

The Role of Public Information and Credit Ratings in the Corporate Bond Market

James Partridge

The University of Western Ontario

Macro Lunch

Credit Ratings

- 3 major credit rating agencies (CRAs)
 - ▶ S&P, Moody's, and Fitch (also Duff & Phelps)
- 3 major markets: sovereign/gov't, corporate, structured finance
 - ▶ I focus on corporate bond ratings
- The bond issuer pays for the rating

Credit Ratings

- Rating system designed to measure relative credit risk
 - ▶ Credit ratings are used as an aggregate measure of risk
- AAA, AA, A & BBB bonds considered investment grade (IG)
- BB, B, CCC, CC & C bonds considered speculative grade (SG)
- Legal restrictions on “institutional investors” (e.g. pension funds) intended to limit risks in managed portfolios

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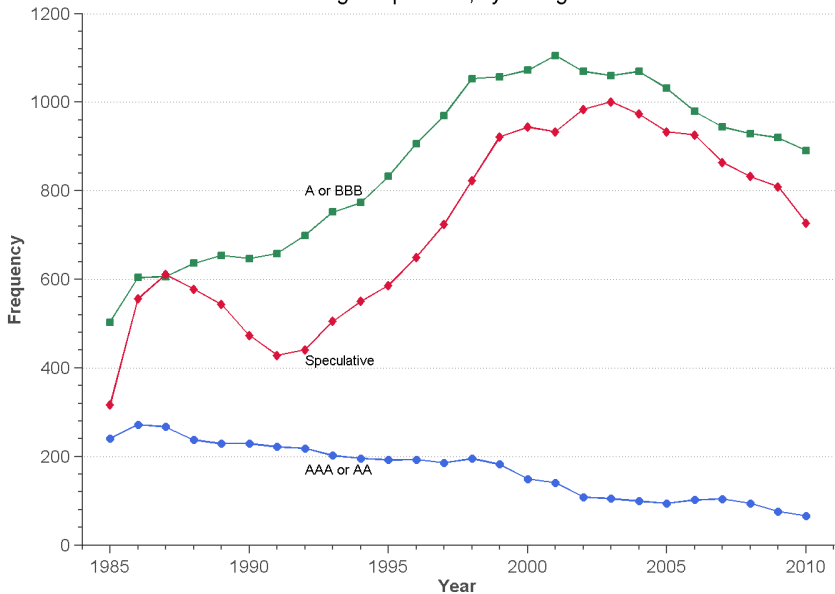
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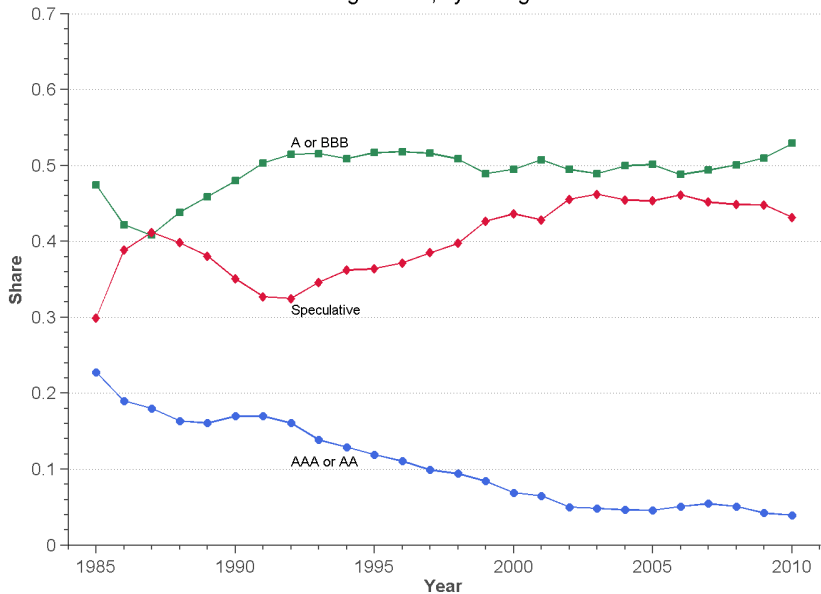
My conjecture:

Ratings have value as a signal, but this value has diminished as information proliferation has increased.

