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Changes in the Financial System

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OTC Derivatives Markets

The market financial derivatives is the fastest growing parts of the financial market over the last 30 years.

“Essentially, these instruments call for money to change hands at some future date, with the amount to be determined by one or more reference items, such as interest rates, stock prices or currency values.” - Warren Buffet

Credit Default Swaps (CDSs)

What is a Credit Default Swap?

A credit default swap is an agreement between two parties that works like a side bet on a football game. Swap sellers promise swap buyers a big payment if a company's bonds or loans default. In return for the promise they get quarterly payments. Neither needs to hold the underlying debt when entering into a swap.



Credit Default Swap Seller

Promises to pay swap buyer a set amount if Widgets "R" Us defaults, often \$10 million

- Receives annual payments from swap buyer in return for "insurance"
- Can include banks, insurance companies, hedge funds or others



Widgets "R" Us Corp.

Borrows money from banks or issues bonds to finance operations.



Credit Default Swap Buyer

Promises quarterly payments to swap seller

- Receives promise of large payout if bond defaults
- Can include banks, insurance companies, hedge funds or others
- If Widget's financial fortunes turn sour, the swap becomes more valuable. A swap holder can resell it and get high payments in return

Stock Options

Stock Options: this is a contract in which one side pays money today for the option to purchase (a call) or sell (a put) a share of stock at a fixed price in the future.

Option Chain for Apple Inc. (AAPL)																
Calls	Last	Chg	Bid	Ask	Vol	Open Int	Root	Strike	Puts	Last	Chg	Bid	Ask	Vol	Open Int	
Apr 20, 2018	16.13	0.23	15.90	16.45	75	5927	AAPL	155	Apr 20, 2018	3.50	-0.05	3.40	3.50	415	11162	
Apr 20, 2018	12.70	0.15	12.70	12.95	205	8563	AAPL	160	Apr 20, 2018	5.10	-0.08	4.90	5.05	631	18285	
Apr 20, 2018	9.75	0.07	9.60	10.00	673	8374	AAPL	165	Apr 20, 2018	7.19	-0.11	6.95	7.25	813	15947	
Apr 20, 2018	7.25	0.06	7.25	7.55	2026	24334	AAPL	170	Apr 20, 2018	9.50	-0.35	9.50	9.80	243	10430	
Apr 20, 2018	5.30	0.05	5.20	5.55	2282	25151	AAPL	175	Apr 20, 2018	12.78	-0.12	12.50	12.85	116	13711	
Apr 20, 2018	3.80	0.10	3.75	3.85	2405	26958	AAPL	180	Apr 20, 2018	16.45	-0.44	15.90	16.25	12	4206	

Futures and Forwards

Futures and Forwards: These are contracts where one side pays the other the difference between the price of a commodity (such as oil) or a financial asset (such as a Treasury Bond) in the future minus a fixed value (called the forward or futures price) set at the outset of the contract.

Interest Rate Swap

Interest Rate Swap: an interest rate swap is an agreement between two entities, whereby one entity pays the long-term interest rate times a notional amount minus the short-term interest rate times the notional amount. The other counterparty – the entity on the other side – does the reverse.

Interest Rate Swap

Example: Counterparty A & Counterparty B

- Notional principal - \$1 million
- Term – 5 years
- A pays 5-Year Fixed Rate to B
- B pays 1-Year Floating-Rate to A
- The initial value is set to be Zero to both A and B

Interest Rate Swap

Counterparty A:

Asset	Liabilities
\$1 million	\$1 million
1-Year Floating-Rate Note	5-Year Fixed Rate Note

Counterparty B:

Asset	Liabilities
\$1 million	\$1 million
5-Year Fixed-Rate Note	1-Year Floating Rate Note

Derivatives

1. Valuation:

- PV of future cash flows: variation in the value of derivatives stemming from changes in the PV of future cash flows. This is called the **Market Risk** of the derivative contract.
- Credit worthiness of the Counterparty:
 - Interest rises 1% → B must pay A. Value of the swap is the PV of all future payments from B to A.
 - But, what would the contract be worth if B went bankrupt?
 - This is called **Counterparty Risk**

Derivatives

2. Zero Net Supply

- For every winner in the derivatives market there is a loser.
- For the market as a whole, there is no market risk
- Regular financial assets like stocks or bonds are in positive net supply and are limited in amount

Derivatives

3. Zero initial value to both sides

- These contracts are restructured so that the initial value are zero to both parties.
- The value of a derivatives contract then changes as the value of the underlining asset changes.

