Lecture notes on risk management, public policy, and the financial system

Forms of leverage

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Credit markets in the U.S.

Collateralized security loans and leverage

Key postwar developments in U.S. credit markets

Reduced role of commercial banks as alternative forms of short-term investment and long-term borrowing grow

- **Disintermediation**: funding via capital markets, not banks
- Closely related to non-bank intermediation, **"shadow banking"**
- Has advanced further in U.S. than rest of world

Rise of capital markets and trading volumes

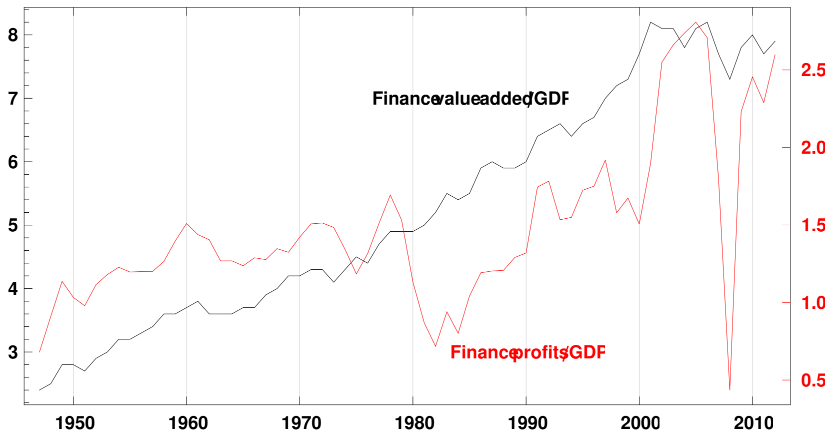
- Increase in borrowing through markets rather than banks via issuance of corporate bonds, commercial paper
- Rise of **wholesale funding** via money markets
- Large capital pools: hedge funds, private equity, reserves

Securitization: pooling assets and creating securities through which their cash flows are distributed, esp. loans, mortgages

Increased leverage by all sectors, but esp. households, financial firms

Increased foreign direct investment in U.S. and by U.S. abroad

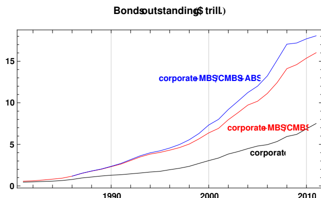
Growth of U.S. finance 1947–2012

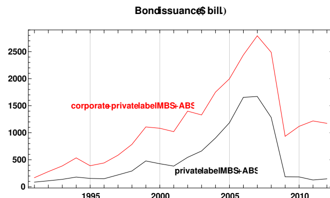


Black plot: Finance and insurance value added as a percentage of gross domestic product, annual. Red plot: financial corporate profits as a percentage of gross domestic product, annual. *Source*: Bureau of Economic Analysis, GDP-by-industry accounts, value added by industry as a percentage of GDP, line 51; National Income and Product Accounts, Table 1.1.5, line 1, Table 6.16A-D, line 3.

Growth of private-sector bond markets 1980–2011

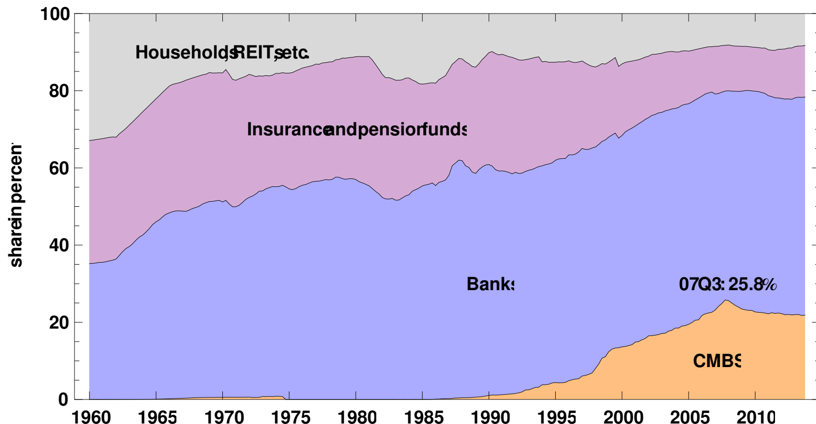
- Growth driven in recent years by mortgage- and asset-backed securities
- Collapse of subprime MBS and ABS issuance in crisis, but revival of corporate bond issuance





Par values. *Source*: SIFMA (`http://www.sifma.org/research/statistics.aspx`).

