THE ROLE OF INFORMATION IN MARKETS

BOJOS PER L'ECONOMIA

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About me

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CREI Researcher Profile

I am a Researcher at the Centre de Recerca en Economia International (CREi).

My research focuses on topics related to information asymmetries and their impact on financial markets and the real economy. I am interested in factors that lead to information and belief heterogeneity, on how these factors may impact incentives of market players to screen and monitor assets, and on the study of regulatory policies to increase liquidity and discipline in markets.

Before joining CREi, I was an Assistant Professor of Finance at the Stanford Graduate School of Business. I earned my PhD in Economics from UC Berkeley, and I have a Masters in Finance and a B.A. in Economics from Universidad Torcuato Di Tella, in Argentina, where I am from. Before my PhD, I spent two years as a Junior Professional Associate at the World Bank.

I am also a Research Affiliate at CEPR, an Affiliated Professor at the Barcelona GSE, an Associate Editor at Management Science, and a member of the Editorial Board at The Review of Economic Studies.

I am also honored to be part of the #cientificaseinnovadoras2020 group.

Research Interests

Corporate Finance, Macrofinance, Security Design, Games with Asymmetric Information, Mechanism Design.

Education

- PhD, Economics, University of California Berkeley, 2014
- MS, Finance, Universidad Torcuato Di Tella, Argentina, 2005
- BA, Economics, Universidad Torcuato Di Tella, Argentina, 2004

Awards and Honors

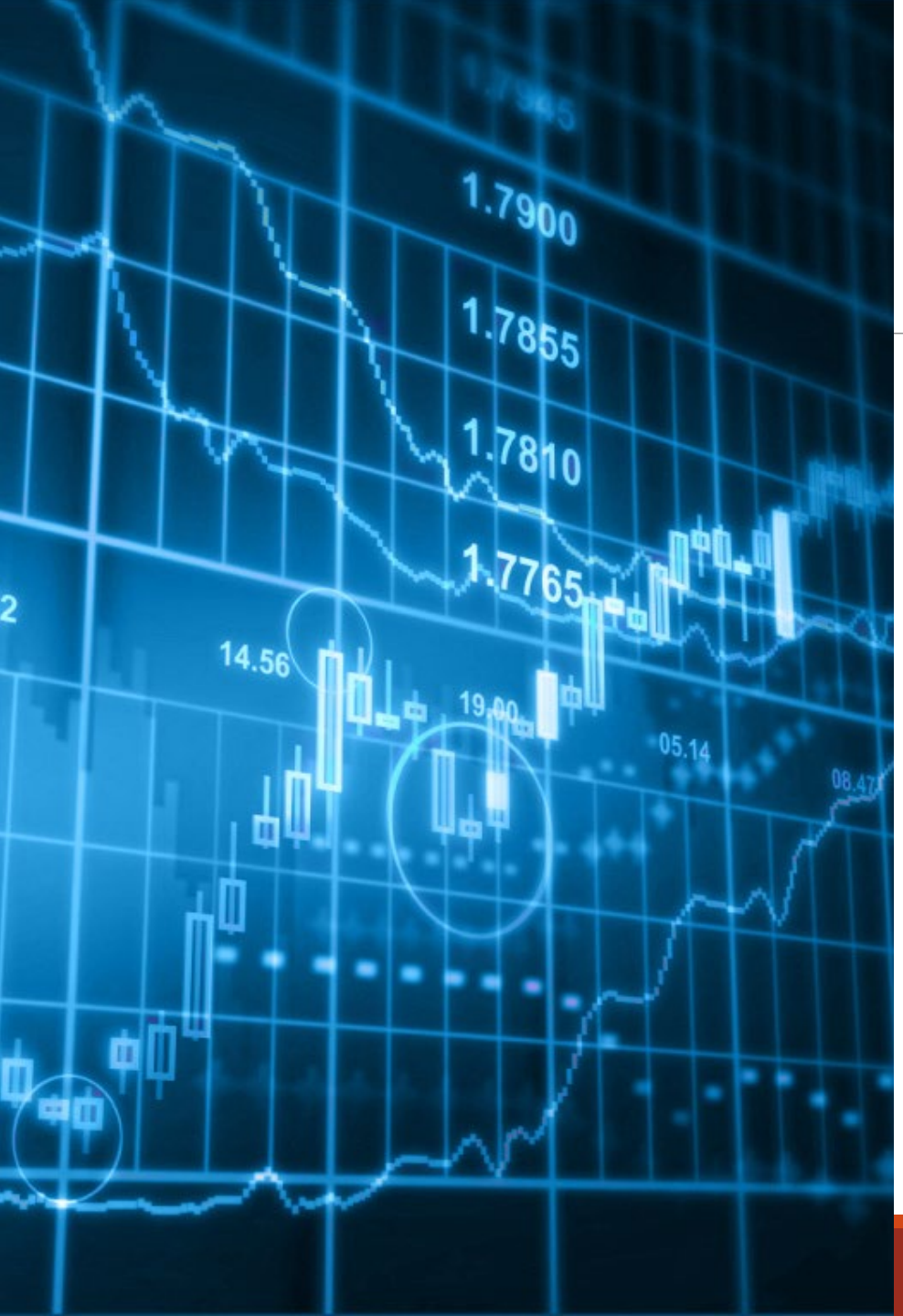
- Junior Prize in Monetary Economics and Finance, Banque de France and Toulouse School of Economics, 2018
- Award for Best Young Economist, Argentina National Academy of Economics (ANCE), 2017
- Top Finance Graduate Award, Copenhagen Business School, 2014
- Runner-up Prize Winner, Best Finance Theory Job Market Paper, Finance Theory Group, 2014
- Dean's Normative Time Fellowship, UC Berkeley, 2012
- Outstanding Graduate Student Instructor Award, UC Berkeley, 2010

Más información sobre mi research en:
https://sites.google.com/site/vicovanasco

ROADMAD


Introduction - Roadmap
Chapter 1: Financial Markets
Chapter 2: Markets with information frictions – Adverse Selection and The Market for “Lemons”
Chapter 3: Markets with information frictions – Moral Hazard
Chapter 4: What I do

INTRODUCTION



Why do we care about markets?

Markets facilitate transactions, and thus allow agents to allocate resources to those that value them the most.

