The Economics of Risk: Old Principles, New Challenges

P.A. Chiappori
E. Rowan and Barbara Steinschneider Professor of Economics
Columbia University

Onorato Castellino Lecture
Collegio Carlo Alberto
November 2014

Roadmap

Roadmap

- Risk and civilization: historical perspective

Roadmap

- Risk and civilization: historical perspective
- A few principles …

Roadmap

- Risk and civilization: historical perspective

- A few principles …

  … and a few challenges

Roadmap

- Risk and civilization: historical perspective
- A few principles …

  … and a few challenges
- What next?

Roadmap

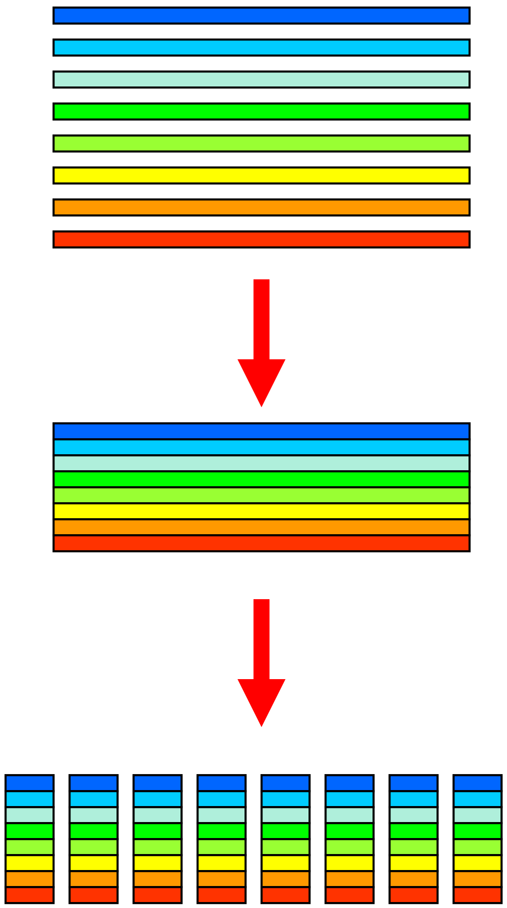
- **Risk and civilization: historical perspective**
- A few principles …

    … and a few challenges

- What next?

Assyrian caravans

Assyrian caravans

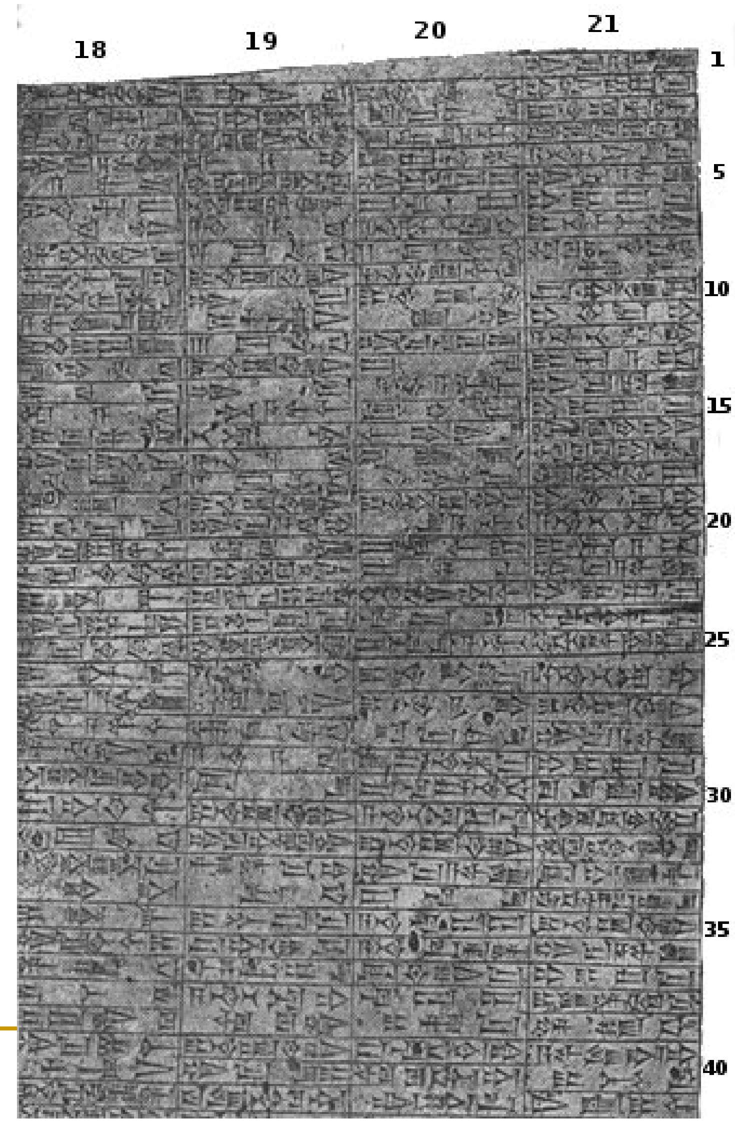


Initial situation: several, non fully correlated risks

Partnership *(ellatum*, 'caravan'*)* between several merchants

→ Each merchant bears a fraction of the total risk

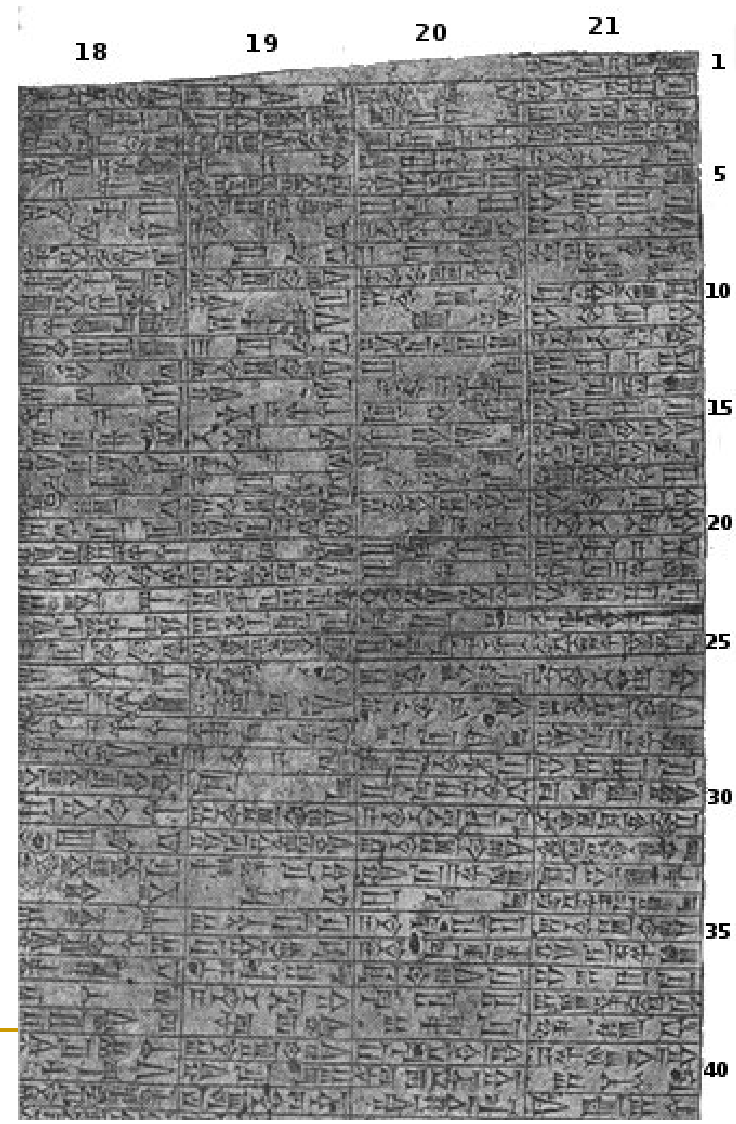
Hammurabi's code



Hammurabi's code

… 48.