Derivatives

4. Uses of Derivatives

- Risk management (Hedging)

Asset	Liabilities
\$100 Fixed Rate Mortgages	\$85 Short-term Deposits
	\$15 Equity

If interest rates rise, this un-hedged firm's equity will fall sharply in value. Why? The bank can hedge by imitating an interest rate swap in which they pay the fixed rate and receive floating rate.

- Speculation – Derivatives contracts are used to create highly levered positions (e.g. AIG)

Derivatives

4. Counterparty Risk (Cont.)

- AIG insured over \$400 billion in mortgage-backed securities leading up to the 2008 crisis.
- How should entities in the derivatives markets manage their counterparty risk?
 - Centralized exchange
 - Collateral flows (e.g. margin account)

Derivatives

4. Counterparty Risk (Cont.)

- Before the crisis, the decentralized OTC Derivatives Markets allowed institutions like AIG to amass its huge one-way bet on housing market.
- Warren Buffett anticipated exactly this type of problem in his letter to shareholders back in 2002

Derivatives

Central Counterparty (CCP) or Clearinghouse

- Flow of \$\$ in the Original Swap:

A \rightarrow NP \times Fixed Rate \rightarrow B

B \rightarrow NP \times Floating Rate \rightarrow A

- The CCP as counterparty to both A and B

A \rightarrow NP \times Fixed Rate \rightarrow CCP

CCP \rightarrow NP \times Floating Rate \rightarrow A

CCP \rightarrow NP \times Fixed Rate \rightarrow B

B \rightarrow NP \times Floating Rate \rightarrow CCP

Everyone needs to worry only about the CCP

Derivatives

Advantages of the CCP over OTC

- Market Risk – the CCP has a net zero position in all bets. Market risk is zero.
- Counterparty Risk – much smaller than with the bilateral OTC arrangements.
- Market Transparency - The CCP 'knows' the market

The Rise of Shadow Banking

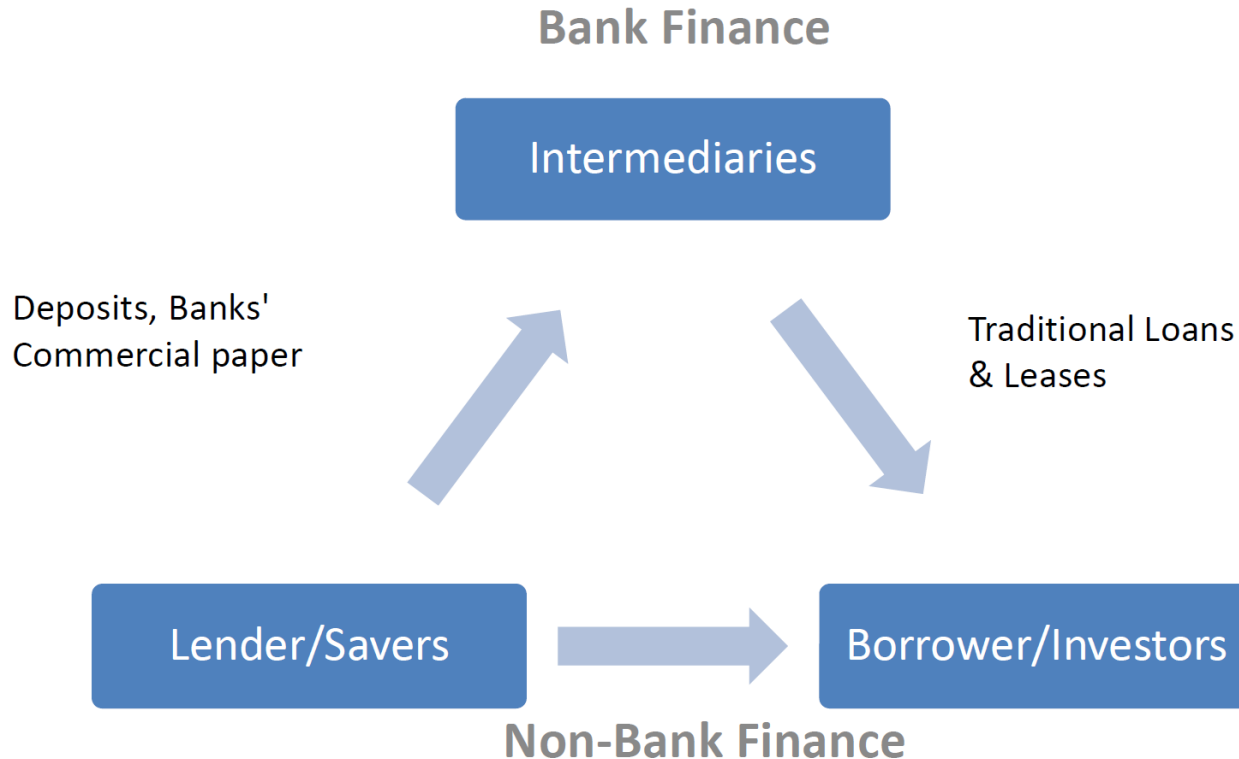
- Finance moves toward market (i.e. non-bank finance) and away from financial intermediation (i.e. bank finance).
- In the 1970s most finance happened through the banking system. Banks are tightly regulated and watched by the Fed, OCC, and FDIC.
- Today, most finance happens in the securities markets – the equity markets, the bond market, the commercial paper market and the market for asset-backed securities.

