Competition Among Rating Agencies and Information Disclosure

by

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Credit Rating Industry - Background

- Industry is dominated by small number of firms
  - S&P, Moody's, and Fitch in bond ratings
  - A.M. Best, S&P and Moody's in insurance ratings

- Possible reasons?
  - Unprofitable industry
  - Substantial entry barriers
  - Regulatory barriers
    - Demand for agency's rating depends on SEC recognition

Moody's Profitability

Credit Rating Reform Act of 2006

- Major objectives
  - Clarify the manner by which a rating agency can be listed as an NRSRO agency
  - Provide SEC
    - Greater authority to inspect agencies
    - Force agencies to discuss how they manage potential conflicts of interest
- Status
  - New rules adopted by SEC in June 2007
  - Currently 9 NRSRO firms with additional firms already making applications
    - S&P, Moody's, Fitch, DBRS, Inc., A.M. Best, Japan Credit Rating Agency, Rating and Investment Information Inc., Eagan Jones Rating Company, and Lace Financial

Goals of This Research

- Theoretical examination of entry in market for ratings
  - What is the entry strategy of a new entrant?
  - Does entry increase overall information disclosure to market participants and, if so, how?

- Empirical Analysis
  - U.S. Property & Casualty Insurance Industry early 1990's – 2000's
    - Incumbent firm – A.M. Best
    - New Entrant – Standard and Poor's
      - Issued 360 full ratings in 1992
      - Almost 800 full ratings by 2004

Literature Review - Theory

- Lizerri – RAND 1999
  - Focus is on strategic information disclosure by agency
  - Monopolist agency leads to the "Minimal disclosure rule"
    - Long term reputation plays no role
- Ottaviani and Sorensen – RAND 2006, JET 2006
  - Consider reputation concerns and revealed signals
  - Builds on earlier work by Scharfstein and Stein AER 1990
- Strausz – Int'l Jrnl of Ind. Org., 2005
  - Trade-off between collusion of agency and the rated company versus reputational concerns
  - Honesty has a high price
    - Price will exceed monopolist price point

Literature Review - Empirical

- Rating transitions
  - Altman and Kao
    - JFI 1992
  - Lando and Skoderberg
    - JBF 2002
- Ratings determinants
  - Kaplan and Urwitz
    - JB 1979
  - Blume, Lim and MacKinlay
    - JF 1998
  - Doherty and Phillips
    - JFSR 2002
- Informational content
  - Hand, et al
    - JF 1992
  - Kliger and Sarig
    - JF 2000
- Differences in ratings across agencies
  - Cantor and Packer
    - JBF 1997
  - Pottier and Sommer
    - JRI 1999

Model of Information Intermediation

- Three players
  - Insurance (Non-financial) company
  - Rating agency
  - Policyholder (Debtholders)

- Insurers differ in financial strength
  - v ~ uniform[0,1]
  - v is private information to insurers

Model of Information Intermediation

- Payoff to buyers of insurance

$$u(v) = E(v \mid I) - aVar(v \mid I)$$

  - $a > 0$ measure value of information to buyers

- When there is no information from an agency, the payoff is
  - $u(v) = \frac{1}{2} - \frac{1}{12}a$ and $u_0 \geq 0$ when $a \leq 6$
  - $a \geq 6$ means an agency providing information is necessary for there to be a market

Model of Information Intermediation

- Payoff to rating agency
  - δ = demand for ratings
  - t = per-unit fee to obtain rating

$$V = \delta t$$

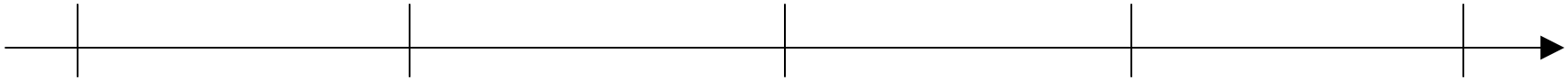
- Payoff to the insurer depends
  - Obtain rating

$$u_R(v) - t$$

  - Receive pooled payoff of unrated companies

$$u_N(v)$$

Timing in the Model



Insurer learns its type v

Agency announces its rating system

Companies decide if they want to be rated

Agency rates companies paying fee t

Payoff to rated and unrated insurers

- Two rating systems considered
  - Full disclosure
  - Aggregated disclosure

Benchmark Model
Full Information Disclosure

- Fee for rating and the demand by firms will be

$$t = u_R(v_F) - \max[u_N(v),0], \text{ and}$$
$$\delta = 1 - v_F$$

- Rating agency's objective function

$$\max_{v} (1-v_F)(u_R(v_F) - \max[u_N(v_F),0])$$

- Solution discussion
  - There exists a $v^* = v_F$ such that only insurers rated $v \geq v_F$ will choose to be rated.
    - Demand for ratings δ depends upon value of information a
    - Profits of agency always increases in the value of information

Value of Aggregated Information Disclosure

- Under full disclosure, the fee equals the willingness to pay for firms with v ≥ vFD , i.e.,

$$t = u_R(v_F) = v_F$$

- Consider an aggregated system where the agency only announces a rating category (e.g., A) and does not disclose v but instead announces the firm is in the interval $v_F + \Delta$

$$v_F + \frac{1}{2}\Delta - \frac{1}{12}a\Delta^2 > v_F$$

  - Pooling the lowest quality firm with higher quality types increase the average fee in a category, however

  - Pooling is costly when information is important

Aggregated Information - Discussion

- Aggregation always dominates full disclosure for the monopolist
- Profits for the agency generally decline as the value of information increases
- As the value of information rises, the number of rating categories will increase
  - E.g., for appropriate values of a we find a three tiered rating scheme is optimal
    - A – high quality
    - B – lower quality
    - Not rated

Entry

- Given the rating system of the incumbent, what is the market for a new entrant?

- Suppose for simplicity the new entrant will fully disclose, companies will demand a new rating under the following two conditions
  - Ex ante, the marginal benefit to the insurer must exceed zero

$$u_{RR} - u_R > 0$$

  - Ex post, the net payoff to the insurer $u_{RR} - t_e$ must be greater than the average payoff to the firms that remain in the aggregated rating category with the incumbent u_R^0

$$u_{RR} - t_e = \max[u_R, u_R^0]$$

Entry Strategy

- Suppose the value of information a is moderate
  - Incumbent therefore optimally assigns same rating to all firms with $v \geq v_M$
  - Entrant will find demand from firms with $v \geq v_e \geq v_M$

- New entrant's objective function

$$\max_{v_e} (1-v_e)\,(u_{RR} - \max[u_R, u_R^0])$$

Primary Empirical Predictions

- H_0 1: New entrant agencies will find greatest demand for their services from the highest quality companies
- H_0 2: The entrant's rating categories will be more stringent than the incumbent's
- Control 1: New entrant will find higher demand from more opaque or complex insurers
- Control 2: Conditional on the amount of information available, the new entrant will target firms where resolving the uncertainty is likely to be rewarded by the firm's consumers.