Well functioning markets allow for …

1. Improved allocation of resources
2. Entrepreneurship and innovation
3. Robust economic growth
4. Risk sharing among households and firms

A simple market

- Suppose that an economy is populated by two types of people: consumers and farmers.
- Farmers harvest and satisfy their eating needs *and* have excess food that they value at $v > 0$.
- Consumers are hungry, and thus value food at θv, where $\theta > 1$.
- In this economy, we say that there are gains from trade, as the consumers value that excess food more than the farmers:

$$\theta v > v \Rightarrow Gains\ from\ trade = (\theta - 1)v$$

- Market: location where farmers can go and sell food and where consumers can go and buy it.
- Thus, for any market price p such that

$$v < p < \theta v$$

there will be trade: farmers sell all their excess food to consumers.

Our application: financial markets

Main role of financial markets:

- Provide Payment and Liquidity Services
  - Financial intermediaries (FI) facilitate transfers of money on the spot and across time!
  - How? Through payment systems and by matching those with need of funds today (borrowers) with those with extra funds (lenders).
- Risk-sharing:
  - FI allow households and firms to share risks.
  - How? Through diversification of solvency and liquidity risks across people and over time.
- Monitoring and Information Processing
  - FI gather and generate information that can be used to allocate resources efficiently.
  - How? Through screening and monitoring borrowers: information gathering/processing.

I. Financial markets facilitate payments

Financial markets facilitate the transfer of money across agents by providing payment services:

- E.g. payment apps, debit/credit cards, checks, bank transfers
- Benefits:
  - Safety: safe storage + avoidance of carrying cash
  - Lower costs: it would be very expensive for us to store our cash + to carry it around
  - Less counterfeiting

I. Financial markets provide liquidity

Financial markets facilitate the transfer of money across time!

- How? By taking deposits from those agents with *excess money today* (savers) and lending it to those with *excess money in the future* (borrowers).
- We will go through an example to understand how financial markets allow agents to transfer money over time.

I. Liquidity services: An example

- Two strangers, Jack and Jill, have the following income streams:

	Money Now	Money One Year from Now
Jack	100	240
Jill	200	120

→ Who is wealthier?

- J&J have the same preferences of consumption over time.
- The bank pays a 20% interest rate on deposits and charges 20% interest to its borrowers.
- They both want to consume 150 today, and 180 tomorrow.

I. Liquidity Services: An example

HOW DO WE COMPARE MONEY THAT COMES AT DIFFERENT POINTS IN TIME?

- Who is “richer,” i.e. can consume more? Why?
- To answer this question we compute the Present Value (PV) of J&J stream of income:

PV Jack’s Wealth: 100 + 240/1.2 = 100 + 200 = 300

PV Jill’s Wealth: 200 + 120/1.2 = 200 + 100 = 300

I. Liquidity Services: An example

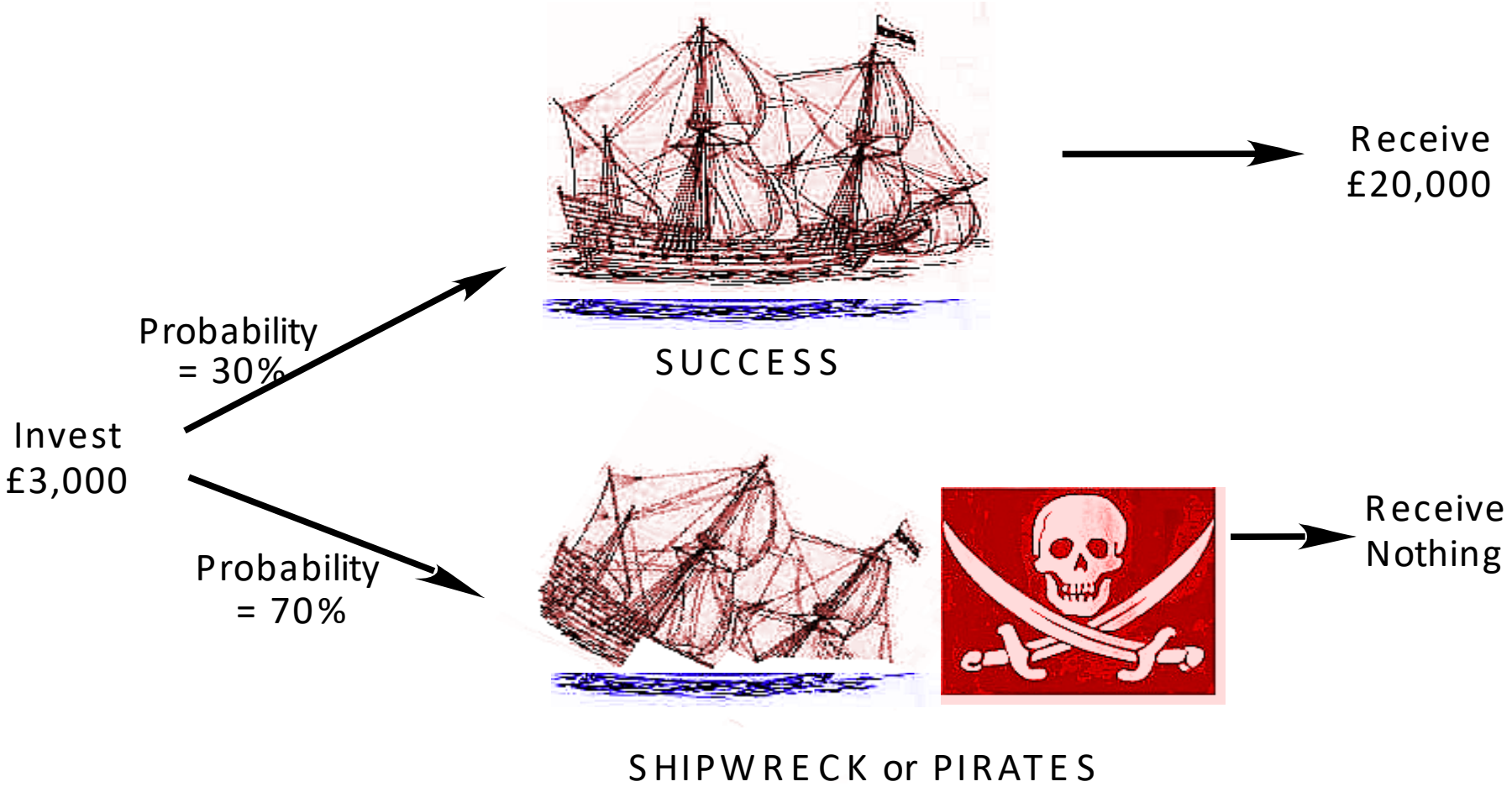
- Jack can take a $50 loan at 20%, Jill deposits $50 at 20%.
- Supply equals demand in the loan market and J&J consume their desired basket:
- Today:
  - Jack consumes 100 + 50 (loan) = 150
  - Jill consumes 200 – 50 (deposits) = 150
- Tomorrow:
  - Jack consumes 240 - 50*(1+20%) (pays loan)= 180
  - Jill consumes 120 + 50* (1+20%) (cashes deposit)= 180