The Rise of Shadow Banking

- As we discussed in Lecture 1, the most important function for the financial system, as we have discussed, is to **generate liquidity**.
- This function has gravitated from banks to the markets → the rise of ‘Shadow Banking’.
 - Money-market mutual funds compete for deposits with banks.
 - Main components: the money market mutual fund industry, the repo market, the commercial paper market

The Rise of Shadow Banking

Traditional Financial System (Financial Assets)

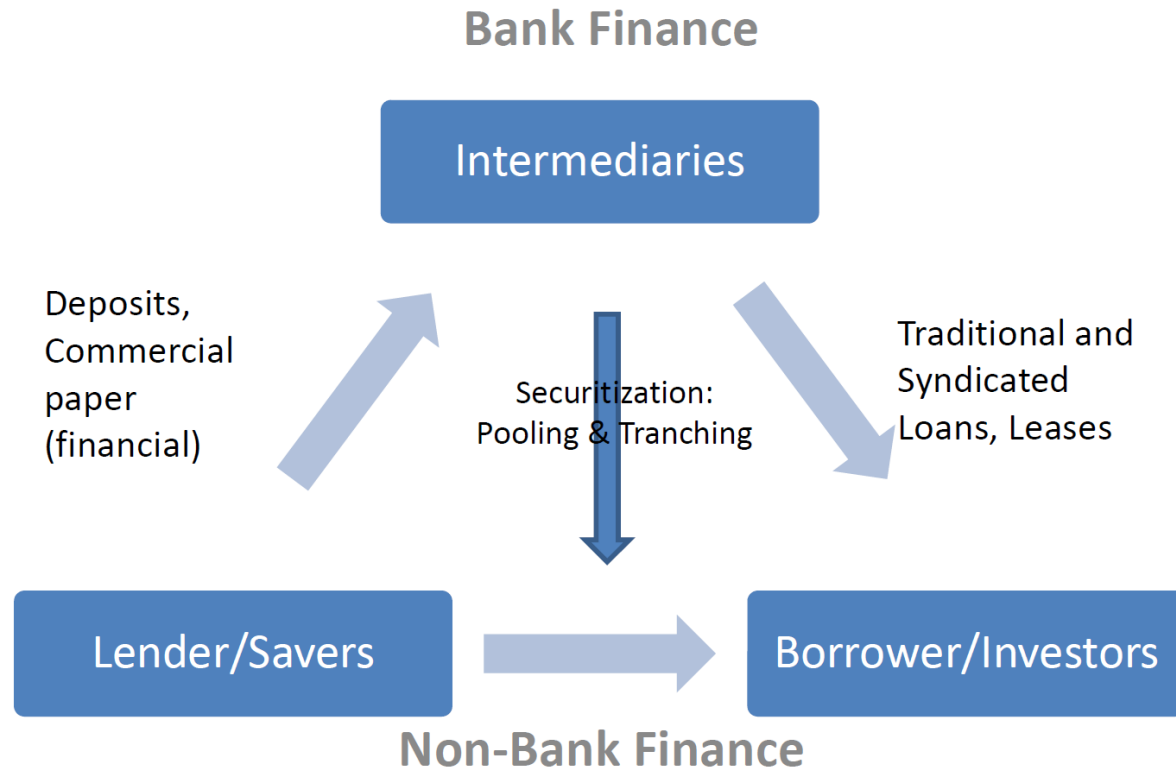


Securities Markets: Bonds, Commercial Paper (non-financial), Public Equity

Derivatives Markets: Commodity Futures, Stock options

The Rise of Shadow Banking

Modern Financial System (Financial Assets)

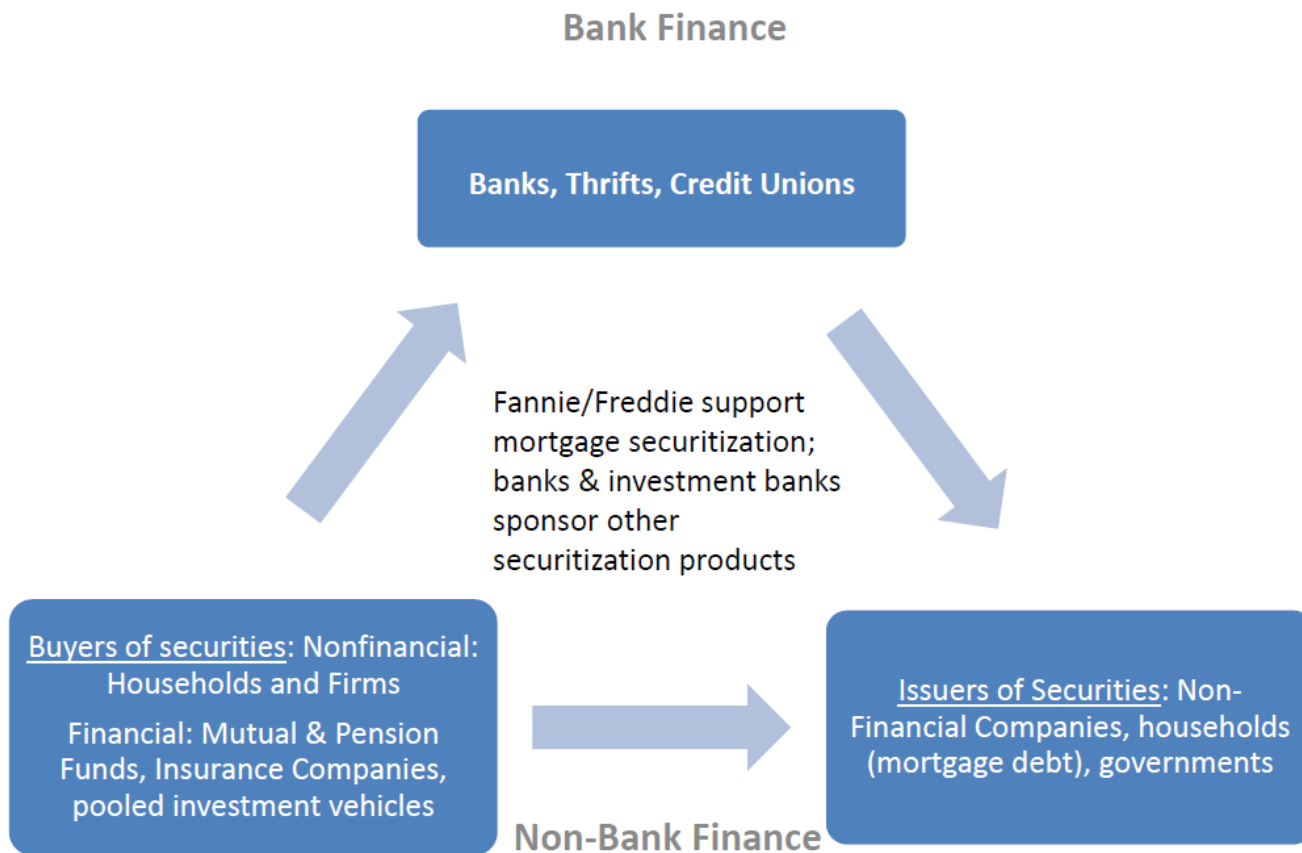


Securities Markets: Bonds, Commercial Paper (non-financial), Public Equity, Mortgage-backed Securities & Asset-backed Securities, CDOs, CLOs, ETFs, etc.

