
The Cost of Biased Insurer Ratings

William L. Ferguson,^{*} James Barrese,^{**} and David T. Levy^{***}

Abstract: Numerous firms offer competing ratings of insurer financial condition. Insurance consumers, producers, and others commonly puzzle over which rating is more accurate. A 1994 Government Accounting Office (GAO) report judged the performance of a group of these insurance rating agencies. That report focused on Type I error (i.e., too high a rating on an insurer that defaults) rather than an appropriate balance between Type I and Type II error (i.e., too low a rating on an insurer that is financially stronger than indicated by the rating). This study investigates the consequences of focusing on Type I errors. We assume that both the demand and supply of insurance are related to an insurer's rating. Using these assumptions, a model demonstrates the theoretical existence of a set of optimal insurer ratings and the societal cost imposed by rating-induced deviations from this set.

INTRODUCTION

Private firms long have been recognized as providing a valuable service to the public by helping to reduce the uncertainty associated with determining relative insurer quality through furnishing opinions regarding the financial condition and stability of insurers (Denenberg, 1967; Harmelink, 1974; Ambrose and Seward, 1988). A number of firms now provide insurer ratings, and other industry information, to the public on a for-profit basis as a result of the significant financial interest the public has in the insurance mechanism. Adverse publicity in recent years associated with the relative increase in the frequency and severity of insolvency among insurers, as well as banks and other financial services firms, has led to criticism of insurer rating agencies for not being timely, among other

^{*}PhD, CLU, CPCU, ARM; Assistant Professor, Department of Economics and Finance, The University of Southwestern Louisiana.

^{**}PhD; Associate Professor, Department of Risk Management and Insurance, The College of Insurance.

^{***}PhD; Professor, Department of Economics and Finance, The University of Baltimore.

reasons (e.g., General Accounting Office, 1994). The purpose of this paper is to develop a model of rational consumer and firm behavior regarding the use of insurer rating information and to identify the consequences of bias in such information for social and public policy.

THE NATURE OF INSURER RATINGS

Insurer ratings basically convey two related types of information: information about the default or claims-paying risk of an insurer relative to other insurers and information about the risk of a given insurer relative to non-insurers. Most rating agencies base their rating opinions primarily on detailed, public quantitative information, supplemented by private information obtained through managerial interviews, surveys, and other qualitative methods and interpretations (see Klein, 1992). Rating agencies are able to generate revenues from the end users of their rating information (e.g., the public, producers) because the rating agencies bear lower search and opportunity costs as a result of their sustainable comparative advantage in collection and analysis of detailed financial and managerial information (Wakeman, 1981). Virtually every rating agency also derives significant fee revenue from the companies being rated, owing to high consumer interest and the substantial marketing, promotion, and related placement value that objective evaluations provide those companies that earn relatively stronger ratings.¹ Table 1 provides a summary distribution of insurer ratings recently issued by each of five commonly relied upon firms.²

Most of the firms report ratings that cluster in their higher classifications, with significant portions in the highest categories most generally described as "superior" and/or "excellent." These firms report a majority of ratings in their financially "secure" range, indicating that most of the insurers rated may reasonably be expected to survive and be able to meet policyholder obligations through an underwriting downturn and/or moderate deterioration in general economic condition. The distribution of ratings by one company, Weiss, is effectively centered at and normally distributed about their "C" category ("fair" financial security), but the relative financial strength of this category is further described as indicative only of current stability vulnerable to adverse change in economic conditions or other financial pressure. This company provides a relative ranking of insurers based only on pure quantitative analysis, whereas the other rating agencies assess relative risk more broadly and incorporate qualitative aspects unique to each insurer (e.g., identified through supplemental managerial interviews, questionnaires, or surveys) in order to provide more meaningful interpretation of quantitative results.