Empirical Analysis

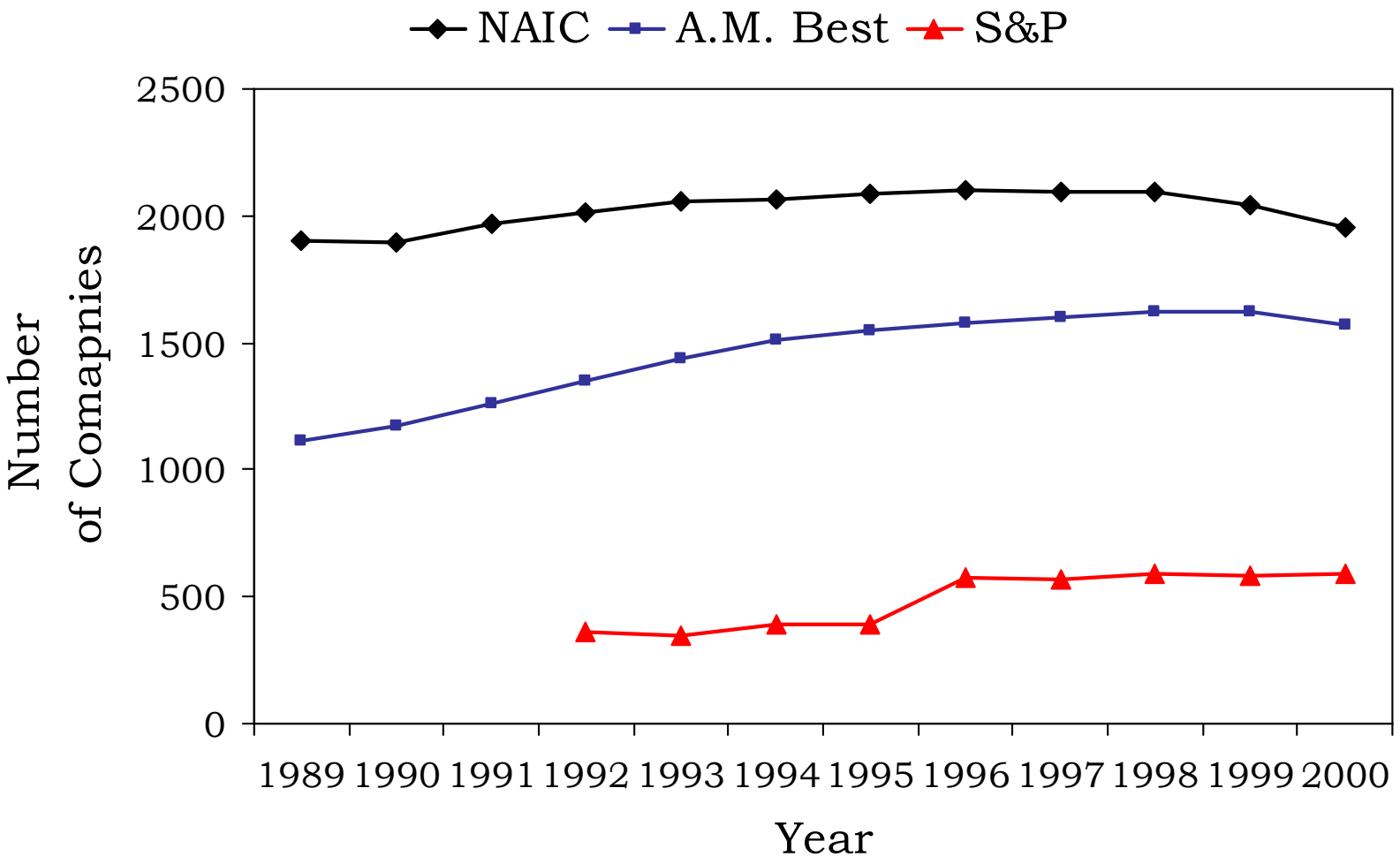
- Two methodologies are used to test the empirical predictions of the model
  - Develop benchmark to measure stringency
    - What is the standard necessary to achieve a particular rating
  - Econometric methodology

- Data is on insurer ratings by two major agencies during early 1990's through 2000

  - A.M. Best – incumbent
    - Subject to significant criticism beginning mid-1980's

  - Standard & Poor's – new entrant
    - Large well established reputation in bond rating market