II. Financial markets facilitate risk-sharing

Financial markets allow agents to share risks with other agents.

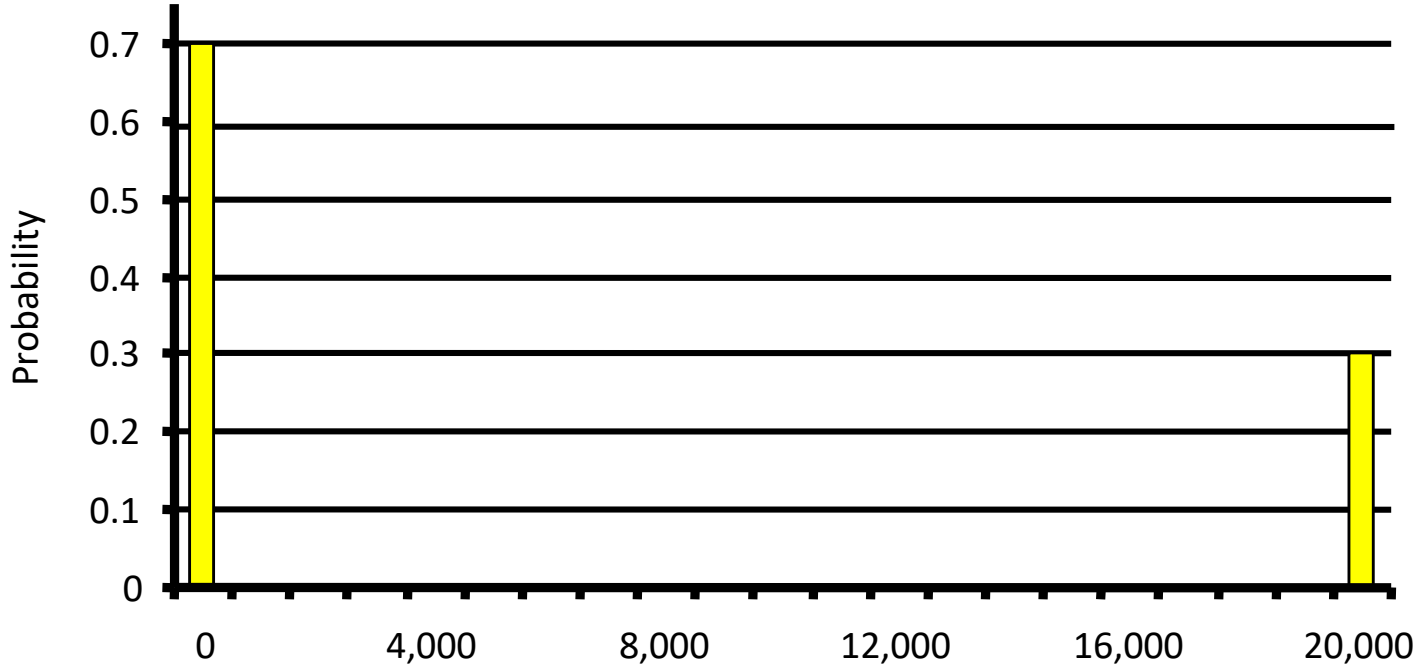
- Consider a very risky project in the 17th century: finance a ship to sail to the spice islands.
- Although the spice trade was generally a very profitable enterprise, the risk of total loss was substantial.
- And there were many sail expeditions ready to receive financing …

II. Financial markets facilitate risk-sharing



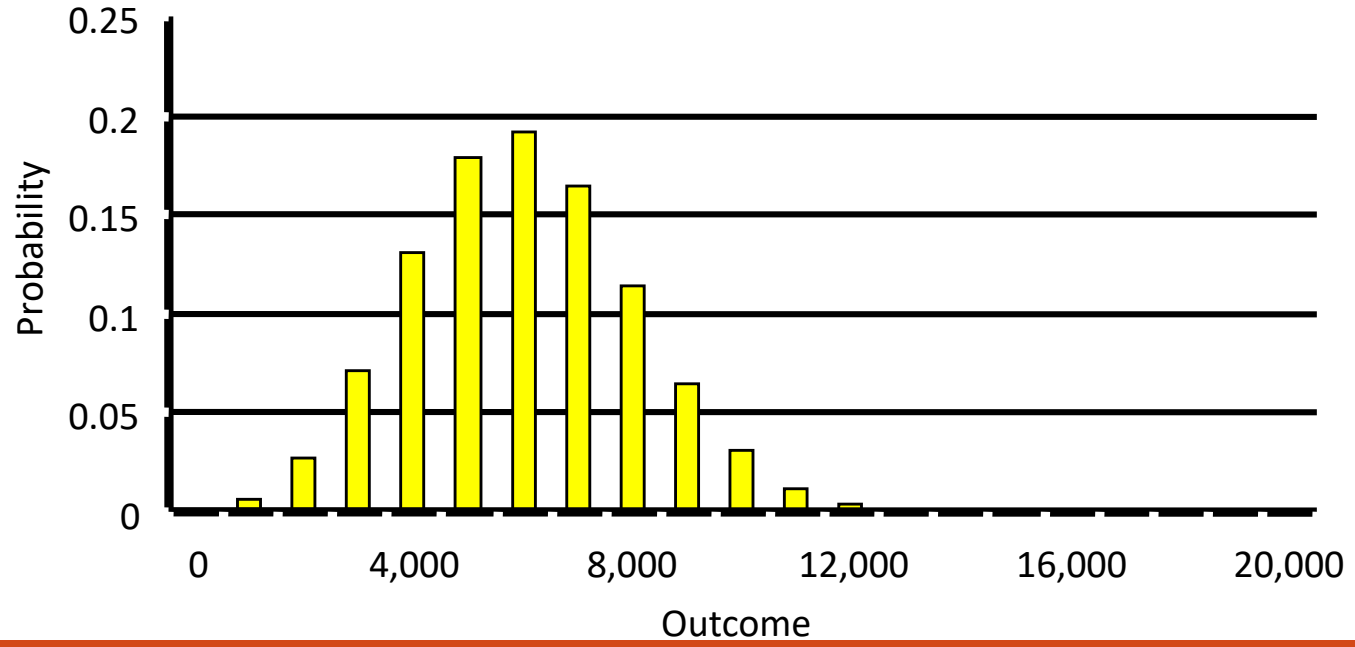
II. Financial markets facilitate risk-sharing

