

# Global Financial Systems

## Chapter 10

### (Credit) Markets (and infrastructure)

Jon Danielsson London School of Economics

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To accompany

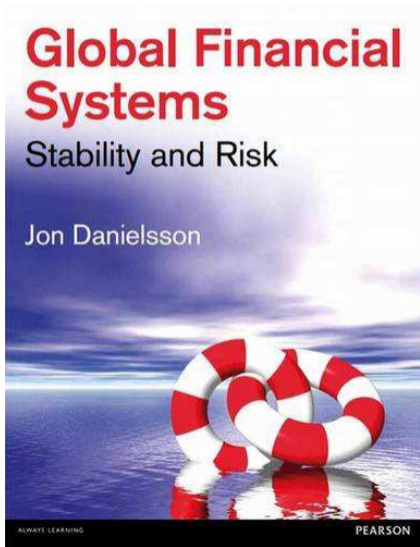
*Global Financial Systems: Stability and Risk*

[www.globalfinancialsystems.org/](http://www.globalfinancialsystems.org/)

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## Book and slides



- Updated versions of the slides can be downloaded from the book web page [www.globalfinancialsystems.org](http://www.globalfinancialsystems.org)

# “Plumbing”

- Refers to the infrastructure that makes the financial system work and tools used by market participants
- We discuss a small subset, those most relevant to the theme of the book
- Derivatives
- Margins
- Payment systems
- CCPs
- Trading strategies, including carry trades
- Securitization

# Content

- These slides combine content from
- Chapter 9: CCPs, trading strategies,
- And have some new content
- John Hull. 2021. *Options, Futures, and Other Derivatives*. 10th. Upper Saddle River, NJ: Pearson

# Market participants

- General term referring to those who engage in trading
- Proprietary trading (*prop trading*) buying and selling for a financial institution's account, in order to make speculative profits
  - this is the target of the US Volcker rule, UK Independent Commission on Banking (Vickers report), EU Liikannen report
- Funds are financial institutions that invest on behalf of clients — e.g. Fidelity, BlackRock, Vanguard, etc. They are generally highly regulated (except hedge funds on next page)
- Family office is a specialized fund investing on behalf of a single investor (or family)
- A Sovereign wealth fund is an institution investing on behalf of a country

# Hedge funds (HFs)

## Lightly but not unregulated

- Lightly regulated funds. Sometimes restricted to only sell to sophisticated and wealthy investors (*accredited*)
- Who consequentially should be able to take care of themselves (no need for micro-prudential protection)
- Still subject to securities laws and deals with regulated parts of the financial system
- Difficult to classify (except by absence of regulations)
- Before 2007, thought to be the main source of financial instability (echoes of 1998 and LTCM)
- We will see them in the endogenous risk chapter (and elsewhere)

# Brokers and prime brokers

- Broker is a financial institution that facilitates transactions — sits in the middle of them
- Prime broker is a financial institution that provides financial services to hedge funds and other similar institutions
  1. credit
  2. trading
  3. risk management
- We will see them in the endogenous risk chapter and the case of Archegos below

# Trading venues

- One can use *over the counter* (OTC) — bilateral transaction between two counterparties
- The traditional trading venue is an open outcry, still used with some commodities
- Today, electronic exchanges are the most common



# Modern trading venues

- The distinction between trading on *exchanges* and trading OTC is of decreasing relevance ...
- Complex, bespoke, illiquid securities are only traded OTC through arrangements made *ad hoc*
- Many liquid securities can now be traded in several different venues, generally on *electronic trading networks* that *interoperate*
- *Dark pools* are trading venues that match buyers and sellers at prices established in other, '*lit*' venues
  - Institutional traders try to reduce *price impact* of transacting big blocks of securities

# Credit Markets

## Where is the risk?

- Newspapers report equity markets (S&P 500, FT100, DAX, CAC40, NIKKEI, etc.)
- But the fixed-income markets are much larger

# Fixed income assets

- Provide payments on a fixed schedule
- Involving creditor(s) and debtor(s)
- Many categories, e.g.
  - plain vanilla bonds
  - loans
  - credit derivatives
- Usually traded in OTC markets
- Volume dwarves equity markets
- And are much more important

# Credit risk

- Probability of default
- More generally chance of losing money
  - interest
  - rating
- Loss given default

