

HEC Paris — M1 — Spring 2022

## *Advanced Finance*

### [#6] ESG

Johan Hombert, Daniel Schmidt

# Lending Game

## Stage 1

WeLend	10,835,411 €
KMAT	3,735,750 €
Lehman Bruder	2,818,604 €
No-Beta-Tech	2,749,050 €
H2CA Lending	1,757,790 €
PYCE Loans	-1,255,884 €
BCKL	-2,914,213 €
Team BDGT	-3,896,369 €
Statlending Inkc	-4,496,700 €
The Loan Wolves	-4,800,004 €
VN2R	-6,500,990 €
ARCA	-6,542,100 €
Gekko's Loan	-9,182,244 €
Pineapple	-19,150,533 €
Paylater	-29,974,974 €
MALT	-32,588,411 €
BKR	-39,434,593 €
CreditAgricool	-59,927,700 €
MRS Capital	-73,695,472 €
FLPHV	-92,985,316 €

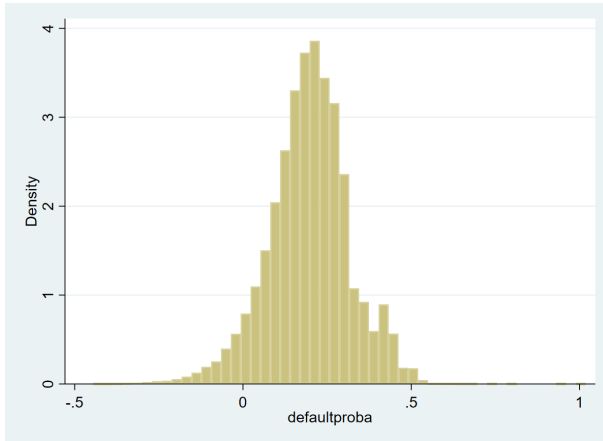
## Stage 2

CreditAgricool	36,520,000 €
BCKL	32,268,090 €
MALT	29,531,900 €
KMAT	29,103,146 €
Team BDGT	22,128,158 €
PYCE Loans	21,888,401 €
BKR	21,842,040 €
Pineapple	16,584,032 €
Lehman Bruder	14,804,013 €
ARCA	12,075,500 €
H2CA Lending	10,838,687 €
No-Beta-Tech	9,790,200 €
Gekko's Loan	9,776,027 €
WeLend	6,250,023 €
MRS Capital	5,568,466 €
Statlending Inkc	2,407,180 €
VN2R	1,356,601 €
The Loan Wolves	-692,437 €
FLPHV	-23,213,902 €
Paylater	-45,753,277 €

# A scoring model

OLS regression	
Dependent variable: 1(default)	
log(income+1)	-.11*** (.0016)
1(income=0)	.25*** (.015)
male	.0038 (.0027)
student	-.078*** (.0049)
retired	-.092*** (.0042)
unemployed	-.00013 (.0045)
marital	-.018*** (.0028)
social1	-.2*** (.0053)
1(social1=0)	-.094*** (.004)
R2	.09
N	100,000

## A scoring model



- Winner's curse  $\Rightarrow$  Should price higher than predicted default proba
- How much higher?

# Lending Game

- Stage 1 average interest rate: 19%  $\Rightarrow$  Too low  $\Rightarrow$  Widespread losses
- Stage 2 average interest rate: 30%  $\Rightarrow$  Many lenders made profits
- Tradeoff between increasing rate to mitigate winner's curse vs. risk of losing market shares

# Lending Game

- How to calibrate the appropriate margin of safety?
- Difficult problem because optimal margin depends on competitors' behavior, which depends on your own behavior, which depends on...
- Two complementary approaches
  1. Trial and error
  2. Game theory

# Trial and error

- Stage 1: Make assumption on competitors' behavior (e.g., they use flat margin of safety of 5%)
- Try and back test different own pricing policies using the "Past Loan" data  $\Rightarrow$  Determine optimal pricing given assumed competitors' pricing policy
- Stage 2: Revise assumption on competitors' behavior based on stage 1 outcome
- Caveat: Competitors may also update strategies between stage 1 and stage 2

# Game theory

- Idea: Guess competitors' behavior, assuming that they are as strategic as you are
- As before, make assumption on competitors' behavior (e.g., they use a flat margin of 5%)

and determine optimal pricing policy (say, margin of 10%) given assumed competitors' pricing policy

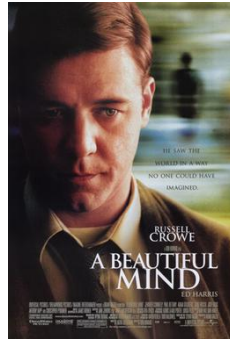
- If competitors follow the same reasoning, they also choose margin a 10%  $\Rightarrow$  Assumption of competitors 5% margin is too low
- Re-optimize assuming competitors use margin of 10%
- And so on, until the assumption about competitors' behavior is consistent with optimization