Coverage of the U.S. P&L Industry
A.M. Best vs. S&P 1989-2000



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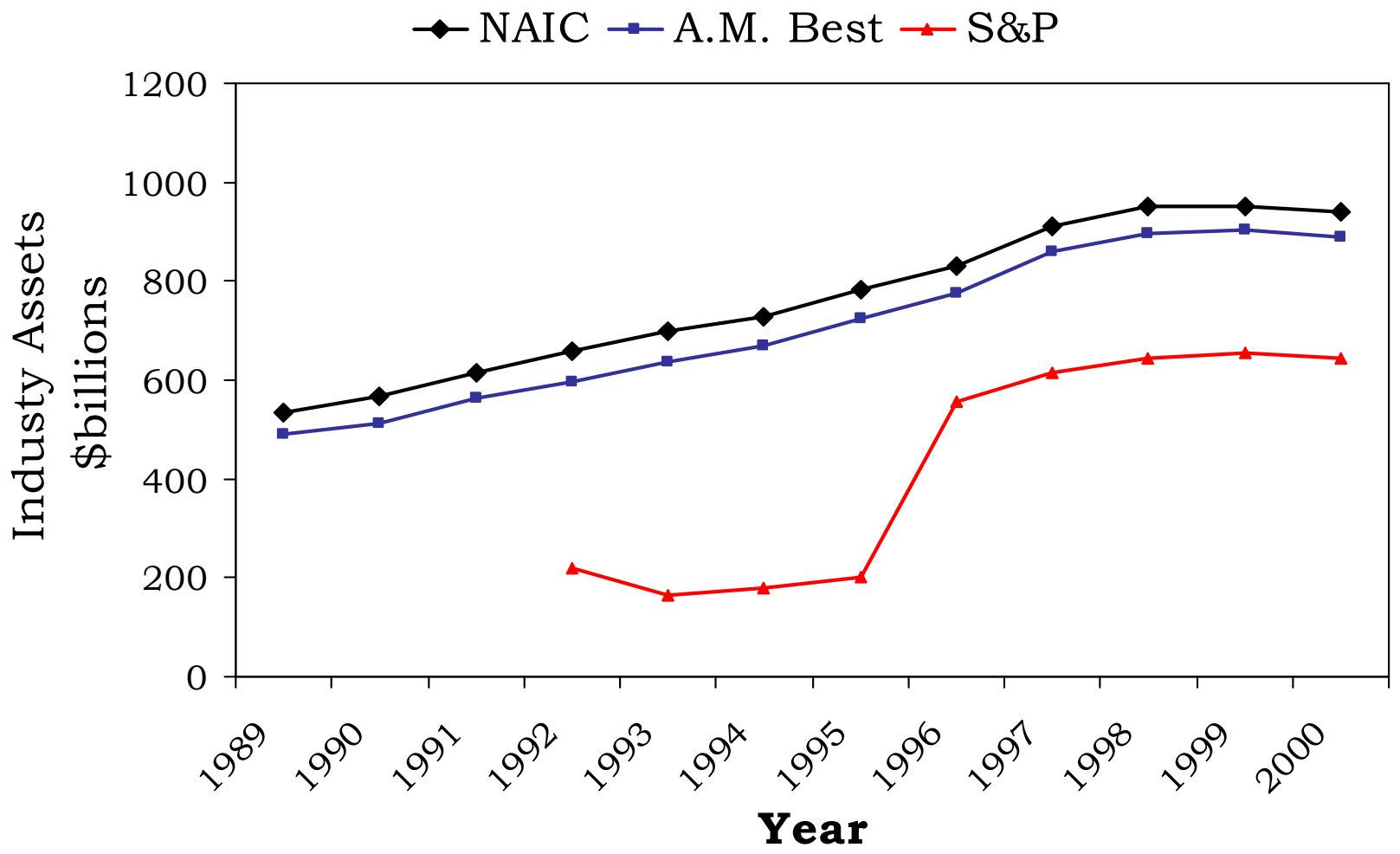


Benchmark

- Agencies stated objective of an insurer rating is to:

"provide an opinion about the insurer's ability to meet its contractual obligations to policyholders"

➔ Probability of Default

- Possible models
  - Regulatory
  - Econometric, statistical or neural network models
  - Simulation
  - Structural models

Estimating Default Probabilities

- Discrete-time hazard model
  - Shumway (2001, 2004)
  - Advantages
    - Single period models produce biased and inconsistent estimates
    - Easily accommodates time-varying covariates
  - Basic idea: estimate via MLE multi-period logit model

$$y_{it} = f(t, \mathbf{x_{it}}; \theta)$$

where y_{it} = indicator = 1 if firm i declares bankruptcy in year t+1

t = time index

$\mathbf{x_{it}}$ = vector of exp. variables used to forecast bankruptcy

θ = estimated parameter vector

$f()$ = probability mass point of failure

Implementing the Hazard Model

- Data base
  - All U.S. Property-Liability insurers
    - Source: NAIC database
    - Time period: 1989-2000
- Dependent variable: Year of bankruptcy
  - Use First Regulatory Event Year
    - E.g., Grace, Harrington and Klein, 1995
    - 300 insurers failed during 1990 - 2001
    - Sources: NAIC and A.M. Best

Explanatory Variables

- Choose variables designed to forecast bankruptcy
  - Financial Analysis and Surveillance Tracking (FAST) system variables
    - Grace, Harrington and Klein, JRI 1995
  - Two additional control variables
    - Firm size: Ln(Total Real Assets)
    - Organization form
      - Indicator = 1 if insurer is a member of mutual or reciprocal group of insurers or is mutual or reciprocal unaffiliated company

Hazard Model Database
Summary Statistics 1989 - 2000

Variable	Solvent Insurers		Insolvent Insurers		Test Statistic
	μ_{sol}	σ_{sol}	μ_{ins}	σ_{ins}	$H_0: \mu_{sol} = \mu_{ins}$
Kenney Ratio: NPW to Policyholder Surplus (PHS)	1.13	0.85	1.87	1.12	9.591
Reserves to PHS	1.03	0.94	1.64	1.25	7.237
1 Yr. Growth in NPW (%)	11.87	41.62	11.69	61.21	0.042
1 Yr. Growth in GPW (%)	11.94	37.63	11.06	52.93	0.244
Surplus Aid to PHS	2.05	4.34	6.07	7.52	7.816
Investment Yield (%)	5.71	1.38	5.41	1.55	2.778
1 Yr. Growth in PHS (%)	8.82	16.30	-8.50	19.87	12.710
Two-year Reserve Development to PHS (%)	-2.73	10.80	4.00	11.62	8.449
Gross Expenses to GPW	0.58	0.76	0.55	0.64	0.843
1 yr. Change in Gross Expenses (%)	0.05	0.47	0.09	0.58	1.006
1 yr. Change in Liquid Assets (%)	1.17	2.66	0.37	1.79	6.518
Investments in Affiliates to PHS	0.58	1.32	0.94	1.74	3.038
Receiv's. from Affiliates to PHS	0.02	0.04	0.04	0.05	5.243
Misc. Recoverables to PHS	0.03	0.05	0.07	0.08	6.691
Non-investment Grade Bonds to PHS	0.65	2.37	0.68	2.49	0.183
Other Invested Assets to PHS	0.01	0.03	0.02	0.04	3.414
Ind. = 1 if insurer has a large single agent	0.12	0.33	0.22	0.42	3.480
Ind. = 1 if insurer has a large agent they control	0.08	0.28	0.12	0.32	1.502
Losses, Exp's, Div's and Taxes Paid to Premiums	1.29	0.73	1.59	0.84	5.205
Total Assets (000000's in 2000 $)	433.65	2215.43	100.76	519.92	8.691
Ind. = 1 if insurer is part of a mutual group	0.26	0.44	0.08	0.28	8.965

Total solvent firm-year observations: 24,062
Total insolvent firm-year observations: 214