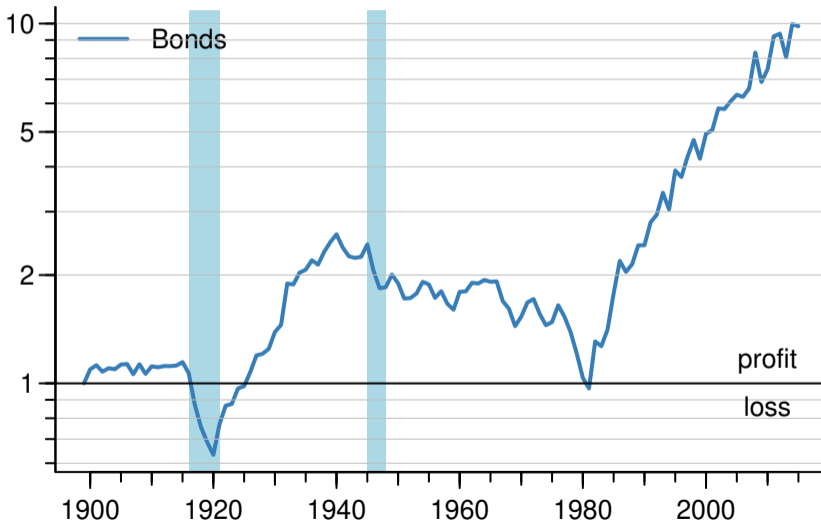
# Pari passu

- Debtors are considered in default as soon as they do not meet a payment obligation on any coupon or principal payment
- “*Pari passu*” clauses mean that debtors are considered in default on all their debt obligations as soon as they default on any particular one
- Note how this influences crisis resolutions

# US fixed income markets

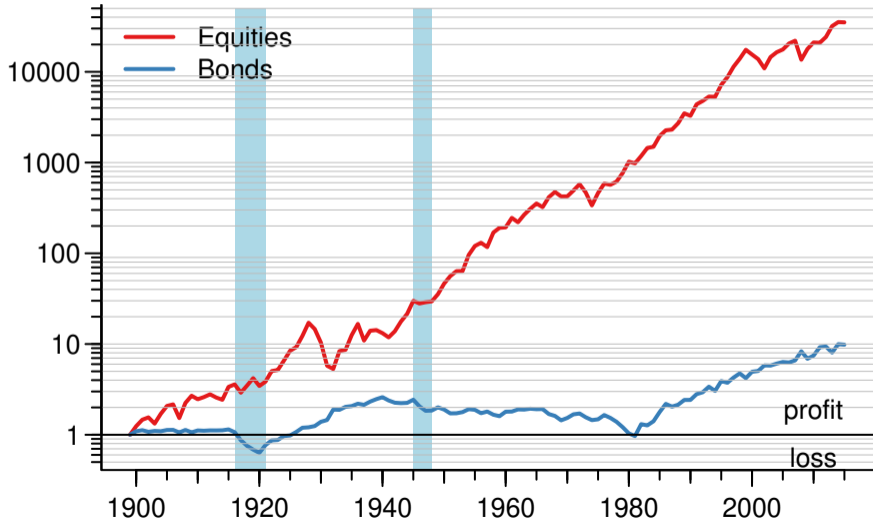
- Largest in the world
- Below, we look at bonds and not bank loans