Commercial real estate debt finance 1960–2013



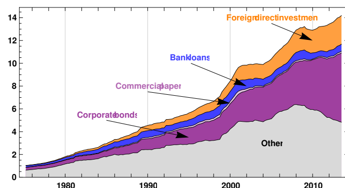
Shares of total commercial real estate lending loans held by each sector, quarterly, percent. Banks include U.S.-domiciled commercial banks and savings institutions. Institutional investors include insurance companies and pension funds. Other includes finance companies. Source: Federal Reserve Board, Financial Accounts of the United States (Z.1), Table L.220.

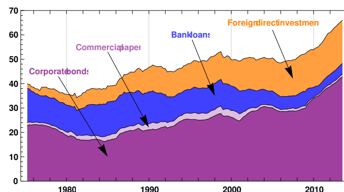
"Shadow banking"

- Key aspect of financial innovation
  - Non-bank intermediation
  - Off-balance sheet treatment: difficult to obtain and aggregate data
  - Falls outside pre-existing regulatory framework
- Institutional elements
  - MMMFs
  - Structured credit products
  - Structured investment vehicles (SIVs) and conduits

Disintermediation in U.S. finance 1980–2013

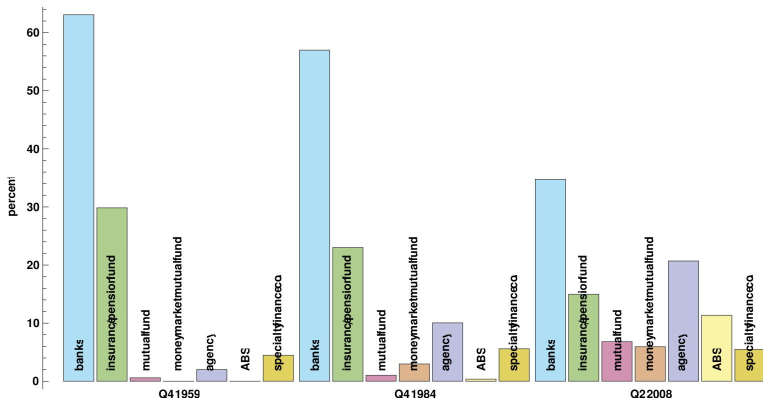
By liability type:





Total liabilities of U.S. nonfarm nonfinancial corporations by type. Bank lending is comprised mostly of commercial and industrial loans (C&I loans). "Other" consists primarily of trade payables and mortgages. Left: $US trillions; right: shares, in percent. Quarterly, 1975 to Q2 2013. *Source*: Federal Reserve Board, Financial Accounts of the United States (Z.1), Table L.102.

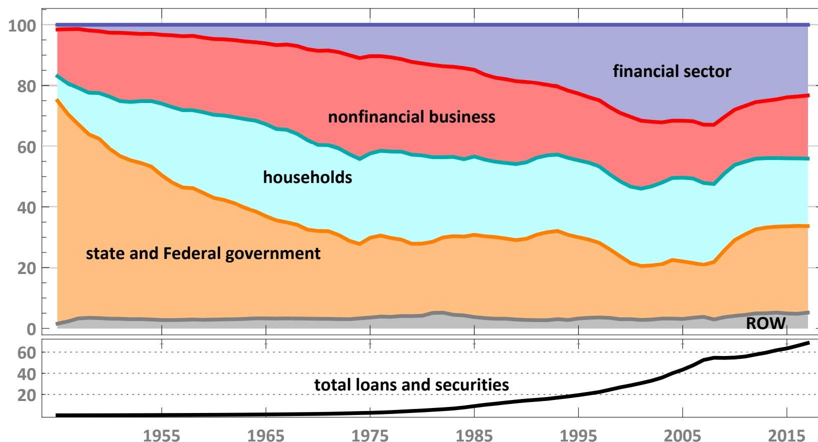
Intermediation by sector 1985–2008



Share of each sector in total credit market assets held by financial sectors, percent. *Source:* Federal Reserve Board, Financial Accounts of the United States (Z.1), Table L.1 (line nos. in parentheses):

