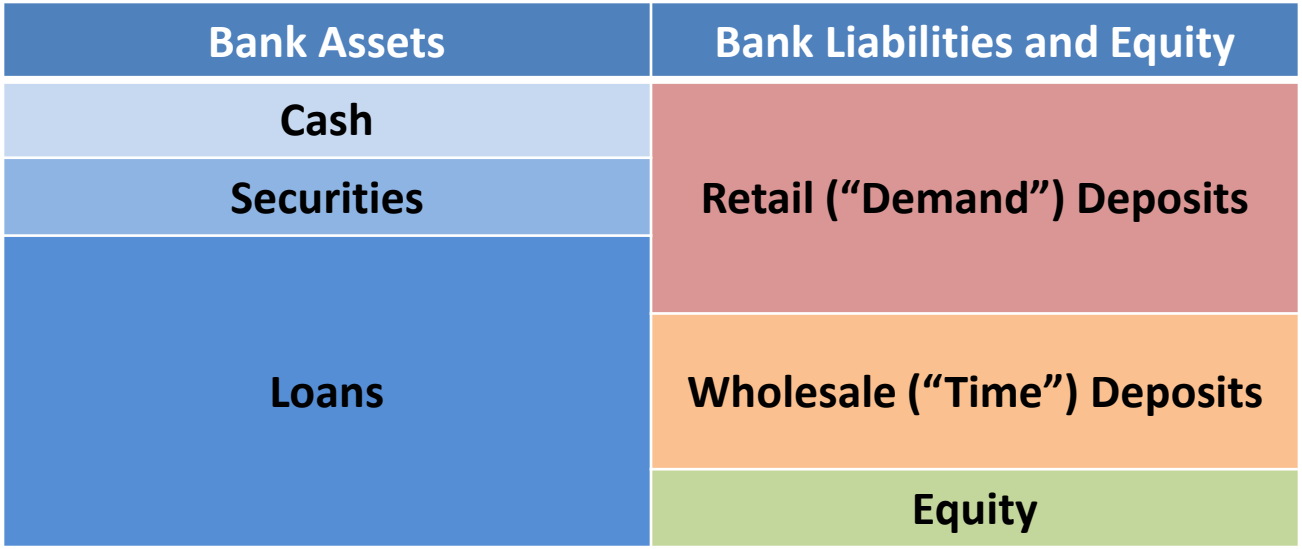
The Big Problem

- The volume of gold warehouse receipts far exceeds the volume of gold in the vault.
  - If a large number of people demand their gold at the same time, he will default and be insolvent. Some depositors will lose their deposits.
- Why might a large number of depositors all want their gold back at the same time?
  1. A random outcome.
  2. *Fear about the potential insolvency of the goldsmith.*

A Bank Run

Minneapolis, Minnesota, USA, 1890

Why Are Runs Possible? Mismatches.



1. Loans are long-term, while deposits are short-term.
2. Loans are illiquid, while deposits are liquid.

Diamond and Dybvig (1983)

- Because of the necessary mismatches, banks are inherently fragile.
- If a depositor ever suspects that many other people will withdraw, the only rational thing for him/her to do is withdraw immediately.
  - There need be no good reason - if you see a line forming at the bank, get in it!
  - Confusion can lead to runs.
  - Runs can occur even on healthy banks.

The (Heavy) Cost of Bank Runs and Banking Panics

- When the source of confusion or concern is related to the economy (and hence the banking system), there can be multiple bank runs at once: a *banking panic.*
- What do banks do when there is a run?
  1. They try to sell assets (securities, loans).
     - But the loans (and sometimes the securities) are illiquid.
  2. They stop lending.
     - This *reduces* money and investment, and so aggravates a cyclical downturn and magnifies a decline in investment, production, and asset prices *whether or not the banks actually fail*.

One Possible Solution: Deposit Insurance

- The idea behind deposit insurance is to comfort depositors.
  - If you are confused, there is no need to withdraw: your money is safe.
  - This *should* prevent runs.
- But think about our goldsmith. Suppose the government insures deposits at his warehouse. Will it change his behavior?

Evidence

- In the 19th century, several states in the U.S. created deposit insurance schemes.
  - They *all* led to disastrous consequences.
    - Reserves, equity, and risk management became less important to the bankers.
    - Depositors didn't care – they were insured.
    - Many banks failed.

Also Necessary: "Prudential" Regulation

- Deposit insurance requires "prudential" regulation to mitigate the *moral hazard* problem.
  - Minimums for "cash on hand" (*reserve requirements)*
  - Minimums for equity (*capital requirements)*
  - Monitoring and control of risk taking.
- To maintain some *market discipline*, it is important to <u>not</u> extend deposit insurance to wholesale (large) depositors.

But Even Then

- Even with deposit insurance and prudential regulation, banks can face sudden large outflows of deposits and thus liquidity shortfalls.
- In order to keep the bank from collapsing, we need a *lender of last resort* (a central bank).
  - The "LLR" guarantees that a bank can quickly convert illiquid loans into cash to meet temporary liquidity needs.