Discrete-Time Hazard Model Regression Results

Variable	Coeff. Est.	Std. Error	χ^2 Statistic	
Intercept	-0.758	1.165	0.423	
Kenney Ratio: NPW to Policyholder Surplus (PHS)	0.005	0.001	10.330	***
Reserves to PHS	189.300	121.000	2.446	
1 Yr. Growth in NPW (%)	0.006	0.003	4.394	**
1 Yr. Growth in GPW (%)	0.507	0.258	3.873	**
Surplus Aid to PHS	0.042	0.013	10.576	***
Investment Yield (%)	-0.012	0.065	0.033	
1 Yr. Growth in PHS (%)	-0.039	0.006	38.680	***
Two-year Reserve Development to PHS (%)	0.031	0.009	13.096	***
Gross Expenses to GPW	0.265	0.180	2.183	
1 yr. Change in Gross Expenses (%)	-0.120	0.196	0.371	
1 yr. Change in Liquid Assets (%)	-0.046	0.052	0.796	
Investments in Affiliates to PHS	0.000	0.000	10.974	***
Receiv's. from Affiliates to PHS	3.321	1.696	3.833	*
Misc. Recoverables to PHS	2.106	1.264	2.776	*
Non-investment Grade Bonds to PHS	0.056	0.032	3.082	*
Other Invested Assets to PHS	6.762	2.203	9.426	***
Dummy = 1 if insurer has a large single agent	0.634	0.221	8.274	***
Dummy = 1 if insurer has a large single agent	-0.321	0.287	1.248	
Losses, Exp's, Div's and Taxes Paid to Premiums	0.696	0.159	19.189	***
Ln(Total Assets in $2000)	-0.471	0.067	50.086	***
Indicator = 1 if insurer is part of a mutual group	-0.834	0.271	9.469	***
Log Likelihood Function Value	-908.62			
Pseudo R^2	25.86%			

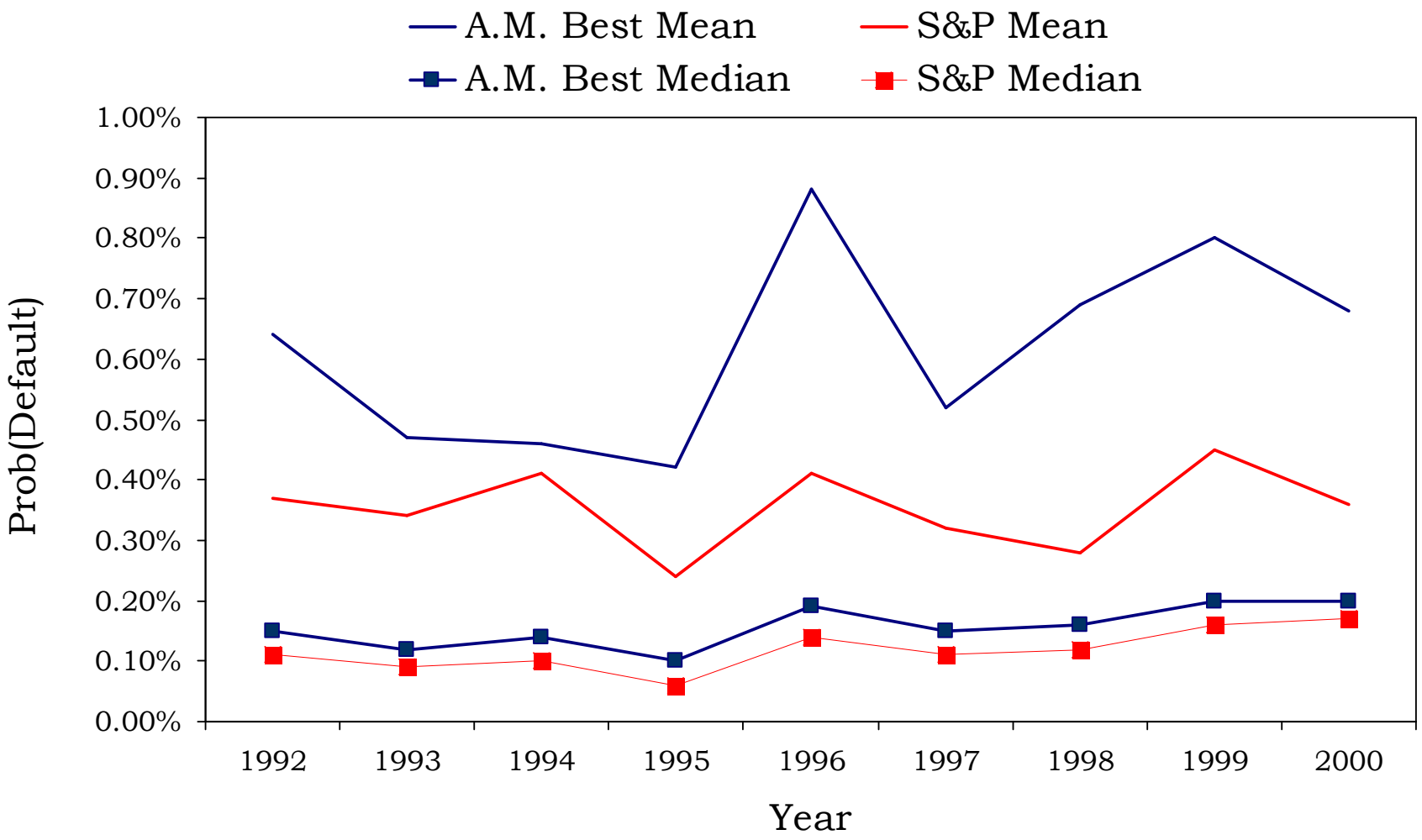
*** - significant at the 1 percent level; ** - significant at the 5 percent level; * - significant at the 10 percent level

Estimated Default Probabilities
Summary Statistics

Firm Type	Num	Ave.	Median	Std. Dev.	1st Perc.	99th Perc.
Solvent	24,062	0.81%	0.20%	2.46%	0.01%	11.08%
Insolvent	214	9.35%	4.46%	12.78%	0.09%	66.45%