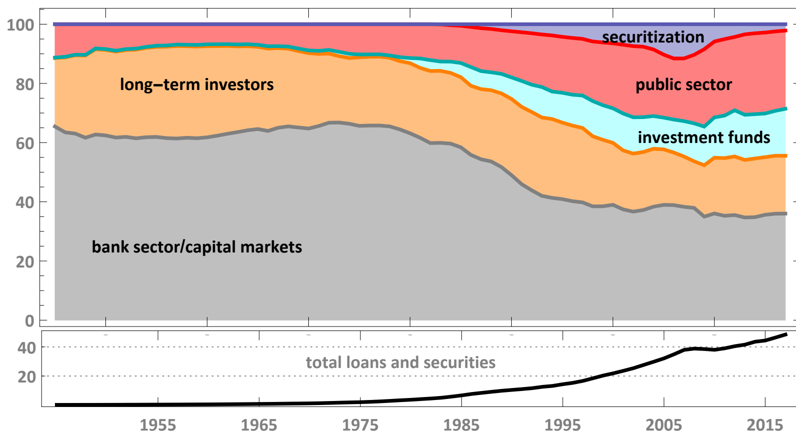
banks	Monetary authority (34) Banks (35, 40-41) Brokers and dealers (56)	money market mutual fund agency	MMMFs (47) GSEs (51) Agencies, GSE MBS (52)
insurance/pension fund	Insurance, pensions (42-47)	ABS	ABS issuers (53)
mutual fund	Incl. ETFs (48-50)	specialty finance co.	Incl. REITs (54-55, 57)

Who's borrowing in the U.S., 1947–2017



Outstanding amount of borrowing via loans and debt securities by sector in U.S. markets, annual. Upper panel displays the share, in percent, of each sector's borrowing in the total. Bottom panel displays the total outstanding amount of loans and debt securities, in trill of $. *Source*: Federal Reserve Board, Financial Accounts of the United States (Z.1), Table D.3.

Who's lending in the U.S., 1947–2017



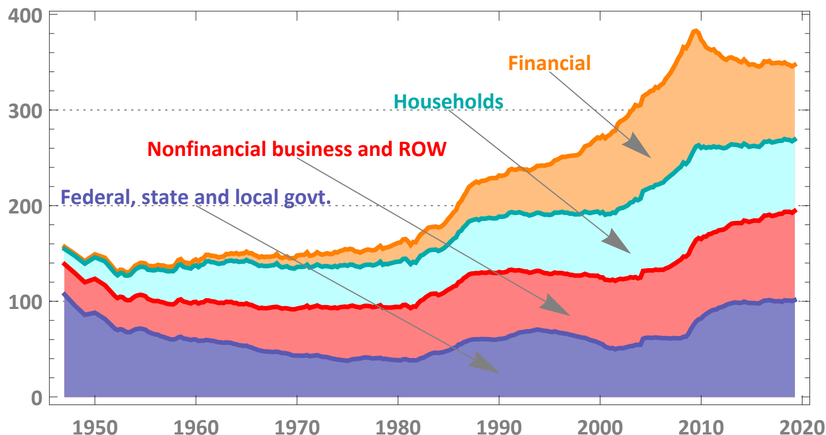
Share of each U.S. financial sector in loans and debt securities held as assets, annual, in percent. "Bank sector" includes finance companies, brokers and dealers. "Long-term investors" include insurance companies and pension funds. "Public sector" includes assets held by the Federal Reserve, and held or guaranteed by government-sponsored enterprises (GSEs). Bottom panel displays the total outstanding amount of loans and debt securities, in tril. of $ *Source:* Federal Reserve Board, Financial Accounts of the United States (Z.1), Tables L.208 and L.214.