The Past of Bank Runs

- In 1622, the Holy Roman Empire tried to debase its currency. This led to widespread runs.
- The "Tulip Bubble" in 1637 led to a panic.
- Many banking panics in the U.K. prior to 1866.
- Very frequent banking panics in the U.S. prior to 1907 (1857, 1873, 1884, 1890, 1893, 1896, 1907) due to system structure.

Introduction of Regulation

- Largely based on the American experience, governments around the world developed deposit insurance schemes along with prudential regulation and LLR operations.
- In virtually all cases,
  - Regulation was applied only to banks that took demand deposits (i.e., *depositories*)
  - LLR lending was only available to these same banks.
- We thought that the days of widespread banking panics were over. But...

The Present, Part 1: The "Slow Motion" Bank Run

<table>
<tr><th>Bank Assets</th><th>Bank Liabilities and Equity</th></tr>
<tr><td>Cash</td><td rowspan="2">Retail ("Demand") Deposits
Insured</td></tr>
<tr><td>Securities</td></tr>
<tr><td rowspan="2">Loans</td><td>Wholesale ("Time") Deposits
Uninsured</td></tr>
<tr><td>Equity</td></tr>
</table>

Wholesale deposits come from other financial institutions and corporations. If these depositors start to worry about a bank's health, they don't "roll over". This is equivalent to a run.

Europe in 2010 - 2011

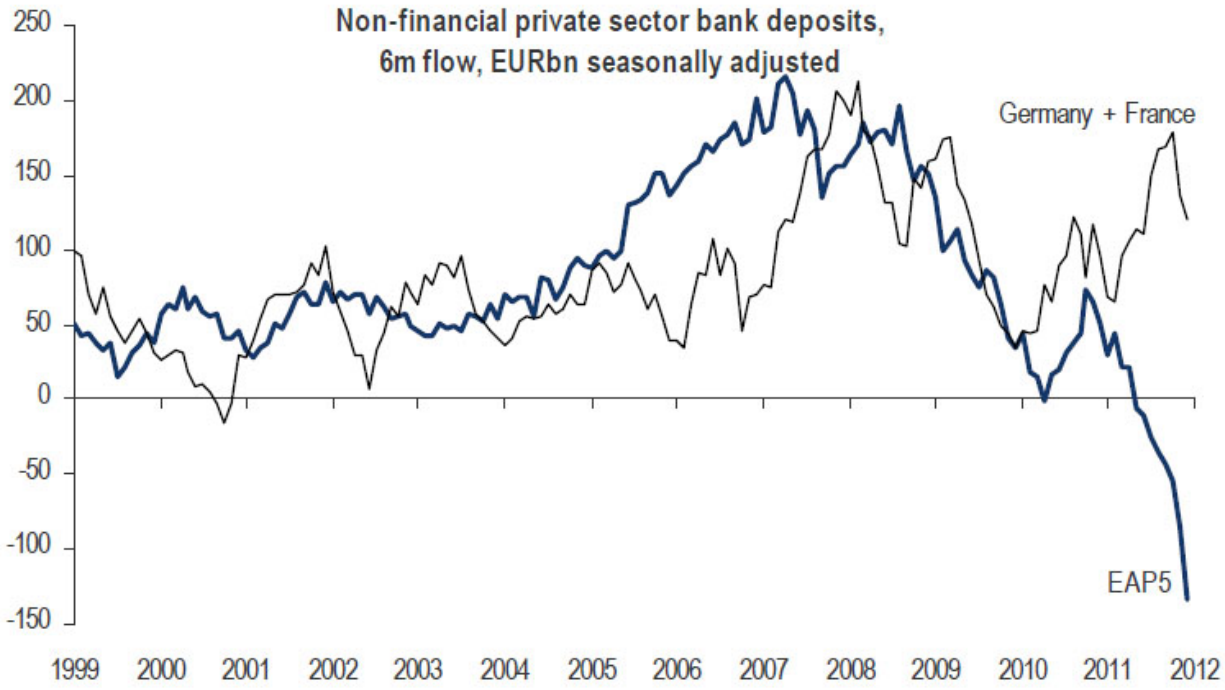
Breakdown of the changes in deposit amounts, Jan 2010 - July 2011 (in bn euro)	change in deposits by other MFIs	change in deposits by non-MFIs (corporations, households, govt)
Total euro area	(€ 461.1)	€ 699.8
Cyprus	(€ 24.3)	€ 7.9
Greece	€ 25.7	(€ 36.1)
Ireland	(€ 99.2)	(€ 8.5)
Portugal	€ 20.3	€ 30.7
Germany	(€ 198.8)	€ 163.7
France	(€ 17.1)	€ 212.7
Italy	(€ 83.8)	€ 179.6
Spain	(€ 24.0)	€ 71.6
United Kingdom	(€ 249.9)	(€ 154.2)

Late 2011: France

- Typical wholesale deposits are 90 to 360 day maturity and continually rolled over. In late 2011, French banks could get no wholesale deposits longer than 60 days.
  - 20% of their wholesale deposits were 7-day maturity or shorter!
- American money market mutual funds cut their deposits at French banks by 50%.