If any one owe a debt for a loan, and a storm prostrates the grain, or the harvest fail, or the grain does not grow for lack of water; in that year he need not give his creditor any grain, he washes his debt-tablet in water and pays no rent for this year.

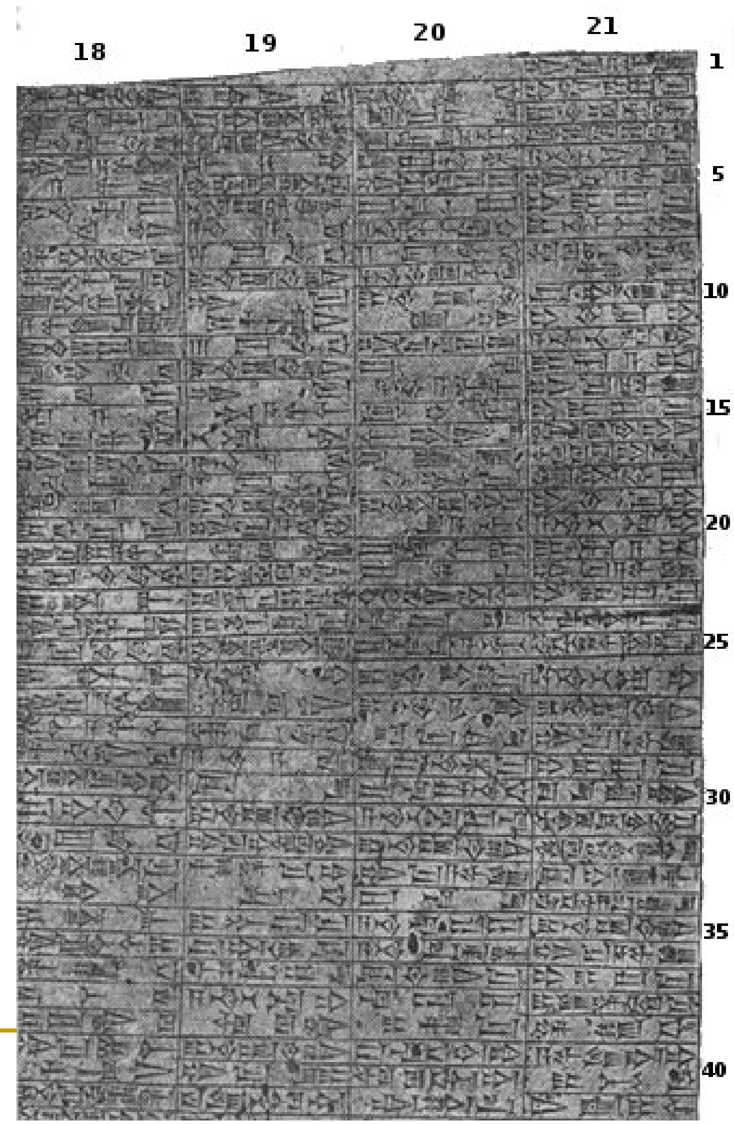


Hammurabi’s code

… 48.

If any one owe a debt for a loan, and a storm prostrates the grain, or the harvest fail, or the grain does not grow for lack of water; in that year he need not give his creditor any grain, he washes his debt-tablet in water and pays no rent for this year.

→ **First CatBonds!**



Insurance contract: Hammurabi's code

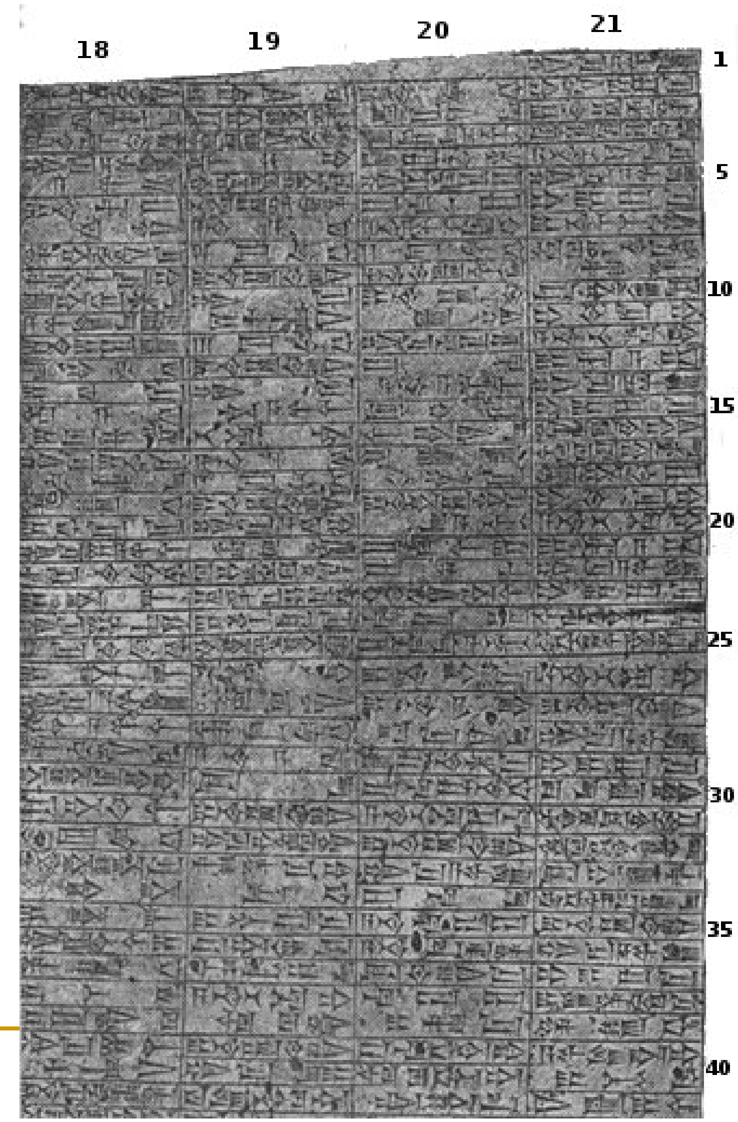
… 102

If a merchant entrust money to an agent (broker) for some investment, and the broker suffer a loss in the place to which he goes, he shall make good the capital to the merchant.

103.

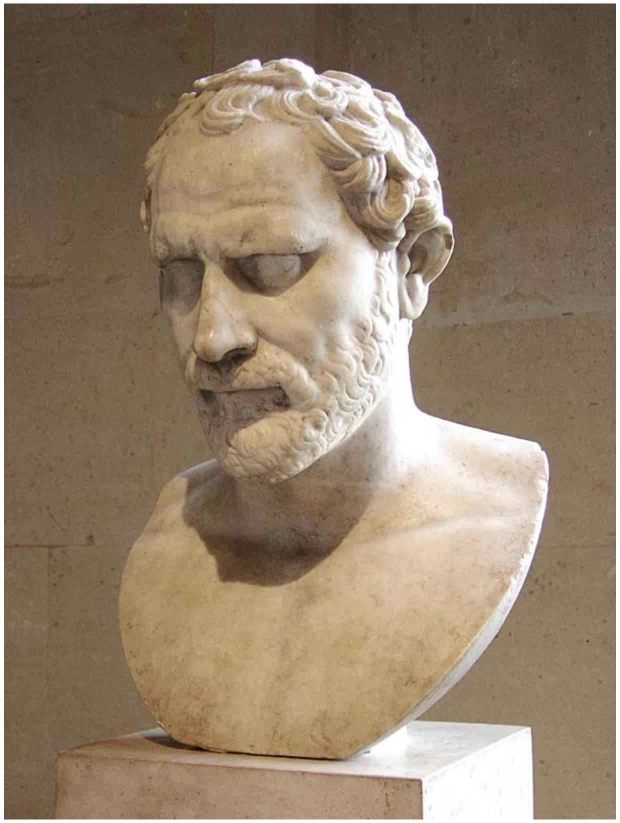
If, while on the journey, an enemy take away from him anything that he had, the broker shall swear by God and be free of obligation.