Leverage since crisis

- Rapid increase in debt levels from 1980s
- Since crisis
  - Financial sector: sharply reduced debt
  - Households: less sharply reduced debt
  - Nonfinancial business: modestly increased debt
  - Public sector: sharply increased debt
- Overall picture not much changes since pre-crisis period

	Debt-to-GDP ratios (%)		
	Q4 1980	Q2 2009	Q1 2019
Total	163	383	347
Financial	21	121	78
Households	47	98	75
Nonfinancial business and ROW	56	85	93
Federal, state and local govt.	39	79	101

U.S. debt-to-GDP ratio by sector 1946–2019



Ratio of total debt outstanding (debt securities and loans) to GDP, current dollars, percent, quarterly, Q4 1946 to Q1 2019. *Source*: Federal Reserve Board, Financial Accounts of the United States (Z.1), Tables D.3 and F.2.

Credit markets in the U.S.

Collateralized security loans and leverage

- Structure of collateralized security loan markets
- Repo markets

Collateralized security loans

- Loans in which financial assets serve as collateral:
  - Securities themselves serve as collateral for long positions in the securities
  - Cash serves as collateral for short positions in the securities
- Predominantly bonds and equity
- Key mechanism by which financial system
  - Establishes leveraged positions
  - Supplies ($\rightarrow$)liquidity to markets and large intermediaries
- Economic functions:
  - Borrowers use collateral markets to finance long positions in securities
  - Lenders of securities or excess cash use collateralized security loans to earn additional interest
  - Short sellers borrow securities in collateral markets to establish positions

Participants in collateralized security loan markets

- Predominantly conducted by intermediaries on both sides of transactions: **market-based** or **short-term wholesale financing** (SWTF)
- Generally involving broker-dealer ("sell side") on at least on side
- Often referred to as **securities financing transactions** (SFTs) by regulators

Legal mechanics of collateralized security loans

- Securities are **pledged**—used as collateral—to obtain secured loans of cash or other securities
  - Pledged assets said to be **encumbered**
- Loans collateralized by securities may look like sales but are economically loans
  - Holder of pledged securities must remit dividend and coupon payments
  - Voting rights a tricky issue
- Collateral may be **rehypothecated** or repledged by lender
  - Adds to liquidity of collateral markets in normal times, can cause freezes in stress
  - **Rehypothecation risk**: collateral seized by downstream lender
- Arrangements for netting

Legal arrangements for holding collateral

- Two types of arrangement, legally distinct but economically similar
  Security interest in collateral transferred to lender
  Title transfer to lender, obligation to return **equivalent collateral**
- Both enjoy wide exemption from **automatic stay** in bankruptcy
  - $\rightarrow$*Seize and sell:* cash lender can sell collateral without delay

Major types of collateralized security loan

Margin loans: loans financing security transactions in which the loan is collateralized by the security

- Key participants: short sellers, e.g. long-short equity HF, institutional investors

Repurchase agreements or **repo:** matched spot sale and forward repurchase of security, at prices implying a lending rate

- Economically equivalent to margin loan

Securities lending is the loan of a security in exchange for a fee

- Administered on large scale by major **custodian banks** (e.g. Bank of New York Mellon (BONY), State Street, JPMorgan)
- Key participants: institutional investors with high-quality collateral

Haircuts

- The full value of the collateral is not lent
- **Overcollateralization**—the excess of the collateral value over the amount lent—provides equity or buffer against price variation
  - The haircut as a fraction of the market value of the collateral is equal to the reciprocal $\frac{1}{L}$ of the leverage in the transaction
- Overcollateralization expressed in two equivalent forms, depending on market conventions

  Margin: market value of collateral/loan par value (e.g. 105 percent)
  Haircut: percentage deduction of loan from the market value of collateral (e.g. 5 percent)
- The haircut agreed when a transaction initiated is called **initial margin**
  - As collateral value fluctuates, counterparties may exchange **variation margin**
  - Similar mechanism to exchange-traded and OTC derivatives markets
- Declines in asset values generally require borrowers to post additional collateral→**fire sales**

U.S. stock market margin debt 1990–2018

Debit balances in margin accounts at New York Stock Exchange (NYSE) member firms, month-end, Dec. 1989 to Nov. 2018, $ bill. *Source*: NYSE Facts & Figures, via Bloomberg ticker MARGDEBT Index.