And Now Into 2012

The latest data on bank deposits suggest the start of broad-based flight from the periphery to the core.



Source: Thomson Reuters DataStream, IMF, Credit Suisse

The Problem

- As the European banks' wholesale funding contracted and shortened in maturity, the entire system became more fragile.
- Funding costs went up.
- Banks responded by cutting back lending, leading to a credit crunch in parts of Europe.

This is why an expanded "LTRO" was so important.

LTRO

- Originally, the ECB's *Long Term Refinancing Operation* (LTRO) was small (€45 billion) and short-term (3-month).
  - Became 6-month in 2008, then 1-year in 2009.
- In December of 2011, the ECB expanded the LTRO by lending €489 billion to 523 banks for 3 years at 1%.
  - Added another €313 billion on 29 February, 2012.

This shows the extent of the "slow motion" run.

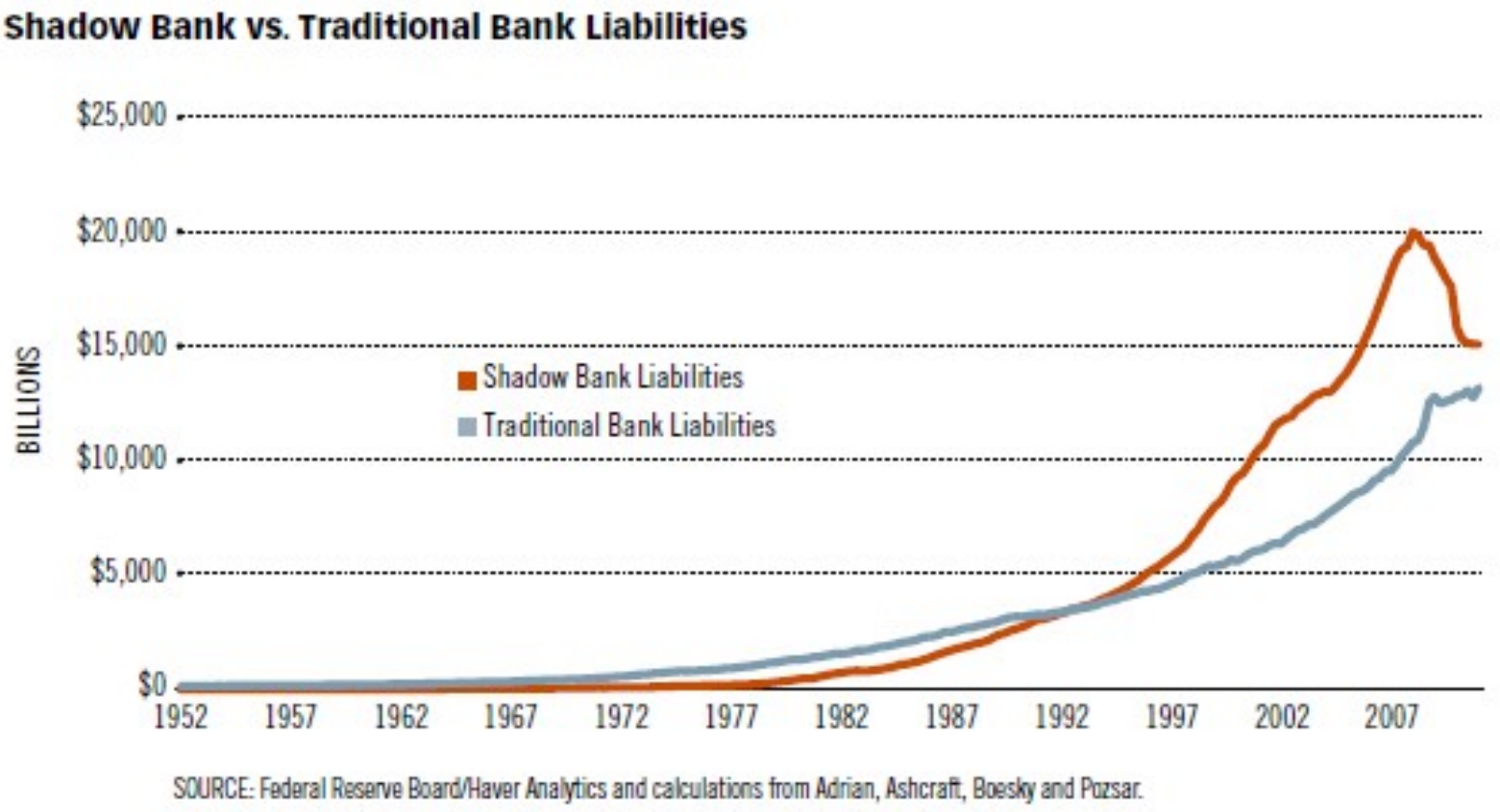
The Present, Part 2: The Runs on "Shadow Banks"

- In the 1980s, large wholesale depositors started looking for ways to make short-term investments without using depository banks.
- At the same time, there were some short- and medium-term borrowers who wanted to stop using depository banks due to cost.
- The "shadow banking" system developed.

