A Quantitative Theory of Information and Unsecured Credit

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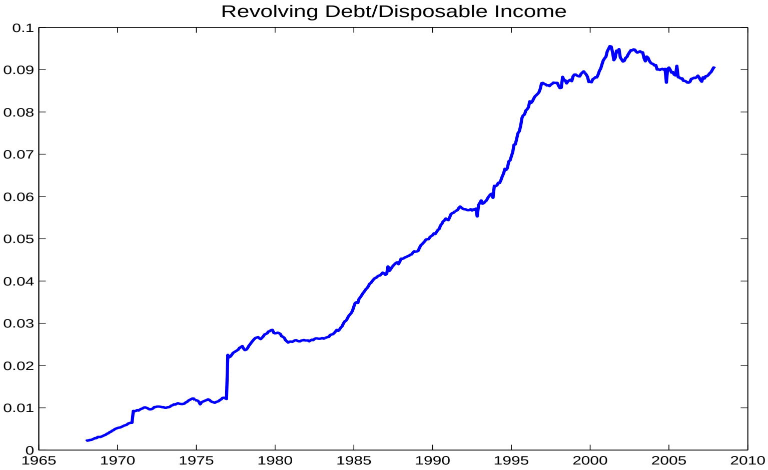
Changes in Debt and Default

- Increase in use of unsecured credit

Revolving Debt / Disposable Income



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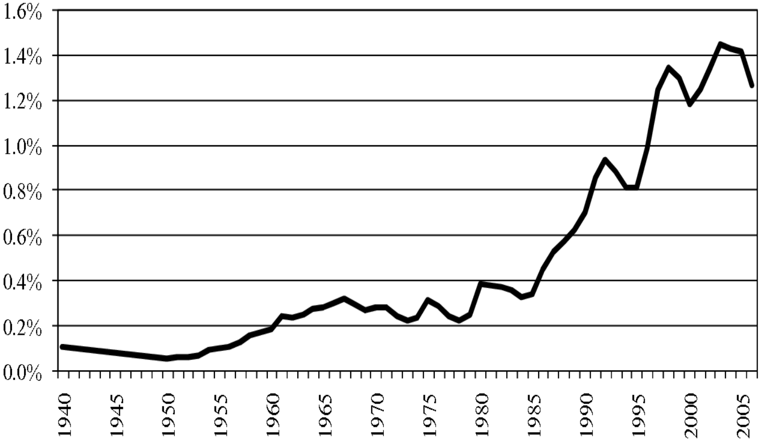
- Increase in bankruptcy filings

Chapter 7 Filings / Population over 16



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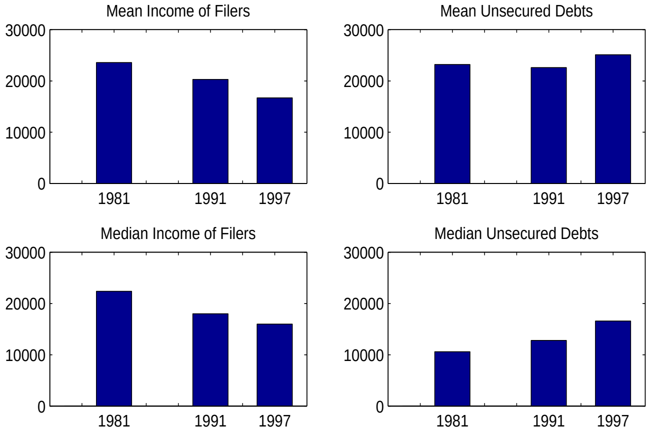
- Increase in debt discharged by filers

Sullivan, Warren, Westbrook (2000)