Ave. Prob. of Default: 1992 – 2000

A.M. Best vs. Standard & Poor's



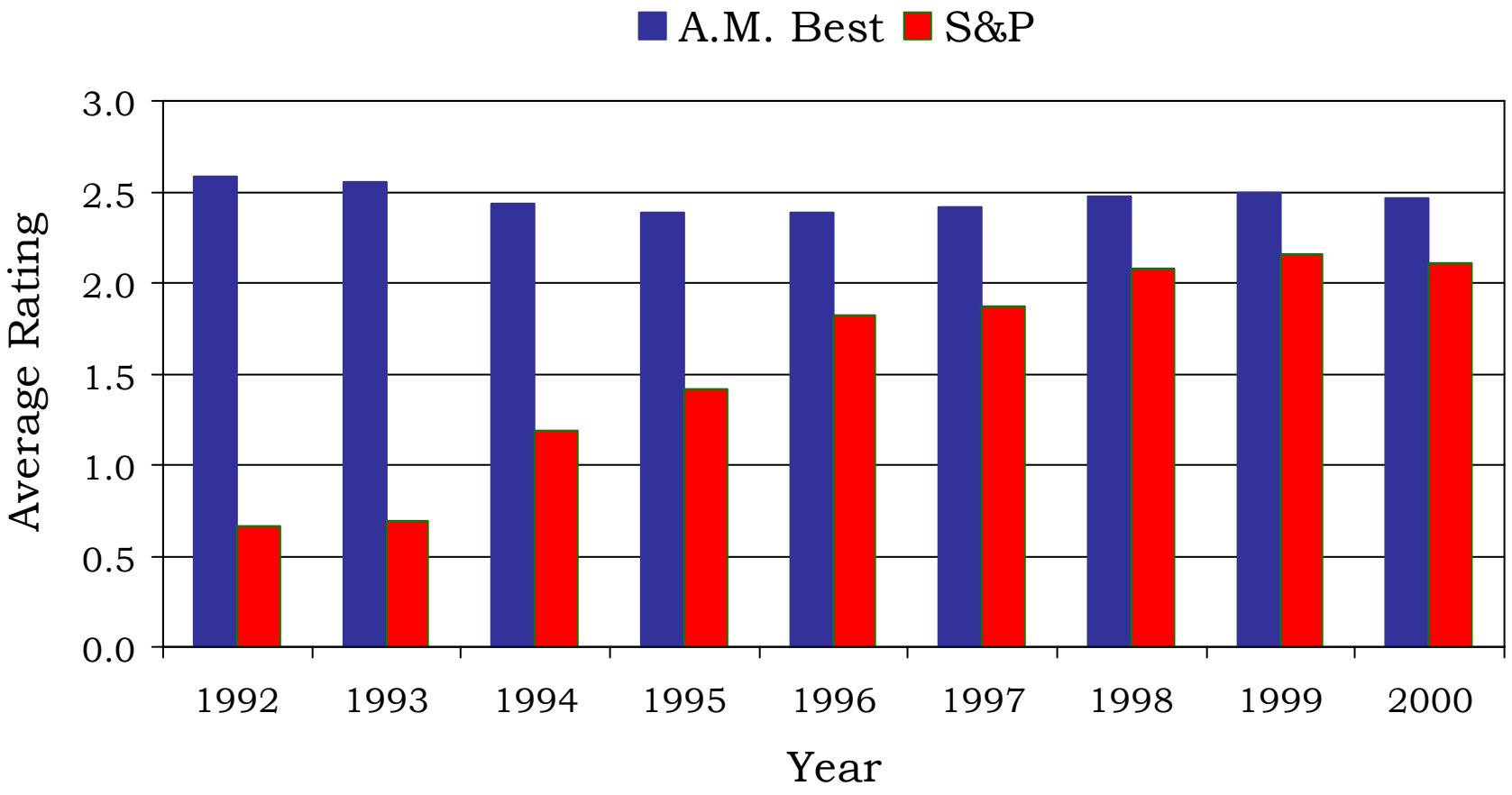
Comparing Categories Across Agencies
A.M. Best vs. Standard & Poor's

Number	Description	A.M. Best	S&P
4	Extremely Strong	A++,A+	AAA
3	Strong	A	AA
2	Good	A-	A
1	Adequate	B++,B+	BBB
0	Marginal	B and below	BB and below

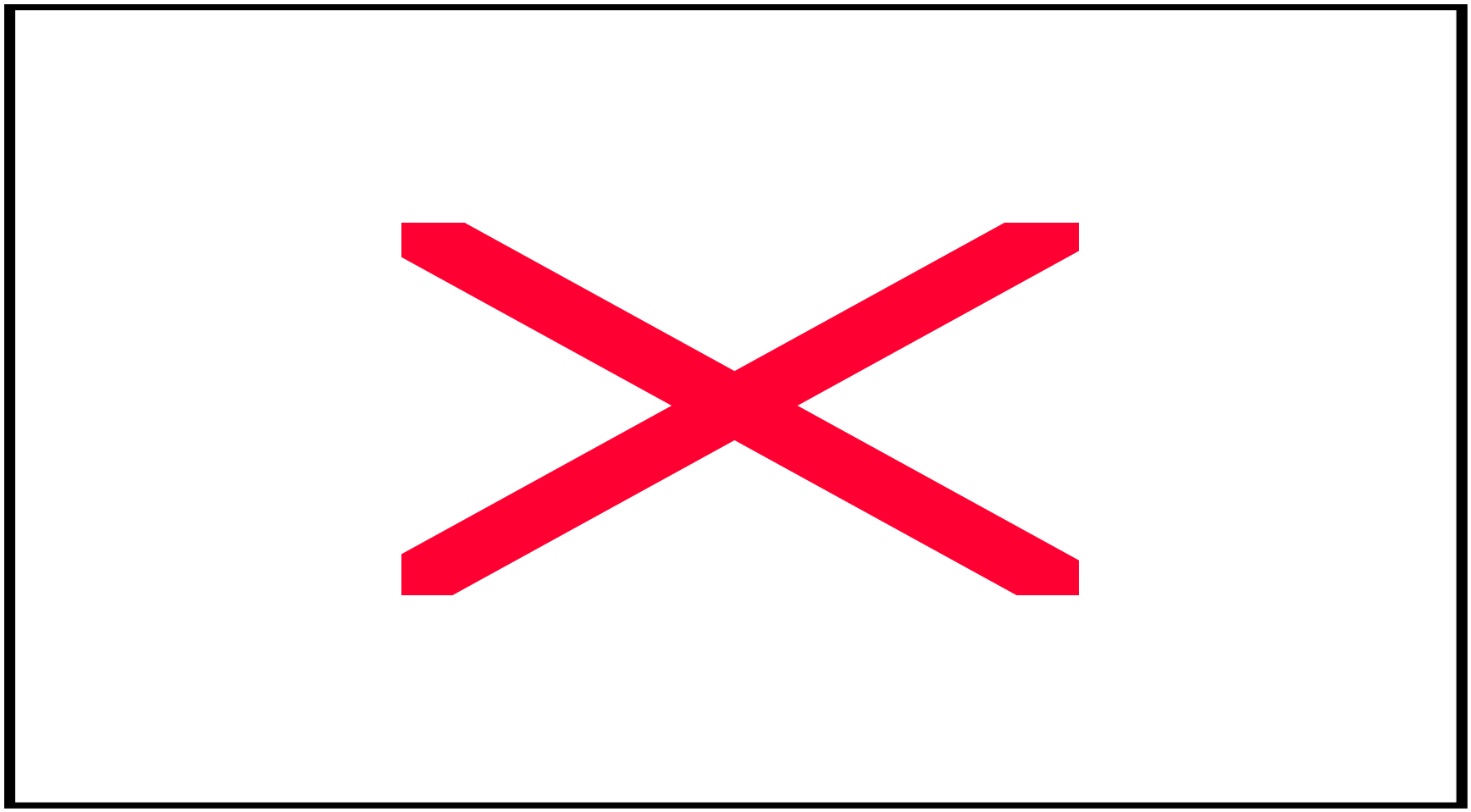
- Categorization follows the prior literature
  - Pottier and Sommer 1999
  - GAO 1994
  - Doherty and Phillips 2002

