Modeling the Credit Card Revolution: The Role of IT Reconsidered

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April, 2014

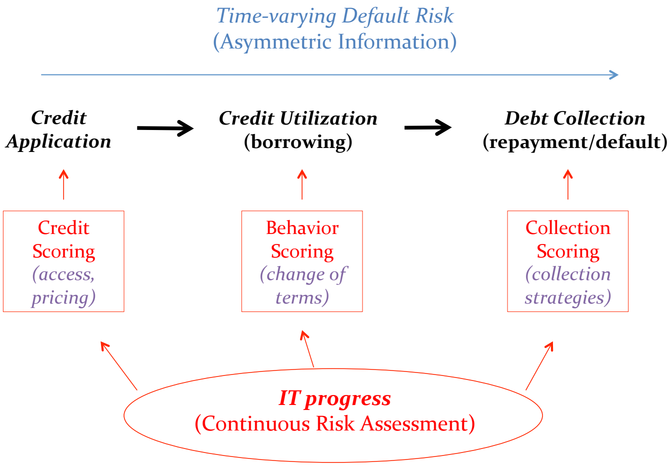
The Role of IT in Credit Markets

Time-varying Default Risk
(Asymmetric Information)

→

Credit Application → ***Credit Utilization*** **(borrowing)** → ***Debt Collection*** **(repayment/default)**

The Role of IT in Credit Markets



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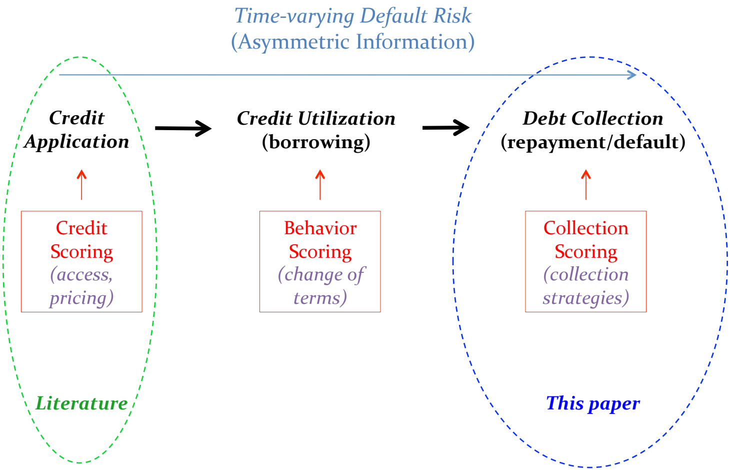

Missing Ingredient of Existing Theory

- Conventional view of consumer default on unsecured debt
  - court-based process, truthful revelation of state
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  - [1.] most debt discharged informally
    - Dawsey & Ausubel (2004): >50% of $ defaulted on
  - [2.] vast resources involved in collection of unpaid debt
    - employment: 350k+ (≈ 30% share of cc-receivables)

Basic Idea of the Paper

- In the model:
  - Enforcement by the lending industry with access to IT
    - enforcement = Ex post 'State verification' (solvency status)
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- Comparative Statics Exercise: IT progress
  - Increase in signal precision (main channel)
  - Reduction in transaction costs

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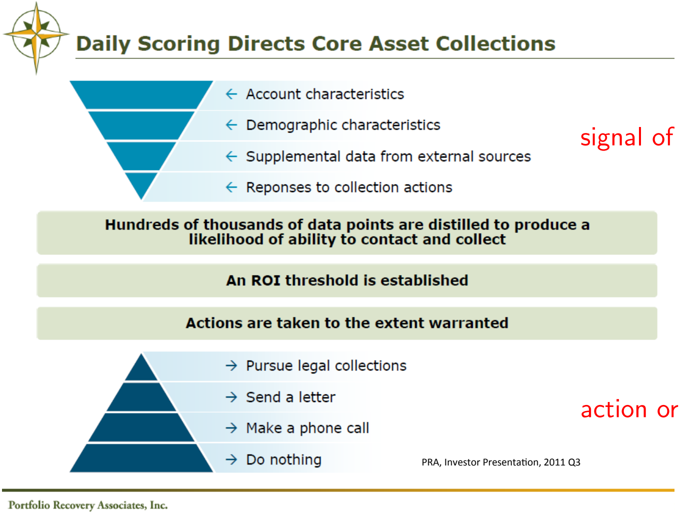
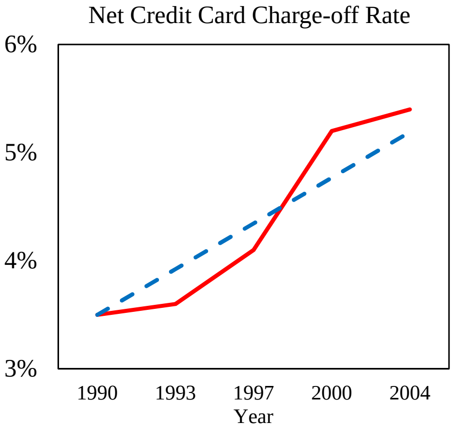