# Game theory

- The resulting strategy and corresponding market outcome is called a Nash equilibrium

**John Forbes Nash Jr.**



# Road map

Finance and growth

Financial crises

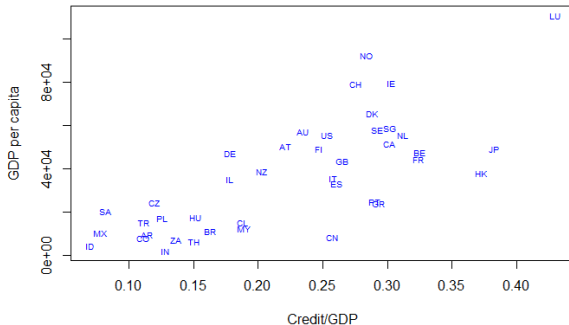
Market failures

The Ramsey rule

ESG

# Does financial development spur economic growth?

- Countries with more developed credit markets are richer



Q. Convinced that financial development makes countries wealthy?

# Correlation is not causation

Correlation between finance and growth could reflect that:

- Financial development spurs economic growth (causality)
- Economic growth spurs financial development (reverse causality)
- Other factors such as education, institutions, etc., drive both economic growth and financial development (omitted variable)

# Different types of financial development

... may have different impact on economic growth

- Market finance (US) vs. bank finance (France, Germany)
- More or less government intervention (China vs. US)
- More or less competition, more or less regulation, etc.

## Case study: French banking deregulation

“Banking Deregulation and Industry Structure: Evidence from the French Banking Reforms of 1985,” Bertrand, Schoar and Thesmar, 2007, *Journal of Finance* [\[pdf\]](#)

- Post-WW2 until 1980s: allocation of credit tightly controlled by the government
- 1985 deregulation: allocation of credit decentralized to profit-maximizing banks
- Impact on the allocation of credit?

## Case study: French banking deregulation

- Econometric analysis: each year  $t$ , run the regression in the cross-section of all French firms

$$\Delta ROA_{t \rightarrow t+2} = a + b \Delta Credit_{t-1 \rightarrow t} + \epsilon$$

- Result

	Before 1985	After 1985
$b$	-0.026	+0.052
(both statistically significant)		

- Before 1985: more credit goes to poorly performing firms
- After 1985: more credit goes to more productive firms

⇒ Better allocation of credit after deregulation

## Case study: French banking deregulation

- Underlying theory: profit-maximizing banks lend when they expect repayment, i.e., to productive firms → Efficient

So, financial deregulation is great?



## Case study: French banking deregulation

- Underlying theory: profit-maximizing banks lend when they expect repayment, i.e., to productive firms → Efficient

So, financial deregulation is great?

- But market forces might also fail: market failures, financial crises

# Financial deregulation, 1980–2008

- Worldwide phenomenon, multi-faceted but common patterns
  - ▶ Less government intervention
  - ▶ More competition
  - ▶ Larger banks through geographical consolidation
  - ▶ Consolidation of commercial banking (deposit-taking, lending) and investment banking (advisory services, securities underwriting and trading) – US: Glass-Steagall Act enacted 1933 repealed 1999
  - ▶ Deregulation of securities markets
- Size of financial sector ↑

# Size of the financial sector

- How to measure the size of the financial sector?

input: income of finance industry (wages + profits)

output: quantity of financial instruments issued (debt, equity, deposits, etc.)

# Size of the financial sector

- US<sup>1</sup>

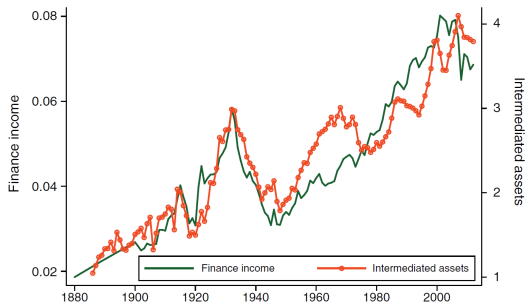


FIGURE 2. FINANCE INCOME AND INTERMEDIATED ASSETS OVER GDP

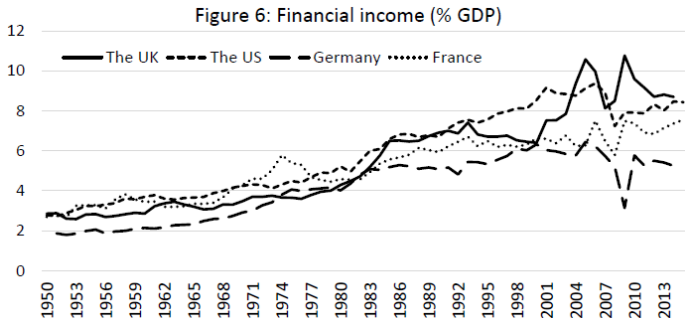
*Notes:* Both series are expressed as a share of GDP, excluding defense spending. Finance income is the domestic income of the finance and insurance industries, i.e., aggregate income minus net exports. It is available from 1880 to 2012. Intermediated assets include debt and equity issued by nonfinancial firms, household debt, and various assets providing liquidity services. Data range for intermediated assets is 1886–2012.