# Real return on US markets



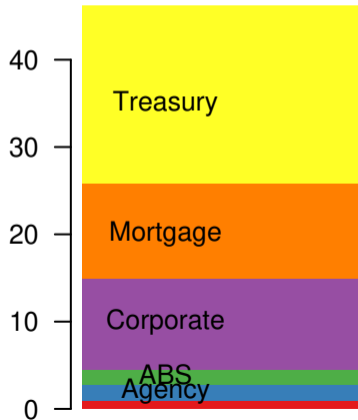


# Real return on US markets

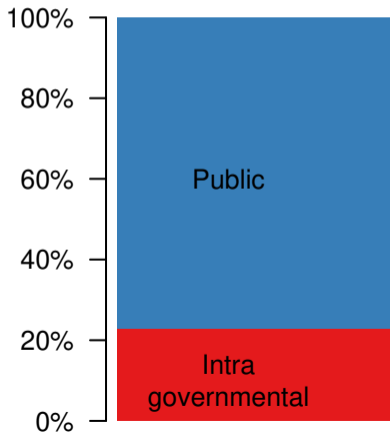


# US bond market overview

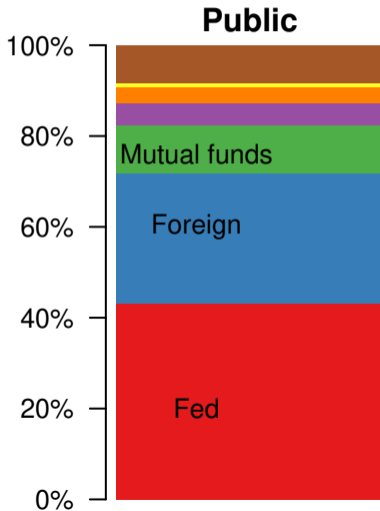
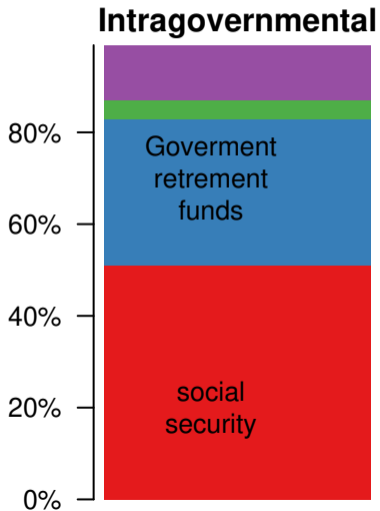
## US debt market USD trillion



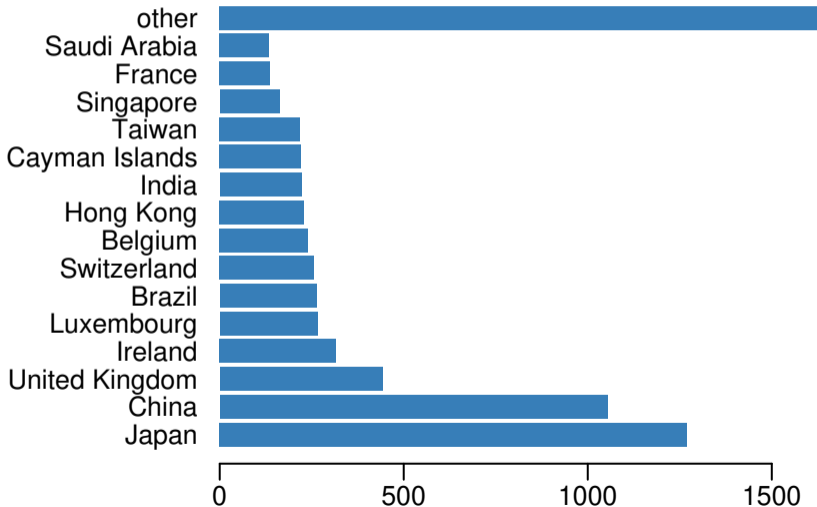
## Treasury



# US treasury bond market



# Foreign holders of US treasury debt



# Rating agencies

- Standard & Poors
- Moody's
- Fitch
- + some new ones
  
- Issue ratings on the creditworthiness of borrowers

“A credit rating is S&P's opinion of the general creditworthiness of an obligor, or the creditworthiness of an obligor with respect to a particular debt security or other financial obligation, based on relevant risk factors.”

# Ratings

S&P	Moody's	
AAA	Aaa	
AA	Aa	investment grade
A	A	
BBB	Baa	
BB	Ba	non investment grade
B	B	
CCC	C	
Default		

some grades missing from table

# Ratings process

- Financial analysis of balance sheet and P&L account
- Quality of management, expected growth of the industry
- Nature of this assessment is subjective
- Ratings are usually reviewed once a year

# Limitations of ratings

- Do not consider the impact of business cycles
- Assume transition probabilities are constant over time
- Rating assumed to be *sole* determinant of default risk
- Not founded on a theory of the firm or any theoretical stochastic processes for leveraged firms
- Not possible to use default correlations



# Ratings and regulations

- Ratings are legally required for many purposes
- E.g. for a security to be repo-able with central banks
- Or as an input into bank capital calculations
- Many entities are restricted to rated investments, often investment-grade
- Many take them seriously — others do not
- This makes ratings very sensitive politically

# EU sovereign debt crisis

- Some EU countries have an AAA rating, others do not
- We discuss the sovereign debt crisis in detail later

## They can make people angry

As Greece got further downgraded, European policies got undermined, provoking rage from EU politicians

“Europe can’t allow three private US enterprises to destroy the euro.” Either their “cartel” was smashed or “independent” European and Asian rating agencies would be set up. “We can’t have a situation where a cartel of three US enterprises decides the fates of entire national economies and their citizens,”  
Viviane Reding, the then EU justice commissioner

# Conflict of interest

- Ratings are generally solicited by the issuer of fixed-income instruments
- Good ratings enhance the marketability of the debt issue
- A rating agency is there to perform due diligence
- But it is paid a percentage based on the amount of financing
- If there is no debt issue, it will not get paid!