- If one investor with £3,000 pounds finances one expedition:
  - With 30% probability she earns £20,000, but with 70% probability she gets zero and looses everything!



II. Financial markets facilitate risk-sharing

- If instead 20 investors deposit £3,000 in the bank and the bank jointly finances 20 independent expeditions:
  - The probability of total loss falls from 70% to 3.56% and the probability of total ruin to 0.08%



III. Financial markets resolve information frictions

There are two agency frictions that are at the center of information economics:

- Adverse Selection
  - Suppose that entrepreneurs in need of funds have private information about their project quality.
  - Some entreprenerus have very profitable ideas (good entrepreurs), while others don't (bad ones).
  - Since investors cannot differentiate between good and bad entrepreneurs, they may *adversely select bad entrepeneurs* together with the good ones.
  - Some theories suggest that the role of FI is to screen borrowers: gather and generate information to separate good from bad projects (e.g. Boot and Thakor, 1997).

III. Financial markets resolve information frictions

There are two agency frictions that are at the center of the banking literature:

- Moral Hazard
  - Suppose that after receiving a loan, an entrepreneur can take actions that are not observed/controled by the investor: hide funds, shirk or take excesive risks.
  - When an entrepreneur receives a loan, she wins if the project does well, but the investor looses if the project does bad: incentives to shirk or shift-risk, as the investor faces the downside.
  - How does an investor ensure that an entrepreneur puts effort in her project and repays?
  - Some theories suggest that the role of FI is to monitor borrowers: spend resources in monitoring and thus controling the actions of the borrowers (Diamond, 1984).

III. Financial markets resolve information frictions

Thus, FI play an esencial role in

- gathering information about potential borrowers (screening),
- ensuring that entrepreneurs exert effort in their projects, do not take excesive risks, and repay their loans (monitoring).

Chapter 1: Financial Markets

Credit markets: an example

- Consider an economy populated by two type of people: households and entrepreneurs.
- Households work and have savings, while entrepreneurs have profitable investment opportunities.
- Households can always invest their savings in a risk-free technology (e.g ECB bonds), that pays a 5% annual return.

Credit markets: an example

- Each entrepreneur has a risky project. Per €1 invested:
  - ✓ 90% prob of success: the project pays €1,5.
  - ✓ 10% prob of failure: the project pays €0.

The expected payoff is a weighted average of the payoffs, with weights = probability of each payoff.

- What is the expected value of the entrepreneur's project per €1 invested?

$$E[v] = 0{,}9 \times €1{,}5 + 0{,}1 \times €0 = €1{,}35$$

- What is the expected return of the entrepreneur's project?

$$Investment \times (1 + E[R]) = E[v]$$

$$E[R] = \frac{E[v] - Investment}{Investment} = \frac{€1{,}35 - €1}{€1} = 0{,}35 = 35\%$$

Credit markets: an example

- If households invest their savings ($€S$) in the safe technology, they obtain a 5% return with certainty:

$$Payoff\ Safe\ Investment = €S \times (1 + 0{,}05)$$

- If households lend their savings to entrepreneurs and ask for an interest rate R_L, they obtain the following expected payoff:

$$Payoff\ Lending\ to\ Entrepreneurs = 0{,}9 \times €S \times (1 + R_L)$$

How do we determine R_L?

Credit markets: an example

- Suppose that households do not care about risk (are risk-neutral).
- Then, households will only lend to entrepreneurs if the payoff from doing so is at least as high as the payoff from investing in the risk-free technology:

$$Expected\ Payoff\ Lending\ to\ Entrepreneurs \geq Payoff\ Safe\ Investment$$

$$0{,}9 \times (1 + R_L) \times €S \geq (1 + 0{,}05) \times €S$$

$$0{,}9 \times (1 + R_L) \geq 1{,}05$$

$$R_L \geq \frac{1{,}05}{0{,}9} - 1 = \frac{0{,}15}{0{,}9} = 0{,}166666$$

Credit markets: an example

- On the other hand, entrepreneurs will only borrow from households if the payoff from doing so is non-negative:

$$Payoff\ Borrowing\ from\ Entrepreneurs \geq 0$$
$$0{,}9 \times (€S \times 1{,}5 - €S \times (1 + R_L)) \geq 0$$
$$€S \times 1{,}5 \geq €S \times (1 + R_L)$$
$$1{,}5 - 1 \geq R_L$$

$$50\% = 0{,}5 \geq R_L$$

- Thus, if $16{,}66\% \leq R_L \leq 0{,}5$, all households lend their funds to entrepreneurs:

Efficient resource allocation!

Credit markets

- What assumptions have we made to obtain the result that financial markets where able to allocate funds efficiently from households to entrepreneurs?

- …

Chapter 2: Information frictions – Adverse Selection and the market for “lemons”

Asymmetric information

- Let's now assume that:

  Entrepreneurs are better informed than investors about the quality of their own investment opportunities.

- This creates an adverse selection problem in the market for credit, that can derive in a market collapse!

Main Idea

- If entrepreneurs are better informed than investors about the quality of their investment opportunities, and …
  - they cannot credibly communicate this to households,
  - how do households know who to lend their money to or at which rate?