⟶ Risk sharing *and* credit

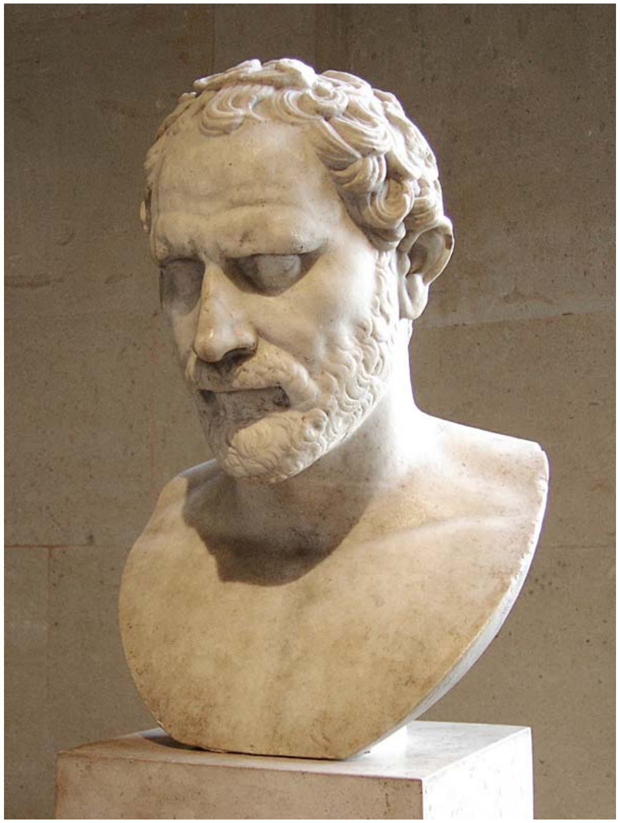


Insurance contract: Mediterranean Trade, IVth century BC

Insurance contract: Mediterranean Trade, IVth century BC



Insurance contract: Mediterranean Trade, IVth century BC



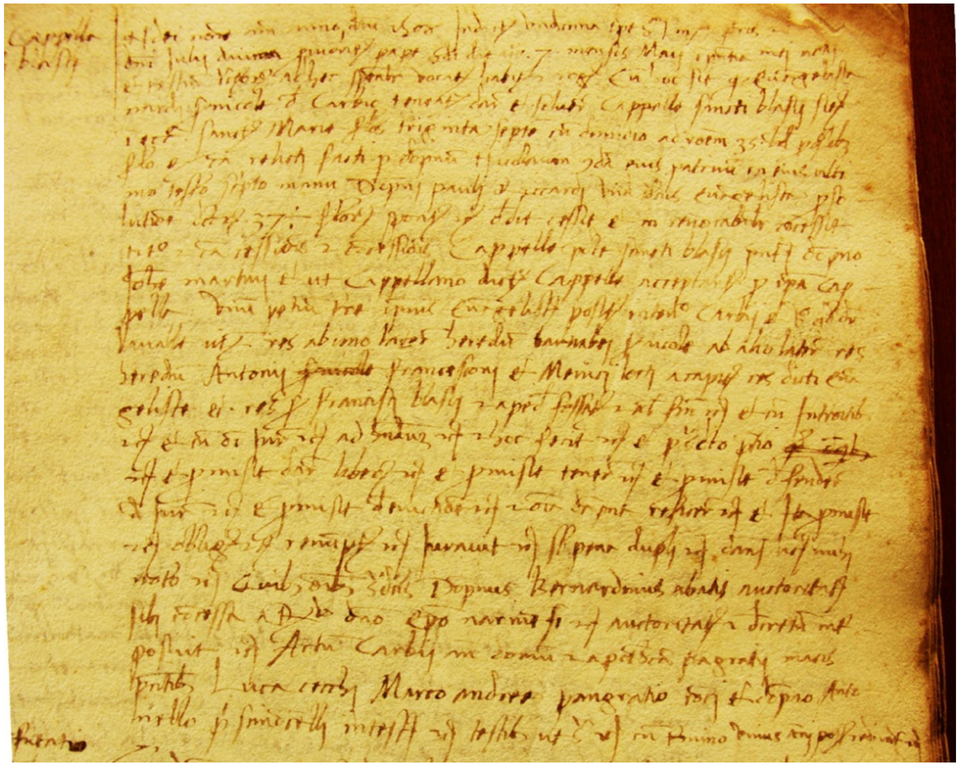
« Androclès de Sphette et Nausicrate de Caryste ont prêté à Artémon et Apollodore, de Phasélis, trois mille drachmes d'argent pour un voyage à Mendé et à Scioné, de là au Bosphore, et même, s'ils le veulent, jusqu'à Borysthène, en longeant la côte à gauche, avec retour à Athènes, (…) affecté sur trois mille amphores de vin de Mondé, qui sera chargé à Mendé ou à Scioné, dans le navire à vingt rames commandé par Hyblésios (…) Artémon et Apollodore ramèneront à Athènes, sur le même navire, toutes les marchandises qu'ils auront prises en échange au Pont. Si ces marchandises arrivent à bon port à Athènes, les emprunteurs payeront aux prêteurs la somme qu'ils leur devront, aux termes du contrat, dans les vingt jours de l'arrivée à Athènes, sans autre déduction que celle du jet, pour le cas où des marchandises auront été jetées à la mer, par décision des passagers délibérant en commun, et celle des rançons qui pourront être payées aux ennemis. (…) »