signal of solvency

action or no action

Preview of Results

Better enforcement technology implies



⇒ accounts for most puzzling development in cc-market

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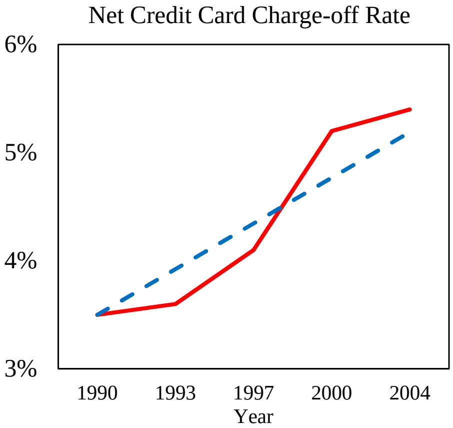


charge-off rate = (net) debt discharged / total debt

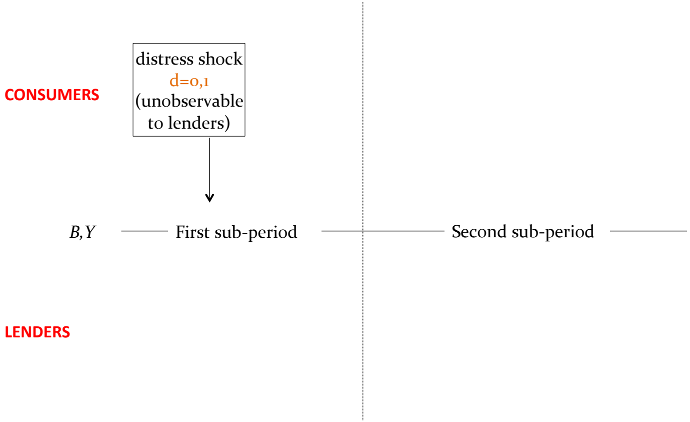
Model

CONSUMERS

B, Y —— First sub-period —— Second sub-period ——

LENDERS

Model