What Is a "Shadow Bank"?

- A *shadow bank* is a financial intermediary that conducts one or more of the functions of a traditional bank but
  - Without access to government deposit insurance
  - Without access to central bank LLR operations
  - Without regulation that goes with those two.
- The *shadow banking system* is the collection of these shadow banks which, together, replicate the activities of traditional banks (but without government oversight or protection).

Shadow Banking in the U.S.



Shadow Bank #1:
The Money Market Mutual Fund

Assets	Equity
Short-term Investments: Government Bills and Notes Highly-Rated ABCP (Asset-Backed Commercial Paper)	*Short-term Funding:* Equity Shares Marked-to-Market Daily Redeemable Daily

Government securities are risk-free; collateral enhances the quality of the ABCP.

Wholesale investors who need liquidity invest here.

- Even though no bank is involved, there is still a transformation going on: the MMMF assets are longer-term and less liquid than its funding.
- What would happen if MMMF investors suddenly worried about the quality of the MMMF assets?

The Run on MMMFs in 2007-2008

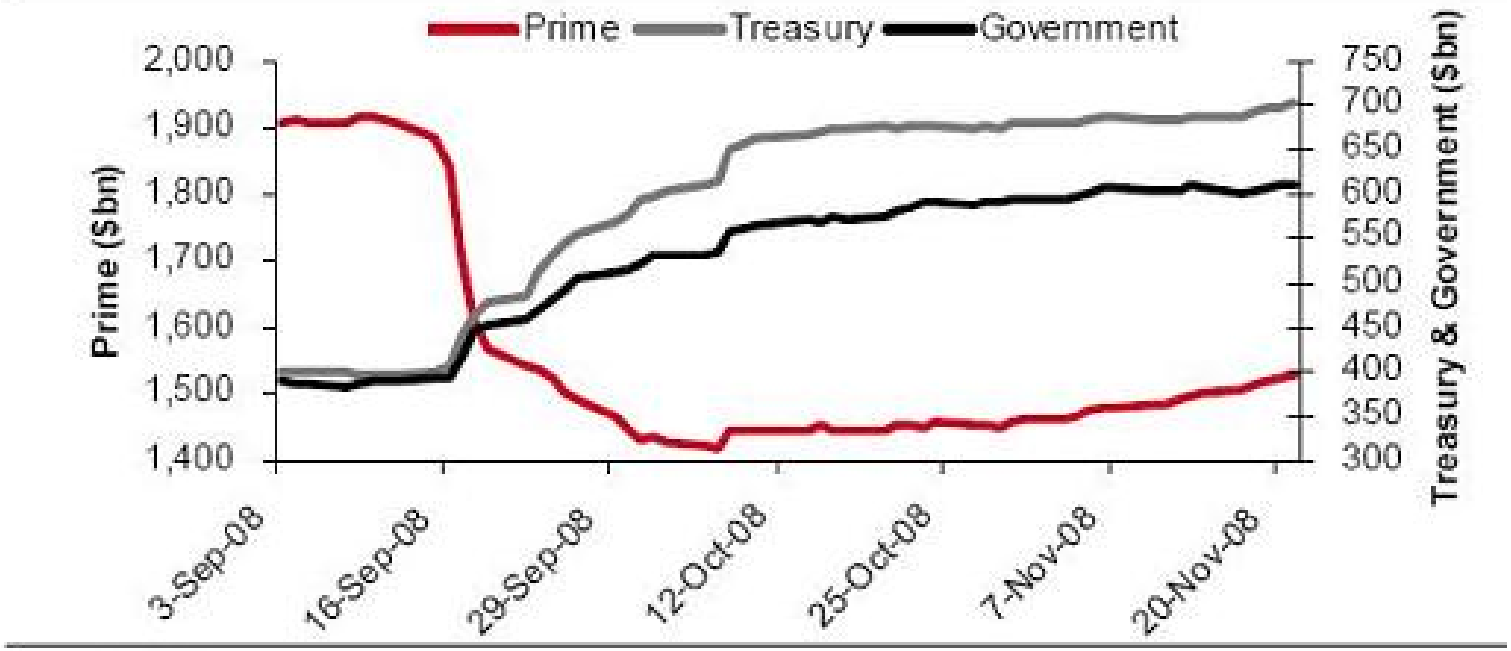
- Two shocks in 2007-2008 led to a run on MMMFs.

1. July/August 2007: some AAA-rated *mortgage-backed securities* defaulted. This caused MMMF investors to question the ratings of the MMMF ABCP.
2. September 15 2008: Lehman Brothers defaulted on its commercial paper. One large MMMF "broke the buck".