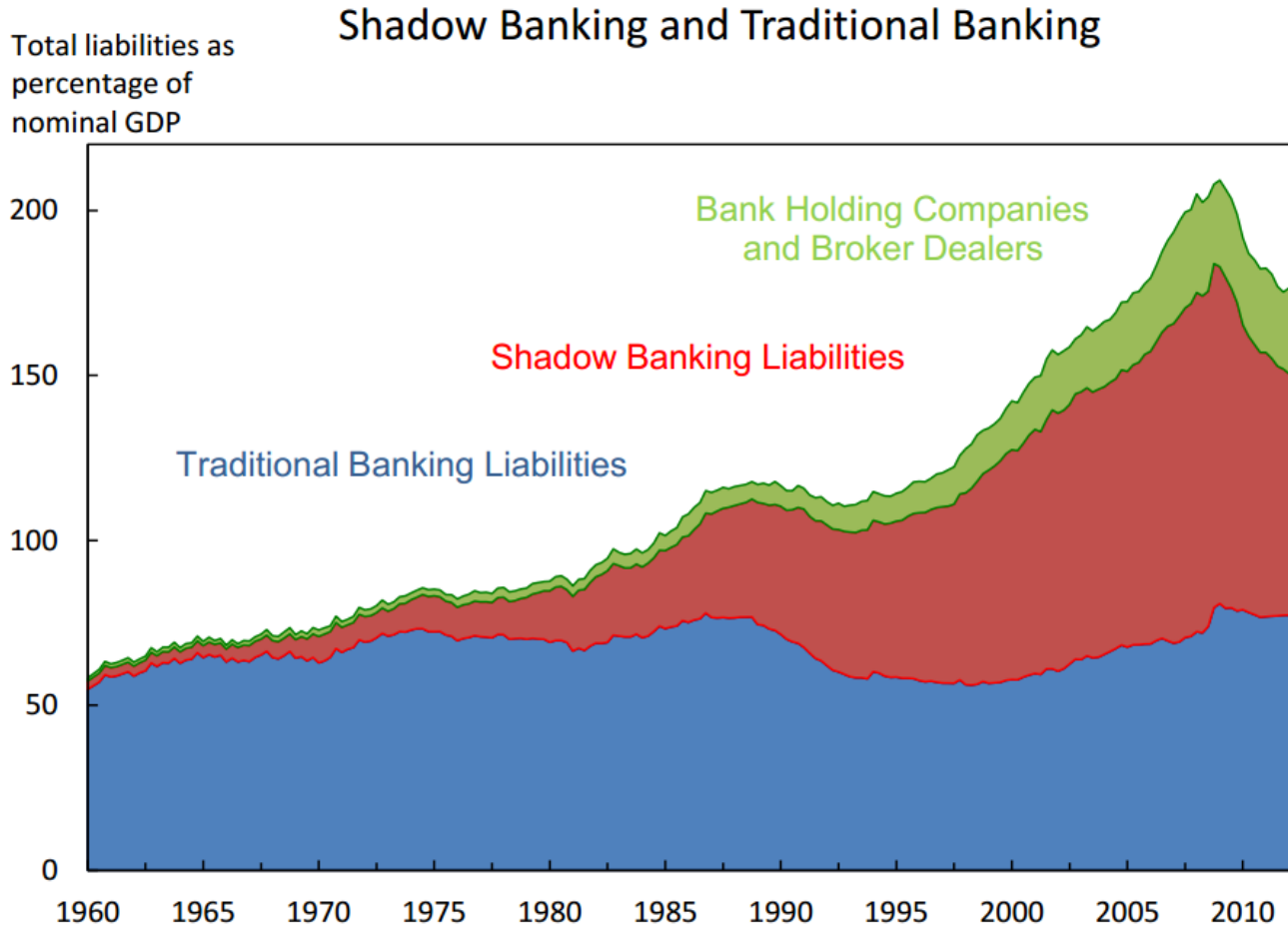
Derivatives Markets: Commodity & Financial Futures, Interest rate and Credit Default Swaps, Options