Table 1. Percent Distribution of Property/Casualty Insurer Ratings

Category		(a) Best	(b) D&P	(c) Moody's	(d) S&P	(e) Weiss
Secure	Superior/Exceptional	21	3*	7	4	<1*
	Excellent	51	42	32	10	4
	Good	17	51	41	21	29
Vulnerable	Adequate/Fair	7	2	17	26	40
	Below Average/Questionable	1	2	4	29	21
	Very Weak/Poor	1	0	0	4	4
	Nonviable/Regulatory Action	2	0	0	5	2
Number of firms with ratings		2,083	115	195	2,073	2,226

Sources:

- (a) = *Key Rating Guide*, 1997, Property/Casualty Edition (Oldwick, NJ: A.M. Best Company).
 (b) = *OneSource Property/Casualty Database*, June 1997 (Cambridge, MA: OneSource Information Services, Inc.).
 (c) = *Moody's Bank & Finance Manual*, December 1996 (New York, NY: Dun & Bradstreet Corp.).
 (d) = *OneSource Property/Casualty Database*, June 1997 (Cambridge, MA: OneSource Information Services, Inc.).
 (e) = *Property & Casualty Insurance Safety Directory*, Spring 1997 (Palm Beach Gardens, FL: Weiss Ratings, Inc.).

*Because of inconsistent nomenclature, this category reflects that portion of insurers given the highest possible rating the agency awards.

The observed clustering of insurer ratings in the higher rating classifications of most agencies exhibited in Table 1 is consistent with reasonable expectations for an industry where the financial condition and market conduct of firms are constantly monitored by regulators as well as a variety of independent rating agencies. This idea is further supported by historical data on the relative failure rates of firms in such industries. Figure 1 provides a comparison of recent insolvency rates for banks, savings and loans (S&Ls), and insurers.

Clustering of firms in the higher ratings categories also is consistent with reasonable expectations associated with the voluntary nature and fee structure of ratings utilized by most agencies. Insurer owners and managers would not be expected to incur large fees or subject their firm to time-consuming rating processes by one or more agencies without a reasonable expectation of earning ratings high enough to generate an appropriate advertising, promotion, placement, or other potential return.

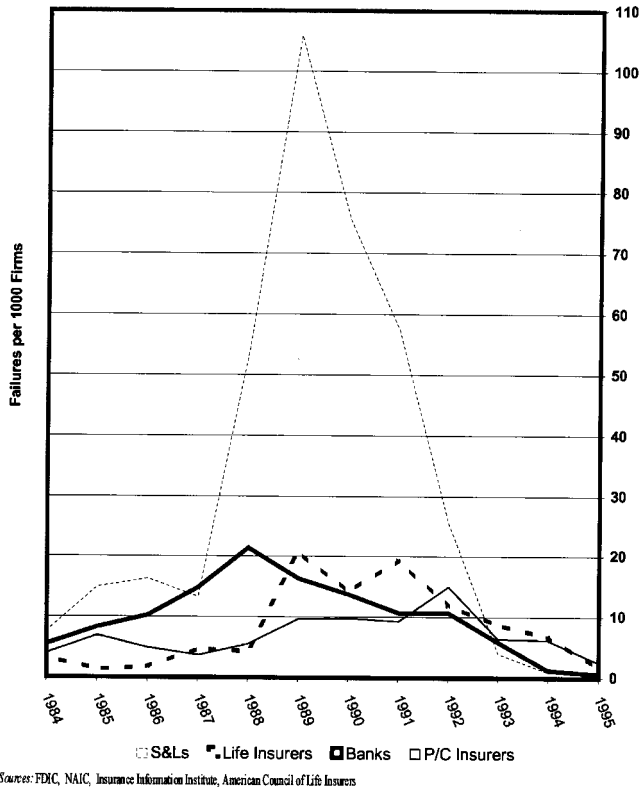


Fig. 1. Failure rates in the financial services industries.

RATING THE RATERS

A recent United States General Accounting Office report (GAO, 1994) was highly critical of most insurer rating agencies in terms of the method, scope, and timeliness of information they provide. The stated objectives of the report were to (1) “compare the rating systems of the five major raters” and (2) “determine which raters were first to report the vulnerability of financially impaired or insolvent insurers” (p. 1), where the latter “take[s] the point of view of insurance consumers” (p. 29). GAO analyzed life/health insurer ratings that were issued during the admittedly short period of August 31, 1989 through June 30, 1992 (p. 30).

The major findings of the report indicated that Weiss and Best provided the broadest coverage of the market (pp. 1, 10–11, and 21–27) and that Weiss assigned fewer top ratings (pp. 1, 12–13, and 16–17) and issued

financial vulnerability ratings faster (pp. 1–2, 14–19, and 22–27) than other agencies. Given the nature of the insurer rating philosophy employed by each agency outlined above, even the casual observer would note that the inevitable temporal delay that occurs with detailed *ex post* qualitative interpretation of interviews, surveys, and data (employed by all rating agencies with the exception of Weiss) clearly foreshadows the GAO findings. The GAO report team admits this (p. 7), but fails to recognize its significance.