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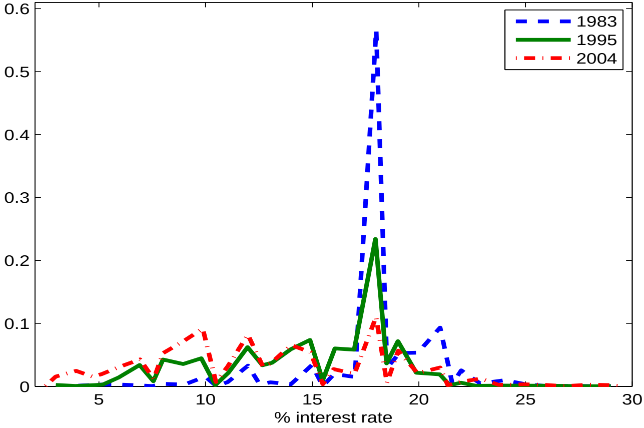
- Increase in debt discharged by filers
- Increase in dispersion in rates


0.6
0.5
0.4
0.3
0.2
0.1
0
5
10
15
20
25
30
% interest rate
1983
1995
2004

Changes in Debt and Default

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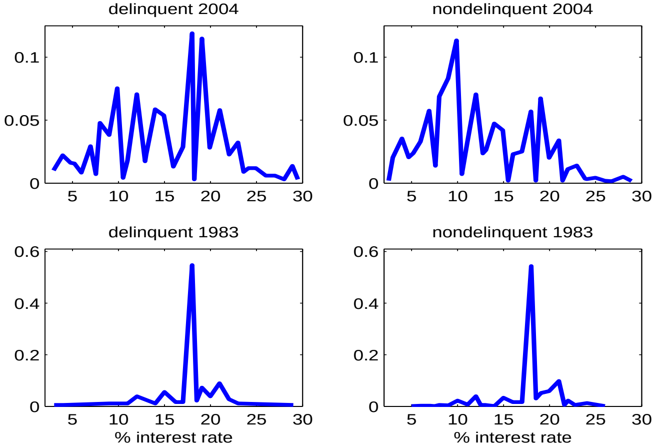
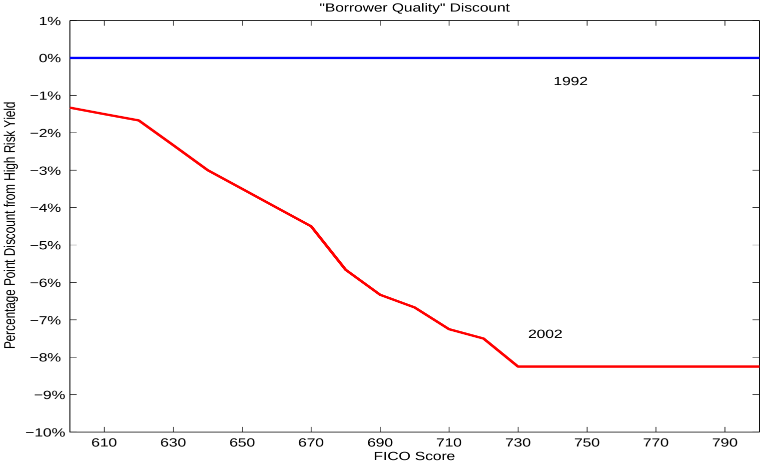
- Increase in bankruptcy filings
- Increase in debt discharged by filers
- Increase in dispersion in rates
- Increase in good borrower discount


delinquent 2004
nondelinquent 2004
0.1
0.05
0
5
10
15
20
25
30
delinquent 1983
nondelinquent 1983
0.6
0.4
0.2
% interest rate
% interest rate


"Borrower Quality" Discount
1%
0%
−1%
−2%
−3%
−4%
−5%
−6%
−7%
−8%
−9%
−10%
Percentage Point Discount from High Risk Yield
1992
2002
610
630
650
670
690
710
730
750
770
790
FICO Score

Main Question

- Can improvements in information account for these facts?