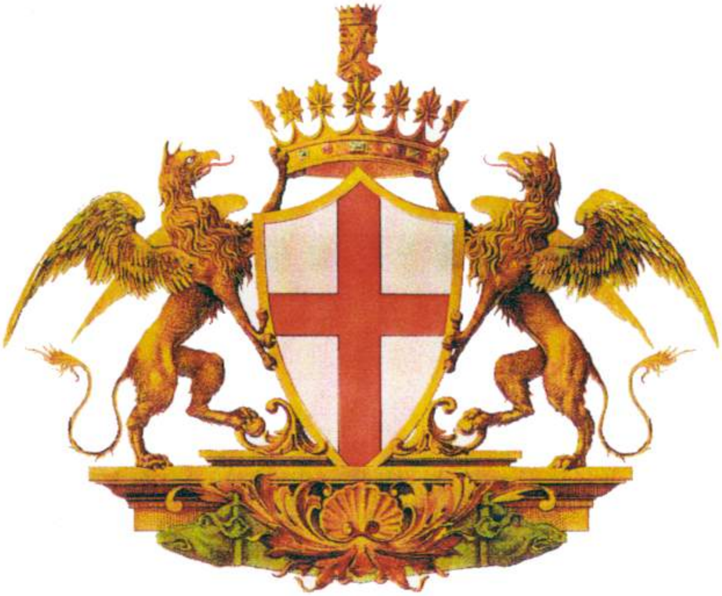
Contre Lacritus

→ Risk sharing *and* credit

First 'pure' insurance contracts

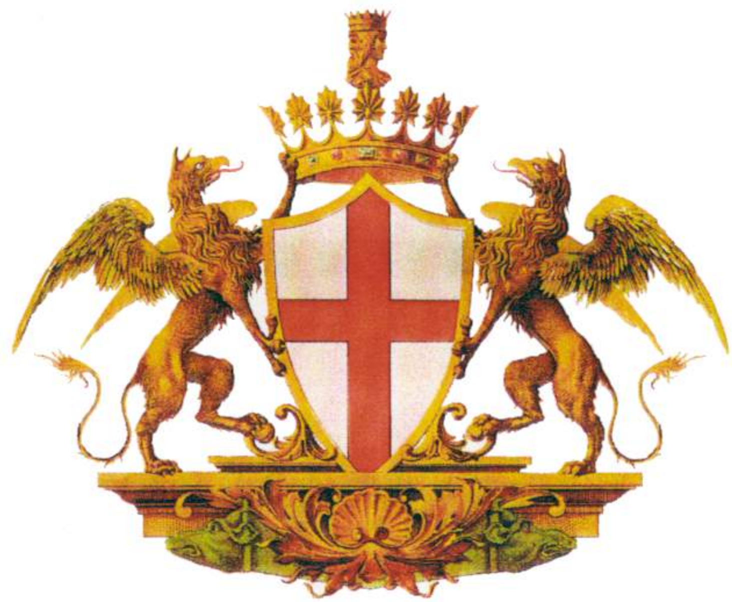
- Genova, 1347 (?)





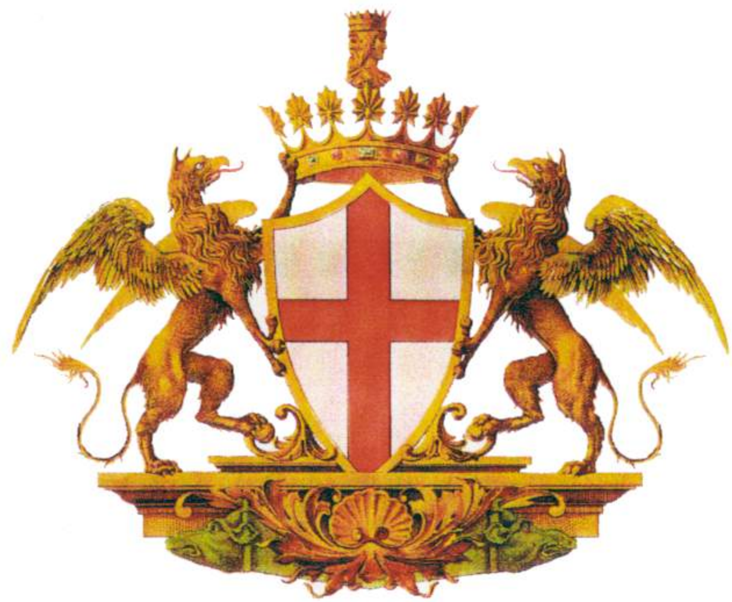
First 'pure' insurance contracts

- Genova, 1347 (?)
- First reinsurance contract: Genova, 1370



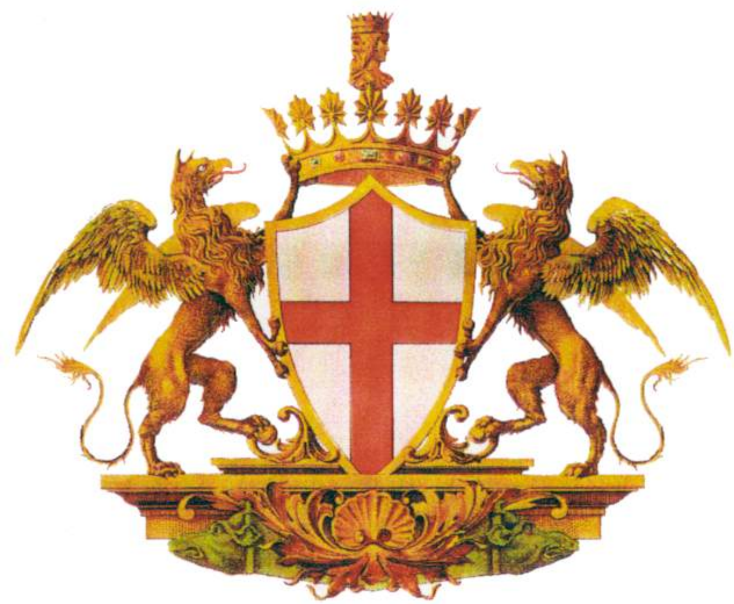
First 'pure' insurance contracts

- Genova, 1347 (?)
- First reinsurance contract: Genova, 1370
- Then commenda, compagnia, …



First ‘pure’ insurance contracts

- Genova, 1347 (?)
- First reinsurance contract: Genova, 1370
- Then commenda, compagnia, … but still ‘local’



Oldest company share

- Dutch East India Company, 1606.
- Insight: trading shares allows
  - To spread the risk to new investors
  - To acquire or get rid of the risk as needed

First insurance company

- Lloyd's 'Coffee House' (London, end XVIIth) → 'underwriter', 'names'

First insurance company

- Lloyd's 'Coffee House' (London, end XVIIth) → 'underwriter', 'names'

First insurance company

- Lloyd's 'Coffee House' (London, end XVIIth) → 'underwriter', 'names'

First insurance company

- Lloyd's 'Coffee House' (London, end XVIIth) → 'underwriter', 'names'

General principle: *spreading the risk*

Roadmap

- Risk and civilization: historical perspective

- **A few principles …**

  … and a few challenges

- What next?

Risk Management: Principles … and Obstacles

Three principles:

- Diversification: aggregating uncorrelated risks
- Division: spreading global risks
- Transfer: allocating risk to agents willing to bear it

Two types of obstacles:

- Limited commitment
- Asymmetric information: moral hazard, adverse selection

Diversification

Example: accident probability 7%

10 vehicles fleet: → 30% (or more) have an accident: every thirty fifth year

1000 vehicles fleet: → 9% (or more) have an accident: every century

100,000 vehicles fleet: → 7,2% (or more) have an accident: every century

Basic concept: *diversification* … assuming *independents risks!*

Limits to diversification:

Correlations !

Limits to diversification:

Correlations !

Limits to diversification:

Correlations !

→ next (geographical) level: *reinsurance*

Limits to diversification:

Correlations !

Development of reinsurance: great fires (New York 1835, Hambourg 1842, Chicago 1871, Boston 1872)

Division: Spreading global risks

Division: Spreading global risks

Division: Spreading global risks

'… by meanes of whiche Policies of Assurance it cometh to passe, upon the losse or perishinge of any Shippe there followethe not the undoinge of any Man, but the losse lightethe rather easilie upon many, then heavilie upon fewe…'

Elisabethan Statute (1601)

Division: Spreading global risks

'… by meanes of whiche Policies of Assurance it cometh to passe, upon the losse or perishinge of any Shippe there followethe not the undoinge of any Man, but the losse lightethe rather easilie upon many, then heavilie upon fewe…'

Elisabethan Statute (1601)

Risk Transfers

Risk Transfers

Risk Transfers

Worst catastrophe (for the insurance business) so far?