Most troubling, however, is the primary GAO assumption that insurance consumers are interested only in, and thus best served by, the very first report of vulnerability in an insurer that later becomes financially impaired or insolvent. Such a goal not only displaces incentives for truth, accuracy, and equity with those of haste and paranoia, but also ignores the reality and purpose of insurer ratings. Insurer rating is by nature an imprecise science. Some ratings will be either too high or too low; some bias will exist. Rational rating agencies try to minimize this bias, for obvious business reasons.

Throughout this paper, we will refer to any situation where an insurer receives a (biased) rating that is too high for their relative risk as a “Type I” error, as characterized in the GAO report (p. 30). Conversely, we will refer to any situation where an insurer receives a (biased) rating that is too low for their relative risk as a “Type II” error. In this context, our Type I/II terminology is akin to basic statistical significance testing, and our aim is similar in that Type II errors must not be ignored. Problems associated with Type II error may be magnified if raters are unduly pressured into issuing lower ratings, or if the agencies themselves broadly increase stringency in applicable rating standards (Blume, Lim, and MacKinlay, 1998).

The GAO report focused only on those insurer ratings that were too high as revealed when an insurer later defaulted (i.e., only on Type I error).³ In contrast, we consider both aspects of potential bias (i.e., both Type I and II errors). We also generalize our results to be independent of default and perverse temporal incentives by assuming simply that insurance consumers prefer timely dissemination of non-biased rating information, regardless of provider or the underlying rating development method employed.

THE EFFECTS OF BIASED RATINGS

The goal of this paper is to examine the social effects of rating agencies disseminating biased ratings. One of the primary functions of insurer ratings is to convey information about the likelihood that an insurer will stay solvent and be able to meet its contractual obligation for coverage.

Thus, the set of insurer ratings should be inversely related to the level of firm risk. We denote the rating by R . For a specific insurer, R is considered biased if it conveys an assessment of relative risk that is either too high or too low.

Insurance is a product that represents a bundle of essentially intangible services, such as risk transfer, loss indemnification, coverage advice, inspections, and loss adjustment assistance, among others. However, when consumers buy insurance, they not only buy the protective package provided by the insurance and the ancillary services of the company and its agent(s), but also face the possibility that the insurance company might default. Like any other product, tangible or intangible, there is a possibility that it may not meet the consumers' needs because of failure of the product. Rating agencies provide consumers with at least some, albeit minimal and not guaranteed, guidance on the potential likelihood of insurer "failure."

We assume that individuals base their perception of the risk of insurer failure, at least in part, on the ratings provided by those agencies that compete in evaluating the financial condition of insurers.⁴ While no empirical studies have explicitly examined the effect of biased ratings, some studies have determined that consumers, especially corporate consumers, may reasonably be expected to react to ratings and rating changes.⁵ The insuring public and producers, who may face a significant errors and omissions (E&O) exposure placing business with an insurer that later fails, have obvious and significant financial interests in being able to obtain timely information useful in their respective decision-making processes regarding relative insurer quality. Policyholders, though somewhat insulated from the full consequences of insurer insolvency because of the existence of limited state guaranty funds, may be expected to willingly pay a premium for the products of higher-quality, safer firms (Sommer, 1996). To the extent bias exists in insurer ratings, perverse incentives and outcomes may result that can lead to significant, inappropriate transfers of wealth.⁶

THEORETICAL FRAMEWORK

Consider a utility function, $U = U(x_1, x_2)$, where x_1 is insurance and x_2 is a vector of other goods. We posit that the utility associated with x_1 is a function of the contractual loss coverage (I) and the quality of the insurer.⁷ One component of insurer quality is the likelihood that the insurer will meet its contractual obligations. An insurer's rating is a measure of the likelihood that the insurer will be able to meet its contractual obligation for coverage in the event that the individual is entitled to coverage. Thus, in determining the optimal level of I , we adopt a framework in which the

rating (R) enters indirectly into a consumer's utility function: $U = U(I, R, x_2)$.⁸