Basic Setup

- J overlapping generations
- Uninsurable idiosyncratic earnings risk
- Individualized pricing of loans
- Informational friction - lenders may not observe state vector of household
- General equilibrium, production economy

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Special Households

- A measure μ_s of households who face no
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  - financial market frictions
- Why?
  - Data show high concentration of wealth holding
  - Don't want median household to have lots of wealth

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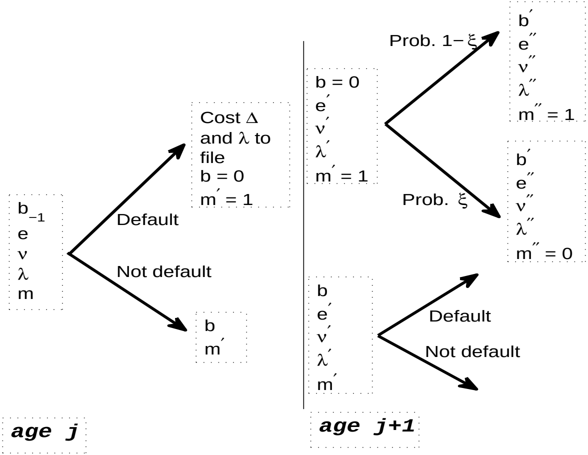
Timeline


b_−1
e
ν
λ
m
Default
Not default
Cost Δ and λ to file
b = 0
m′ = 1
b
m′
b = 0
e′
ν′
λ′
m′ = 1
Prob. 1−ξ
Prob. ξ
b′
e″
ν″
λ″
m″ = 1
b′
e″
ν″
λ″
m″ = 0
b
e′
ν′
λ′
m′
Default
Not default
age j
age j+1

Loan Pricing

- Pricing function:

$$q(b,l) = \begin{cases} \frac{1}{1+r} & \text{if } b \geq 0 \\ \frac{(1-\widehat{\pi}^b)\psi_j}{1+r+\phi} & \text{if } b < 0 \end{cases}$$

- Full information:

$$\widehat{\pi}^b = \sum_{e',\nu',\lambda'} \pi_e(e'|e)\,\pi_\nu(\nu')\,\pi_\lambda(\lambda'|\lambda)\,d\left(b(a,y,e,\nu,\lambda,j,m),e',\nu',\lambda'\right)$$

- Partial information:

$$\widehat{\pi}^b = \sum_e \sum_\nu \sum_\lambda \Pi' \Pr(e,\nu,\lambda|b,y,j,m)$$

$$\Pi' = \left[\sum_{e'} \sum_{\nu'} \sum_{\lambda'} \pi_e(e'|e)\,\pi_\nu(\nu')\,\pi_\lambda(\lambda'|\lambda)\,d(b,e',\nu',\lambda')\right]$$

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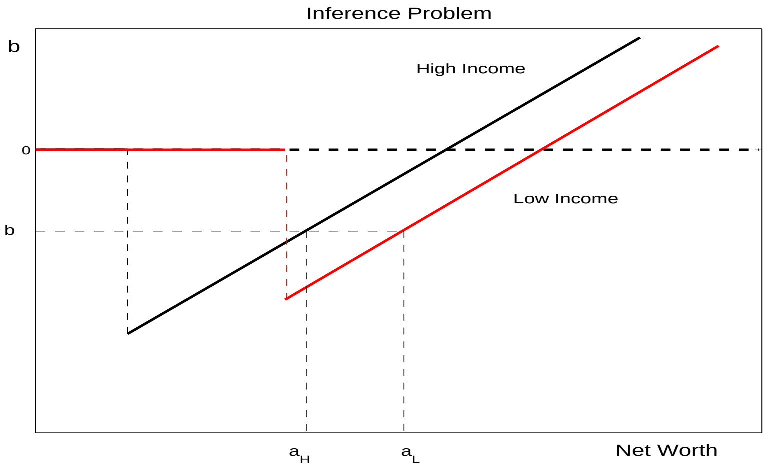
Equilibrium Inference



The Game

- Anonymous market assumption
- Households post desired borrowing (signaling) b
- Intermediaries post q for given b and are committed
- Households take highest q for their desired b (Bertrand competition)

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Off-Equilibrium Beliefs

- Given $q(b)$, there exists stationary distribution $\Gamma^{\star}$
- For each observable, find largest debt level $\underline{b}$
- For $b < \underline{b}$ set $q = 0$ (always default) as OEB