Rating Frequencies, by Rating Class



Rating Shares, by Rating Class



What I Do

- Show distribution of bond ratings has shifted away from high ratings
- Develop a model with credit ratings and public information to match this fact
- Test the following implication: price dispersion has increased for high-rated bonds

The Fall of Highest Rated Firms is “Robust”

- Not a question of evolving CRA standards/incentives
 - ▶ leverage ratios are stable by rating
 - ▶ leverage ratios are slightly higher by cohort

▶ Appendix

- These firms aren't simply merging
 - ▶ ignoring the financial sector, the assets controlled by AAA and AA firms have also decreased

	1985	1990	1995	2000	2005	2010
AAA	34	26	17	8	4	1
AA	0	4	8	3	6	8
A	0	1	3	9	6	7
BBB	0	0	1	2	3	3
B	0	1	1	0	0	0
Merged	0	1	2	6	6	6
Retired	0	1	2	6	9	9

Table: Evolution of circa 1985 AAA firms

Motivation

- There has been a shift from bank to bond and equity financing
 - ▶ Bonds have doubled as a proportion of corporate liabilities
- Policy changes vis-à-vis CRAs may not have intended effect
- CRAs have received much attention/criticism due to MBS and CDO ratings, but corporate bonds are a different product
- Financial press suggests three answers:
 - ▶ investors in general have larger appetite for risk
 - ▶ knowledgeable investors place less emphasis on CRA ratings
 - ▶ firms now find it too costly to maintain high ratings
- All three indicate that elite ratings now have a lower value
- What is the fundamental change?

Story

- **Then:** CRA ratings were the primary source of firm information, few had access to SEC filings, firm prospectus, . . .
- Now: Bloomberg, WSJ Online, etc. all provide market data and firm analysis; firm info is readily available
- Rating and third-party market analysis both act as signals of firm's well-being or quality
- Cost required to achieve high ratings

*Investors now have direct information on firm quality –
high quality firms no longer willing to incur cost of high ratings*

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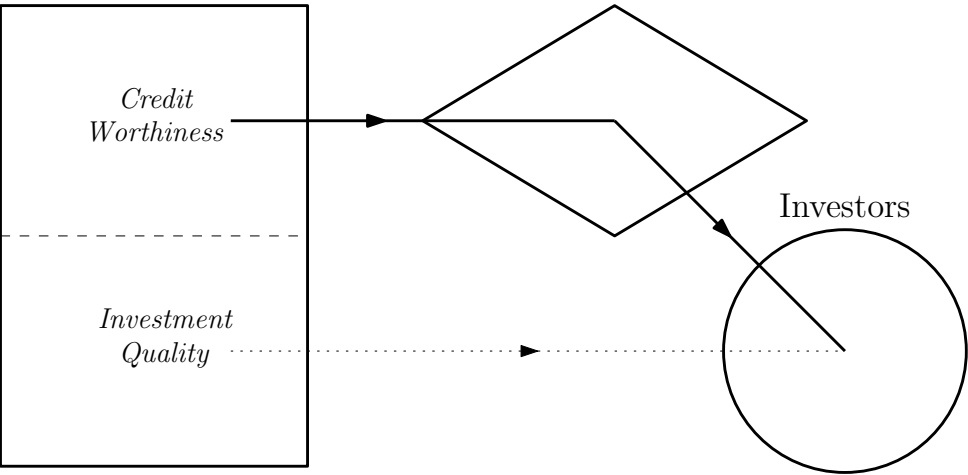
Firm

Rating Agency

*Credit
Worthiness*

Investors

*Investment
Quality*



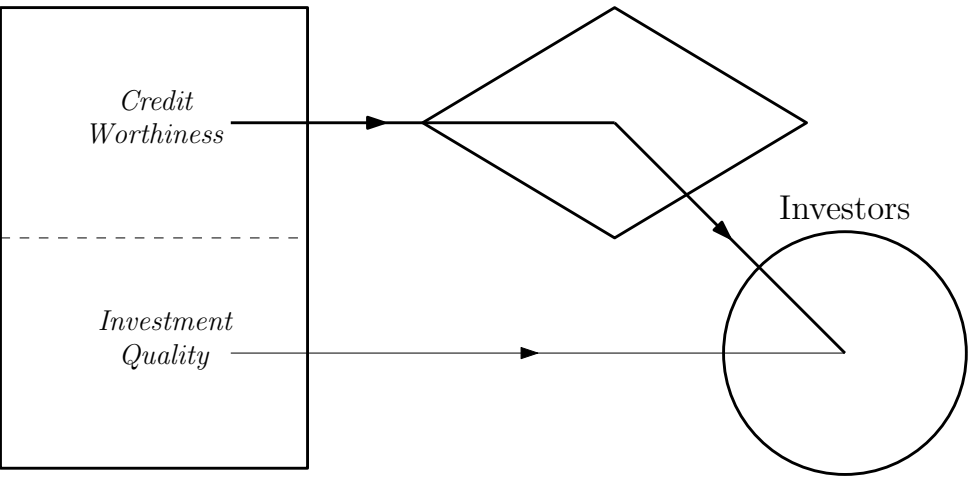
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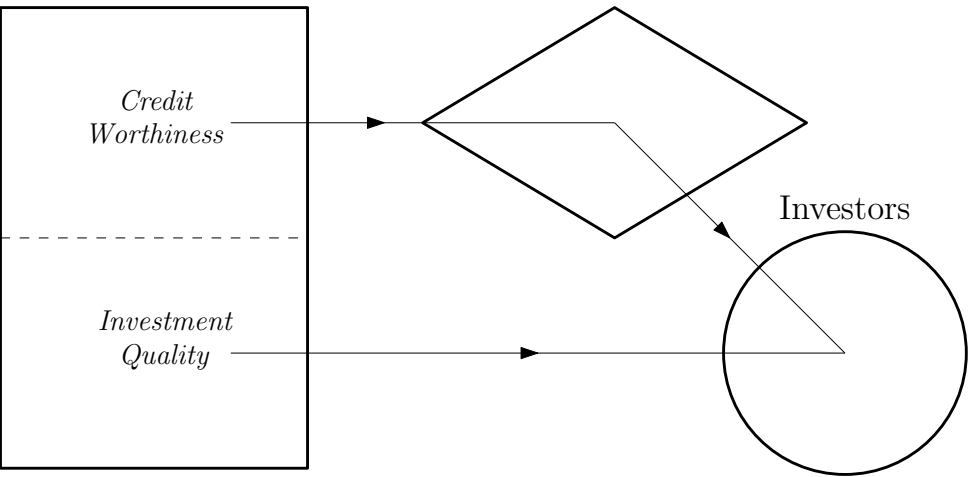
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Literature