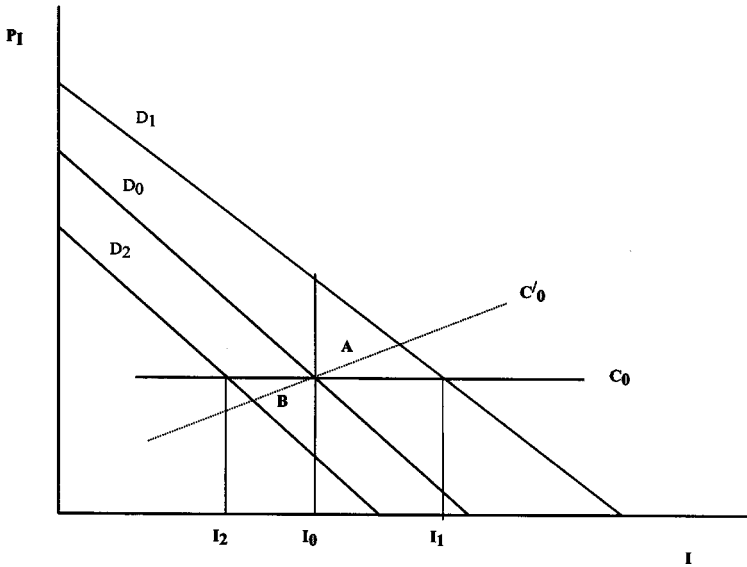
We assume that a consumer's perception of insurer solvency or claims-paying risk is influenced by the ratings assigned by rating agencies, and we approach the socially optimal level of I in terms of informational content to consumers. We also posit that the rating is an argument in the production function of x_1 , but it is sufficient that there be either a demand or a supply effect. That is, we begin with a somewhat unrealistic assumption that ignores responses made by insurers to rating practices. In particular, if rating agencies exaggerate the effect of default risk, then insurers may respond by reducing default risk. If the set of ratings is too low (i.e., overestimates the true level of insurer risk—the Type II error), both supply and utility may be lower than the socially optimal level. At the margin some insurance purchases will not be made and some of the risks involved will not be undertaken, resulting in a lower level of output and utility than that associated with the set of correct ratings.

MODEL OF CONSUMER/INSURER BEHAVIOR

The demand for insurance can be derived from the conditions for utility maximization subject to a budget constraint. Given separate implicit and independent prices associated with the amount of insurance and the risk of failure, the cost of insurance to a potential insured increases with I and R . An insured's total income (M) subject to budgetary constraint thus may be written as $M = p_I I + p_R R + p_2 x_2$, where p_R is the implicit price of a rating improvement. Budget and utility assumptions combined produce a downward-sloping demand curve for I for any given level of R .

Both the supply of insurance and the rating of an insurer are derived from the profit function for individual firms. The levels of R and I are determined by the price of output (assuming a competitive market), the prices of the inputs, and a production function. We assume a positive relation between the general levels of profitability, total capital, and the rating assigned by a rating agency. For example, insurer financial risk can be reduced, which should be correlated with higher ratings, by increasing capitalization. Increasing capitalization can be accomplished with an influx of capital or, over time, by adopting more conservative underwriting practices.

Let R_0 represent the case where the insurer's rating (reported level of risk, R_0) equals the actual level of insolvency risk. For the rating set R_0 , the cost curve is equal to C_0 and the optimal amount of insurance is I_0 , as shown in Figure 2.⁹



- P_1 = price of insurance.
- C_0 = cost of insurance given actual insolvency risk consistent with an insolvency risk associated with a rating of R_0 .
- D_0 = demand schedule for insurance given a rating level R_0 .
- D_1 = demand schedule for insurance given a lower insolvency risk associated with rating level R_1 , where R_1 represents a higher rating than R_0 .
- D_2 = demand schedule for insurance given a higher insolvency risk associated with rating level R_2 , where R_2 represents a lower rating than R_0 .

Fig. 2. The demand and supply of I where R affects the level of demand only

If the actual level of risk is greater than that represented by the rating (i.e., when ratings are biased upward—the Type I error), too much insurance may be demanded. Let D_1 in Figure 2 represent this consumer demand, compared to demand D_0 when the individual is well informed about true risks. At this incorrect level of risk evaluation I_1 is exchanged. The loss to society is the difference between the costs of additional provision relative to the true value of demand, or triangle A. Similarly, there are social losses when the actual level of risk is less than the reported level (i.e., when ratings are biased downward—the Type II error). For example, if the demand associated with an erroneously low rating set is D_2 , the amount of insurance exchanged is I_2 , and the loss to society is triangle B. Although we have concentrated thus far on a constant cost of production model, it is important to note that the social losses indicated by triangles A and B still

exist under the more traditional representation of increasing marginal costs of production (i.e., the dashed line C_0 in Figure 2).