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<sup>1</sup>“Has the US Finance Industry Become Less Efficient? On the Theory and Measurement of Financial Intermediation,” Philippon, 2015 *American Economic Review* [[pdf](#)]

# Size of the financial sector

- Europe<sup>2</sup>



<sup>2</sup>“Financial Consumption and the Cost of Finance: Measuring Financial Efficiency in Europe (1950–2007)” Bazot, 2018, *Journal of European Economic Association* [\[pdf\]](#)

# Road map

Finance and growth

**Financial crises**

Market failures

The Ramsey rule

ESG

# Financial crises

- Stock market crises: bubble → crash
- Debt/banking crises: credit expansion → defaults → credit crunch

# Dot-com bubble

WEEKDAY TRADER

## In 1999 Tech Ruled

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By Lawrence Strauss and Carolyn Whelan   Dec. 27, 1999 11:59 pm ET

Text size  

*Editor's Note: This week, Weekday Trader reviews the market's -- and our own -- best and worst performers of 1999. Today we start with the best performing stock groups of the year; Tuesday we'll report on the worst. Wednesday we'll cover Weekday Trader's winners for 1999, and Thursday we'll review our losers.*

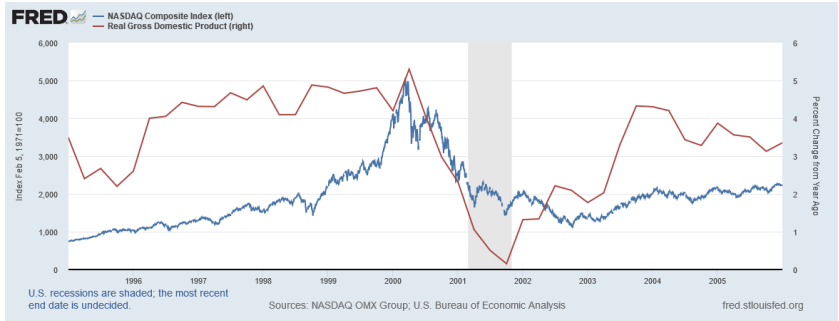
Tech, tech and more tech.

That's how 1999 shaped up on Wall Street, with technology stocks powering the markets to record highs. As of late Monday afternoon, the Nasdaq Composite index, a key benchmark for technology stocks, is up some 80% from last December 31.



# Dot-com bubble

Useful source for macro data: <https://fred.stlouisfed.org/>



**stock market:** late 1990s bubble → 2000 crash

**real economy:** GDP growth slows down for  $\approx 2$  years

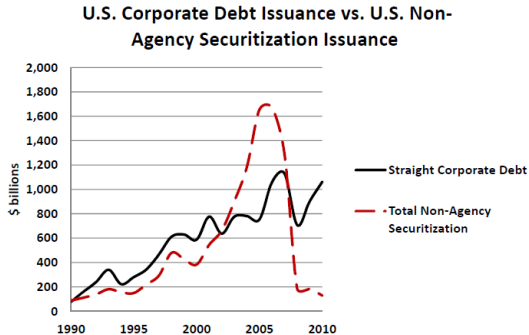
# Stock market crisis

- Stocks mostly held by individuals and equity-financed investment funds (mutual funds, pensions funds)
- Stock market crash  $\Rightarrow$  Wealth shock but no insolvency problem

$\Rightarrow$  Limited propagation to the real economy

# Financial crisis of 2008

- Phase 1: Credit expansion



(source: Gorton and Metrick, 2013)

2000–2008 strong growth in **securitized debt**

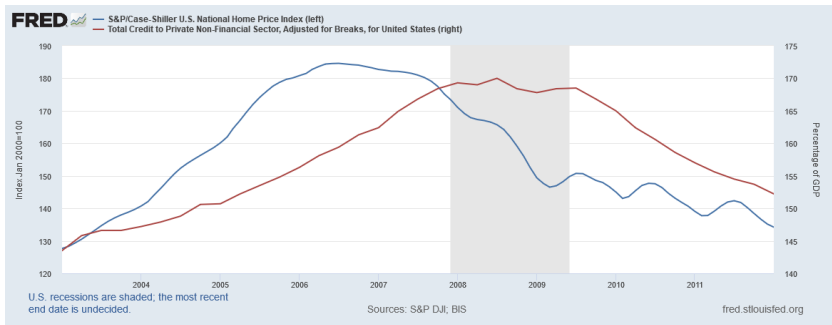
# Financial crisis of 2008

**Table 7: Major Securitized Asset Classes**

Aircraft leases	Manufactured housing loans
Auto loans (prime)	Mortgages (prime)
Auto loans (subprime)	Mortgages (alt-A)
Auto leases	Mortgages (subprime)
Commercial real estate	Mortgages (commercial)
Computer leases	RV loans
Consumer loans	Small business loans
Credit card receivables	Stranded utility costs
Equipment leases	Student loans
Equipment loans	Trade receivables
Franchise loans	Time share loans
Future flows receivables	Tax liens
Healthcare receivables	Taxi medallion loans
Health club receivables	Viatical settlements
Home equity loans	Whole businesses
Intellectual property cash flows	
Insurance receivables	
Motorcycle loans	
Music royalties	