Risk Transfers

Worst catastrophe (for the insurance business) so far?

Answer: Katrina (≅50 billions)

Risk Transfers

Worst catastrophe (for the insurance business) so far?

Answer: Katrina (≅50 billions)

Total cap of NYSE?

Risk Transfers

Worst catastrophe (for the insurance business) so far?

Answer: Katrina (≅50 billions)

Total cap of NYSE?

Answer: ≅15 trillions

Risk Transfers

Therefore:

- Capacity in (potentially) infinite supply…
- … if risk can be transferred!

Roadmap

- Risk and civilization: historical perspective
- A few principles …

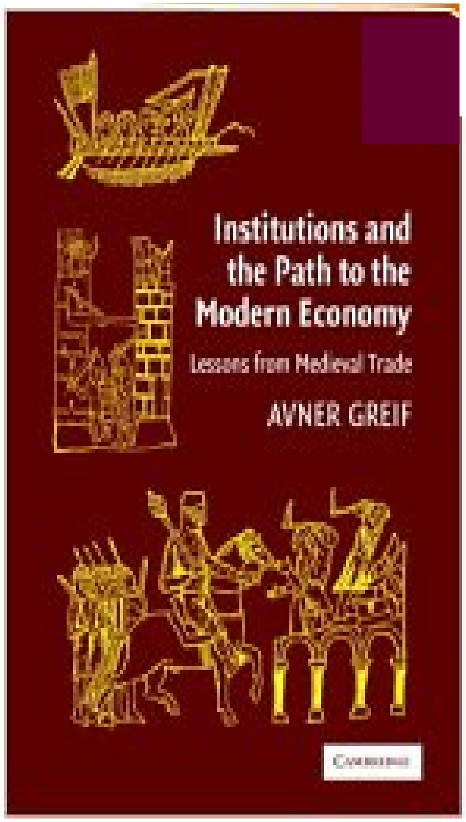
  … and a few challenges

- What next?

Obstacles to Risk management

Two types:

1. **Limits to commitment** … from individual defaults to limited liability.
   - Avner Greif: 'Maghrebis' vs. Genovese
   - Role of institutions; legal system; social norms, cultures, networks
   - Counterparty risk: monolines, CDS…



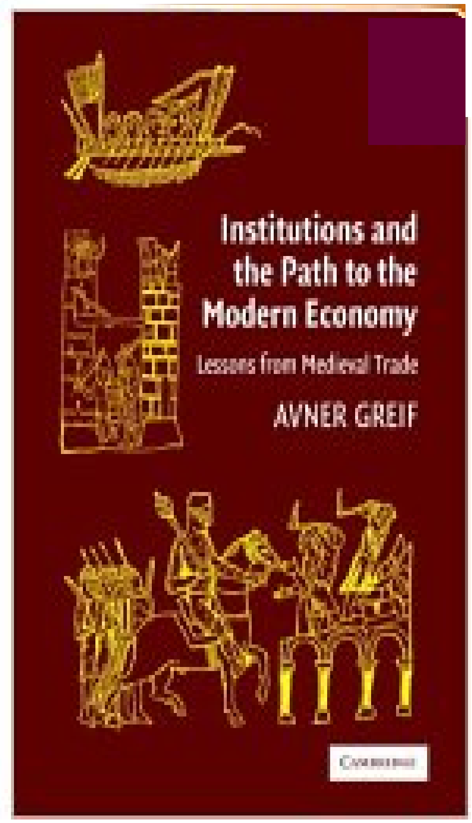
Obstacles to Risk management

Two types:

2. Asymmetric information: *incentives* ('moral hazard')…

- Iron Law of insurance: coverage reduces incentives to reduce risk
- Example: subprime mortgages
- General problem: ***debt contract as incentives to risk taking***

… and *(adverse) selection* (e.g.: the Affordable Care Act)



Roadmap

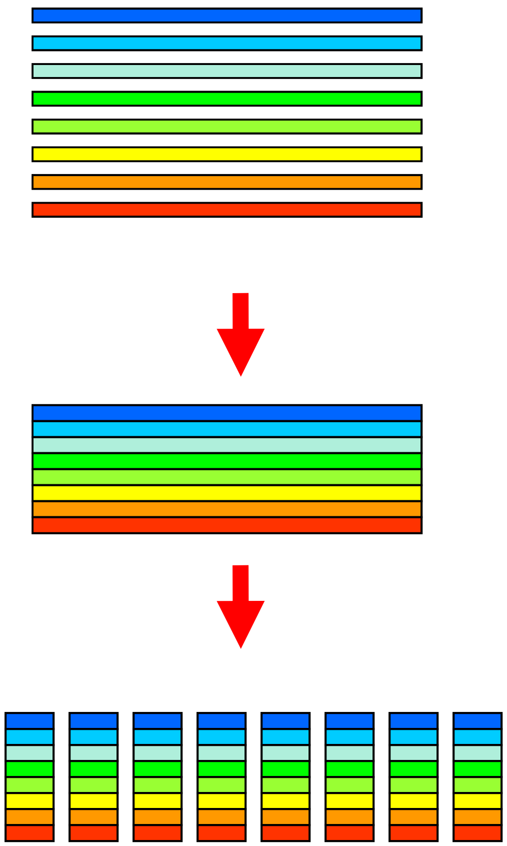
- Risk and civilization: historical perspective

- A few principles …

  … and a few challenges

- **What next?**

From Assyrian caravans ...

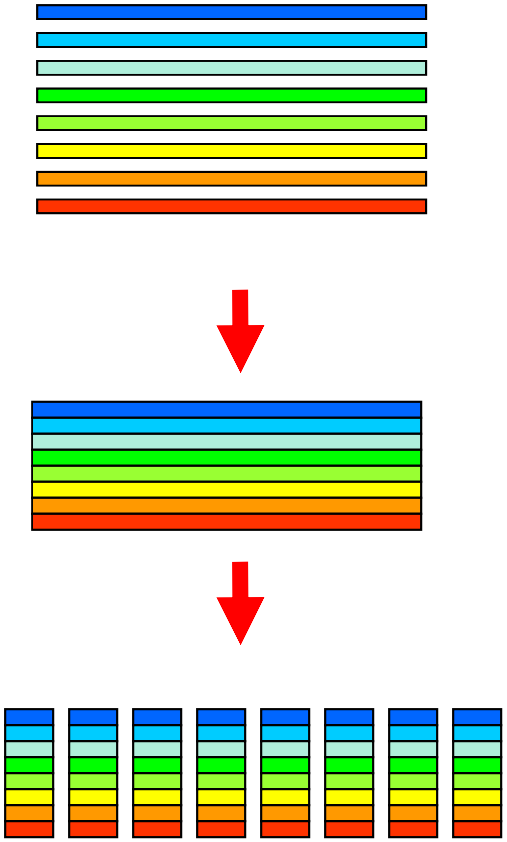


Initial situation: several, non fully correlated risks

Aggregation

Division

… to securitization

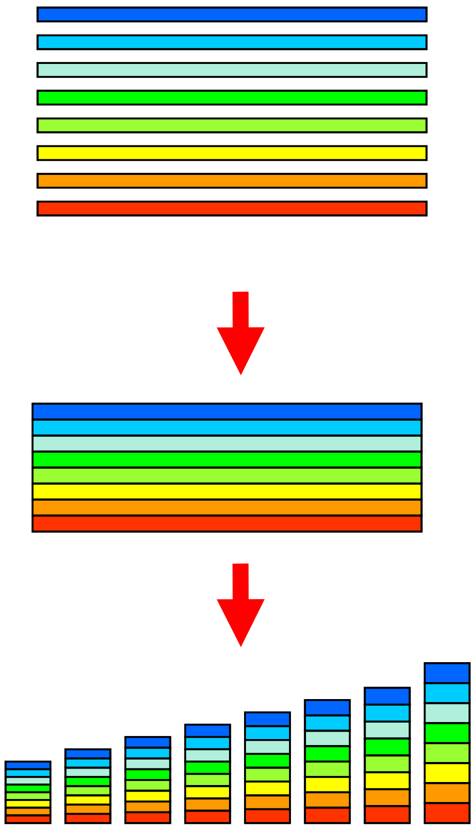


Individual Mortgages
(including ‘subprime’), ..