- Academic literature has focused on other questions
 - ▶ CRA incentives in structured finance market well-studied
 - ▶ feedback effects
 - ▶ bond, equity or bank financing
- Unique to this paper: firms influence their rating

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 - ▶ CRA incentives in structured finance market well-studied
 - ★ Mathis, McAndrews & Rochet 2009
 - ★ Skreta & Veldkamp 2009
 - ★ Bolton, Freixas & Shapiro 2009
 - ★ He, Qian & Strahan 2011
 - ▶ feedback effects
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Environment

- Firms are of **type** $\theta \in \{G, B\}$, unobserved by all
 - ▶ determines probability the firm's project is successful
- Economy receives a **signal**, ν , about firm's type
 - ▶ probability signal is 'accurate' is ω
 - ▶ assume $\omega > 0.5$
- The firm invests in the rating process, economy then observes **rating**
 - ▶ accuracy of rating depends on investment

Timing

- ① Ex ante:
 - ▶ known: public signal (H or L)
 - ▶ unknown: type (G or B)
- ② Interim:
 - ▶ firm chooses π
 - ▶ rating is formed and observed (A , B or C)
 - ▶ debt contracts are issued, interest rates conditioned on h and ν
- ③ Ex post:
 - ▶ outcome of project is realized (0 or y)
 - ▶ debt is paid if project pays off

Model

- Firms:

- ▶ endowed with a project that might earn y if investment is received
- ▶ project requires investment D , fixed
- ▶ $\mathbb{1}(h, \nu) = 1$ if investment is received, 0 otherwise

$$V(\nu) = \max_{\pi} -c(\pi) + E_{\theta, h} [\mathbb{1}(h, \nu) (y - DR(h, \nu)) | \nu] \quad (1)$$

- Investors:

- ▶ investors observe ν and h
- ▶ have access to risk free outside option which pays Dr
- ▶ expected return is then:

$$E_{\theta} [DR(h, \nu) | h, \nu] = Dr \quad (2)$$

Distributions

- Types:

- ▶ $Pr[\theta = G] = \lambda$
- ▶ $Pr[\theta = B] = 1 - \lambda$

- Ratings:

- ▶ $Pr[h = A|\theta = G] = Pr[h = C|\theta = B] = p_1 + (p_2 + p_3)\pi$
- ▶ $Pr[h = B|\theta = G] = Pr[h = B|\theta = B] = p_2(1 - \pi)$
- ▶ $Pr[h = C|\theta = G] = Pr[h = A|\theta = B] = p_3(1 - \pi)$

- Signals:

- ▶ $Pr[\nu = H|\theta = G] = Pr[\nu = L|\theta = B] = \omega$
- ▶ $Pr[\nu = L|\theta = G] = Pr[\nu = H|\theta = B] = 1 - \omega$

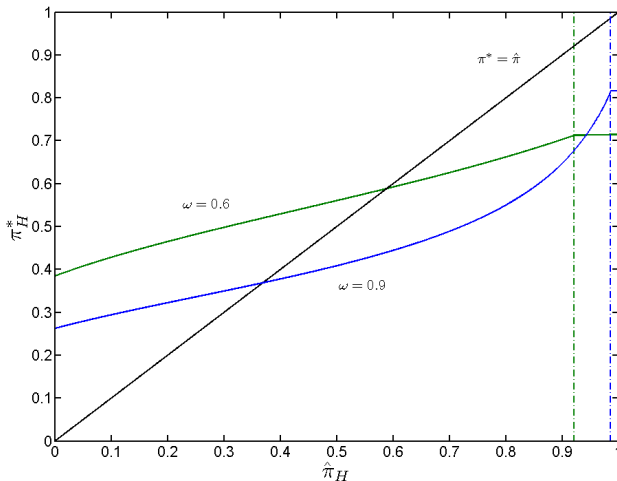
Equilibrium

Definition

An equilibrium is a set of interest rates, $\mathbf{R}^* = \{R^*(h, \nu)\}_{h \in \{A, B, C\}, \nu \in \{H, L\}}$, and rating investment allocations, $\{\pi_\nu^*\}_{\nu \in \{H, L\}}$ such that:

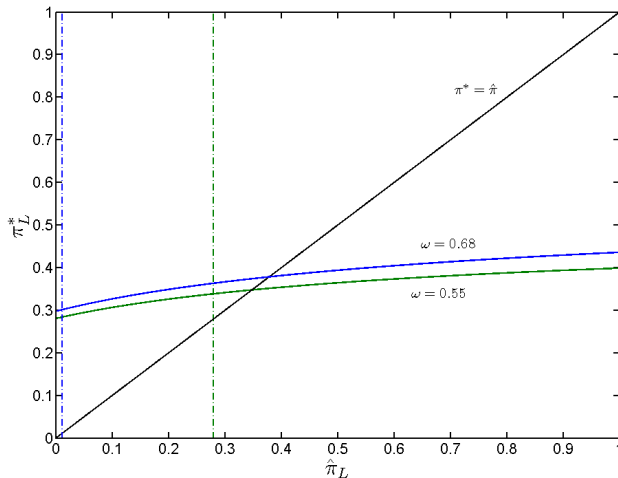
- ① given \mathbf{R}^* , π_ν^* maximizes $V(\nu)$;
 - ② $E_\theta [DR^*(h, \nu) | h, \nu] = Dr \ \forall h, \nu$.
- Rational expectations implies π^* is consistent with investor beliefs about π .
 - ▶ Limit focus to interest rates that are mutually consistent, and consistent with π^* .

Equilibrium



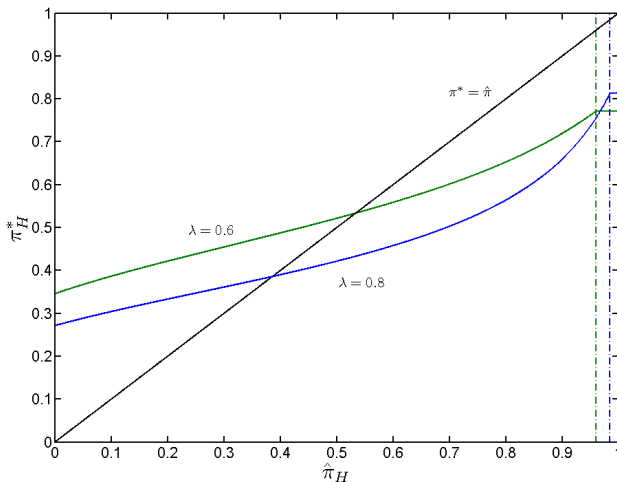
π_H^* decreases as ω increases from 0.6 to 0.9.

Equilibrium



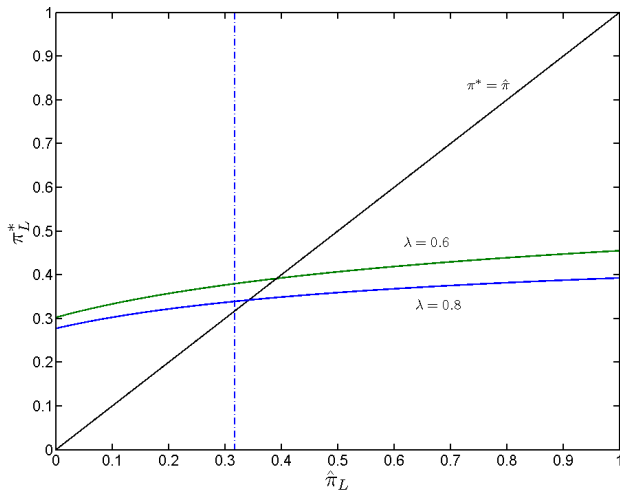
π_L^* increases as ω increases from 0.55 to 0.68.

Equilibrium



π_H^* decreases as λ increases from 0.6 to 0.8.

Equilibrium



π_L^* decreases as λ increases from 0.6 to 0.8.