All sorts of loans were securitized. Most problematic: subprime mortgages

# Financial crisis of 2008



2003–06: strong **housing price** growth and **credit** growth

# Financial crisis of 2008

- Phase 2: Defaults

**Table 10: S & P Global Structured Finance 5-Year Default Rates (%)**

5 years ending	AAA	AA	A	BBB	BB	B	CCC	CC/C	Investment-grade	Spec-grade	All
2000	0.00	0.00	0.09	0.46	5.65	12.50	44.00	100.0	0.05	12.30	0.69
2001	0.00	0.00	0.30	0.58	3.37	11.64	35.29	75.00	0.10	9.66	0.74
2002	0.00	0.21	1.34	3.85	7.91	12.77	53.33	50.00	0.63	11.99	1.45
2003	0.11	0.37	1.01	9.21	10.81	14.60	44.44	38.46	1.33	13.40	2.36
2004	0.13	0.51	1.19	9.55	11.99	15.31	22.73	25.00	1.62	13.69	2.73
2005	0.12	0.60	1.68	5.79	10.05	28.92	48.94	30.00	1.28	19.27	3.17
2006	0.00	0.72	1.67	5.14	8.53	25.00	53.93	22.73	1.33	16.99	3.19
2007	0.00	0.51	1.13	4.14	5.83	10.69	52.91	55.74	1.17	11.68	2.63
2008	0.01	0.07	0.42	4.26	3.95	10.10	40.00	48.86	1.13	9.13	2.33
2009	0.22	0.64	2.14	7.93	9.98	22.18	40.26	57.55	2.67	16.96	4.83
2010	1.53	5.91	12.14	22.33	33.73	50.89	50.68	52.17	10.34	40.56	14.96

Default on securitized debt ↑ over 2006–2010

# Financial crisis of 2008

- Defaults propagate in the financial sector
  - High leverage
  - Network of liabilities between financial institutions

## Lehman Files for Bankruptcy, Merrill Sold, AIG Seeks Cash

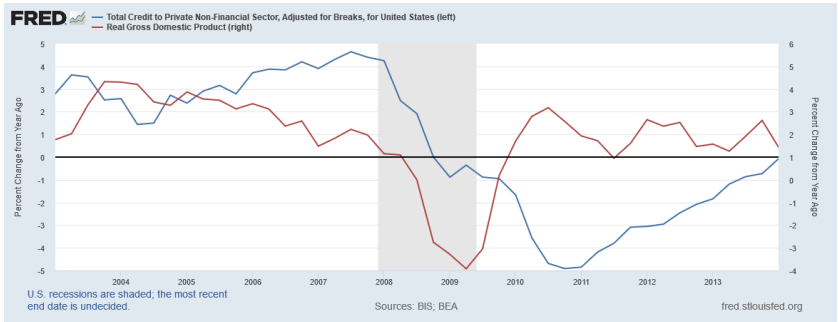
*By Carrick Mollenkamp, Susanne Craig, Serena Ng and Aaron Lucchetti*

Sept. 16, 2008 6:52 pm ET

NEW YORK -- The American financial system was shaken to its core on Sunday. [Lehman Brothers Holdings](#) Inc. filed for bankruptcy protection, and [Merrill Lynch](#) & Co. agreed to be sold to [Bank of America](#) Corp. [BAC -1.41%](#) ▼

# Financial crisis of 2008

- Phase 3: Credit crunch and economic recession



2008–09: distressed banks cut lending  $\Rightarrow$  credit to non-financial sector  $\downarrow$   
and GDP  $\downarrow$



# Banking crises

- Excessive credit growth
  - ⇒ Defaults, which propagate in the financial sector
  - ⇒ Distressed banks stop lending to the real economy
  - ⇒ Economic crisis

# Future crises?

- What to expect if
- ... cryptos crash
- ... Italy defaults
- ... Chinese housing market collapses

# Financial distress

- Banks in financial distress cannot lend to companies (credit crunch)
- What if companies are in financial distress?