…bunched and sold to an
entity (SPV)…

… funded by issuing bonds
(‘*mortgage-backed securities*’) …

… to securitization



Equity **AAA**

('toxic waste')

Individual Mortgages
(including 'subprime'), ..

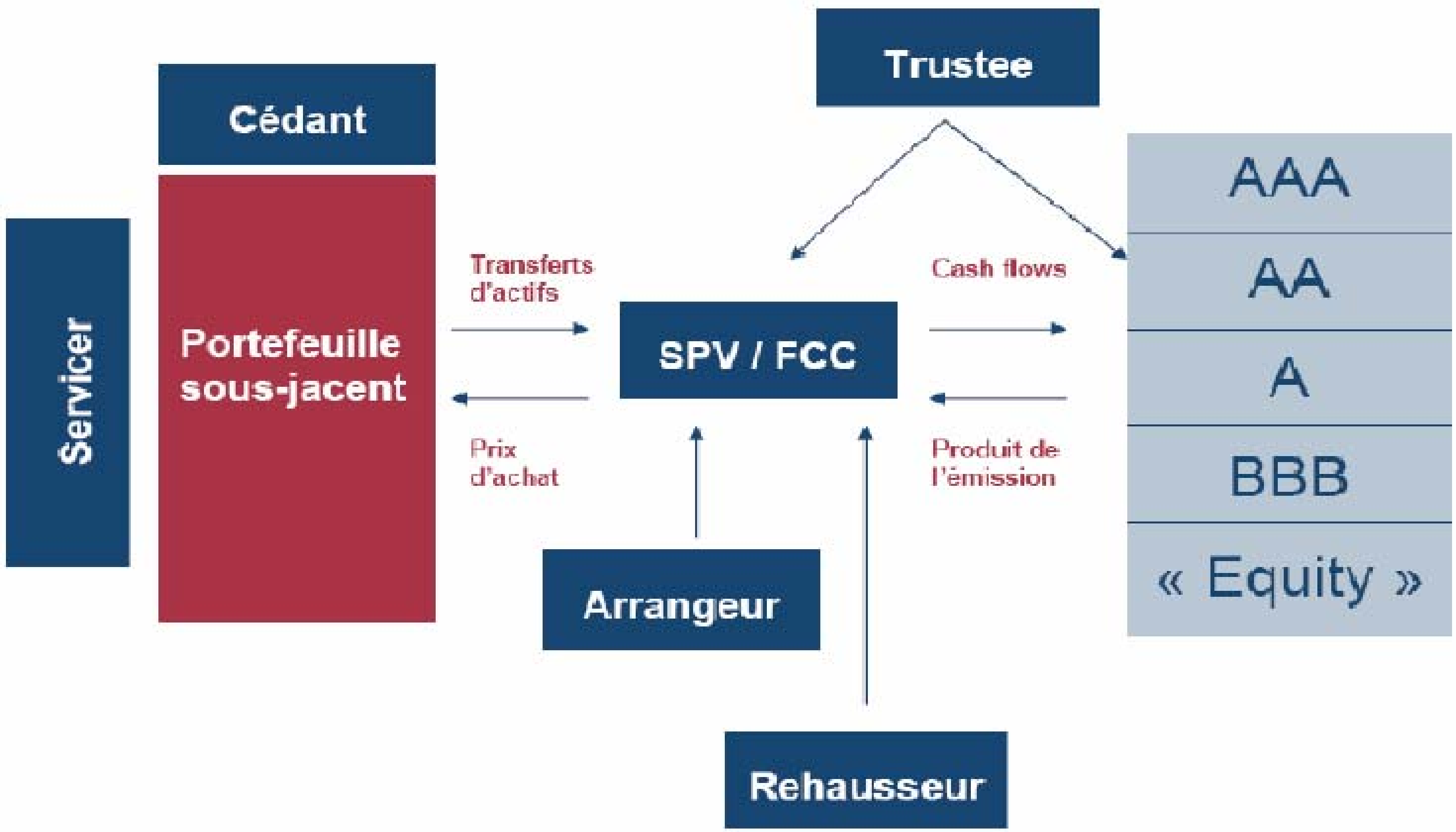
Aggregation

…bunched and sold to an
entity (SPV)…

Division

… funded by issuing bonds
('*mortgage-backed securities*') …
… by 'tranches' of various
seniorities ('structured products'),
sold to different agents → Transfer

Nowadays: cat bonds, securitization,…



General movement:
from local to global…

General movement:
from local to global…
and from ‘traditional’ to ‘new’ model

General movement

Traditional model

- Different risks *managed and born* by different institutions (insurers, banks, markets, …);
- Vocabulary, concepts, methods, regulations differ
- Common conception:

Financial intermediaries *warehouse* risk

- → Main limit: equity capital

General movement

‘New’ model

- Different risks *managed* by different institutions but ultimately *born* by markets (to some extent)
- Vocabulary, concepts, methods, regulations largely homogeneous (**capital** as the common metric)
- Common conception:

Financial intermediaries *process* risk

- Much larger capacity ….

General movement

‘New’ model

- Different risks *managed* by different institutions but ultimately *born* by markets (to some extent)
- Vocabulary, concepts, methods, regulations largely homogeneous (**capital** as the common metric)
- Common conception:

Financial intermediaries *process* risk

- Much larger capacity ….

  … but old dangers take new forms!

Dangers: a few examples

1. Limits to commitment (from individual defaults to limited liability).

   Example: ‘monolines’; CDS;…

   - Contagious failures, domino effects
   - Notion of *systemic risk*
   - Keywords: correlation, endogenous
   - Central banks as lenders of last resort …

     … including for governments?