Mechanism

- At certain interest rates $y - DR(h, \nu) < 0$ so firms cannot commit to honour debt
- Implies firms that are (almost) known to be type B will not get an investment
- Firms weigh benefit of lower borrowing cost against increasing cost of π knowing they might be lowering the probability of investment if they are a B type
- As ω increases correlation between signal and type increases, thus firms (and investors) learn more about their type

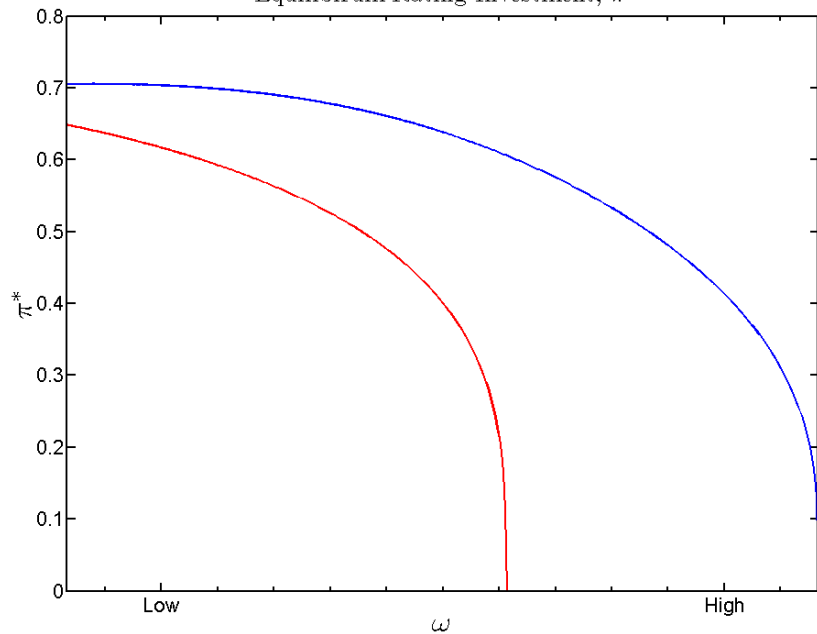
Result

Proposition

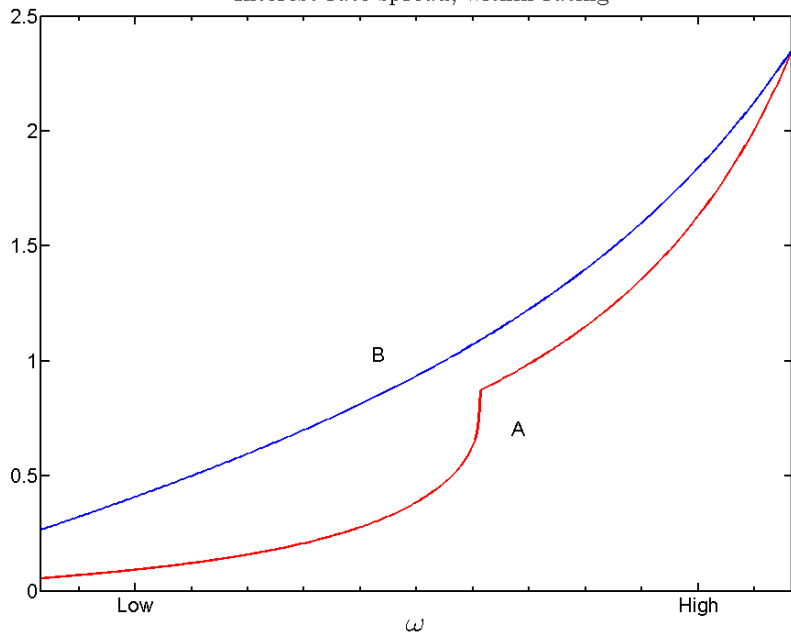
There exists some $\bar{\omega}$ such that π_H^ is decreasing in $\omega \ \forall \omega > \bar{\omega}$.*

- As ω increases, all firms choose lower π
 - ▶ leads to less A , more B ratings
- Interest rate spread increases for firms with different signal, same rating
 - ▶ testable implication

Equilibrium Rating Investment, π^*



Interest rate spread, within rating



Mergent Fixed Income Securities Database

- All of the information is sourced from prospectuses
- For CUSIP and ratings data, Mergent obtains direct feeds
- Has ratings from the 4 major agencies

Data

- 4 year bins starting in 1990, ending 2009
- Use yield to maturity spread over treasury bonds at offering
 - ▶ Captures the risk/default premium paid by firms
- Keep only fixed coupon bonds (90-100% in every year)
- Use the rating closest to offering
 - ▶ 80% within 2 days of offering, 80% before offering
- 8,755 offerings

Data

Ratings	1990-1993	1994-1997	1998-2001	2002-2005	2006-2009
All	1080	1624	2422	2071	1551
AAA/AA	223	228	287	134	91
A/BBB	719	980	1346	866	902
SG	138	416	789	1071	558

Table: Observations in each rating-period bin

Data

Ratings	1990-1993	1994-1997	1998-2001	2002-2005	2006-2009
All	410	769	1205	1208	736
AAA/AA	77	65	111	57	30
A/BBB	271	396	560	397	325
SG	69	332	583	783	408