- As households may attract bad quality entrepreneurs, they may require a higher rate of return to be compensated for the risk of default.

- Good entrepreneurs may find this rate prohibitively high, and exit the market.

- Thus, households will be adversely selecting bad entrepreneurs only, and may choose to exit the market as well.

Example

- Let's continue with our example of the economy with households and entrepreneurs.
- Suppose that there are two types of entrepreneurs:
  1. 30% of entrepreneurs are **good** and obtain a return of 20% per unit invested.
  2. 70% of entrepreneurs, however, are **bad** and get nothing from their investments.
- While entrepreneurs know if they are good or bad, households cannot observe/verify the entrepreneur's quality.
- As in our previous example, households can always obtain a 5% safe return by saving their money in safe government bonds.

Example (cont.)

- Suppose that households charge an interest rate of R_L to entrepreneurs.
- The expected payoff from lending €S to an entrepreneur is:

$$\underbrace{0{,}3 \times €S(1 + R_L)}_{\text{With 30\% probability, the household lent her savings to a good entrepreneur, who never defaults.}} + \underbrace{0{,}7 \times €0}_{\text{With 70\% probability, the household lent her savings to a bad entrepreneur, who always defaults.}}$$

Example (cont.)

- As a result, the minimum interest rate that will make households willing to lend their savings to an entrepreneurs is:

$$\underbrace{0{,}3 \times €S(1 + R_L) + 0{,}7 \times €0}_{\text{Expected payoff from lending the savings to the entrepreneur}} \geq \underbrace{€S\ (1 + 0{,}05)}_{\text{Payoff from investing the savings in the risk-free technology}}$$

$$30\% \times €S(1 + R_L) \geq €S\ (1 + 0{,}05)$$

$$1 + R_L\ \geq \frac{1{,}05}{0{,}3}$$

$$R_L\ \geq 0{,}35 = 35\%$$

Example (cont.)

- If households request a return of at least 35%, would good entrepreneurs be willing to borrow?
- Entrepreneurs only obtain a 20% return from their productive investment opportunities, so repaying 35% is prohibitively high.
- Thus, entrepreneurs only invest their own funds into profitable investment opportunities.
- As households only attract bad entrepreneurs who never repay, they exit the credit market as well, and invest their savings in the safe technology.
- Loss in efficiency: the credit market collapses due to adverse selection!

The Market for “Lemons”

Akerlof (1970), Quaterly Journal of Economics

- George Akerlof won the 2001 Nobel Memorial Prize in Economics for his work on asymmetric information in markets.
- In his 1970 paper, he shows how markets can collapse (or not exist), when sellers have private information about the quality of the assets that they sell.
- His leading example was the market for used cars.
- When trying to sell a good car, sellers will be adversely affected by those who are trying to sell “lemons”: bad quality cars.
- Buyers cannot tell whether the car is for sale because it is a lemon the owner wants to get ride of, or because it is good but the seller needs funds or wants a better car, for example.
- In this situation, if gains from trade are not large enough, markets can collapse.

The Market for “Lemons”

Akerlof (1970), Quaterly Journal of Economics

- Let’s try to go over a related example in groups of 3-4 students …

IN CLASS EXERCISE.

How do financial markets address adverse selection problems?

- Financial intermediaries that screen borrowers: e.g. banks
- Credit registries (public info), financial analysts and scoring models (costly but public info), internal risk models and relationship lending (private info)
- Smart contracts:
  1. Loans with down-payments (pago inicial): skin-in-the-game
  2. Loans with collateral
  3. Loans with guarantors

✓ One of my main interests in economics is to think about what are the optimal contracts that maximize the amount of credit in an economy, without exposing it to too much risk.

Chapter 3: Information frictions – Moral Hazard

Asymmetric information

- Let's now assume that:

  Entrepreneurs can take (private) actions that affect their investment opportunity's probability of success or the lenders ability to be repaid

- We will see that this will create a moral hazard problem in the market for credit, that can also derive in a market collapse!

Main Idea

- Incentives for entrepreneurs to repay their obligations.
  - What prevents borrowers from claiming their project failed, and that they cannot repay?
  - If lenders cannot verify the project's success, how can they enforce repayment?

- Incentives for entrepreneurs to work hard in the investment project.
  - Shirking: If the profits from the investment project will be used to re-pay borrowers, what incentives do the entrepreneurs have to work hard?
  - Risk-shifting: borrowers suffer the downside, entrepreneurs can can enjoy the upside.

Moral Hazard in Credit Markets

- There are multiple identical firms that seek finance for their projects
- Each firm requires an investment of 1
- Firm returns are risky and identically and independently distributed across firms
- A firm's cash flow, y, is a priori unobservable to lenders

Risk: borrowers can lie about the project's cash flow realization,
avoid repayment, and run away with the funds

- If lenders cannot guarantee repayment, credit markets collapse: projects are not financed.
- How can lenders enforce repayment? How can we bring credit markets back?

Moral Hazard in Credit Markets

- Let's assume that by paying a monitoring cost **K** the lender can observe the realized cash flow, y, and enforce contractual repayment.
  - Of course, full repayment can only be enforced if cash flows are sufficiently high.
  - This cost could capture, for example, the costs of suing the borrower and taking her to court.

- Assumption 1: lending is profitable

$$\underbrace{E[y] - K}_{\text{Expected return from financing a firm and always monitoring}} > \underbrace{1 + r_f}_{\text{Expected return from investing in a risk-free technology}}$$

Costly State Verification and Monitoring

There is a lot of work that focuses on trying to understand how to write contracts to overcome the moral hazard problem in markets.