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Initial Pricing Function

- With PI, may be multiple equilibria – $q = 0$ and no borrowing is one
- We choose q^0 to locate equilibrium with highest q
- Can borrow at risk-free rate $r + \phi$ to debt level that requires default in all states
- Iterate inward from there
  - Compute stationary distribution and impose off-equilibrium beliefs
  - Compute conditional prob of current shocks given borrowing
  - Compute implied zero-profit price function q^1
  - Update with convex combination of price functions

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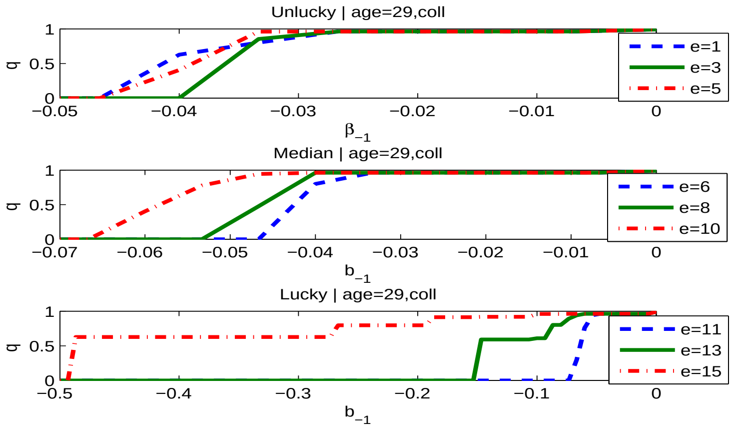
Calibration

Calibration	Model	Target
Discharge/Income Ratio	0.276	0.560
Fraction of Borrowers	0.126	0.125
Debt/GDP Ratio	0.021	0.014
Default Rate	1.37%	1.20%
Interest Rate	1.02%	1.00%

Pricing Functions



Average Interest Rate | Whole Econ

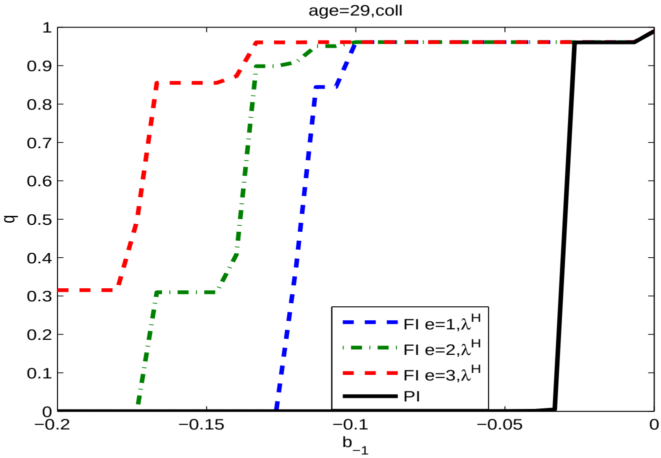
	$b < 0, m = 0$		$b < 0, m = 1$	
Mean	b	q	b	q
Coll	0.2769	0.9038	0.1243	0.8703
HS	0.0842	0.8490	0.0440	0.8233
NHS	0.0332	0.8034	0.0278	0.7306

Aggregate Stats

Unsecured Credit Market Aggregates

	FI	PI
Discharge/Income Ratio	0.276	0.138
Fraction of Borrowers	0.126	0.050
Debt/GDP Ratio	0.021	0.001
Default Rate	1.37%	10^{-4}%

Pricing Functions



Pricing Functions

- Rates go immediately from $r + \phi$ to ∞
- Risk-free borrowing is also restricted
- Unsecured credit market disappears (lemons problem)

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Where Does All the Credit Go?