Dangers: a few examples

2. Moral hazard: credit originators

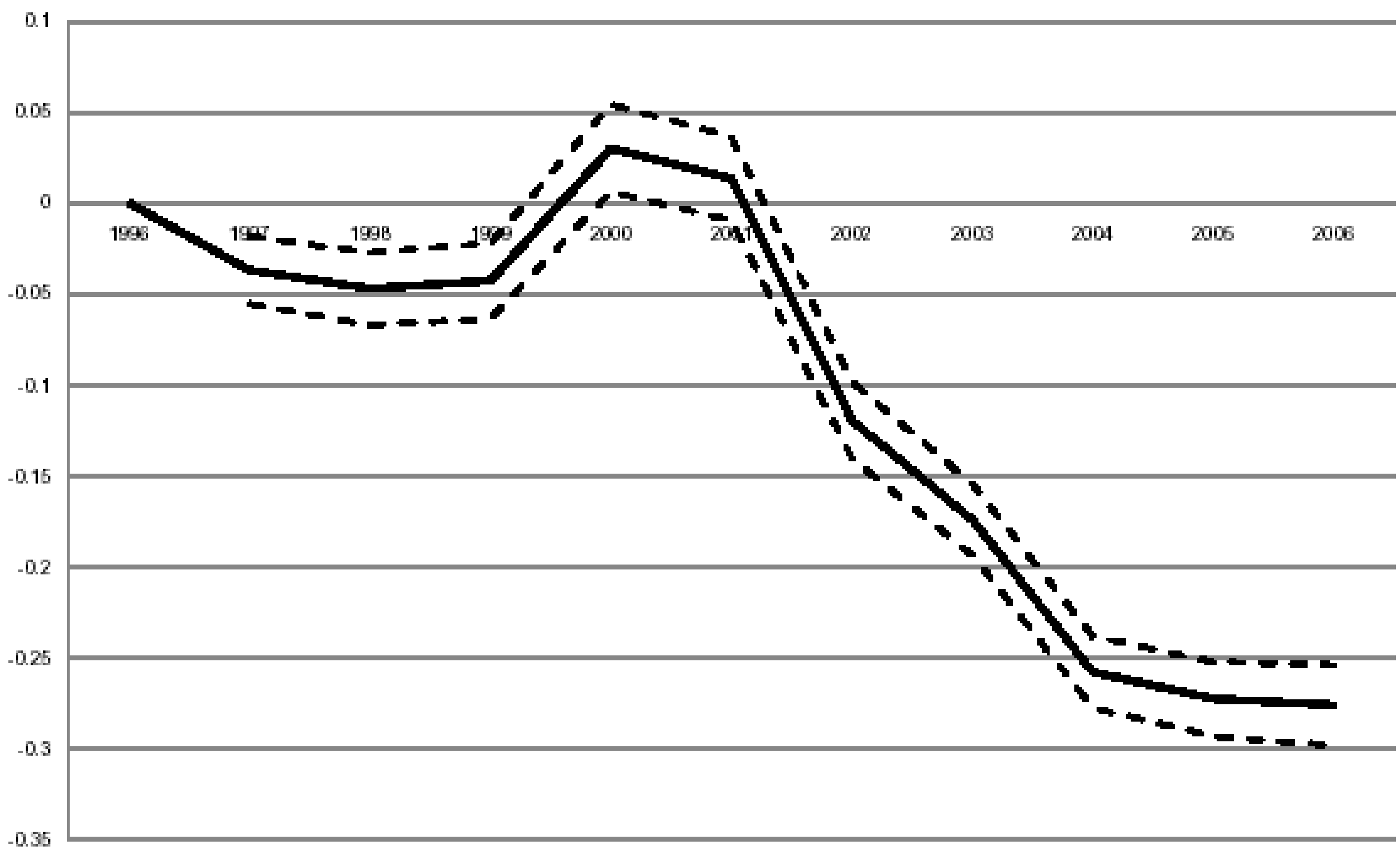
The Consequences of Mortgage Credit Expansion, Atif Mian & Amir Sufi, Chicago GSB, 2007

Figure 4A

Mortgage Denial Rates For High 1996 Denial Zip Codes

This figure plots the estimated coefficients of β and 95% confidence intervals for each year for the following first difference county fixed effects specifications:

$$Denied_{zct} - Denied_{zc,1996} = \alpha_c + \beta_t * HighLatentDemand_{zc,1996} + \varepsilon_{zct} \; for \quad t = 1997, 1998, \ldots, 2007$$



Dangers: a few examples

2. Moral hazard: credit originators

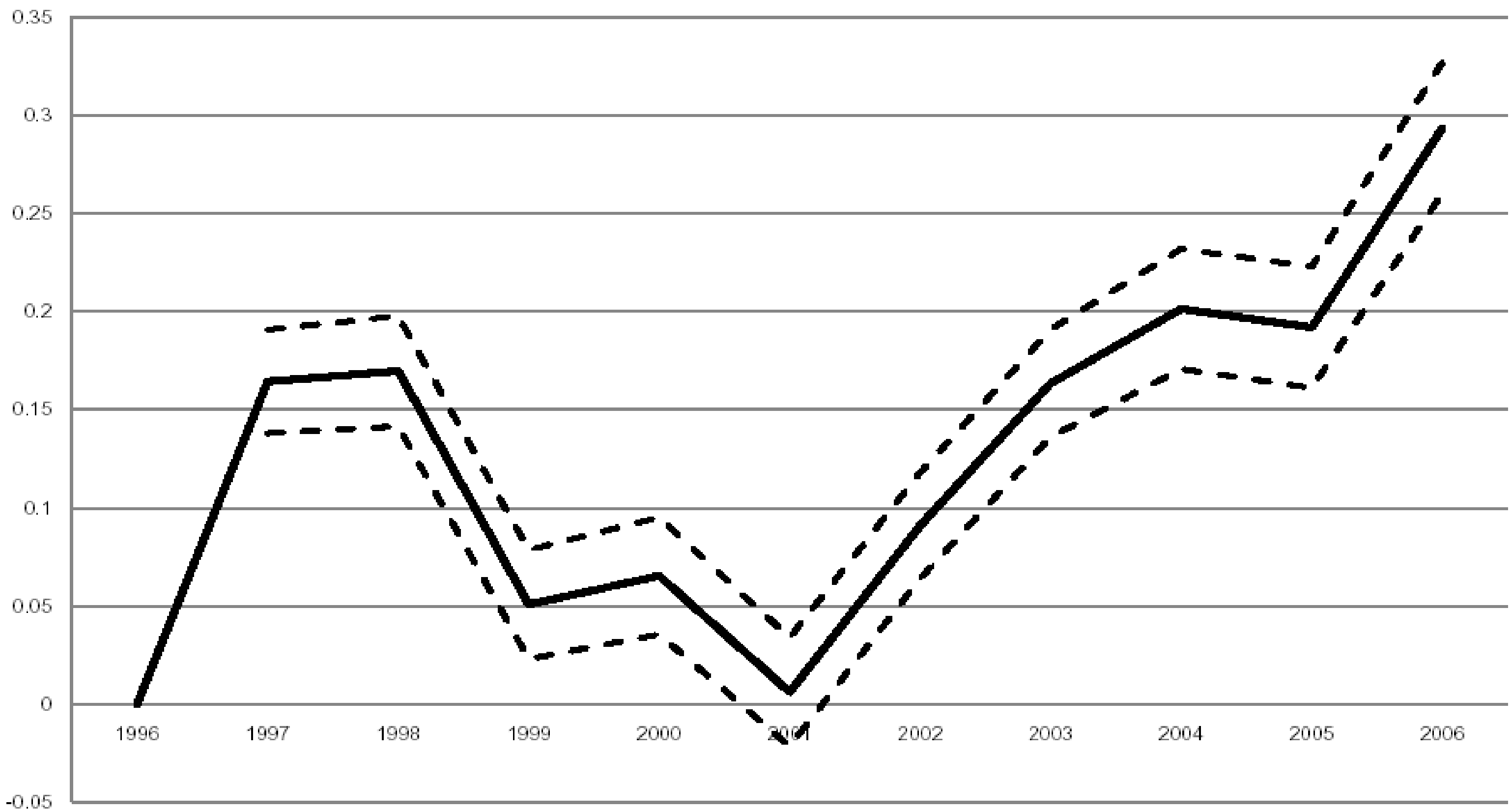
The Consequences of Mortgage Credit Expansion, Atif Mian & Amir Sufi, Chicago GSB, 2007

Figure 4C
Disintermediation For High 1996 Denial Zip Codes

This figure plots the estimated coefficients of β and 95% confidence intervals for each year for the following first difference county fixed effects specifications:

$$Sold_{zct} - Sold_{zc,1996} = \alpha_c + \beta_t * HighLatentDemand_{zc,1996} + \varepsilon_{zct} \ for \quad t = 1997, 1998, \ldots, 2007$$