Table: Number of firms issuing debt in each rating-period bin

Bond Types

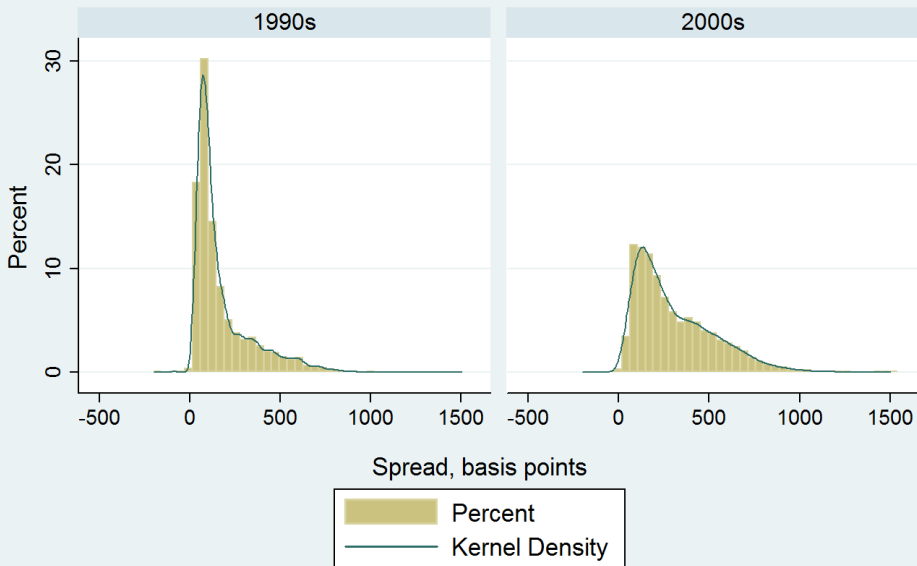
Type	1990-2009		1990-1999		2000-2009	
	#	%	#	%	#	%
CCOV	2	0.02	2	0.05	0	
CCUR	284	3.24	56	1.38	228	4.86
CDEB	7,625	87.09	3,520	87.00	4,105	87.47
CMTN	217	2.48	127	3.13	90	1.92
CPAS	391	4.47	312	7.68	79	1.68
CPIK	24	0.27	1	0.02	23	0.49
EBON	193	2.20	26	0.64	167	3.56
PS	6	0.07	6	0.15	0	
PSTK	5	0.06	5	0.12	0	
TPCS	7	0.08	7	0.17	0	
UCID	1	0.01	0		1	0.02
Total	8,755		4,062		4,693	

Price Dispersion

- As information proliferates bond prices are affected
 - ▶ Investors condition on ratings *and* public information
- Standard deviation of bond prices increasing for each rating class...
 - ▶ but so is the mean...
 - ▶ so use coefficient of variation (CV) instead
- Can test for statistical significance