Repo market mechanics

- Cash borrower said to have entered a repo transaction, cash lender a **reverse repo** transaction
- What makes it a secured loan, rather than a purchase and sale?
  - Seller (cash borrower) has obligation to repurchase
  - Seller bears market risk, since sale and repurchase prices determined at start
- Most repo overnight, but rolled over for longer periods
  - **Term repo** has longer maturities than o/n
- Most repo **general collateral** transactions, collateralized by any securities within a class, e.g. Treasurys or agencies
  - Substitution of securities: repo purchaser (cash lender) may return "equivalent" securities
  - Other repo collateralized by specific securities identified by CUSIP
- Most repo is **Treasury repo** collateralized by Treasurys
- Generally governed by standardized documentation: **Master Repurchase Agreement**
  - Provides for netting of some transactions

Participants in the repo market

- Very large market, near \$2 trillion
- Key participants:
    - "Outer market": cash lenders include MMMFs, corporate treasuries; cash borrowers include hedge funds, institutional investors
    - Larger banks and broker-dealers intermediate between cash lenders and borrowers
    - "Inner market": trades between dealers to manage and fund inventories, support market-making
- **Dealer matched-book repo:** simultaneously enter repo and reverse-repo with different counterparties, earn spread
    - Dealer raises cash from reverse-repo counterparty and lends to repo counterparty
    - At same time, dealer rehypothecates repo counterparty's collateral to reverse-repo counterparty

Types of repo

Tri-party repo: third-party custodian values securities, settles trades via transfers of cash and securities between participants' accounts

- Used by larger participants in repo markets, primary trading venue for cash lenders and borrowers
- Accounts for about $\frac{2}{3}$ of U.S. transaction volume
- In U.S., BONY sole tri-party custodian

Delivery-versus-payment (DVP) or **bilateral repo:** direct transactions in specific collateral

- Generally between dealers, and in U.S., cleared though **Depository Trust and Clearing Corporation** (DTCC)

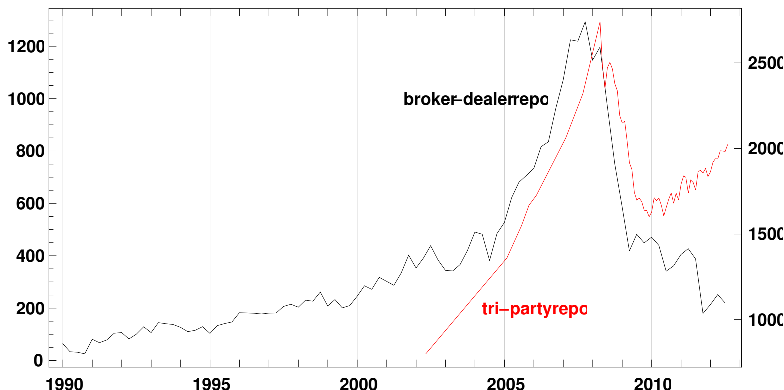
GCF Repo: similar to tri-party repo, but open to smaller dealers

- Executed via a DTCC subsidiary and cleared through BONY tri-party platform

Tri-party repo and systemic risk

- Day-long, complex settlement process: daily “unwind”
- Custodian bank BONY provides intraday financing of dealers' securities, large intraday counterparty exposure during settlement
- Custodian may trigger default of weak dealer by declining to clear its trades
- Custodian may itself be weakened by default of major participant

U.S. broker-dealer and tri-party repo 1990–2012



Black plot (left axis): net liabilities under security repurchase agreements of U.S. broker-dealers, $ billions. Red plot (right axis): daily average transaction volumes in the tri-party repo market, all collateral classes, $ millions. *Sources*: Federal Reserve Board, Financial Accounts of the United States (Z.1), Table L.127, Federal Reserve Bank of New York.

Treasury repo reference rates

Secured Overnight Financing Rate (SOFR): index of overnight Treasury repo rates, blending rates on tri-party general collateral, GCF Repo, and DVP repo transactions

Broad General Collateral Rate (BGCR): similar to SOFR index, but includes only tri-party and GCF

Tri-Party General Collateral Rate (TGCR): similar to BGCR index, but includes only tri-party