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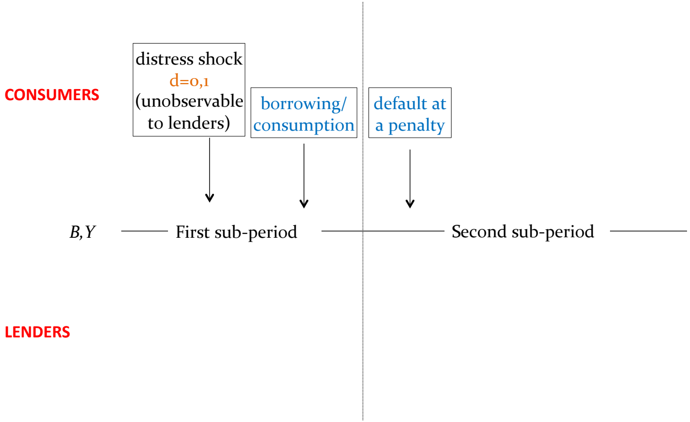
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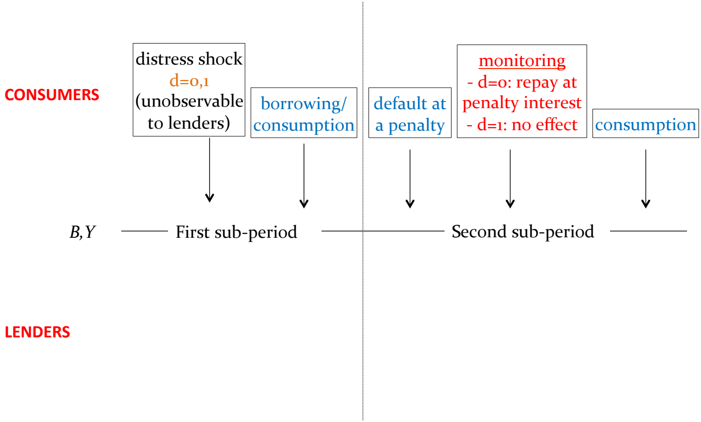
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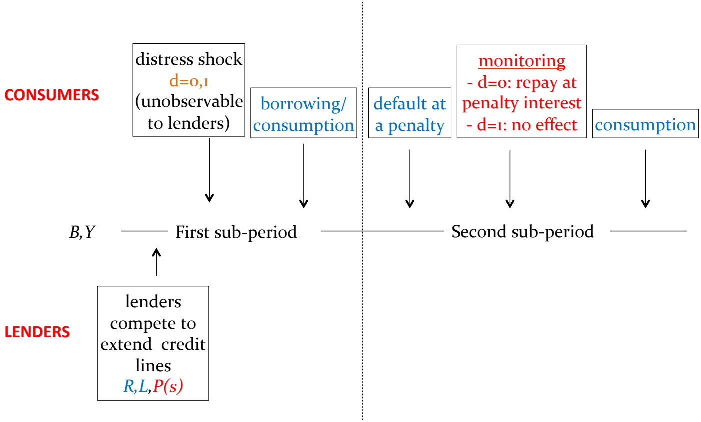
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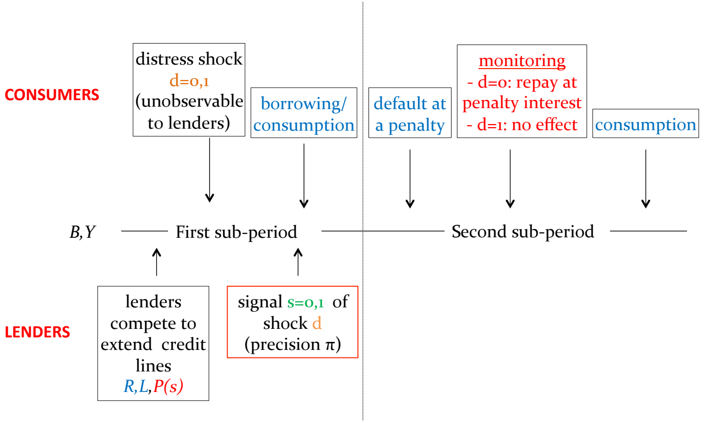
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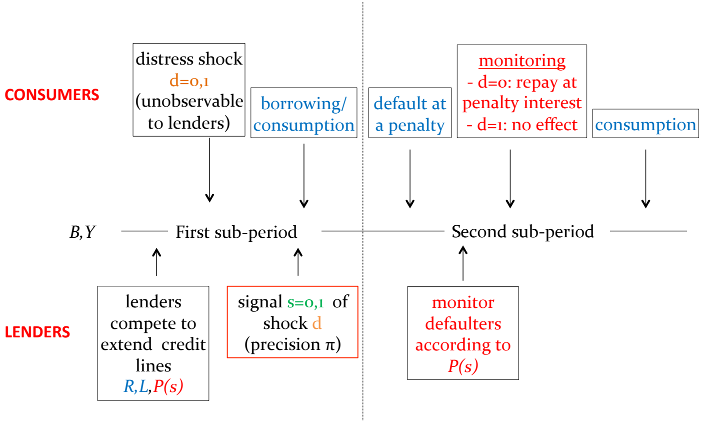