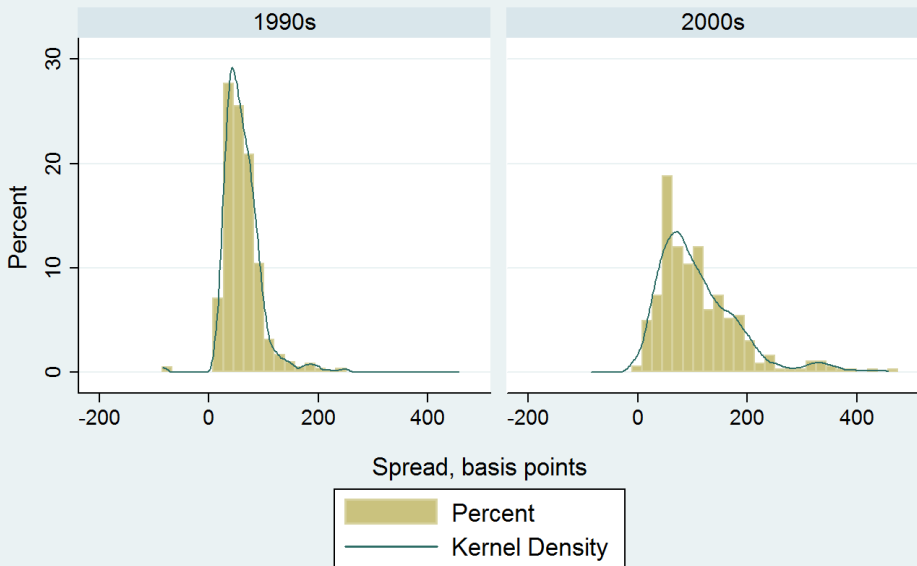
Spread Over Treasury by Decade

All Ratings



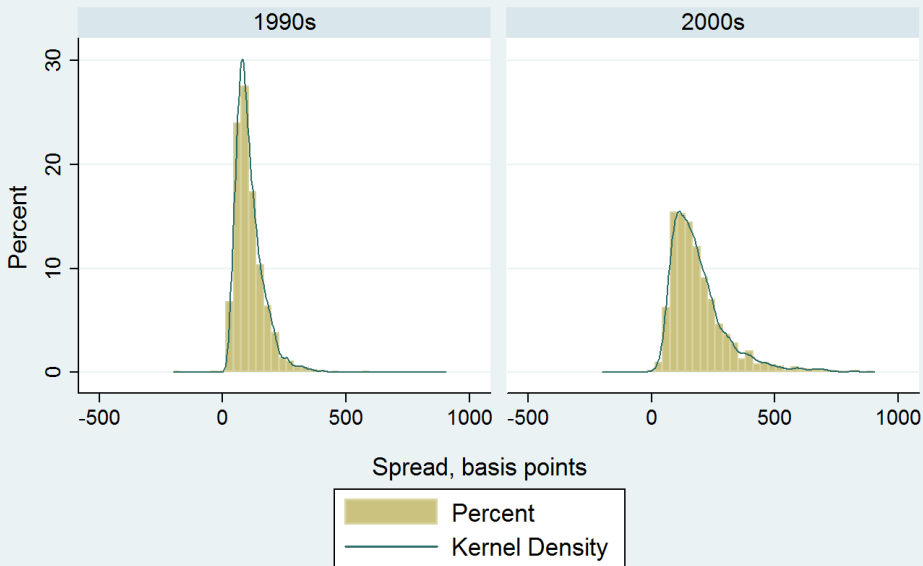
Spread Over Treasury, by Decade

AAA or AA

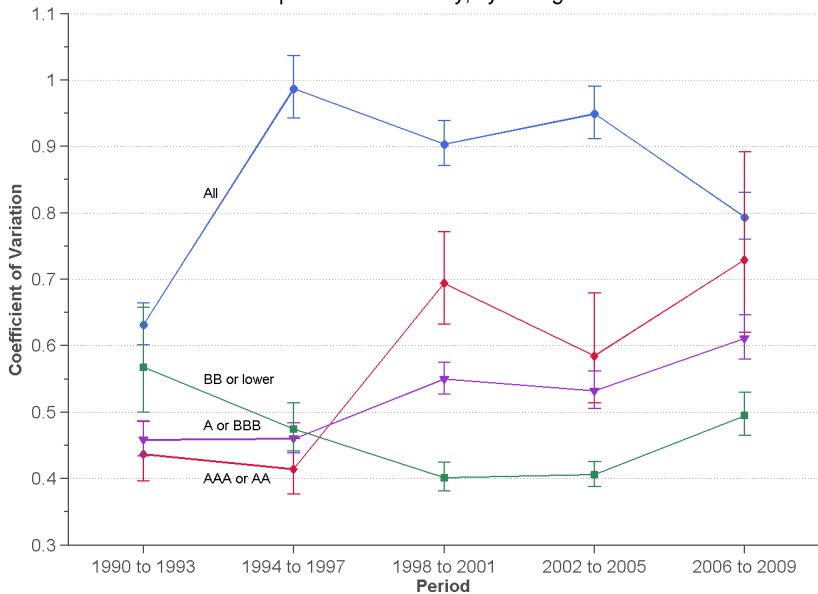


Spread Over Treasury, by Decade

A or BBB



Spread over Treasury, by Rating Class



Conclusion

- Vanishing AAAs consistent with improved information about firm quality
- Story implies an increase in bond price dispersion
- Consistent with new data:
 - ① distribution of bond ratings has shifted away from high ratings
 - ② price dispersion has increased within rating
- Changes in rating distribution aren't necessarily caused by changing CRA standards

Appendix

- Leverage ratios

▸ By Rating

▸ By Cohort

- Assets

▸ Assets

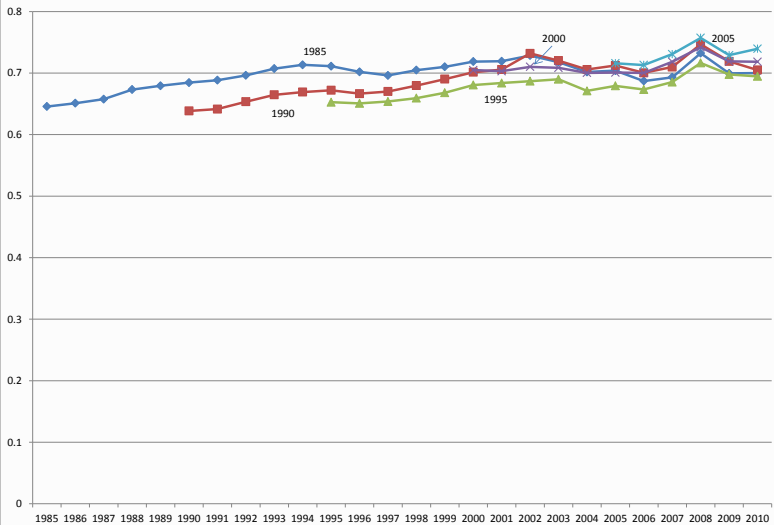
- Numbers dropping in every cohort of AAA and AA