## Classroom game: Delicious Ltd

- Delicious Ltd was a fast-growing restaurant chain whose growth was suddenly stopped by Covid. It consumed all its cash and accumulated debt. Its balance sheet is now:
  - Assets: 100
  - Senior debt (due next year): 120
  - Equity: -20
- Covid is over. Delicious considers opening new restaurants. The CF of this project is:
  - Cost (today): 30
  - Revenues (next year): 45
  - Discount rate: 0%
- Asset value and revenues are all realized next year
  - Next year CF: 100 if project is not funded; 145 if funded

# Round 1

- Team up by groups of 2 students
- First student (by alphabetical order of first name): **CEO of Delicious**
  - You try to raise money from the **Investor** to finance the project. Your goal is to maximize the equity value of the company
- Second student: **Investor**
  - You have 30 to invest. You can finance Delicious' project or invest in government bonds with return 0%. Your goal is to maximize your profit
- **CEO** and **Investor** negotiate: any financing arrangement is possible but the senior creditor (who is not part of the negotiation) must be repaid first no matter what
  - If project is not funded:  $CF = 100$ ; senior creditor gets 100; Delicious' shareholders get 0
  - If project is funded:  $CF = 145$ ; senior debt 120 must be repaid first
- **Do you have questions?**

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- **Negotiation is open!**

## Round 2

- The **Senior creditor** joins the negotiation
- First student (by alphabetical order of first name): **Investor**
  - Same objective as before
- Second student: **Senior creditor**
  - You cannot provide any new funding. You may agree to renegotiate your senior debt claim. Your goal is to maximize your cash flow
- Third student: **CEO**
  - Same objective as before
- The three players negotiate
- **Do you have questions?**

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- **Negotiation is open!**



# Debt overhang

- This should remind you of **debt overhang** in Corporate Finance
- Round 1: positive NPV project cannot be financed because benefits accrue to senior creditor
- Round 2: overcoming debt overhang requires to renegotiate (restructure) the debt

# Road map

Finance and growth

Financial crises

**Market failures**

The Ramsey rule

ESG

# What is the social responsibility of businesses?

- From the invisible hand of the market

*“By pursuing his own interest he frequently promotes that of the society more effectually than when he really intends to promote it.”*

Adam Smith, *The Wealth of Nations*, 1776

*“The social responsibility of business is to increase its profits.”*

Milton Friedman, *The New-York Times*, 1970

- ... to welfare economics

*“Under the proper assumptions profit maximization is indeed efficient but the limits of the argument must be stressed.”*

Kenneth Arrow, *Social Responsibility and Economic Efficiency*, 1973

# First Theorem of Welfare Economics

- An economy in which all individuals pursue their own interests achieves an efficient outcome if the following conditions are satisfied:
  1. Perfect competition (no market power)
  2. Complete markets (no externality, no asymmetric info, no missing market)
  3. Rationality
- First Theorem of Welfare Economics due to Léon Walras (1870), Vilfredo Pareto (1906), Kenneth Arrow and Gérard Debreu (1951)

# First Theorem of Welfare Economics

- Proof of the theorem: transactions are carried out if and only if they are mutually beneficial
  - If A values a good €100 and B can produce it for €50, production and transaction take place → Efficient
  - If B's cost is €150, production does not take place → Efficient
- A “theorem” because a if/then statement, not because the conclusion is always true
  - If the conditions are not satisfied, market forces may not lead to an efficient outcome

# Pareto efficiency

- The Welfare Theorem states conditions for market forces to lead to **Pareto efficient** outcome, meaning (roughly speaking) that the size of the economic pie is maximized but the distribution of it across people may be unequal
- Society may have a preference for equality and redistribute income through taxes, free public services, etc.
- Corporations may choose to have social objectives

# Market failures

- Market forces do not lead to an efficient outcome if the conditions of the Welfare Theorem are not satisfied
- Market failures
  1. Market power
  2. Externality, incomplete or missing markets
  3. Irrationality

# Market power

- The Welfare Theorem does not hold if companies have market power
- Dominant companies may
  - increase prices to customers (monopoly power)
  - lower prices to suppliers and wages to employees (monopsony power)
  - prevent entry of novel firms and products (e.g., killer acquisitions)



# Market power

- Traditional market power: dominant firm in the industry
  - ▶ Current concerns about big tech
- New growing concern: several firms in the industry but all have the same owners<sup>3</sup>

<i>JPMorgan Chase</i>	<i>[%]</i>	<i>Bank of America</i>	<i>[%]</i>	<i>Citigroup</i>	<i>[%]</i>
Vanguard	6.28	Berkshire Hathaway*	6.90	BlackRock	6.43
BlackRock	6.28	Vanguard	5.94	Vanguard	5.96
State Street	4.12	BlackRock	5.94	State Street	4.04
Capital Research	3.68	State Street	4.01	Fidelity	3.00
Fidelity	2.10	Fidelity	2.37	Invesco	1.67

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<sup>3</sup>Azar, Schmalz, Tecu, 2018, Anticompetitive Effects of Common Ownership, *Journal of Finance* [\[pdf\]](#)

# Externality

- The Welfare Theorem does not hold if there are externalities
- Example: pollution
  - ▶ A business can produce using clean or dirty technology

	Shareholders' profit	Environmental damage
Dirty technology	15	-10
Clean technology	10	0

Q. What is socially efficient? What do profit-maximizing shareholders do?

# Externality

- The Welfare Theorem does not hold if there are externalities
- Example: pollution
  - ▶ A business can produce using clean or dirty technology