Average Ratings 1992-2000

A.M. Best vs. Standard & Poor's

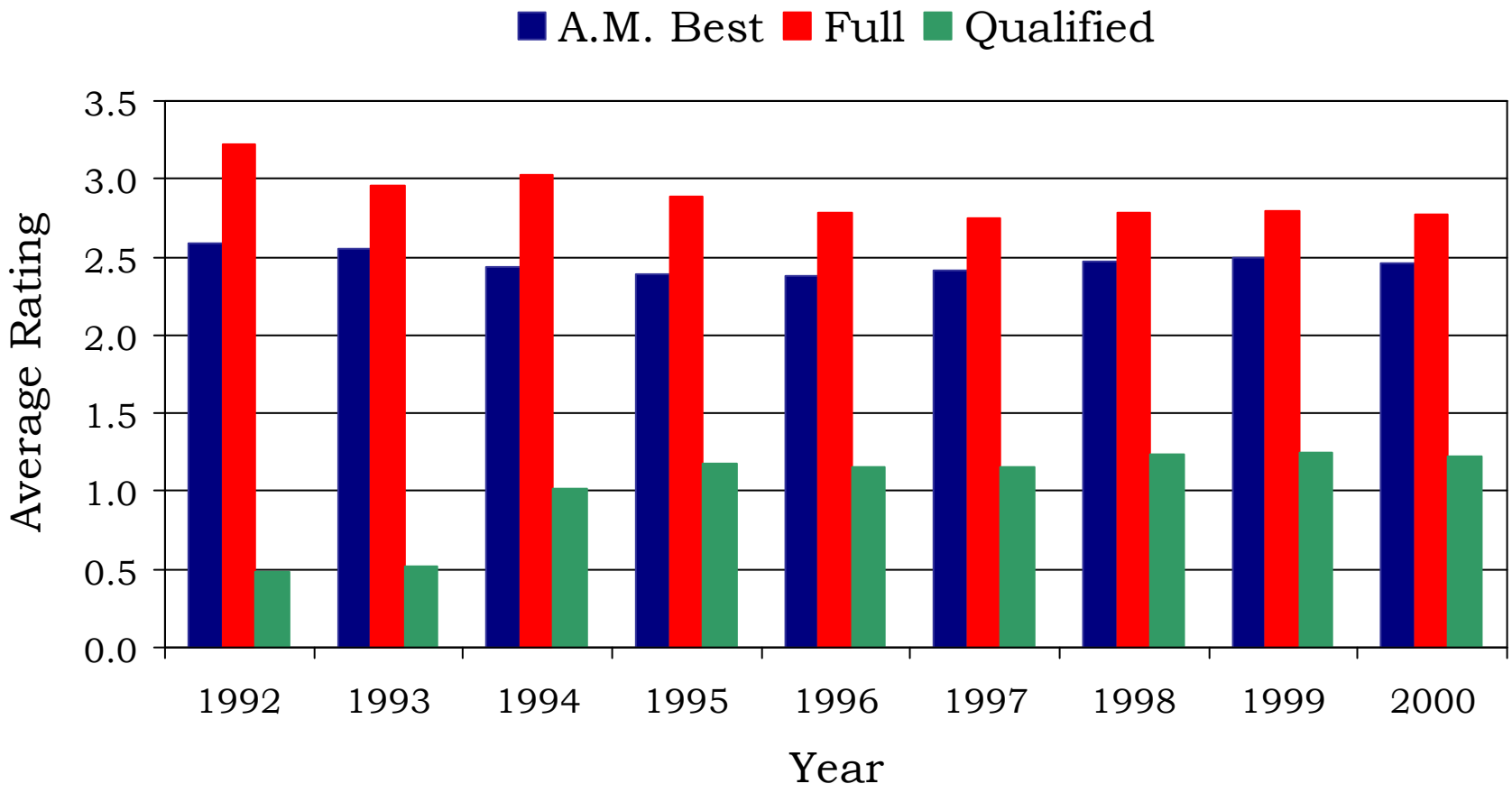


How did S&P Enter this Market? Full Ratings vs. Unqualified Ratings



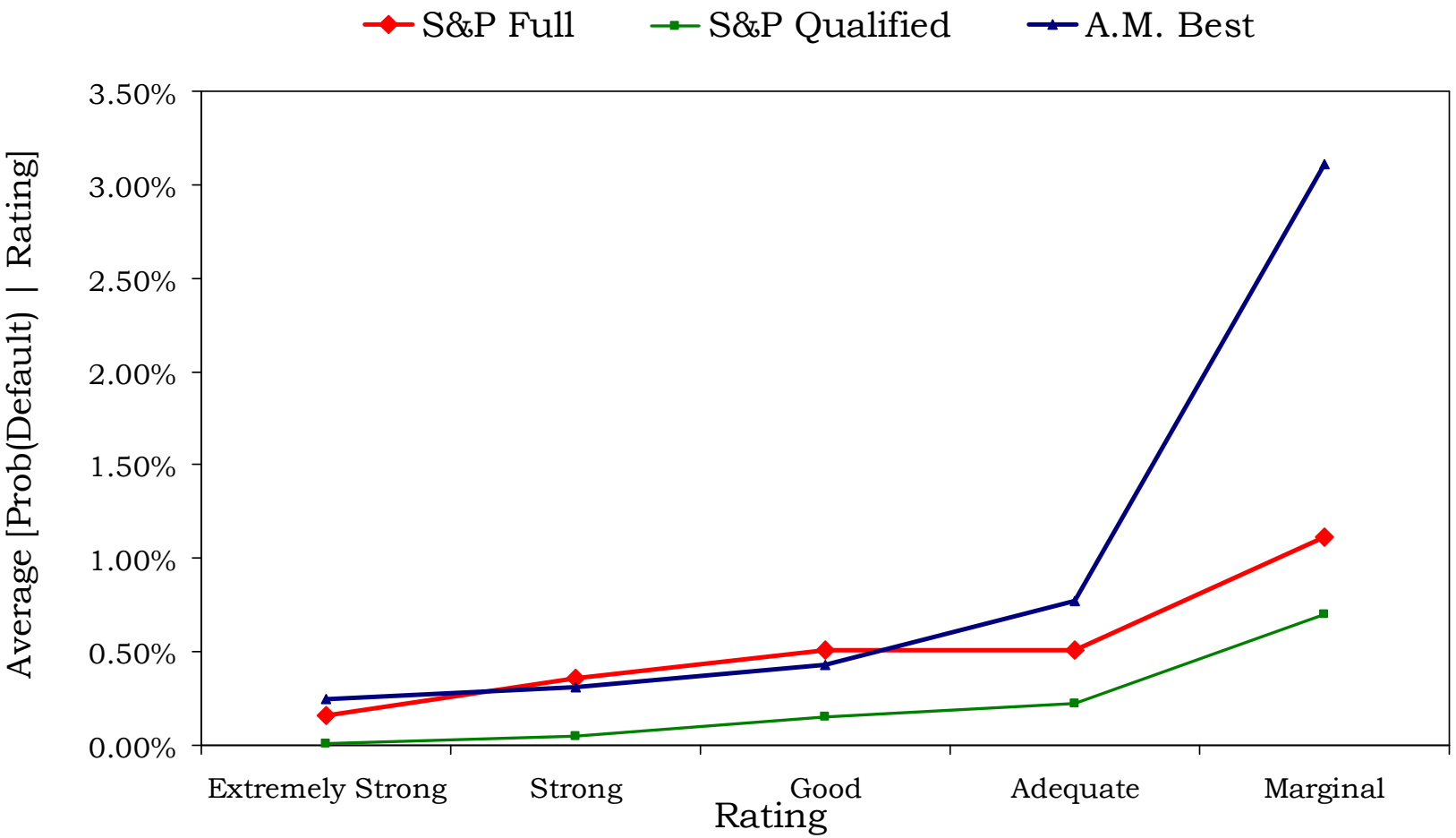
Average S&P Rating 1992 - 2000

Full Ratings vs. Unqualified Ratings



Measuring Stringency - Ave. Default Prob. by Rating Category: 1992 - 2000

A.M. Best vs. S&P Full vs. S&P Unqualified



Ratings on Common Firms

A.M. Best vs. S&P Full Rating: 1994-2000

Panel A

A.M. Best Rating	**S&P Full Rating**				
	Marginal	Adequate	Good	Strong	Extremely Strong
Marginal	1	0	0	0	0
Adequate	1	5	9	4	0
Good	0	50	143	24	6
Strong	0	4	279	111	7
Extremely Strong	0	0	56	481	266

Total number of firm-year observations: 1447

S&P and A.M. Best agree:	36.35%
S&P and A.M. Best almost agree:	58.81%
S&P rates significantly higher than A.M. Best:	0.69%
S&P rates significantly lower than A.M. Best:	4.15%

Ratings on Common Firms

A.M. Best vs. S&P Qualified Rating: 1994-2000

Panel B

	S&P Qualified Rating				
A.M. Best	Marginal	Adequate	Good	Strong	Extremely Strong
Marginal	49	23	0	0	0
Adequate	136	86	11	0	0
Good	89	200	84	2	0
Strong	112	320	291	8	0
Extremely Strong	65	139	265	78	9

Total number of firm-year observations: 1967

S&P and A.M. Best agree:	12.00%
S&P and A.M. Best almost agree:	37.67%
S&P rates significantly higher than A.M. Best:	0.00%
S&P rates significantly lower than A.M. Best:	50.33%

Empirical Model to Explain Rating Differences

- Assume the following model is used by the incumbent rating agency to determine the rating for a particular firm

$$r_{if} = \alpha_i + \boldsymbol{\beta_i X_f} + e_{if}$$

where
- r_{if} = rating issued firm f by the incumbent agency
- α_i = constant term for the incumbent agency
- $\boldsymbol{\beta_i}$ = vector of coefficients summarizing the incumbent agency's rating technology
- $\boldsymbol{X_f}$ = vector of observable information for firm f
- e_{if} = error term of the incumbent agency's rating of firm f