The Rise of Shadow Banking

Modern Financial System (Financial Institutions)

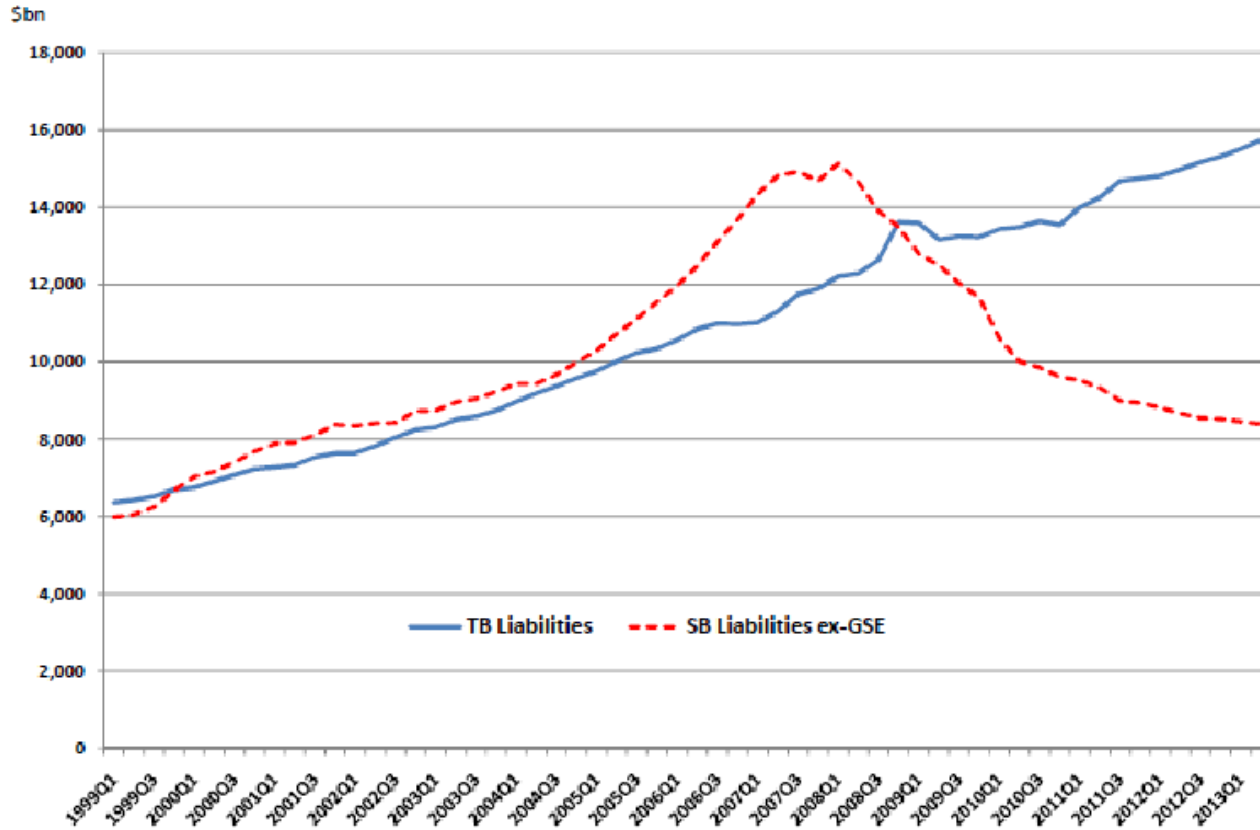


The Rise of Shadow Banking



Source: "Financial Stability Policies for Shadow Banking" - Federal Reserve Bank of New York Staff Reports, Feb 2014

The Rise of Shadow Banking



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The Rise of Shadow Banking

Many commentators have characterized the 2008 crisis as a run on the shadow banking system.