	Shareholders' profit	Environmental damage
Dirty technology	15	-10
Clean technology	10	0

Q. What is socially efficient? What do profit-maximizing shareholders do?

- ▶ Clean is socially optimal but profit-maximizing shareholders choose dirty

# Pigovian tax

- Solution: Pigovian tax (=polluter pays)
  - Set a **tax** equal to the environmental damage

	<b>Tax</b>	Shareholders' profit	Environmental damage
Dirty technology	<b>10</b>	$15 - 10 = 5$	-10
Clean technology	<b>0</b>	10	0

- Profit-maximization is now aligned with social value
- Can also be implemented with cap-and-trade (cf. lecture 4 with Daniel)
- Absent a carbon tax, corporations may choose to internalize the social cost of carbon emission

## Externality in finance

- Banks choose between safe and risky strategy

	Bank outcome	Bank profit	Cost of credit crunch for the economy
Safe strategy	OK (proba 1)	+10	0
Risky strategy	OK (proba 0.75)	+20	0
	Fails (proba 0.25)	0	-40

- ▶ Safe is socially optimal but profit-maximizing (and risk-neutral) banks choose risky
- ▶ Solution: regulation such as capital requirements (=cap on leverage) to limit bank risk taking

# Incomplete markets

The Welfare Theorem does not hold if there are market frictions, such as:

- Frictions in contracting/negotiation
  - Round 1 of the debt overhang game
- Missing markets
  - Hirshleifer effect (missing insurance market before information is revealed)
  - Under-production of information (if no reward for producing socially useful info – cf. lecture 2)
- Asymmetric information
  - Over-production of information (if used to take advantage of less informed investors – cf. lecture 2)

# Irrationality

- The Welfare Theorem does not hold if people are less-than-rational
- Examples
  - Over-optimistic investors  $\Rightarrow$  overpriced stock  $\Rightarrow$  excessive corporate investment
  - Over-confident investors  $\Rightarrow$  trade too much and pay excessive brokerage fees

# The Welfare Theorem in the market for corporate control

- Does the market for corporate control (M&As, PE buyouts) lead to efficiency gains?
- Or do market failures disconnect shareholder value from social welfare in this market?



# Case study: Private Equity



- How do PE firms create value for their shareholders?
  - ▶ By improving operations at target companies?
  - ▶ Or by extracting surplus from other stakeholders?

## Case study: Private Equity

- “Private Equity, Jobs, and Productivity,” Davis et al., 2014, *American Economic Review* [\[pdf\]](#)
- Data: 5000 US companies acquired by PE firms, 1980–2005

## Case study: Private Equity

- PE firms cut employment at target companies

$$\text{Employment growth}_{t \rightarrow t+2} = \frac{\text{Jobs created} - \text{Jobs destroyed}}{\text{Employment}} = -2\% \text{ on average relative to control firms}$$

- ...but only at previously public companies, whereas employment grows at previously independent companies

Dependent variable:	Type of private equity buyout	
	Public to private	Independent to private
Employment growth rate from buyout year $t$ to $t + 2$	-10.36 (0.38)	10.51 (0.24)
Excess reallocation rate from buyout year $t$ to $t + 2$	5.08 (0.21)	4.69 (0.10)

- Job reallocation goes up (reorganization is taking place)

$$\text{Job reallocation}_{t \rightarrow t+2} = \frac{\text{Job created} + \text{Job destroyed}}{\text{Employment}} = +5\%$$

## Case study: Private Equity

- PE firms cut wages

Earnings Per Worker (EPW) decreases 2.4% on average

Dependent variable: Change in establishment log real EPW from buyout year $t$ to $t + 2$		
	Targets	Controls
Continuers	-0.024 (0.002)	Omitted group

## Case study: Private Equity

- PE firms close targets' poorly performing plants and create new plants in profitable business segments

Location in own-industry TFP distribution as of the buyout year $t$	Probability of plant exit by year $t + 2$	
	Targets	Controls
Bottom tercile	0.143 (0.023)	0.091 (0.002)
Middle tercile	0.112 (0.034)	0.062 (0.002)
Top tercile	0.078 (0.015)	0.067 (0.002)

*Panel B. Plant entry probabilities in the first two years post buyout (logistic specification)*

Location in own-industry TFP distribution in $t + 2$ , two years after buyout	Probability that a plant operating in $t + 2$ entered in $t + 1$ or $t + 2$	
	Targets	Controls
Bottom tercile	0.056 (0.015)	0.121 (0.006)
Middle tercile	0.071 (0.016)	0.078 (0.003)
Top tercile	0.127 (0.029)	0.072 (0.003)

# Case study: Private Equity

- In summary, PE firms create shareholder value by
  - Reorganizing target companies, cutting employment at large public targets, and growing small independent targets, closing unproductive units, expanding productive units → Efficient?
  - Cutting wages → Extract surplus from employees/zero sum game?
- More academic research on the impact of PE
  - In the hotel industry [\[pdf\]](#)
  - In the healthcare industry [\[pdf\]](#)
  - In higher education [\[pdf\]](#)

# Road map

Finance and growth

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## How to value very long term investments?