1. Punishing or auditing a borrower who fails to meet contractual obligations, e.g. does not pay.
   - ✓ Delegated monitoring, Diamond (1984)
   - ✓ Costly state verification, Townsend (1979)

2. Preventing opportunistic behavior of a borrower during the realization of a project, e.g. risk-shifting or exerting little effort.
   - ✓ Moral hazard, Holmstrom and Tirole (1997)

A Model of Delegated Monitoring

- The theory put forward by Diamond (1984) is that banks economize on monitoring costs
- Thus, investors are better off by delegating the monitoring activities to an intermediary.
- Investors, however, may still have to monitor the bank!
- The theory relies on some assumptions:
  1. Economies of scale in monitoring
  2. Small capacity of investors: one project requires many investors

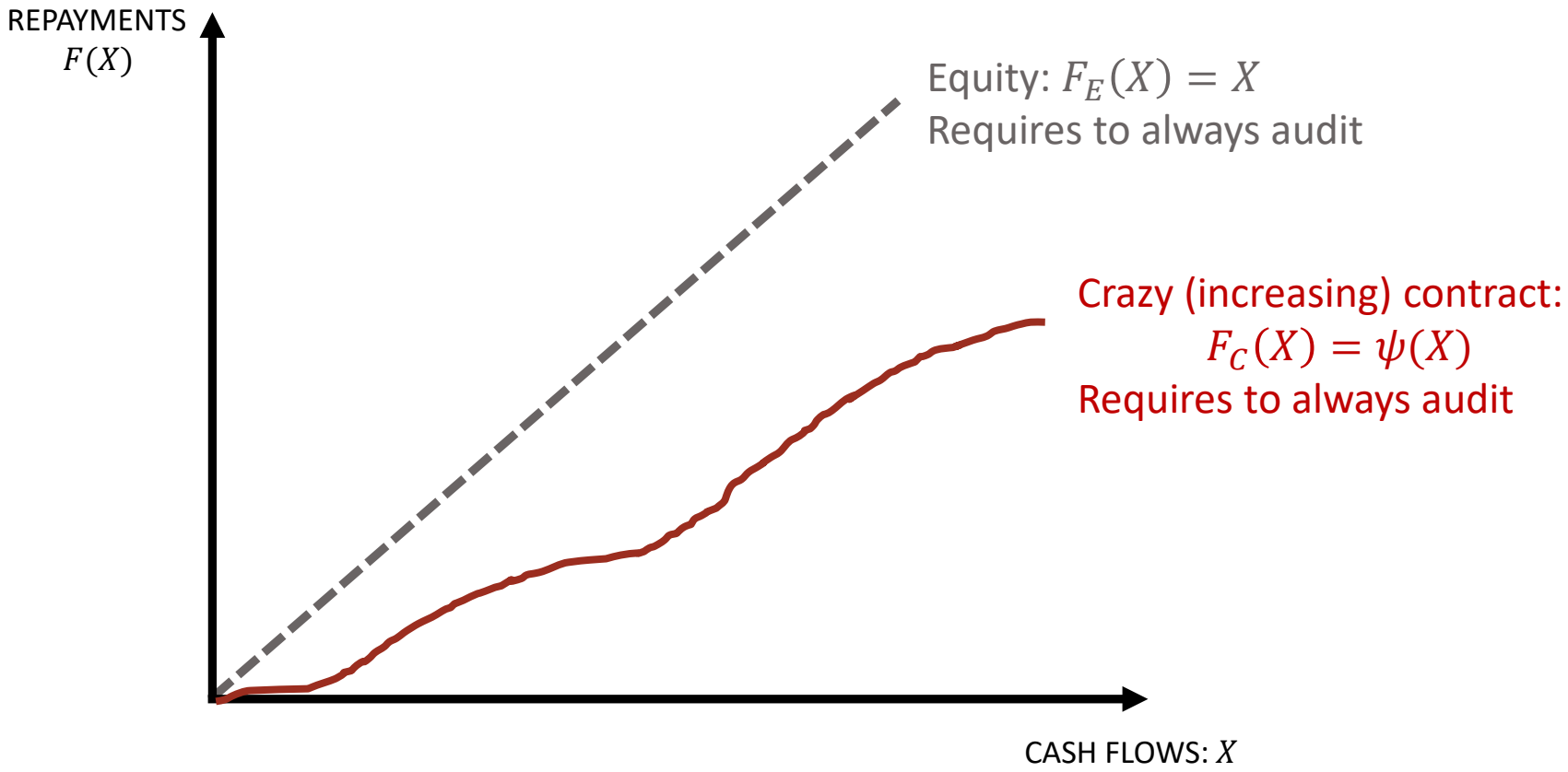
A Model of Delegated Monitoring

- The bank's incentives to repay depositors are provided by the threat of a bank closure, i.e., bankruptcy
- The bank promises to repay a fixed deposit rate, r_D, to depositors
- The bank is audited only when the bank does not repay. After an audit, the lenders take all the assets.
- Thus, in equilibrium, the bank only defaults when there are not enough cash flows