▸ Cohorts

▸ Back

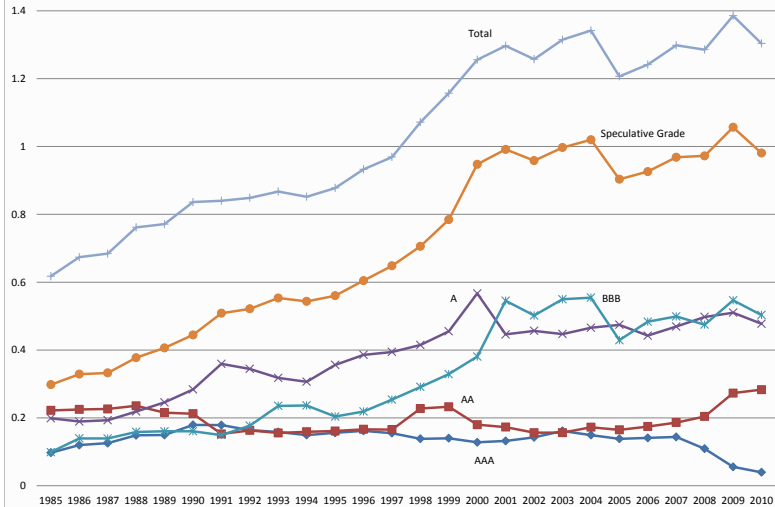
By Rating, No Financials, Book Value

Average Leverage Ratio by Cohort



Total Assets

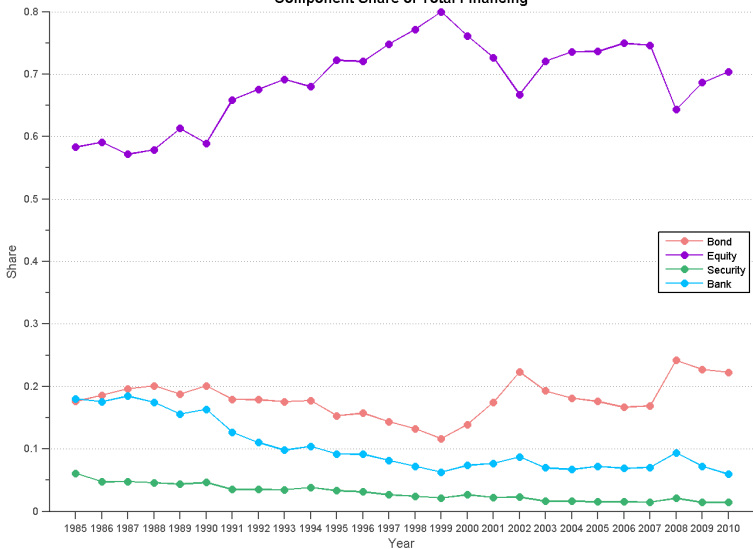
By Rating, nonfinancials



AAA and AA Cohorts

Year	1985	1990	1995	2000	2005
1985	240				
1986	220				
1987	195				
1988	170				
1989	155				
1990	140	230			
1991	130	210			
1992	120	195			
1993	110	180			
1994	105	170			
1995	100	160	190		
1996	95	150	180		
1997	90	140	160		
1998	80	125	140		
1999	70	110	120		
2000	45	70	85	150	
2001	40	60	70	125	
2002	30	45	50	95	
2003	30	42	50	90	
2004	28	40	50	80	
2005	25	38	45	75	90
2006	25	40	45	75	88
2007	25	38	45	75	85
2008	22	35	40	60	70
2009	22	32	35	50	60
2010	18	28	30	40	50

Component Share of Total Financing



► Back

CV Confidence Intervals

- Suppose r.v. X is distributed log-normal with mean μ and std. dev. σ
- We want a confidence interval on $CV = \sqrt{\text{Var}(X)}/E(X)$

$$\begin{aligned}E(X) &= \exp\left(\mu + \frac{1}{2}\sigma^2\right) \\ \text{Var}(X) &= \exp(2\mu + \sigma^2)(\exp(\sigma^2) - 1) \\ CV &= \sqrt{\exp(\sigma^2) - 1}\end{aligned}\tag{3}$$

CV Confidence Intervals

- Let $Y = \ln X$
- Y is distributed $N(\mu, \sigma^2)$ and the test statistic for σ^2 is:

$$\frac{(n-1)s^2}{\sigma^2} \sim \chi_{n-1}^2$$

- The lower and upper bounds can be defined as follows:

$$a_L \equiv \frac{(n-1)s^2}{F_{\chi^2}(n-1)^{-1}(1-\alpha/2)}$$

$$a_U \equiv \frac{(n-1)s^2}{F_{\chi^2}(n-1)^{-1}(\alpha/2)}$$

- Thus, using these bounds on σ^2 and eq. (3), the following is a $1 - \alpha$ confidence interval for the coefficient of variation of X :

$$\left[\sqrt{\exp(a_L)}, \sqrt{\exp(a_U)} \right]$$