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  - $L > L_{min}(d=1)$: *Risky* Contracts (positive probability of default)
    - $L \in (L_{min}(d=1), L_{min}(d=0)]$: Non-monitored contracts
      (default if $d=1$ for all $P(s)$)
    - $L > L_{min}(d=0)$: Monitored contracts
      (default if $d=1$, or if $d=0$ and $P(s) < \bar{P}$)

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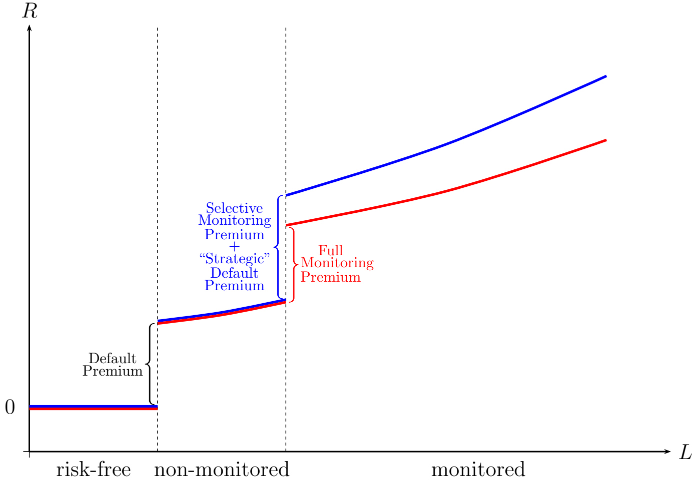
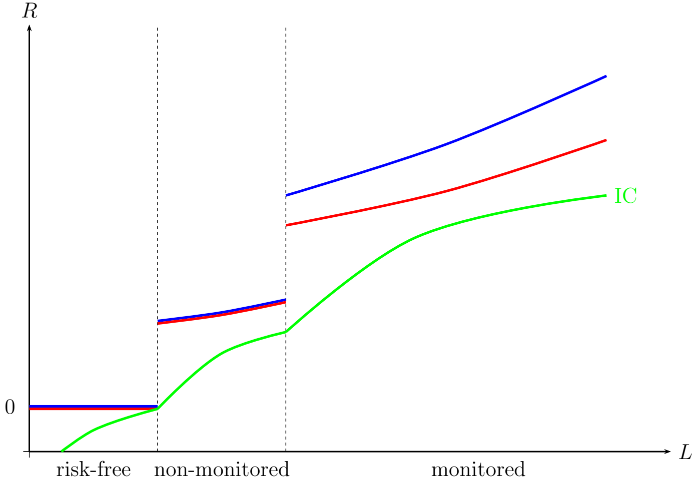
      (decrease as π increases)

How Do Lenders Price Defaultable Debt



How Does π Impact Pricing?



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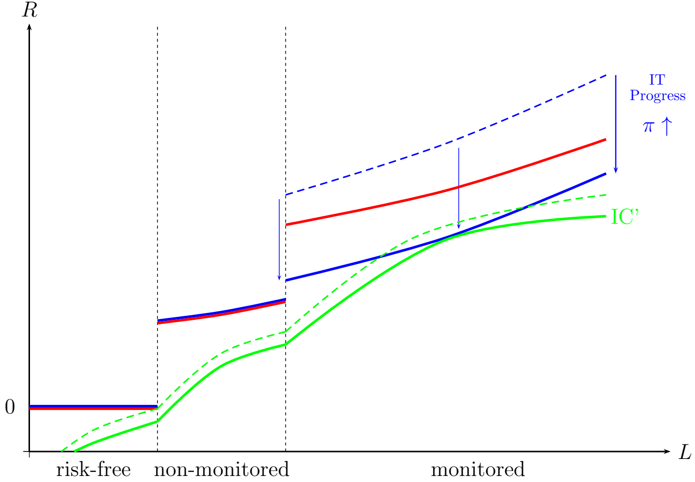
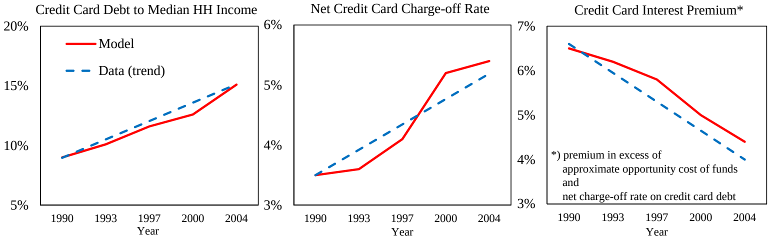