Empirical Model to Explain Rating Differences

- We want to explain differences between the new entrant's ratings and the incumbent's

$$r_{ef} - r_{if} = (\alpha_e - \alpha_i) + (\beta_e - \beta_i)\boldsymbol{X_f} + (e_{ef} - e_{if})$$

Difference in rating stringency

Differences in rating technology

  - Econometric problem – we only see these differences for firms that receive a rating from the new entrant

Econometric Methodology

- Heckman's (1978) sample selection model
  - First stage
    - Estimate Probit regression predicting whether firm f either
      - Requested a full rating from S&P, or
      - Was assigned a qualified rating by S&P
    - Use results of Probit regression to estimate inverse Mill's ratio for firms that receive (or were assigned) an S&P rating
  - Second state – Estimate OLS regression where

$$r_{ef} - r_{if} = \alpha_f + \gamma IMR_f + n_f$$

Hypotheses and Explanatory Variables
Probit Regressions

- H_0: Higher quality firms have stronger demand
  - Proxy by Ave. Pr[Default | A.M. Best Rating] – Pr[$Default_i$]
  - Proxy by A.M. Best rating category indicators

- H_0: More opaque/complex firms have stronger demand
  - Positively related to firm size
  - Negatively related to geographical concentration of business
  - Related to mutual organizational form
    - Negative - comparative advantage literature (see Mayers and Smith)
    - Positive – less information in the market place

- H_0: Insurers whose customer base has moderate sensitivity to information
  - Positively related to retail consumers

Hypotheses and Explanatory Variables
Second-stage OLS Regressions

$$r_{ef} - r_{if} = \alpha_f + \gamma IMR_f + n_f$$

- H_0 1: Firms with stronger likelihood of benefiting from a higher rating will self-select to receive an S&P rating
  - Test H_0: $\gamma = 0$ vs. H_A: $\gamma > 0$
- H_0 2: New entrant will have a more stringent rating system
  - Test H_0: $\alpha_f = 0$ vs. H_A: $\alpha_f < 0$