Both led to <u>confusion</u> about MMMF asset values.

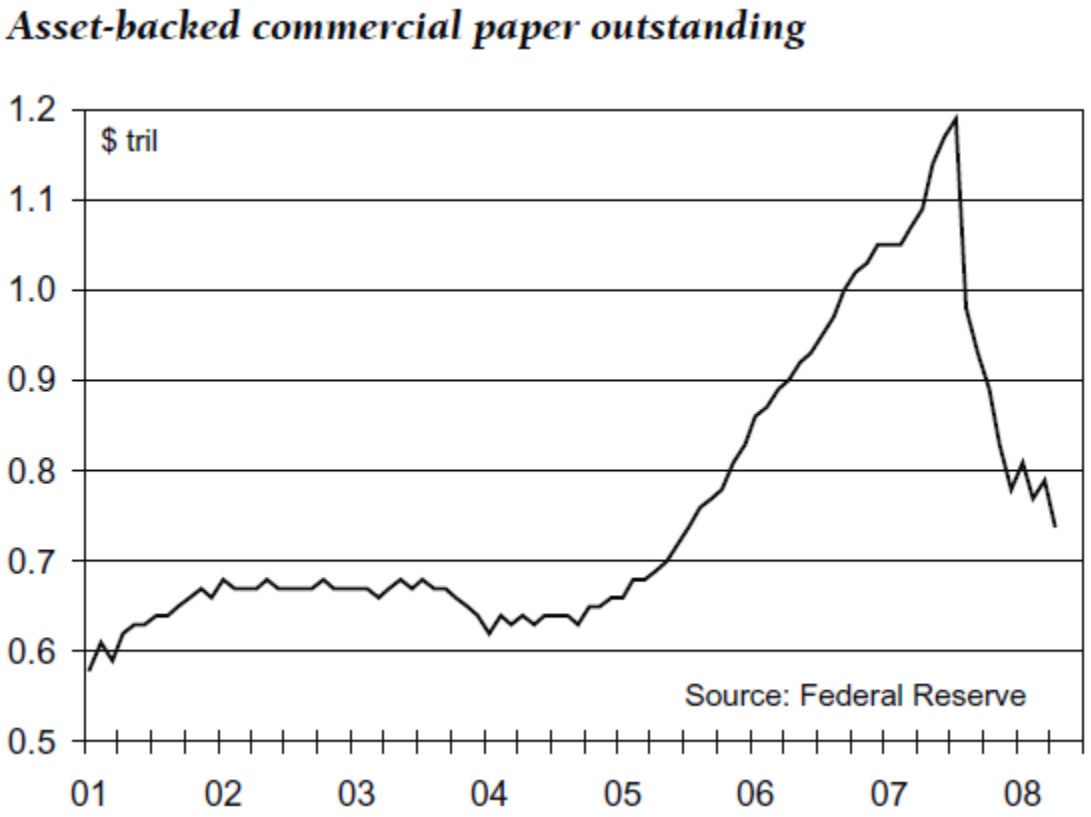
The Run on MMMFs

Figure 3. Major Shift Within Taxable Institutional and Retail Money Market Fund Assets Away From Prime Funds as Panic Spread and the Resulting Government Intervention



Source: Crane Data.

The Resulting Collapse of the ABCP Market



Cost and Solution

- The cost of the run on MMMFs was massive. Many high-quality firms relied on a continual roll-over of their ABCP to finance their operations.
  - Notice that they, too, were borrowing short-term and investing long-term.
- The run ended after the Federal Reserve extended deposit insurance to MMMFs.

Shadow Bank #2: The Repurchase Market

- Economically, “repos” are simply short-term collateralized loans.
  - Maturity can be overnight, “term”, or open-ended.
- Example:
  - a borrower sells $10 million of securities to an investor/lender today;
  - simultaneously, the borrower promises to repurchase the securities for $10,005,555 in 10 days.

Note: Legal title to security passes to the investor/lender.