Now consider an expansion of the analysis to permit a reaction by insurers when assigned an incorrect rating. In this case, curves D_0 and C_0 (Fig. 2) represent *ex ante* expectations of the insurer. That is, we assume that insurers attempt to position themselves in the market and to achieve a target rating by manipulating underwriting standards, price, investment strategy, liquidity and the level of capitalization, among other cost factors (i.e., insurers manipulate C_0 in anticipation of earning R_0). When the rating assigned and the targeted firm risk are both R_0 , then consumers make unbiased choices (selecting I_0) and the strategy of the insurer is satisfied.

In the event of an unexpected (or biased) rating, the insurer may suffer opportunity costs and be faced with the prospect of having to reposition itself. For any firm, a rating that is incorrectly low may induce consumer choices that make it impossible for the firm to achieve its *ex ante* position and the too low rating may become justified. Similarly, for a firm that behaves responsibly, such behavior may ultimately justify a rating that is initially too high. However, for a firm that behaves irresponsibly, a rating that is too high may not become justified, though for a period of time external forces may mask the difficulty.

If a firm that initially positioned itself in expectation of R_0 receives a rating higher than expected (i.e., R_1 —the Type I error), that insurer may experience higher than anticipated demand (i.e., D_1 versus D_0). The larger applicant base, containing relatively more good risks, should allow the insurers to maintain their planned underwriting philosophy. Premium receipts likely would be higher than anticipated, reducing liquidity risk and affording the firm an opportunity to strengthen and better diversify its investment portfolio. Financially responsible firms, however, are wary of the siren song that accompanies excessive growth (Anderson and Formisano, 1988). Financially irresponsible firms, by contrast, might easily squander their unexpected, short-term bounty by ratifying a poor underwriting strategy, undertaking greater investment risk, or extracting or otherwise redirecting perceived excess capital into less than appropriate uses. Unfortunately, revelation of the true condition of a financially irresponsible firm may be delayed by such macroeconomic factors as strong market investment returns or cyclically low loss ratios.

Similarly, if an insurer that initially positioned itself as an R_0 receives a rating lower than predicted (i.e., R_2 —the Type II error), that insurer will experience lower than anticipated demand (i.e., D_2 rather than D_0). The resultant applicant pool likely will be inferior to expectation, increasing the risk of adverse underwriting results and non-competitive pricing. To compound this situation, lower than anticipated premium receipts will contrib-

ute to increased liquidity risk and also may entice the insurer to accept higher than desired investment risk. Each of these factors increases overall firm risk, possibly to the point of making the lower rating a self-fulfilling prophecy even for a financially responsible firm. However, an unrecognized financially responsible firm could be expected to be able to successfully reveal their strategic resource allocation so as to earn a more appropriate rating at the earliest opportunity and reduce the social costs that have occurred in the interim. A financially irresponsible firm may never recover, and although this may be appropriate, the cost to insureds, affected guaranty funds, and taxpayers might be substantial.

Finally, because of structural delays inherent to both the financial reporting and rating processes, the relative impact of Type I and II rating errors may differ across industry segments. For example, a Type II error may adversely impact a life insurer to a lesser extent than a property insurer because the longer term, lower claim frequency characteristics of life products might afford a life insurer time to reposition itself and attain a more appropriate higher rating. Offsetting this advantage, however, are factors such as the voluntary nature of life products in general and the concomitant need for reputational capital, as well as greater dependence upon investment returns to honor long term commitments to policyholders. Again, Type II rating errors can be costly and should not be ignored or downplayed.

POLICY IMPLICATIONS

Balancing Type I and II errors is a problem involving value judgments. The apparent preference of some groups, and advocated in the GAO (1994) study, is to weigh real costs to society solely from the perspective of insurer insolvency avoidance. This perspective essentially regards rating agencies that issue lower ratings or downgrades more rapidly as preferable, regardless of the actual number of incorrect or untimely issues. Unfortunately, this method fails to recognize potentially significant costs that may result from the dissemination of ratings that can impede productive economic activity. Further, the GAO position raises questions about the proper role of government regulation affecting the public interest in general, and in particular to private rating services.