Summary Statistics

Rating Differences 1994 - 2000

	A.M Best Only	A.M. Best + S&P Qual.	A.M. Best + S&P Full	Test Statistics		
	μ_a	μ_q	μ_f	$H_0: \mu_a = \mu_q$	$H_0: \mu_a = \mu_f$	$H_0: \mu_q = \mu_f$
Ind. = 1 for Marginal AMB Rating	0.089	0.035	0.001	10.0 ***	24.7 ***	8.1 ***
Ind. = 1 for Adequate AMB Rating	0.216	0.115	0.015	11.5 ***	33.6 ***	12.6 ***
Ind. = 1 for Good AMB Rating	0.284	0.193	0.153	8.6 ***	12.0 ***	3.1 ***
Ind. = 1 for Strong AMB Rating	0.244	0.368	0.278	10.1 ***	2.7 ***	5.6 ***
Ind. = 1 for Extremely Strong AMB Rating	0.166	0.289	0.553	10.9 ***	28.0 ***	15.9 ***
Median Pr(Def. |AMB) - Insurer Pr(Def.)	-0.005	-0.001	-0.002	11.6 ***	5.9 ***	4.7 ***
S&P Rating	-	1.215	2.770			53.9 ***
A.M. Best Rating	2.182	2.762	3.368	20.0 ***	46.3 ***	18.6 ***
S&P Rating - A.M. Best Rating	-	-1.547	-0.598			33.0 ***
Ind. = 1 if insurer part of a mutual group	0.319	0.473	0.175	12.1 ***	12.4 ***	19.7 ***
Total Assets (000000's in 2000 $)	352.3	414.9	1,860.4	2.0 **	9.6 ***	9.2 ***
% NPW in Retail Lines of Insurance	0.360	0.356	0.322	0.4	3.9 ***	2.8 ***
Ind. = 1 if year = 1994	0.154	0.166	0.020	1.2	23.3 ***	15.8 ***
Ind. = 1 if year = 1995	0.163	0.162	0.036	0.2	19.2 ***	13.0 ***
Ind. = 1 if year = 1996	0.138	0.163	0.150	2.6 ***	1.2	1.0
Ind. = 1 if year = 1997	0.133	0.146	0.160	1.4 *	2.6 ***	1.1
Ind. = 1 if year = 1998	0.136	0.126	0.197	1.2	5.4 ***	5.5 ***
Ind. = 1 if year = 1999	0.137	0.116	0.220	2.5 ***	7.1 ***	7.9 ***
Ind. = 1 if year = 2000	0.138	0.122	0.217	1.8 **	6.9 ***	7.3 ***

*** - sig. at the 1 percent level; ** - sig. at the 5 percent level; * - sig. the 10 percent level; 1925 qualified S&P ; 1459 full S&P; 6587 A.M. Best

Probit Regression Results

Panel A: Regression Results	**Did Insurer Receive Qualified Rating from S&P?**		**Did Insurer Request Full Rating from S&P?**	
Independent Variable	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Intercept	-0.950 ***	-2.467 ***	-0.766 ***	-5.641 ***
Median Pr(Default | A.M. Best) - Insurer Pr(Default)	16.891 ***	8.562 ***	4.210 ***	0.144
Ind. = 1 for Adequate A.M. Best Rating		0.079		0.639 **
Ind. = 1 for Good A.M. Best Rating		0.091		1.460 ***
Ind. = 1 for Strong A.M. Best Rating		0.451 ***		1.651 ***
Ind. = 1 for Extremely Strong A.M. Best Rating		0.286 ***		2.174 ***
Ln(Total Assets in $2000)		0.063 ***		0.191 ***
Ind. = 1 if insurer is part of a mutual group		0.500 ***		-0.632 ***
% NPW in Retail Lines of Insurance		-0.141 ***		0.170 ***
State of Business of Herfindahl		-0.104 **		-0.568 ***
Log-likehood function value	-4811.9	-4592.2	-3846.8	-2879.6
Pseudo R^2	0.016	0.061	0.073	0.306
Panel B: Estimated Marginal Effects				
Median Pr(Default | A.M. Best) - Insurer Pr(Default)	16.891 ***	2.213 ***	0.848 ***	0.016
Ind. = 1 for Adequate A.M. Best Rating		0.021		0.070 **
Ind. = 1 for Good A.M. Best Rating		0.024		0.160 ***
Ind. = 1 for Strong A.M. Best Rating		0.117 ***		0.181 ***
Ind. = 1 for Extremely Strong A.M. Best Rating		0.074 ***		0.239 ***
Ln(Total Assets in $2000)		0.016 ***		0.021 ***
Ind. = 1 if insurer is part of a mutual group		0.129 ***		-0.069 ***
% NPW in Retail Lines of Insurance		-0.036 ***		0.019 ***
State of Business of Herfindahl		-0.027 **		-0.062 ***

*** - significant at the 1 percent level; ** - significant at the 5 percent level; * - significant at the 10 percent level

Second-Stage OLS Rating Difference Regression Results

Independent Variable	Did Insurer Receive Qualified Rating from S&P?		Did Insurer Request Full Rating from S&P?	
	Model 1	**Model 2**	**Model 1**	**Model 2**
Intercept	-1.8229 ***	-2.6280 ***	-1.3560 ***	-0.9242 ***
	(0.265)	(0.127)	(0.120)	(0.041)
Inverse Mills Ratio	0.1889	0.0924 ***	0.0808 ***	0.0338 ***
	1.0460	8.7910	6.4290	8.8150
R^2	0.57%	4.40%	2.91%	5.17%
Expected increase in rating due to insurer strategic choice	0.276	1.081	0.758	0.326
Estimated difference in ratings due difference in S&P vs. A.M. Best standards	-1.823	-2.628	-1.356	-0.924
Average Rating Difference S&P Rating - A.M. Best Rating	-1.547	-1.547	-0.598	-0.598

*** - significant at the 1 percent level; ** - significant at the 5 percent level; * - significant at the 10 percent level

Concluding Comments

- Theoretical model predicts
  - Entry will happen at the top of the distribution
  - Entrant's rating scheme will be more stringent
- Empirical results largely support theoretical hypotheses
  - Difference with previous literature
  - Interesting difference with qualified ratings vs. full ratings
- Policy implication – reducing barriers to entry may increase the quality of credit rating systems
  - Question - theoretically will this result hold if we relax assumptions about errors in reporting ratings