Credit Risk in Repos

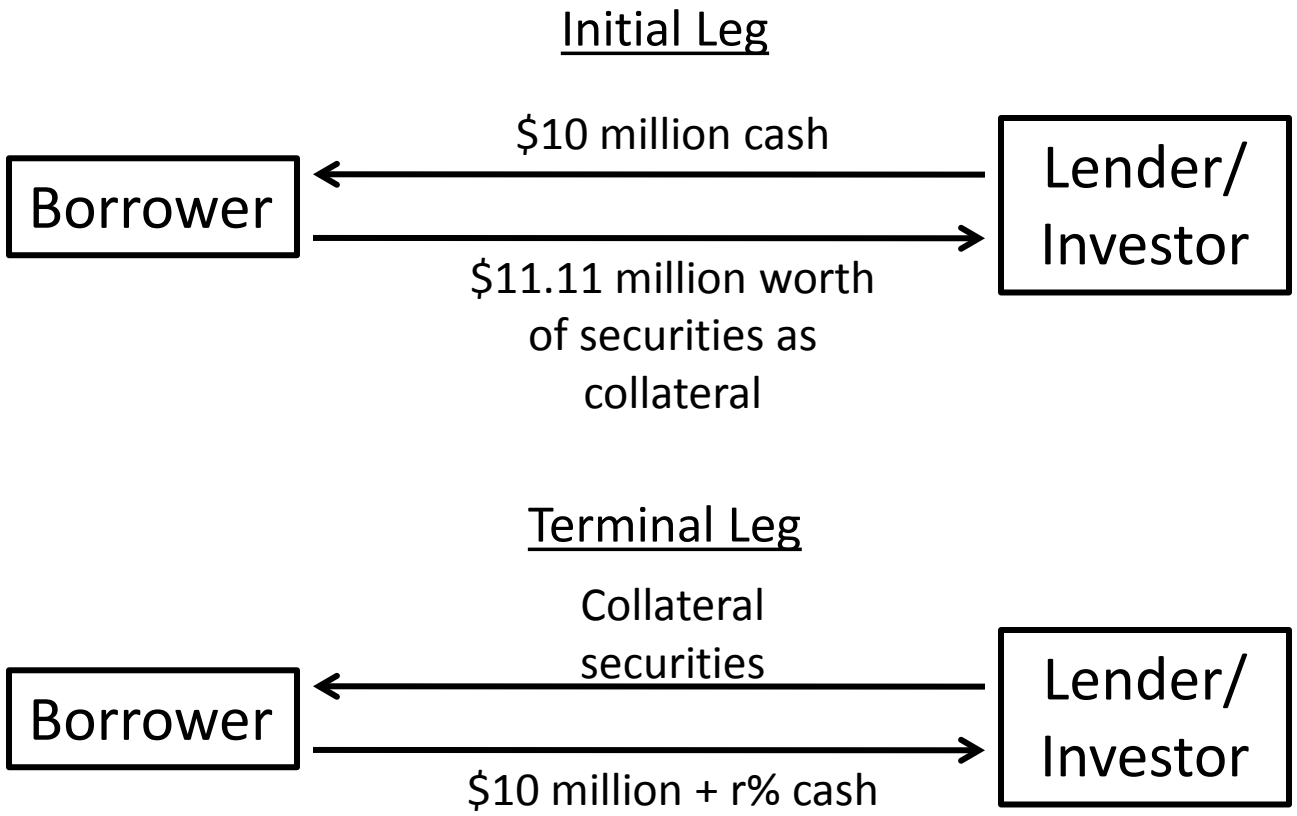
- The borrower owes the creditor cash; the pledged security collateral is credit protection.
  - The lender/investor is only exposed to credit risk if the value of the pledged security falls below the promised repo price.
- Lender/investors demand “haircuts” as excess collateral.
  - Example: If the “haircut” is 10% and the pledged collateral is worth $1 million, the lender/investor will only lend $900,000.

Repo Example

- An investment bank needs $10 million in cash to finance the temporary holding of some securities.
- A creditor asks for r% interest and a 10% haircut for a repo.
- The repo has an open maturity – either party can terminate it on any day.

➢ This is effectively a collateralized loan that can be “rolled over” every day.

Repo Example



The Borrower's Balance Sheet While the Repo Is Open

Assets	Liabilities + Equity
$11.11 million of pledged securities	$10 million loan
	$1.11 million equity

- If the pledged securities are longer term than the loan, then the borrower is engaged in the same maturity/liquidity mismatch as a traditional bank.

History of Repos in U.S.

- 1920s: New York Fed started taking *Bankers Acceptances* as collateral in repos to encourage development of a liquid market.
- 1950s:
  - Institutional investors needed ways to invest excess cash on overnight basis (they were earning nothing in banks).
  - Government bond dealers were financing their holdings through expensive bank loans.
- Into 1990s: Collateral for repos was mostly government securities.