Quantitative Extension

- Life-cycle environment (27 periods)
- Analytic model embedded within each period
  - baseline period length (1 sub-period) $=$ 1 year
- B endogenous
- Y stochastic
- E $= (Y < .25\bar{Y})$ + medical bills + divorce + unwanted pregnancy
- Only medical shock assumed directly defaultable $\rightarrow$ low ϕ

Model Accounts for Both Trends and Levels



- information precision x3 over the 90s

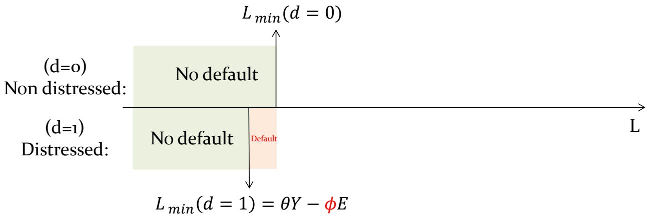
- transaction cost declines by 20% (Berger, 2003)

Why Model Matches Trends?

	Benchmark Model		Decomposition		
	90s	00s	τ_{90s}	π_{90s}	
(in % unless otherwise noted)			π_{00s}	τ_{00s}	τ_{fit}
CC Debt to Med. Income	9.0	15.1	11.2	13.9	15.1
CC Charge-off Rate	3.5	5.4	5.5	4.1	4.1
Defaults (per 1000)	4.5	10.8	9.0	7.5	7.9
- fraction monitored	30	18	17	31	32
- fraction strategic	0.0	19	19	0	0
Frequency of Risky Cont.	21.4	36.6	35.7	31.3	31.1
- fraction fully monitored	100	1	0	100	100
- fraction sel. monitored	0	99	100	0	0
Discharge to Income	74	89	82	80	82
CC Interest Premium	6.5	4.4	6.1	5.3	4.6

Why Model Matches Levels?

Standard model:



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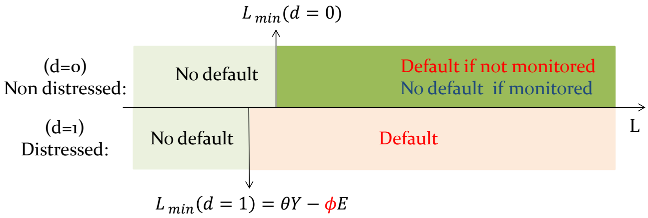
Our model:



Conclusions

- Complementary mechanism of IT-driven expansion of credit card lending
  - departure motivated by:
    - prevalence of informal bankruptcy
    - involvement of lenders in debt collection
- Addresses Achilles' heel of existing models

THE END

BACKUP SLIDES

Literature: Unsecured Credit and IT

- Adverse Selection and Ex-ante Role of IT

  Narajabad (2012), Athreya, Tam and Young (2008), Sanchez (2012)
  Livshits, MacGee and Tertilt (2011)

- Informal Bankruptcy

  Benjamin and Mateos-Planas (2011), Athreya, Sanchez, Tam and Young (2012), Chatterjee (2010)

- Standard Modeling Frameworks

  Livshits & MacGee and Tertilt (2006, 2010),
  Chatterjee, Corbae, Nakajima and Rios-Rull (2007), Athreya (2003) etc...