Should the government publicly endorse ratings that overemphasize default risk? One justification for such a policy might be that buyers of insurance underestimate the risk of insurance company default or of losses. There is some evidence that consumers underestimate losses with small probabilities; these arguments typically have been applied to the insurance

of rare events, such as earthquakes, hurricanes, and nuclear disasters (see, for example, Slovic et al., 1977). Another justification for the biased approach might be that insurer default should be minimized because it leads to external effects on other parts of the economy. While it may be desirable from a social point of view to avoid insurer bankruptcy, this aim is inappropriately accomplished through the provision of biased information to consumers and/or investors.

CONCLUSION

We do not argue the value of timely information and decisive action on the part of rating agencies and consumers, nor do we advocate governmental involvement in the rating process. The model we present, however, indicates that biased rating information, and governmental advocacy of such ratings without clear and convincing justification, may have significant unintended effects on the provision of insurance and associated social costs. The purpose inherent to insurer rating agencies regarding accurate evaluation and interpretation of complex quantitative and qualitative information over time implies that in the end the process of issuing financial ratings is still more art than science. The non-guaranteed nature of individual insurer ratings implies that *caveat emptor* will remain the bane of the insuring public, producers, and other end-users of insurer rating information. Encouraging bias in rating information does not serve the public interest well.

NOTES

¹For example, Weiss Ratings, Inc. places great promotional and advertising emphasis on deriving revenue solely from end-users and not from rated insurers. However, the relative strengths and weaknesses of this or any of the myriad other potential marketing strategies available to and employed by individual rating agencies do not directly influence the model, analysis, or results we develop in this paper.

²The A.M. Best Company has provided industry information and insurer quality ratings since 1899. Duff & Phelps Credit Rating Co. has provided research and ratings on various corporate, structured, and sovereign financial instruments since 1932 and insurer financial ratings since 1986. Moody's Investors Services published information on industrial and corporate securities as early as 1900, initiated the rating of individual railroad bonds in 1909 (expanding to municipalities in 1914), and by 1924 covered virtually the entire U.S. bond market, but did not begin rating insurer financial condition until 1986. Standard & Poors Corporation has rated individual bond issues since 1923, but began rating insurer condition only in 1983. Weiss has rated various financial institutions since 1971, but began issuing insurer ratings only in late 1989.

³GAO (1994, p. 29) states "[b]y comparing raters' timing in assigning 'vulnerable' ratings to

insurers that became financially impaired or insolvent, we placed the most value on reducing the likelihood that an insurer would be rated 'secure' when it should have been rated 'vulnerable.' We realize that this placed less value on reducing the likelihood that an insurer would be rated 'vulnerable' when it should have been rated 'secure'."

⁴Other researchers also have adopted this approach. For example, Winter (1982) specifies a consumer's utility function with the insurer rating as an argument of the function.

⁵Recent papers on the usefulness, impact, or implications of insurer ratings include Ambrose and Seward (1988), Ambrose and Carroll (1994), Cowan, Power, and Singh (1994), Pottier (1997), and Singh and Power (1992). Aspects of these studies involve the idea that insurer ratings affect behavior of some economic players.

⁶For example, Sommer (1996) asserts that riskier insurers receive lower prices for their products. This essentially reduces their relative market premium share, unjustly rewarding such firms for their risk with lower guaranty fund premiums and further compounding the moral hazard associated with owner abuse of flat-rate guaranty protection. Biased ratings delay discovery and resolution of such problems in risky firms, and unfairly burden less risky firms.

⁷This is a sufficient, but not necessary, condition for the derivation of the results claimed in this paper.

⁸We assume that the utility function is increasing in each of its arguments and that each argument is subject to diminishing returns. For simplicity, we also assume that the marginal value of the amount of insurance and the marginal value of the risk of failure are independent (i.e., $U_{I,R} = 0$).

⁹Optimal is defined in the sense that the marginal value of R in terms of the representative individual equals the marginal cost of R to insurers. We assume that level of risk can be reduced at constant costs over the relevant ranges so lower levels of risk have constant effects on the costs of increasing the industry level of I (i.e., leading to shifts in the curve with no effect on slope), which is consistent with the findings of Grace and Timme (1992), among others.