The rating agencies are amongst the most profitable financial firms

## Case: Hannover Re and Moody's

- CRAs made a big push into Europe in the early 1990s
- Allegedly used aggressive tactics to collect fees
- Moody's informed the German insurance company Hannover Re in the mid-1990s that it had decided to rate the company at no charge but was looking forward to the day Hannover Re was willing to pay for the ratings
- Hannover Re refused and never paid Moody's
- Moody's rated Hannover Re anyway, starting with Aa2 in 1998, downgrading three times, eventually to Baa1 (near junk) in 2003
- S&P, which did get paid by Hannover Re, has rated it AA- from 2003 until 2012
- Moody's stopped rating Hannover Re in 2008

# Quality of ratings

- Rating agencies have always been criticized for the quality of their ratings
- They have missed spectacular corporate failures
- Also problems in individual countries
  - Asia before the 1997 crisis
  - European sovereigns before last year
- Perhaps their worst failure relates to structured credit — discussed later

## So what can we do?

- Ratings are necessary
- And we don't want them provided by the government or under government control
- The current European attitude seems to be based on a desire to shoot the messenger
- More competition is beneficial — it is on the way
- It would be better if the issuers did not pay for the rating
- It is tricky whether they should be held legally accountable
  - 1<sup>st</sup> amendment protection in US
- We do rely too much on them in regulation

# Basic assets and derived assets

- Assets like equities (stocks), commodities and foreign exchange (FX) are known as *basic assets*
- A *derivative* is an asset whose properties are derived from a basic asset, like forwards, futures, swaps and options



## Forwards and futures

- A contract for delivery of an asset at a predetermined price sometime in the future
- I will buy \$1.2 million from you for €1 million in one year

Description	Forward	Future
	Sold by banks OTC	Traded on organized exchanges
Contractual size	Tailor-made for client	Standardized amounts
Settlement	Buy or sell assets at maturity at the contract price	Marking to market
Expiration date	Tailor-made for client	Standardized delivery dates
Delivery	Usually delivered	Rarely delivered

# Swaps

- The exchange of future payment flow from two assets
- I own a bond that pays €1 million in coupon payments every year for the next ten years, you own a bond that pays \$1.2 million every year for the next ten years, and we agreed to swap the payment flow

# Options

- A contract that gives the buyer the *right, but not the obligation* to enter into a transaction in the future
- It is a *contingent claim*

**Call** the buyer has the right to buy

**Put** The buyer has the right to sell foreign

**Option premium/price** The buyer pays a fee for the right, payable upfront

- Example next page

## Example option

- An airline buys the right to purchase one barrel of oil one year from today at the price of \$50
- If the price at the time exceeds \$50, the airline enters into the transaction and otherwise, not
- The price of such an option is obtained from the *Black-Scholes* equation

# Margins

- Derivative transactions mean that one of the counterparties may owe money to the other in the future
- That means one counterparty faces credit risk
- The financial institution that enters into a derivative transaction with a client will typically insist on some protection against that credit risk
- Typically that is a *margin*

# Details

- A margin is a fraction of the contract amount that is kept in cash in a special account

**Initial margin** percentage of the amount covered by cash or collateral In a margin account (e.g. 20%)

**Maintenance margin** amount that must be in the margin accounts (e.g. 50% of initial margin)

## Example

- An airline enters into a contract with a bank for delivery of 1 million barrels of oil in one year at \$50 million
- Initial margin is 20% so the airline has to provide  $0.2 \times 50 = 10$  million in cash upfront
- If the price of oil falls to \$40, the airline owes the bank \$5 million and will have to provide an additional  $0.5 \times 10$  million in margins to the margin account
- That is a *margin call* and has typically to be met the same or next day
- Otherwise position is *liquidated*
- Note how that can be destabilizing in a crisis

## Case: Archeos a \$10 billion family office

- It had several prime brokers: Credit Suisse, Deutsche Bank, Goldman Sachs, Morgan Stanley, MUFG, Nomura, UBS and Wells Fargo
- All the prime brokers had an almost perfect view of their position
- Archeos traded swaps (\$20 billion), which meant that when its positions went against it, it had to provide margins to its prime broker
- And when its positions were in its favor, it could take money out of the margin account



- When Archeos was getting into serious difficulty, it ignored the margin calls
- Some prime brokers reacted immediately by liquidating their positions. They lost little or nothing
- That caused prices to fall, so those prime brokers who were slowly lost significantly
- \$20 billion fire sale
- Credit Suisse lost \$5.5 billion
- Nomura \$2.87 billion

# Margins, haircuts and leverage

- Borrowed money and securities are used as *leverage* to increase the purchasing power of traders' capital

# Haircuts

- Similar to initial margin
- Securities pledged for collateral, only a portion of the current market value counts as a pledge. The rest is a haircut
- Term has other meanings, such as losses to bondholders in credit restructuring, like Greece