- Consider a green project that costs €1 trillion today to reduce CO<sub>2</sub> emission and save environmental costs €20 trillion in 100 years.

Worth it or not?



# How to value very long term investments?

- Consider a green project that costs €1 trillion today to reduce CO<sub>2</sub> emission and save environmental costs €20 trillion in 100 years.

Worth it or not?

- Same question to save costs in 10 years is much easier  $\Rightarrow$  Discount at the 10-year interest rate (+ risk premium if payoff is uncertain)
- What is the 100-year discount rate?
  - (Almost) No bonds with 100 year of maturity
  - Even if 100-year bonds were traded, they would not be priced by people who'll be living in 100 years (they're not born yet)  $\Rightarrow$  Their price would not reflect the social value of saving costs in 100 years

# A Rawlsian lottery

- Future generations will likely be wealthier than us

⇒ Transferring costs from them to us is inefficient and unfair

... unless the cost on us is significantly less than the cost on them

- How to discount costs on future vs. current generations?
- Suppose your lifetime earnings are decided by a coin toss. You can choose between two possible coin tosses

A. Head: 3000 euros/month  
Tail: 6000 euros/month

B. Head: 3100 euros/month  
Tail: 5900 euros/month

Q. Which lottery do you prefer?

# Redistribution under the veil of ignorance

- We just elicited your preferences for redistribution under a Rawlsian veil of ignorance

*“[Suppose] no one knows his place in society, his class position or social status. . . The principles of justice are chosen behind a veil of ignorance.”*

John Rawls, *A Theory of Justice*, 1971

- If B is 100% richer than A, then 1 euro for B  $\longleftrightarrow$   $1 + \gamma$  euros for A

Inequality aversion  $\gamma =$

- Let's extrapolate:

If B is  $x\%$  richer than A, then 1 euro for B  $\longleftrightarrow$   $1 + \gamma x\%$  euros for A

# Growth

- How rich will people be in 100 years?
- GDP in 2020 vs. 1920: grows 25x, i.e., at 3% per year ([source](#))
- Can we extrapolate to 2120?

# Growth

- How rich will people be in 100 years?
- GDP in 2020 vs. 1920: grows 25x, i.e., at 3% per year ([source](#))
- Can we extrapolate to 2120?
  - Economic growth not stationary (20th century was an outlier)
  - Growth calculation should include environmental damages

# The Ramsey rule

- **Ramsey rule:** A society featuring inequality aversion of  $\gamma$  and growth rate of  $g$  per year should discount long term (risk-free) investments at rate  $\gamma \times g$
- Calibration in the Stern Report (2007)

$$\gamma = 1, g = 1.3\% \Rightarrow \text{discount rate} = 1.3\%$$

$$\text{€1 billion today} \longleftrightarrow 1.013^{100} = \text{€3.6 billion in 100 years}$$

- Nordhaus (2018 Nobel Prize)

$$\gamma = 2, g = 2\% \Rightarrow \text{discount rate} = 4\%$$

$$\text{€1 billion today} \longleftrightarrow 1.04^{100} = \text{€50 billion in 100 years}$$

# The Ramsey rule

- The Ramsey rule can be adjusted for risk to account for  
uncertain investment payoff  
  
uncertain economic growth and environmental damages

**Frank P. Ramsey**



Ramsey, c. 1921

**John Rawls**



Rawls in 1971

# Road map

Finance and growth

Financial crises

Market failures

The Ramsey rule

**ESG**



# ESG

- Can/should/do companies and investors deviate from profit maximization to correct market failures?
- Socially Responsible Investment (SRI) considers both financial performance and non-financial, usually Environmental, Social, and corporate Governance (ESG) aspects

# Two rationales for ESG

1. **Market failure rationale:** adopt ESG policies even if they do not maximize profit

- ▶ Reduce carbon emission even if it increases production costs

2. **Profit rationale:** adopt ESG policies because they maximize profit

- ▶ Innovate to reduce carbon emission is costly in the short-run but profitable in the long-run when carbon emissions are highly taxed
- ▶ ESG is appealing to customers and employees
- ▶ Hedge climate risk and transition risk
- ▶ Avoid litigation risk

# Two rationales for ESG

- The two rationales are mutually exclusive: maximize profit vs. broader mandate
- What is the rationale stated by asset managers and corporations?

# Larry Fink's 2021 letter to CEOs



years and reshape asset prices of every type. **We know that climate risk is investment risk. But we also believe the climate transition presents a historic investment opportunity.**

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## Sustainable long-term growth

Our motivation for responsible investment is to achieve the highest possible return with moderate risk. Companies' activities have a considerable impact on society and the environment around them. Over time, this could affect their profitability and so the fund's return. We therefore consider both governance and sustainability issues, and publish clear expectations of companies in the portfolio.