- Assume q^0 is pricing function (risk-free borrowing)
- Bad borrowers would default, raising premium
- Good borrowers reduce borrowing
- Bad borrowers are identified, premiums rise, borrowing falls
- Good borrowers must reduce borrowing again
- Continues until debt is essentially risk-free

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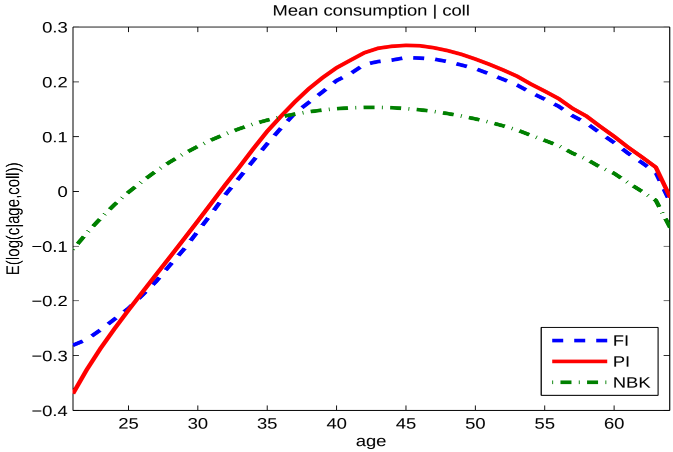
Changes

	1983		2004	
Levels	Data	Model	Data	Model
$E(r)$	14.72	4.00	9.85	14.96
$E(r \mid m = 1)$	14.50	4.00	11.63	15.85
$E(r \mid m = 0)$	14.72	4.00	9.46	13.60
$Var(r)$	7.90	0.00	26.63	18.85
$Var(r \mid m = 1)$	8.68	0.00	33.88	25.33
$Var(r \mid m = 0)$	7.53	0.00	25.60	17.84
Changes	Data	Model	Data	Model
$E(r \mid m = 1)$-$E(r \mid m = 0)$	-0.22	0.00	12.28	12.08
$Var(r \mid m = 1)$-$Var(r \mid m = 0)$	1.15	0.00	7.28	7.59
$E(r \mid 1983)$-$E(r \mid 2004)$			5.67	-10.96
$Var(r \mid 1983)$-$Var(r \mid 2004)$			18.73	18.85
$Var(r \mid m = 1, 1983)$-$Var(r \mid m = 1, 2004)$			25.20	25.33
$Var(r \mid m = 0, 1983)$-$Var(r \mid m = 0, 2004)$			18.07	17.84

Consumption Smoothing



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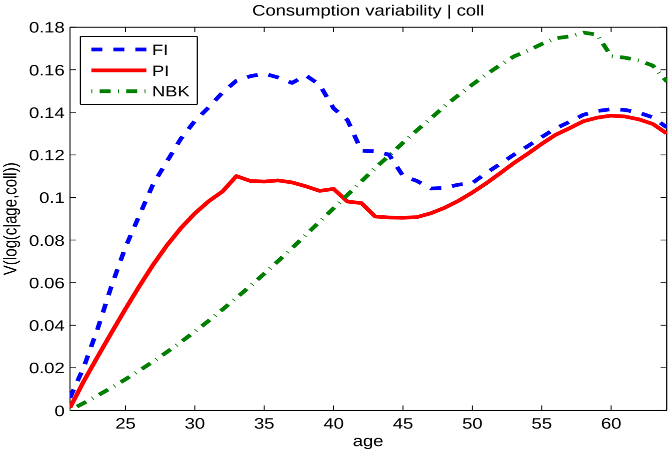

Welfare Gain

C_{eq}	Coll	HS	NHS
$PI \rightarrow FI$	0.86%	0.32%	0.13%
$FI \rightarrow NBK$	2.64%	1.18%	1.06%
$PI \rightarrow NBK$	3.50%	1.50%	1.19%

Summary

- Improved information can account for behavior of unsecured credit
  - more default and more debt
  - dispersion in interest rates
  - good borrower discount
- Improved information makes all households better off
- Bankruptcy rate not informative for desirability of bankruptcy reform

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Ongoing work

- Understand consequences of banning information
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    - Data Protection Directive (EU)
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- Hirshleifer Effect: is less information sometimes better?

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