# Mark-to-market

- Traditional accounting is historical values
- Misses changes in market values
- Hence marking-to-market
  - Relates to the maintenance margin

# Mark-to-model or magic

- What to do if there is no market?
- Exactly what happened in 2007
- Mark-to-model
- Those turned out to be unreliable
- So really marking-to-magic

# Marking and financial stability

- Marking does provide useful protection
- But when used in a mechanistic fashion, it becomes *procyclical*
- People may stop trusting it in a crisis
- Giving rise to vicious endogenous risk feedback loops
- MTM is one of many approaches that fatten tails

# Payment system

# Payment system

- Used to settle payments by transferring money between economic agents
- Can refer to a narrow system, perhaps enabling one owner of a mobile phone to transfer money to another
- Or a national system, either directly operated by the government (typically central bank) or directly under its control
- Also refers to an international system like SWIFT
- The payment system is fundamental to an efficient economy
- If it fails, economic activity grinds to a halt
- Nobody can make any electronic payments, including debit/credit cards



# Examples

- Real-time gross settlement systems (RTGS). Immediate, no netting. Final and irrevocable
  - Eurosystem has TARGET2
  - Federal Reserve Banks, Fedwire (RTGS, for banks with accounts at the Fed)
- Private payment systems
- Visa, Mastercard, Apple Pay, Alipay, Paypal, Ethereum, etc.
- Integrity of the payment systems is of primary national interest, including guarding against criminals, terrorists and hostile nation-states

# Central (clearing) counterparty (CCP)

# Clearing and settlement

- There are a host of chores to do after trades are agreed ...
- *Clearing houses* mitigate counterparty risk among broker-dealers
- Depository Trust & Clearing Corp. in the U.S. cleared \$1.48 *quadrillion* of trades and held \$34 trillion of securities in trust in 2009
- Some clearing houses act as *central counterparties*, e.g. in many futures and options exchanges

# CCPs

- One way to mitigate the systemic risk from CDSs and the like is *central counterparties*
- But, will CCP create a new systemic risk?
- Should eliminate asymmetric information
- Ideally, one CCP or clear cross-netting arrangements
- i.e. CCP is the legal counterparty to every market participant
- Promises to solve the problem of asymmetric information
- Many exchanges
  - Cross netting?
- They can not be allowed to go bust. See next slide
- National ambitions get in the way

## But the CCP can not be allowed to fail

- Huge amount of default risk concentrated in the CCP, and *everyone* is exposed to it
- Hong Kong CCP defaulted in the 1980s
- Should the CB backstop it?
- Will it excessively increase margins during a crisis and create *endogenous risk*?
- Ensuring the CCP is well capitalized means standardizing margining across the whole market: positive feedback
- Unless there's just one CCP, clearing and netting between CCPs becomes an issue

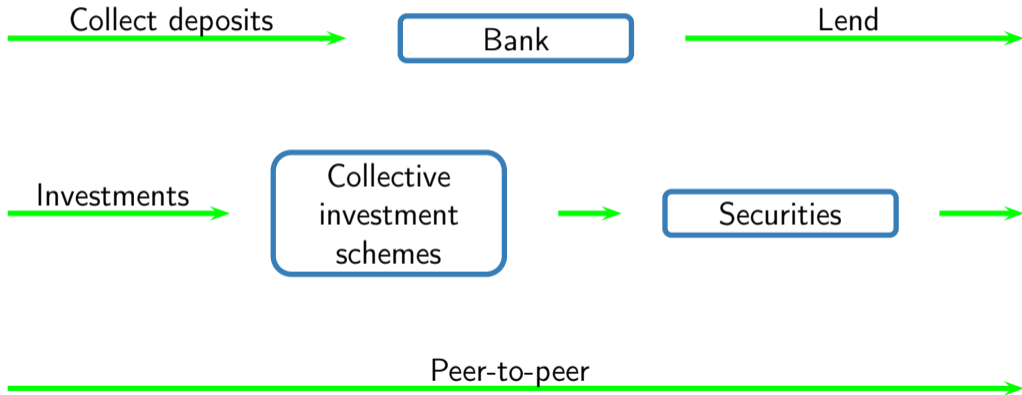
# Shadow banking

- Credit intermediation that involves entities and activities (fully or partly) outside the regular banking system
- Said differently, an operation that does banking without being called a bank
- Term created in 2007
- Before known as market-based finance or non-banks
- Now sometimes called *parallel banking* because shadow banking is seen as a negative term
- Historically, mostly US
- But now widespread in most countries