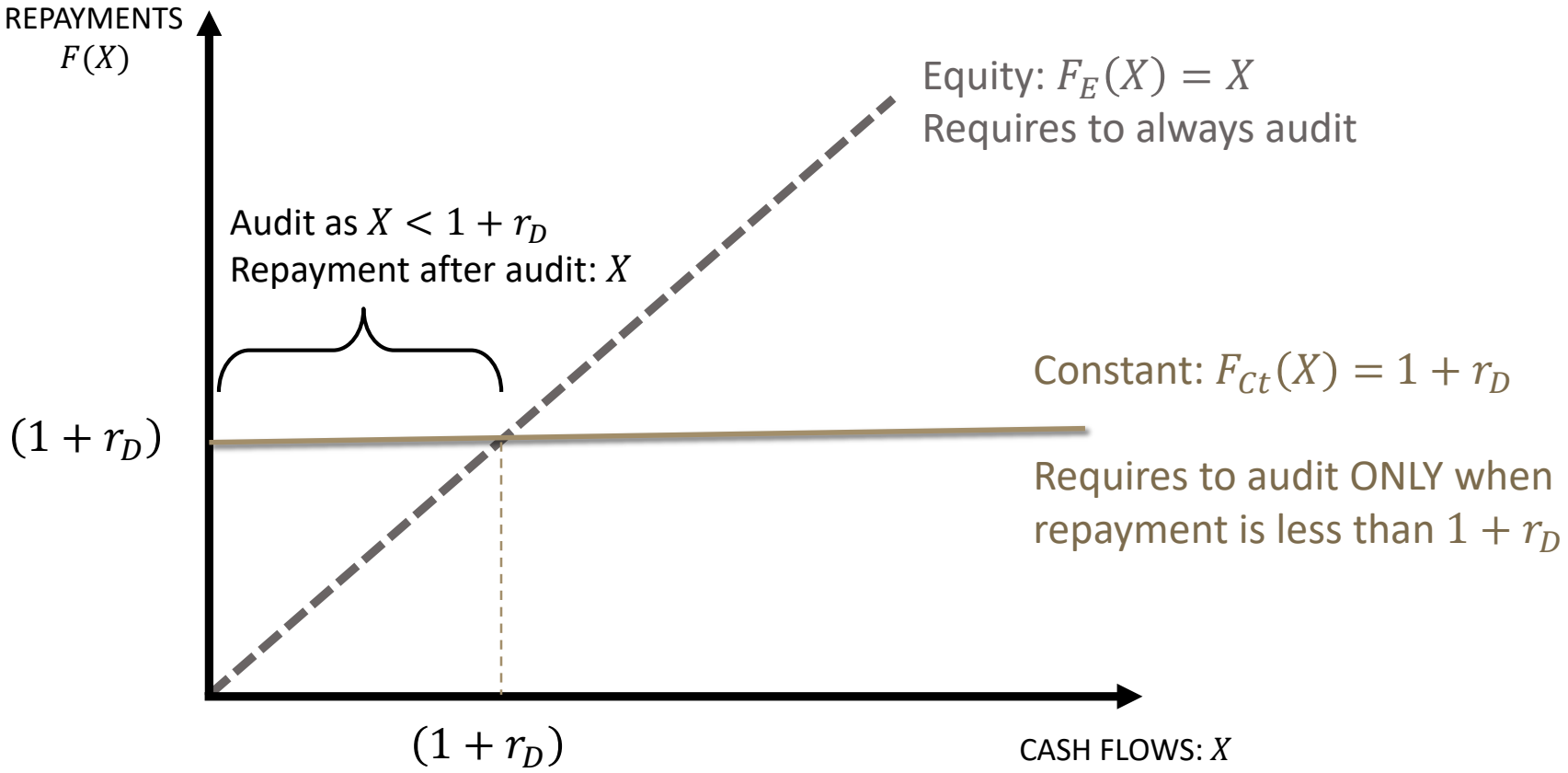
A Model of Delegated Monitoring

- Monitoring the borrower's cash flows is costly (auditing cost)
- The contract the bank offers can be designed so that depending on the repayment it is audited or not.
- Minimisation of the auditing costs leads to the Standard Debt Contract. Why?
- Diversification + Information insensitivity