  $\Rightarrow$ define modeling issues / challenges

Lenders: Contract Assignment

- Choose $K = (R, L)$ & $P(s)$ to maximize

$$\max_{K,P} V(K, P)$$

subject to

$$\mathbb{E}\Pi(I, K, P) - \lambda \sum_{I=(d,s)} \delta(I, K, P)P(s)Prob(I) \geq 0,$$

where $I \equiv (d, s)$ and ex-post profit function $\Pi(I, K, P)$ given by

$$\Pi(I, K, P) = \begin{cases} R\max\{b(I, K, P), 0\} & \text{if } \delta(I, K, P) = 0 \\ -L + L(1 + \bar{R})(1 - d)P(s) & \text{if } \delta(I, K, P) = 1 \end{cases}$$

Consumers: Decision to Default

- Choose $\delta \in \{0, 1\}$ to maximize

$$V(K, P) \equiv \mathbb{E} \max_{\delta \in \{0,1\}} [(1 - \delta) N(I, K, P) + \delta D(I, K, P)]$$

where $I = (d, s)$ and

$N(\cdot)$ is indirect utility fcn. associated with repayment

$D(\cdot)$ is indirect utility fcn. associated with default

Consumers: Indirect Utility from Repayment

- Under repayment, choose b, c, c' to maximize

$$N(I,K) \equiv \max_{b \le L} U(c,c')$$

subject to

$$\begin{cases} c = Y - B + b - \rho(K,b) \\ c' = Y - b - dE - \rho(K,b) \end{cases}$$

where $I = (d,s)$ and

$$\rho(K,b) = R\max\{b(I,K,P),0\}/2$$

Consumers: Indirect Utility from Default

- Under default, choose b, c, c' to maximize

$$D(I, K, P) \equiv \max_{-L \leq b \leq 0} \mathbb{E}_I U(c, c')$$

subject to

$$\begin{cases} c = Y - B + L + b \\ c' = (1-\theta)Y - (1-\phi)dE - b - mX(d) \end{cases}$$

where $I = (d, s)$ and

$$X(d) = (1-d)((\underline{\theta} - \theta)Y + L(1+\bar{R}))$$

$\underline{\theta}Y + \bar{R}L$ s.t. d=0-consumer does not default if $P = 1$

Definition of Equilibrium

- Equilibrium is: indirect utility functions

$$V(\cdot), N(\cdot), D(\cdot)$$

  and decision functions

$$\delta(\cdot), b(\cdot), K(\cdot), P(\cdot)$$

  s.t. consistent with problems defined above.

Parameterization

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  - indebtedness for 2004: 15%
  - charge-off rate for 2004: 5%
  - discharge to income of bankruptcy filer in the 90s
  - 3 fold increase in π centered around .5
  - $\lambda = .3$ to get regime switch around $\pi = .5$

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- Decline of transaction cost by 20% (consistent with Berger, 2003)

Direct Impact of IT-Based Solution

- In early 90s, GE capital developed PAYMENT; first comprehensive solution (Markuch et al., 1992) to direct collection resources:
  - Markov model of evolution of delinquent debt as a function of possible actions taken by collectors
  - systematic comparison of accounts treated vs non-treated
    - report 7-9% gain in overall effectiveness and improved borrower goodwill
    - explicit mention that most gains due to more frequent selection of *no action*
    - as for first implementation of this sort of system this is big number

Direct Impact of IT-Based Solution

- Banerjee (2001) directly looks at yield from litigation on cc-receivables:
  - yield from litigation boosted from 24% to 40% by IT!

Direct Impact of IT-Based Solution

- Other industry studies report even higher numbers:
  - PRA, major debt collection agency, reports 120% gain in debt recovered per dollar spent on collection over the years 1997-2004 (Annual Report, 2011)
  - Trustmark National Bank, discussed adoption of Fair ISAAK debt collection system in late 90s: 35-58% gain on consumer receivables with same staff

Other Important Evidence

- In 90s all 3 major credit bureaus started offering collection scores, marketed to debt collection industry; this accounts for 7% of their revenue, which suggests:
  - 1. these scores aid collection by segmenting/prioritizing debtors
  - 2. segmentation and prioritization is of first order importance

Comparison to the Model

- IT progress rate in the ballpark of assumed numbers:
  - in model 33% gain in efficiency, industry data report vary between 9%-120%
- Cost of monitoring on the high side, but not unreasonable:
  - pre-PAYMENT GE spent $150 million on final write-offs $400 million
    - suggests 150/(400/.74)=.28 as upper bound on monitoring cost (we use .3)
    - aggregate costs also consistent with the model's implication: data: 350k*$50k*30% -2% x $800 billion on 5%x800 billion aggregate charge-offs