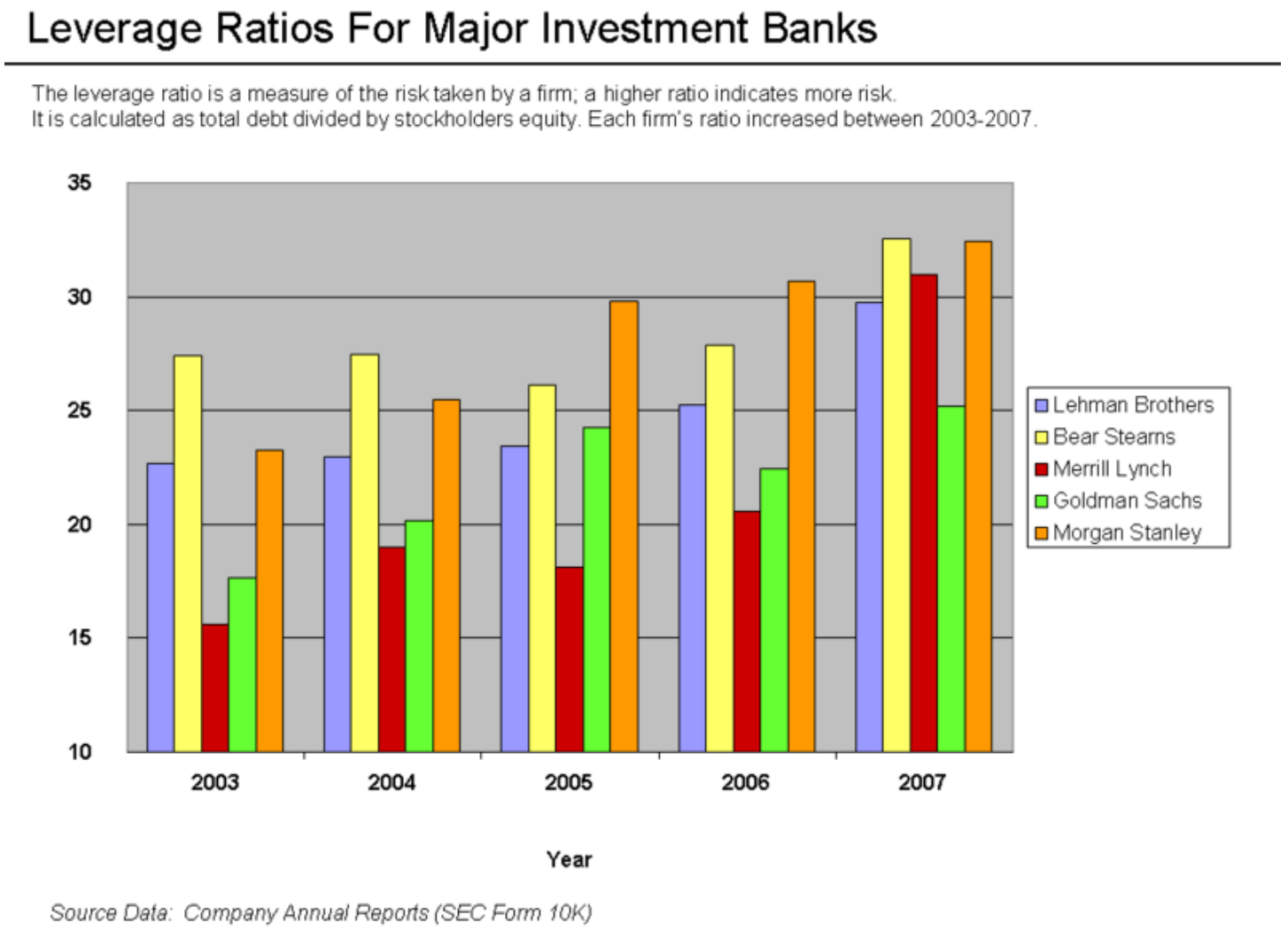
History of Repos in U.S.

- Starting in 1990s:
  - Huge demand for government securities to address counterparty risk (margin or collateral).
    - Collateral in derivative trades
    - Margin for payment and settlement systems (DVP, RTGS, CHIPS)
  - Huge supply of money from mutual funds, corporate treasurers, etc. to lend overnight.
  - Result: creditors starting accepting other securities as collateral.

History of Repos in U.S.

- Late 1990s into first decade of 21st century:
  - "General Collateral" that would be accepted by lenders became more opaque and less liquid (structured products: MBS, CDOs, etc.)
  - Haircuts for GC repos went to 0% (yes, ZERO)
  - At the same time, competition was squeezing investment banking profit margins.
- Result:
  - Investment banks levered up, largely through repos. Half of their assets were financed this way.

D/E Ratios for Investment Banks



The Repo Market

- Experts estimate the total repo market in 2007 to have been about $12 trillion.
  - Total assets in the U.S. banking system were only $10 trillion.
- Problem: much of the collateral was not very liquid (or was completely illiquid).
  - 37% of repo collateral was structured products (MBS, CDOs, etc.).