# Shadow banking

Savers

Borrowers



# Money market funds (MMF)

- The type of a shadow bank that raises most concerns is *money market mutual fund* — it can have many other names
- Intermediary that manages money
- Low-risk securities (commercial paper, certificates of deposits and treasuries)
- Ability to withdraw money at short notice
- Maintain the value of the principal of its assets
- Higher yield than bank accounts
- Big worry in the US and especially China



# Benefits of shadow banks

- If the banking system is inefficient
- Shadow banks can provide a cheaper alternative way of connecting savers with investors
- Has been a big benefit to the United States
- And establishing such a system is the objective of the European Capital Markets Union — even if they wouldn't use those words

# Growth in non-bank assets

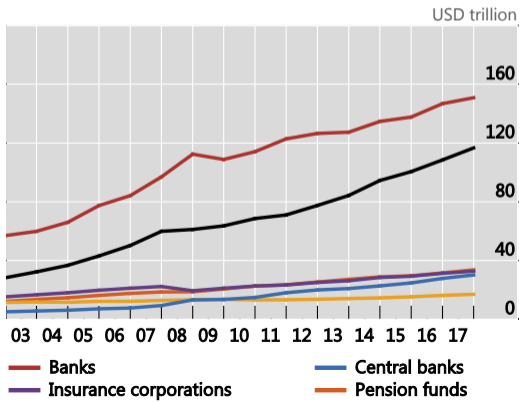
[www.fsb.org/wp-content/uploads/P040219.pdf](http://www.fsb.org/wp-content/uploads/P040219.pdf)

Assets of financial intermediaries<sup>1</sup>

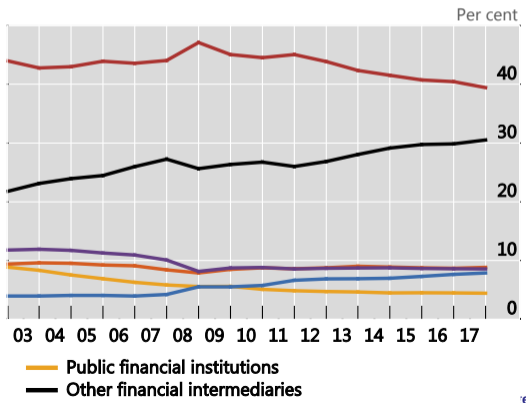
21+EA-Group

Exhibit 2-2

Total global financial assets



Share of total global financial assets



# Why worry?

- Systemic risk
- Regulatory arbitrage
  - Asian crisis — Thailand
- Monetary policy transmission
- Channel for capital flows
- Unknown unknowns

# Benefits — ~~Shadow~~ Parallel banking

- More competition
- More diverse financial system
- Financial inclusion

# Trading strategies

- Rules used by traders when deciding what to buy and sell
- Can be highly formalized and automated (like HFTs)
- Or a vague preference for low-risk or safe investments
- Often are unconscious
- We have seen several examples, especially in the endogenous risk chapter
- Discuss momentum, value, technical trading, carry, short, and HFT below

# Value investing

- Find companies trading below their *inherent worth*
- Stocks with strong fundamentals like earnings, dividends, book value, cash flow
- The strategy of Warren Buffett
- One example of a mean reversion trade

Seeking yield is maximizing risk

Warren Buffett

# Technical trading

- Forecasting prices with quantitative methods
- Often successful with statistical arbitrage and HFT
- Less likely to work at lower frequencies
- Many studies proclaim it works
- A problem with data mining. Forecasting in-sample not a proof of success
- Most public studies have methodological problems
- However, if someone is successful, they will not really talk about it in any detail

## Momentum — trend following

- Buying assets that have seen recent price increases and sell those that have fallen in price
- Can endogenously affect prices (self-validating in the short run)
- In the long run, it may cause bubbles and crashes
- May be conscious, but perhaps more likely done subconsciously
- , For example, we only engage with successful managers



# High–frequency trading (HFT)

- Using technology to beat everybody else
- Famous example Nathan Rothschild, pigeons and Napoleon's defeat in Waterloo in 1815
- Now done with high–speed computers, data networks and *algorithmic trading*
- Main fears crystallized in the flash crash of May 2010

# Shorts

# Short selling

- Selling assets one does not own — borrow with the intention of buying back later
- In many cases, a legitimate hedging activity
- But can be used to make directional speculative bets
- Difficulties in sorting out economic vs. political or moral arguments

# Naked short selling

## Two different activities

- A. A short speculative position, rather than hedging
- B. Short selling an asset without borrowing it