## Business Roundtable's 2019 Statement of the Purpose of a Corporation

While each of our individual companies serves its own corporate purpose, we share a fundamental commitment to all of our stakeholders. We commit to:

- Delivering value to our customers. We will further the tradition of American companies leading the way in meeting or exceeding customer expectations.
- Investing in our employees. This starts with compensating them fairly and providing important benefits. It also includes supporting them through training and education that help develop new skills for a rapidly changing world. We foster diversity and inclusion, dignity and respect.
- Dealing fairly and ethically with our suppliers. We are dedicated to serving as good partners to the other companies, large and small, that help us meet our missions.
- Supporting the communities in which we work. We respect the people in our communities and protect the environment by embracing sustainable practices across our businesses.
- Generating long-term value for shareholders, who provide the capital that allows companies to invest, grow and innovate. We are committed to transparency and effective engagement with shareholders.

# What's in E, S, and G?

- Example: MSCI criteria

MSCI ESG Score									
Environment Pillar				Social Pillar				Governance Pillar	
Climate Change	Natural Capital	Pollution & Waste	Env. Opportunities	Human Capital	Product Liability	Stakeholder Opposition	Social Opportunities	Corporate Governance	Corporate Behavior
Carbon Emissions	Water Stress	Toxic Emissions & Waste	Clean Tech	Labor Management	Product Safety & Quality	Controversial Sourcing	Access to Communication	Board	Business Ethics
Product Carbon Footprint	Biodiversity & Land Use	Packaging Material & Waste	Green Building	Health & Safety	Chemical Safety	Community Relations	Access to Finance	Pay	Tax Transparency
Financing Environmental Impact	Raw Material Sourcing	Electronic Waste	Renewable Energy	Human Capital Development	Consumer Financial Protection		Access to Health Care	Ownership	
Climate Change Vulnerability				Supply Chain Labor Standards	Privacy & Data Security		Opportunities in Nutrition & Health	Accounting	
					Responsible Investment				
					Insuring Health & Demographic Risk				

*"Integrating MSCI ESG Ratings into investment decision making can help identify risks and opportunities that may not be captured by conventional financial analysis"* (MSCI brochure)

# What's in E, S, and G?

## Correlations between ESG Ratings

Correlations between ESG ratings at the aggregate rating level (ESG) and at the level of the environmental dimension (E), the social dimension (S), and the governance dimension (G) using the common sample. The results are similar using pairwise common samples based on the full sample. SA, RS, VI, A4, KL, and MS are short for Sustainalytics, RobecoSAM, Vigeo Eiris, Asset4, KLD, and MSCI, respectively.

	KL SA	KL VI	KL RS	KL A4	KL MS	SA VI	SA RS	SA A4	SA MS	VI RS	VI A4	VI MS	RS A4	RS MS	A4 MS	Average
ESG	0.53	0.49	0.44	0.42	0.53	0.71	0.67	0.67	0.46	0.7	0.69	0.42	0.62	0.38	0.38	0.54
E	0.59	0.55	0.54	0.54	0.37	0.68	0.66	0.64	0.37	0.73	0.66	0.35	0.7	0.29	0.23	0.53
S	0.31	0.33	0.21	0.22	0.41	0.58	0.55	0.55	0.27	0.68	0.66	0.28	0.65	0.26	0.27	0.42
G	0.02	0.01	-0.01	-0.05	0.16	0.54	0.51	0.49	0.16	0.76	0.76	0.14	0.79	0.11	0.07	0.30

Source: "Aggregate Confusion: The Divergence of ESG Ratings," Berg, Kölbel and Rigobon, 2022 [\[pdf\]](#)



## Some questions on ESG investing

- Should firms with great market power be given bad ESG ratings?
- Why don't governments tax or ban polluting activities directly instead of regulating their financing?
- How to measure the impact on an ESG fund? (Define 'impact')
- Should ESG investing be advertized as 'doing well by doing good'?

## Conclusion of the course

- Many new exciting areas & challenges in finance: digitalization and artificial intelligence, financial stability, social responsibility, etc.
- We've tried to give you tools to think about these issues
- I hope you enjoyed it and got convinced that finance is fun — and useful 😊

# Finance & Research at HEC

- M2
  - Practice oriented: 'Finance' major
  - Research oriented: 'Quantitative Economics and Finance' major
- More? Do a PhD
  - 5 years; academic careers; avg starting salary 220,000 USD; more info at <https://www.hec.edu/en/doctoral-program/research-areas/finance>

# Examples of Research Topics



**Noémie Pinardon-Touati** (placement: Columbia University, 2022)  
*Private Credit Under Political Influence*

**Huan Tang** (placement: London School of Economics, 2020)  
*The Value of Privacy in P2P Finance*



**Maxime Bonelli** (5<sup>th</sup> year PhD student)  
AI in Venture Capital

**Sylvain Catherine** (placement: Wharton,  
University of Pennsylvania, 2018)  
*Keeping Options Open: What Motivates Entrepreneurs?*