Balance Sheet of a "Typical" Investment Bank

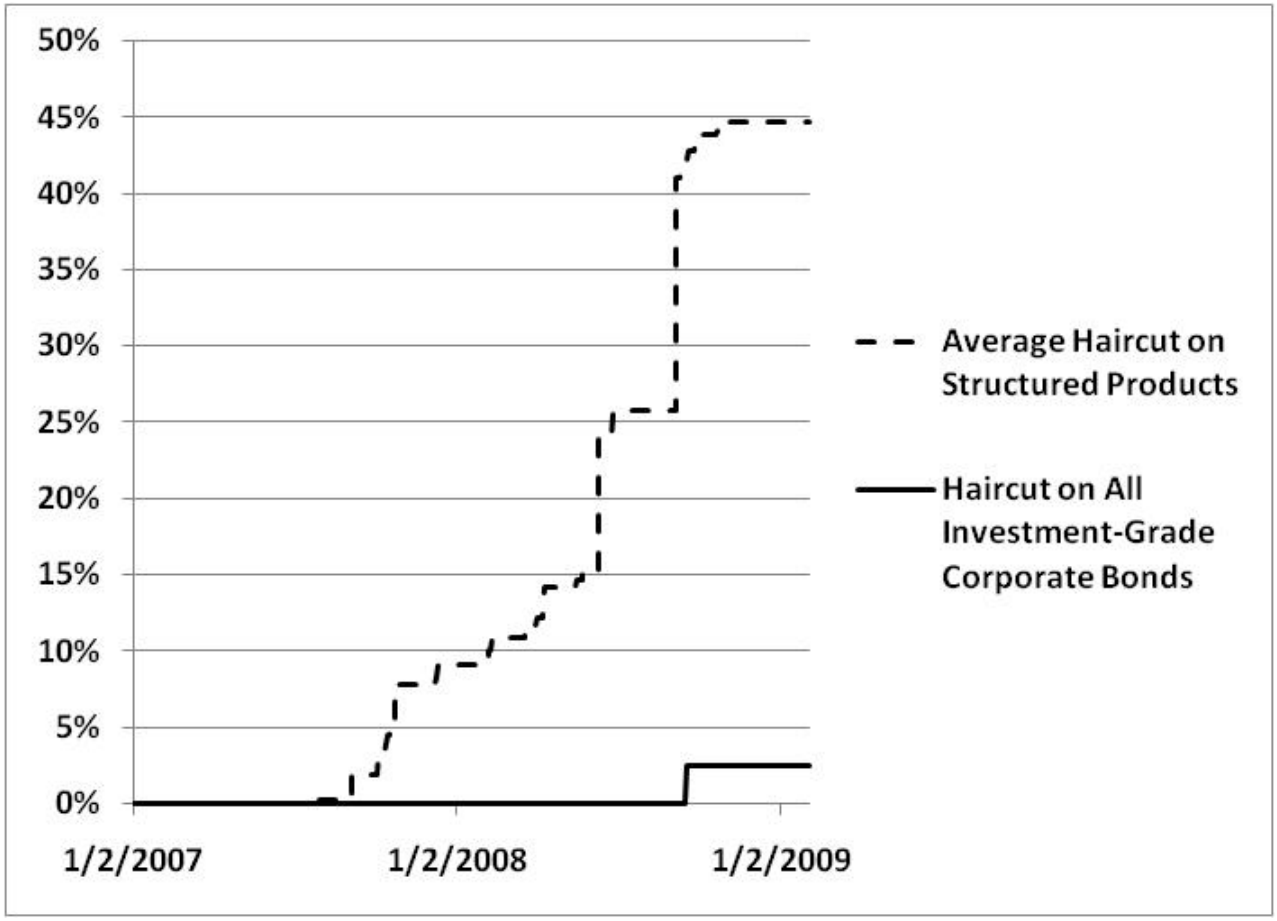
Assets	Liabilities + Equity
100 in securities, many of them illiquid	50 due in open-ended repos
	46.78 bonds
	3.22 equity

"Lehman funded itself through the short-term repo market and had to borrow tens or hundreds of billions of dollars in those markets each day from counterparties to be able to open for business. Confidence was critical. The moment that repo counterparties were to lose confidence in Lehman and decline to roll over its daily funding, Lehman would be unable to fund itself and continue to operate." Report of Anton R. Valukas (2010).

The Sunspot

- Evidence of default problems in subprime mortgages started to develop in early 2007.
- In theory, this evidence should have only affected the value of subprime-mortgage related structured products.
- However…because of the complexity of structured products and the lack of a liquid market for them, no one knew which financial firms had the biggest exposure to subprime.
  - ➢ Confusion

Response: Increased "Haircuts"



Source: Gorton and Metrick (2010)

The Problem with Increased Haircuts

- As haircuts increase, the supply of funds decreases.
- Repo borrowers have few choices:
  - Offer any unpledged securities as additional collateral;
  - Find an equity infusion and buy more securities to post as collateral;
  - Close a repo out, take back the collateralized securities, and sell them to make payment.
    - If the securities are illiquid, this will be a “fire sale”. Prices will be discounted, which wipes out equity.

The Solution

- Eventually, the Federal Reserve effectively extended LLR privileges to many firms that had been using the repo market for financing.
  - The Fed exchanged $260 billion in Treasury securities for lower-quality securities. This allowed firms to post high-quality collateral and re-access the repo market.

The Future of Bank Runs

- My prediction: the 21st century will mirror the 19th and 20th.
  - Periodic panics and runs on non-bank financial institutions, perhaps followed by deflationary collapses.
- One alternative is to explicitly extend government guarantees to a broad array of short-term investments.
  - Moral hazard
  - Unfathomable potential costs
- DO NOT BE SURPRISED. Any time you see a maturity mismatch, a run is possible (regardless of the setting).