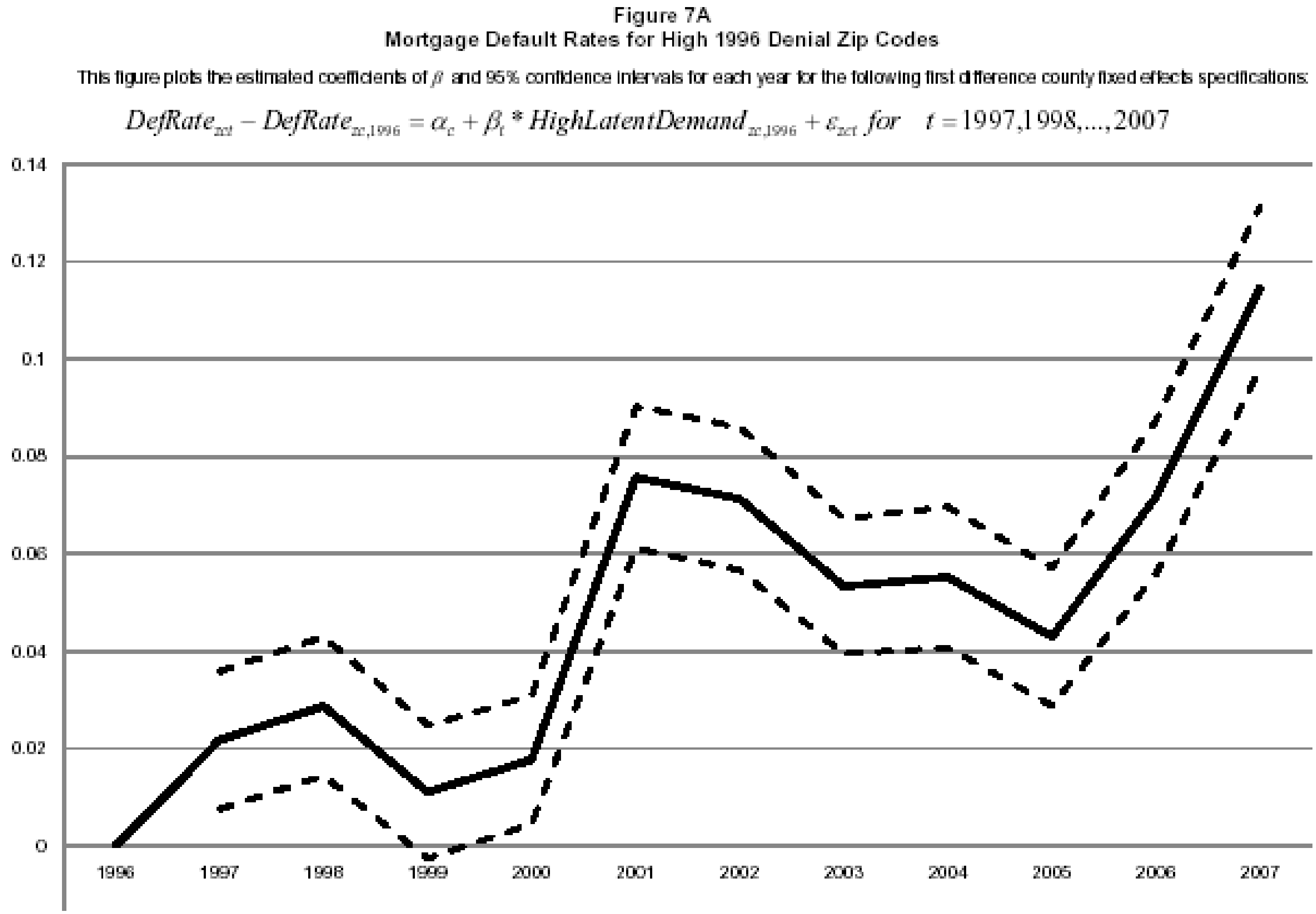
Disintermediated loans are loans sold to any third party except for Fannie Mae, Freddie Mac, Ginnie Mae, and Farmer Mac within 1 year of origination.



Dangers: a few examples

2. Moral hazard: credit originators

The Consequences of Mortgage Credit Expansion, Atif Mian & Amir Sufi, Chicago GSB, 2007



Dangers: a few examples

3. Moral hazard: intermediaries

Valuation Categories

Balance Sheet, 2nd quarter 2007

	Lehman Brothers	Bear Stearns	
Level 1	96 (35.6%)	39 (17.7%)	priced by market
Level 2	152 (56.3%)	163 (74.1%)	Mark to model
Level 3	22 (8.2%)	18 (8.2%)	Management's best estimate
Total ($ billion)	270	220	

Dangers: a few examples

4. The role of regulation: 'Credit-Induced Boom and Bust', di Maggio and Kermani (2014)

- Starting in 1999, anti-predatory laws (verification of borrowers repayment ability, limits on fees, rates and penalties) adopted in several states.
- In 2004 the OCC enacted a *preemption rule*

  → National banks and subsidiaries exempt from APL
- Consequences:
  - Increase in credit supply (almost 20%)
  - House prices: explains half of the boom and 2/3 of the bust
  - Delinquencies: initial decline, then sharp increase …
  - … especially where subprime loans important

Conclusion: the role of regulation

- Regulation indispensable: debt financing tends to induce excessive risk taking
- Extremely complex
- Competence is an issue
- Capture is an issue
- Beware the schizophrenic tendencies of the government!

Elizabethan Statute (fin XVIème)

'… by meanes of whiche Policies of Assurance it cometh to passe, upon the losse or perishinge of any Shippe there followethe not the undoinge of any Man, but the losse lightethe rather easilie upon many, then heavilie upon fewe, and rather upon them that adventure not then those that doe adventure, whereby all Merchantes, speciallie the younger sorte, are allured to venture more willinglie and more freelie (…) therebie to advance and increase the generall wealthe of the Realme, her Majesties Customes and the strengthe of Shippinge.'

Elizabethan Statute (fin XVIème)

'… by meanes of whiche Policies of Assurance it cometh to passe, upon the losse or perishinge of any Shippe there followethe not the undoinge of any Man, but the losse lightethe rather easilie upon many, then heavilie upon fewe, and rather upon them that adventure not then those that doe adventure, whereby all Merchantes, speciallie the younger sorte, are allured to venture more willinglie and more freelie (…) therebie to advance and increase the generall wealthe of the Realme, her Majesties Customes and the strengthe of Shippinge.'

Elizabethan Statute (fin XVIème)

'… by meanes of whiche Policies of Assurance it cometh to passe, upon the losse or perishinge of any Shippe there followethe not the undoinge of any Man, but the losse lightethe rather easilie upon many, then heavilie upon fewe, and rather upon them that adventure not then those that doe adventure, whereby all Merchantes, speciallie the younger sorte, are allured to venture more willinglie and more freelie (…) therebie to advance and increase the generall wealthe of the Realme, her Majesties Customes and the strengthe of Shippinge.'

Elizabethan Statute (fin XVIème)

‘… by meanes of whiche Policies of Assurance it cometh to passe, upon the losse or perishinge of any Shippe there followethe not the undoinge of any Man, but the losse lightethe rather easilie upon many, then heavilie upon fewe, and rather upon them that adventure not then those that doe adventure, whereby all Merchantes, speciallie the younger sorte, are allured to venture more willinglie and more freelie (…) therebie to advance and increase the generall wealthe of the Realme, her Majesties Customes and the strengthe of Shippinge.’