# Shortselling issues

- Profits from falling markets
- But is it any different from just selling assets one owns?
- Hard to see an economic distinction
- Hence the political/moral dimension of profiting from a crisis or causing prices to fall
- Frequently banned
- However, little empirical evidence indicating damage from short-selling or the effectiveness of banning
- Muddy Waters vs. Casino in France —  
<https://www.youtube.com/watch?v=xzfCNdH40kk>

# Relevance to financial stability

- Most trading activities discussed here are not important for the stability of the entire financial system
- However, they can be one of the hidden mechanisms that culminates in a crisis
- Like a large, hidden, sell-on-loss strategy
- Flash crashes a big worry

# Mechanics of a short

- A speculator borrows stock
- From somebody who intends to hold the stock but is happy to earn a fee for lending it
- The speculator commits to returning the stock at a predetermined date in the future
- The lender insists on a margin to protect themselves
- So the risk in shorting is either that the price increases or it temporarily increases, and the speculator is unable to meet the margin

# The Wirecard short

- Wirecard was a German financial institution that briefly became a very large
- The Financial Times ran articles about how it might have been fraudulent
- Heavily shorted
- The German regulator, Bafin, prosecuted the FT and banned shorting
- Then Wirecard was revealed as having been fraudulent
- FT schadenfreude
- Head of Bafin was fired
- Incredibly, Baffin staff was allowed to trade in Wireguard stock



# Short squeeze

- Those shorting are vulnerable to short-term price movements
- Suppose someone quickly buys a lot of stock, and then the price increases
- And the speculator shorting is squeezed — short squeeze
- Because she will receive matching calls which have to be met on the same day
- If she can't meet the margin call, her position is liquidated on the spot

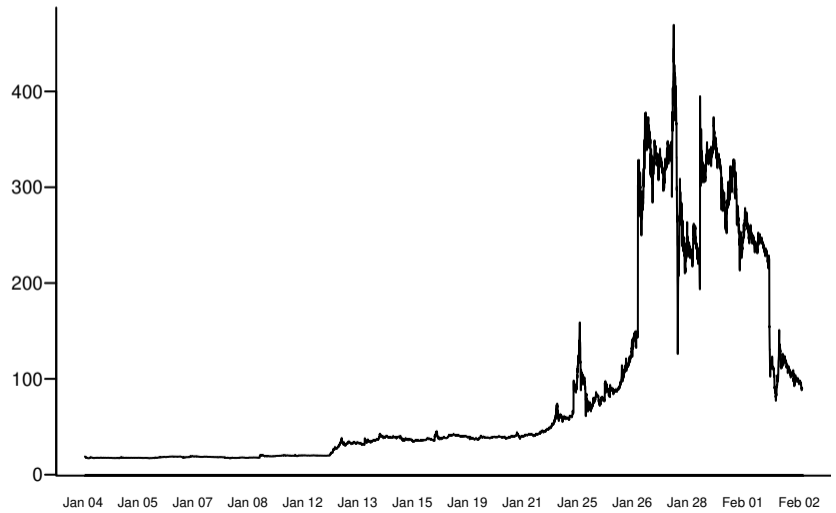
## Volkswagen short squeeze 2008

- Porsche wanted more voting shares in VW, so it started to buy its shares
- VW stock price increased from €30 in 2005 to €150 in 2007 for no apparent reason, becoming the world's most valuable automaker
- VW appeared massively overvalued (at the height of a global crisis, no cars selling) — speculators started shorting it
- Short position 12% of outstanding shares
- Porsche owned 43% and 32% in share options. The German government-owned another 20.2%
- Not many shares to buy on the open market
- Speculators cover positions, price up to €1,000
- Losing \$30 billion in the process to Porsche
- Highly controversial. Was it legal? Did the German regulators allow it to happen?

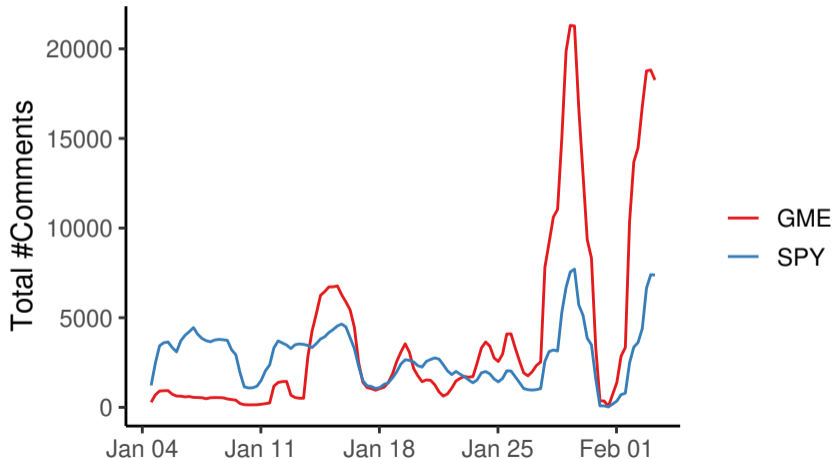
# Gamestop (and some others)