A STANDARD DEBT CONTRACT



A STANDARD DEBT CONTRACT



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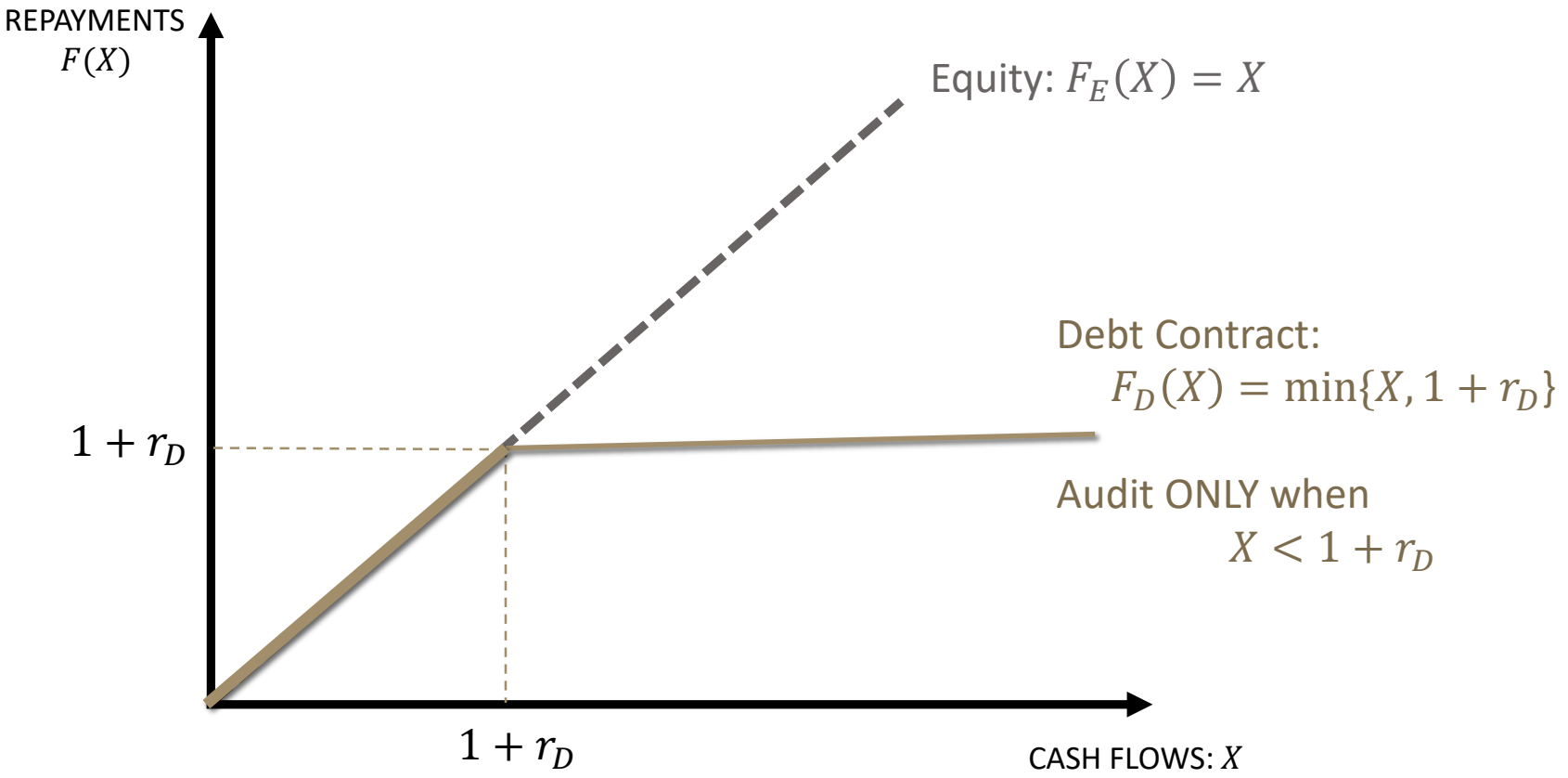
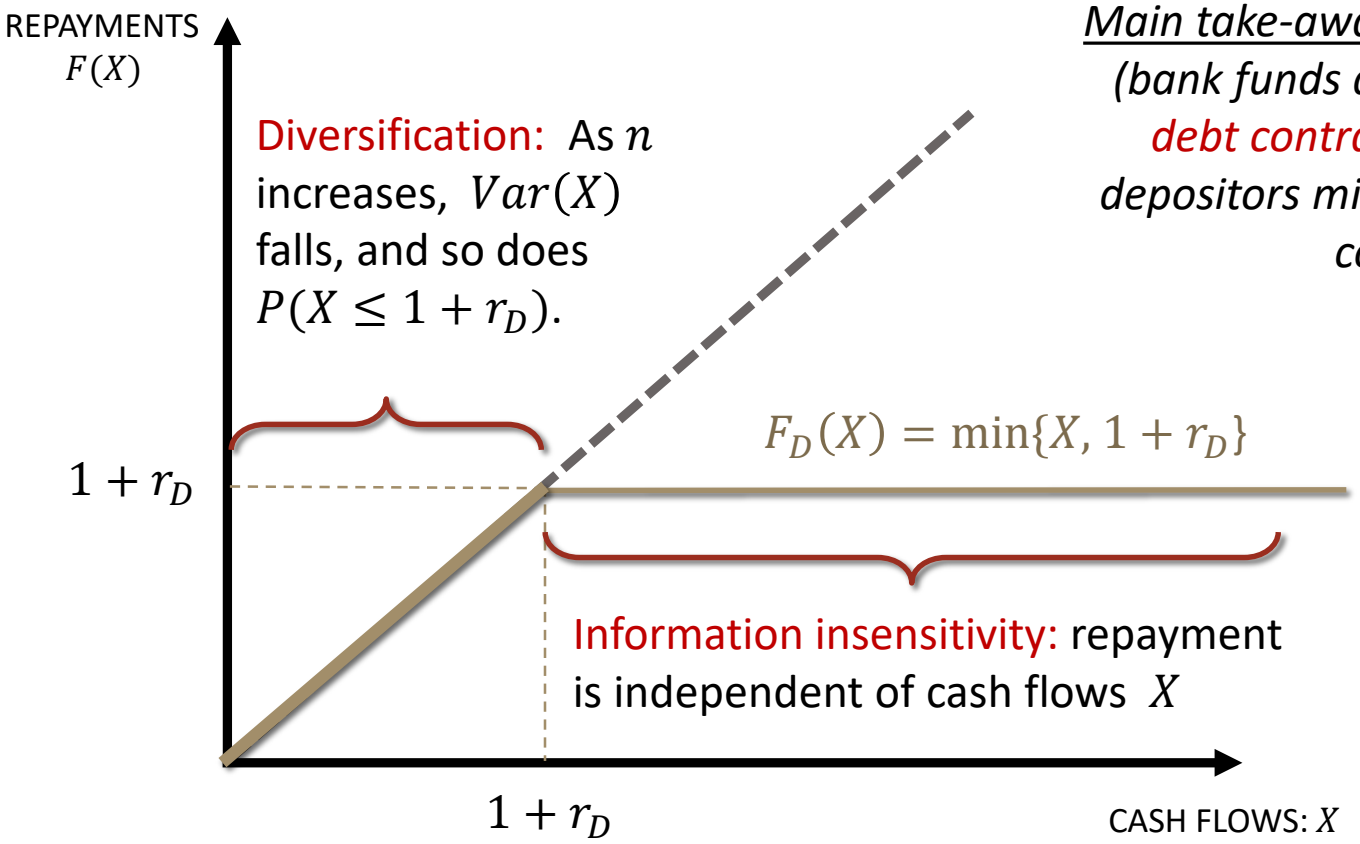


A STANDARD DEBT CONTRACT



Main take-away: diversification (bank funds all projects) and debt contract to all bank depositors minimizes auditing costs.

A Model of Delegated Monitoring

Intuition.

- When investors directly lend to firms, they all have to monitor.
- When the bank intermediates, only the bank monitors (and this is good), but now all investors have to monitor the bank!
- Solution: as the bank diversifies its portfolio, if there are enough independent projects, the probability of the bank being insolvent goes to zero, and so does the cost of monitoring the bank with debt contracts.
- Debt-alike deposit contracts + diversification are esencial for the main result.

More Moral Hazard in Credit Markets

- How do contracts ensure that entrepreneurs work hard on their projects? No shirking.
- If the project's revenues go to the lender, the entrepreneur has no incentives to work hard.

- How do financial markets provide incentives?
  - Skin-in-the-game: ask entrepreneurs to invest their own funds in the project as well.
  - Collateral: ask entrepreneurs to put some colateral that they will loose if the project fails.
  - Relationship lending: if this project fails, no more funding in the future.
  - Gain project control: through loan covenants, or by becoming a shareholder (like angel investors or private equity funds).

Chapter 4: What I do

Information in financial markets

I am a researcher in economics and finance. I spend most of my time thinking about how information affects …

- Market discipline: incentives to finance good quality investment opportunities.
- Market liquidity: how easy it is for sellers to find buyers to trade and vice-versa.
- Market dynamics: with a focus on belief formation in markets.
- Regulation.

… and writing my ideas down with mathematical models. We call this applied theory: we use mathematical models to capture ideas that apply to a particular setting.

In my case, I specialize on models with financial markets and information frictions.

My motivation

- 2001: Argentina has a severe financial crisis together with a deep recession.
- 2008: US experiences the largest financial crisis since the 1930s, which translated into a deep recession in the US and Europe.

Motivated by these and many other crisis, many economists are interested in the following questions …

- Do financial markets expose economies to excessive risk?
- If yes, how do they do so?
- Does this mean we want to eliminate financial markets? If not, should we regulate them? How?

My motivation

- To answer these questions, we need frameworks that allow us to think about what could be failing in a market.

- Once we have identified what is failing (what we call “the market friction”), then we can start thinking about the implications and the role for regulation.

- Models give us discipline to address problems and have become a language economists use to communicate ideas.

Preguntas?