REFERENCES

- Ambrose, Jan M., and Anne M. Carroll (1994) "Using Best's Ratings in Life Insurer Insolvency Prediction," *Journal of Risk and Insurance*, 61 (2), pp. 317-327.
- Ambrose, Jan M., and J. Allen Seward (1988) "Best's Ratings, Financial Ratios and Prior Probabilities in Insolvency Prediction," *Journal of Risk and Insurance*, 55 (2), pp. 229-244.
- Anderson, Dan R., and Roger A. Formisano (1988) "Causal Factors in P-L Insolvency," *Journal of Insurance Regulation*, 6 (4), pp. 449-461.
- Babbel, David F. (1981) "Inflation, Indexation, and Life Insurance Sales in Brazil," *Journal of Risk and Insurance*, 49 (1), pp. 111-135.
- Beresford, Peter T. (1984) *An Analysis of the Impact of Life Insurance Cost Disclosure*. Doctoral Dissertation, University of Pennsylvania.
- Blume, Marshall E., Felix Lim, and A. Craig MacKinlay (1998) "The Declining Credit Quality of U.S. Corporate Debt: Myth or Reality?," *Journal of Finance*, 53 (4), pp. 1389-1413.
- Bouzouita, Raja, and Arthur J. Young (1998) "A Probit Analysis of Best Ratings," *Journal of Insurance Issues*, 21 (1), pp. 23-34.

- Brotman, Billie A. (1989) "Reliability of Best's Insurer Ratings Using Financial Information Published in the Annual Report," *Journal of Insurance Issues*, 12 (1), pp. 58-70.
- Cowan, Arnold R., Mark L. Power, and Ajai K. Singh (1994) "Timeliness of Best Rating Changes for Stock Life Insurance Companies," presentation at the annual meeting of the *Southern Risk and Insurance Association*.
- Denenberg, Herbert S. (1967) "Is 'A-Plus' Really a Passing Grade?," *Journal of Risk and Insurance*, 34 (3), pp. 371-384.
- Grace, Martin F., and Stephen Timme (1992) "An Examination of Cost Economies in the U.S. Life Insurance Industry," *Journal of Risk and Insurance*, 59 (1), pp. 72-115.
- Harmelink, Philip J. (1974) "Prediction of Best's General Policyholder Ratings," *Journal of Risk and Insurance*, 41 (4), pp. 621-632.
- Klein, Robert W. (1992) *Insurance Company Rating Agencies: A Description of Their Methods and Procedures*. Kansas City: National Association of Insurance Commissioners.
- Phelps, Charles E., and Steven T. Parente (1990) "Priority Setting in Medical Technology and Medical Practice Assessment," *Medical Care*, 28 (8), pp. 703-723.
- Pindyck, Robert S., and Daniel L. Rubinfeld (1976) *Econometric Models and Economic Forecasts*. New York: McGraw-Hill.
- Pottier, Steven W. (1997) "Life Insurer Risk Characteristics and the Rating Process," *Journal of Insurance Issues*, 20 (2), pp. 111-130.
- Singh, Ajai K., and Mark L. Power (1992) "The Effects of Best's Rating Changes on Insurance Company Stock Prices," *Journal of Risk and Insurance*, 59 (2), pp. 310-317.
- Slovic, Paul, Baruch Fischhoff, Sarah Lichtenstein, Bernard Corrigan, and Barbara Combs (1977) "Preference for Insuring Against Probable Small Losses: Insurance Implications," *Journal of Risk and Insurance*, 44 (2), pp. 237-258.
- Sommer, David W. (1996) "The Impact of Firm Risk on Property-Liability Insurance Prices," *Journal of Risk and Insurance*, 63 (3), pp. 501-514.
- United States Government Accounting Office (1994) *Insurance Ratings: Comparison of Private Agency Ratings for Life/Health Insurers*, GAO/GGD-94-204BR. Washington, DC: 29 September 1994.
- Wakeman, L. Macdonald (1981) "The Real Function of Bond Rating Agencies," *Chase Financial Quarterly*, 1, pp. 18-26; as reprinted in Clifford W. Smith (1989) *The Modern Theory of Corporate Finance*, 2nd ed., pp. 410-415. New York: McGraw-Hill.
- Waldfoegel, Joel (1993) "The Deadweight Loss of Christmas," *The American Economic Review*, 83 (5), pp. 1328-1336.
- Winter, Ralph A. (1982) "On the Choice of an Index for Disclosure in the Life Insurance Market: An Axiomatic Approach," *Journal of Risk and Insurance*, 49 (4), pp. 513-538.
- Zeckhauser, Richard, and William Samuelson (1989) "Status Quo Bias and Insurance Markets," *John Liner Review*, 3 (2), pp. 38-50.