- Gamestop had been seen by hedge funds as a company in difficulty
- That its stock price was destined to fall
- It was hence heavily shorted
- Then, small investors, coordinating via Reddix's WallStreetBets page, started to buy Gamestop on the Robinhood platform — squeezing the hedge funds

# Gamestop prices



# WallStreetBets (reddit) sentiment. Gamestop and SPY (SP-500 ETF)



# Outcome

- The largest shorting hedge fund lost almost \$3 billion — forced to close out the position at a high price
- Robinhood was eventually forced to limit trading
- Robinhood clears trades via Depository Trust & Clearing Corp
- Lag between when investors orders and when cash is exchanged for securities, brokerages have to maintain deposit accounts at the clearinghouses
- DTCC wants \$3 billion in collateral
- Robinhood eventually raised \$2.4 billion from shareholders, allowing it to lift trading restrictions

# Securitisation

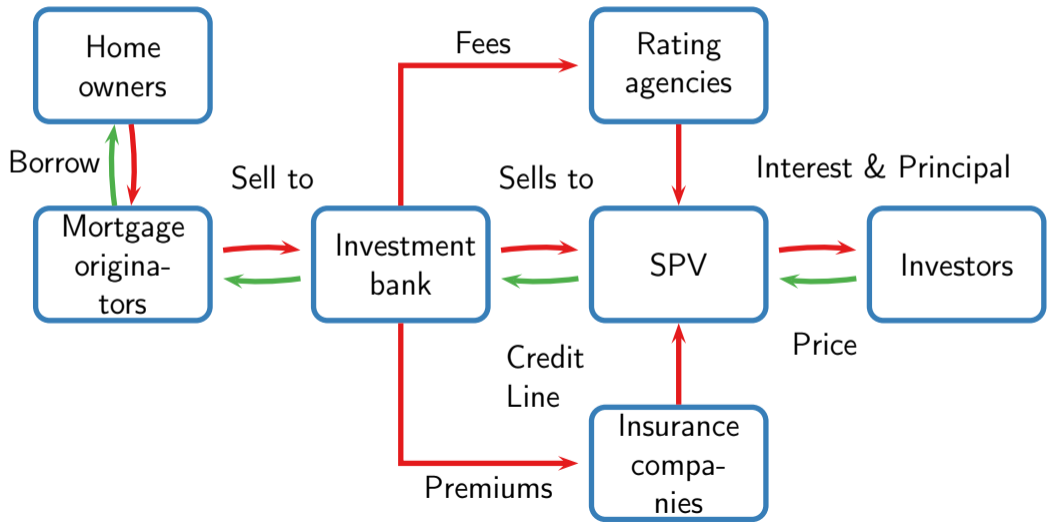
- The process of creating *asset-backed securities*
- Various types of credit type assets are *pooled* together (in a portfolio) and sold in various forms to creditors
- For example, credit card debt, car loans and mortgages
- Securitization with subprime mortgages was at the core of the crisis from 2007

# Mechanics

- A firm has a pool of assets
  - e.g., corporate loans, mortgages, credit card receivables
  - this company is known as the *originator*
- The originator creates a *special purpose vehicle* (SPV)
  - a separate legal firm under the control of the originator
- The SPV buys the assets from the originator and sells rights to the payment flow from the SPV
- The SPV is typically *overcollateralized*
  - value of assets exceeds the value of rights
- The difference is equity



# Mortgage securitization chain



## “Bowie Bonds”

Bonds backed revenues of David Bowie's 25 albums recorded before 1990. (Bowie was a 1960s and 1970s rock star). They were issued in 1997, \$55 million, paid an interest rate of 7.9% and had an average life of ten years.

# Why securitise

- It allows banks to transfer risk
- Hence, free up regulatory capital
- Credit becomes cheaper
- Investors can invest in previously inaccessible assets
- Credit risk resides with those who are most able to manage it

# Drawbacks

- Lemon problem for the buyer
- Moral hazard
  - e.g. originator only intends to hold on to a mortgage for a few months
  - so cares less about quality than if intending to hold to maturity
- Exposes originators to liquidity risk — like Northern Rock

# Bibliography I

Hull, John. 2021. *Options, Futures, and Other Derivatives*. 10th. Upper Saddle River, NJ: Pearson.