- Financial institutions cannot survive from a sudden panicky withdrawal without the substantial injection of short term funds.
- The traditional banking system is protected by FDIC insurance and the Central Bank (Fed) as the Lender of Last Resort.
- Shadow banking started collapsing when there were a run on short term repo market, illiquidity in the commercial paper market, and a sudden lack of confidence in the money market mutual fund industry.

Traditional Banking

	Assets	Liabilities	
Loans	100	92	Deposits
		8	Equity

Q. Where is the liquidity risk?

Shadow Banking, Version #1

(Securitization with REPO Finance)

Bank, after securitization			
	Assets	Liabilities	
Cash	95	92	Deposits
Residual	5	8	Equity (required capital = 5)
SPV			
	Assets	Liabilities	
Sec. Loans	100	80	AAA Rated Bonds
		15	BBB Bonds
		5	Residual
Investment Banks			
	Assets	Liabilities	
AAA Rated Bonds	80	75	Repo Borrowing
		5	Equity
Money Market Mutual Fund			
	Assets	Liabilities	
Reverse Repo	75	75	Money Market Accounts

Q. Where is the liquidity risk?

“Run on Repo”

	Investment Banks		
	Assets	Liabilities	
AAA Rated Bonds	80	75	Repo Borrowing
		5	Equity
	Money Market Mutual Fund		
	Assets	Liabilities	
Reverse Repo	75	75	Money Market Accounts

Repo Borrower (IB) sells \$80 in AAA rated bonds to lender (MMMF) for \$75 in cash
 Agrees to repurchase the asset tomorrow at $\$75 \times (1 + \text{repo rate})$

"Haircut" = $(\text{Value of Collateral} - \text{Amount Borrowed}) / \text{Value of Collateral}$

"Haircut" = $(\text{Assets} - \text{Liabilities}) / \text{Assets} = \text{Equity} / \text{Assets}$

"Haircut" = $(80 - 75) / 80 = 6.25\%$

What happens if the “haircut” doubles?

What if the 'haircut' doubles?

	Investment Banks		
	Assets	Liabilities	
AAA Rated Bonds	80	70	Repo Borrowing
		5	Equity

Repo Borrower (IB) sells \$80 in AAA rated bonds to lender (MMMF) for \$70 in cash

$$70 = 80 \times (1 - \text{"haircut"}) = 80 \times (1 - 12.5\%)$$

I-Bank must sell assets (or come up with additional equity...)

How much of AAA bonds can I-Bank hold at 12.5% haircut?

How much can I-bank hold? (How much must I-bank sell?)

	Investment Banks		
	Assets	Liabilities	
AAA Rated Bonds	40	35	Repo Borrowing
		5	Equity

"Haircut" = $(\text{Assets} - \text{Liabilities}) / \text{Assets} = \text{Equity} / \text{Assets}$

12.5% = $\$5 / \text{Assets}$, so Assets Falls to \$40

I-Bank must sell \$40 of its bonds!

Shadow Banking, Version #2 (Asset-Backed Commercial Paper)

Bank, after securitization			
	Assets	Liabilities	
Cash	100	92	Deposits
		8	Equity (required capital = 0)
			↓ ↑
			Liquidity Guarantee Excess Spread
SPV			
	Assets	Liabilities	
Sec. Loans	100	100	Asset-Backed CP
Money Market Mutual Fund			
	Assets	Liabilities	
Asset-backed CP	100	100	Money Market Accounts

Q. Where is the liquidity risk?

News Articles

Bill Hwang

- Worked for Julian Robertson's Tiger Management
- Managed Tiger Asia Management
- 2012, investigated for insider trading and black-listed by regulators and banks for several years

Archegos Capital Management Blow-up

- Formed by Bill Hwang as a family-office hedge fund
 - Estimated AUM – \$10 Billion
 - Highly leveraged using total return swaps with minimum disclosure
 - Collapsed after the margin-calls by its prime brokers (Goldman, Credit Suisse, Nomura, Morgan Stanley). Estimated total loss \$30 Billion
-

News Articles

It is clear that financial institutions didn't learn from the past lessons (e.g. LTCM, Bear Sterns, Lehman Brothers, AIG)

- Profit vs. Risk management
- Counter-party risk
- Opacity of OTC derivatives contracts - Warren Buffett once called the instruments “financial weapons of mass destruction.”
- Lack of information on entities like hedge funds



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