ACTUARIAL STANDARDS BOARD

Actuarial Standard
of Practice
No. 25

Credibility Procedures Applicable to Accident and Health, Group Term Life, and Property/Casualty Coverages

Developed by the
Casualty and Health Committees of the
Actuarial Standards Board

Adopted by the
Actuarial Standards Board
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November 1996

TO: Members of Actuarial Organizations Governed by the Standards of Practice of the Actuarial Standards Board and Other Persons Interested in Credibility Procedures

FROM: Actuarial Standards Board (ASB)

SUBJ: Actuarial Standard of Practice No. 25

This booklet contains the final version of Actuarial Standard of Practice (ASOP) No. 25, *Credibility Procedures Applicable to Accident and Health, Group Term Life, and Property/Casualty Coverages.*

Background

Credibility procedures are an integral part of ratemaking and prospective experience rating, and may be used for other purposes. The purpose of this ASOP is to provide guidance to actuaries in the assignment of credibility values to data.

The Subcommittee on Ratemaking of the Casualty Committee of the ASB named three members as a task force to prepare an initial draft of a proposed standard on credibility procedures. A task force of the Health Committee of the ASB was also starting to draft a proposed actuarial standard of practice on credibility procedures, this one for accident and health (A&H) coverages. The ASB decided that a single standard of practice on credibility, which would apply to both casualty and A&H coverages, would be preferable, if it were possible to develop such a text.

The initial casualty draft of this proposed standard was shared with the health task force, which then collaborated with the casualty task force to extend the draft to encompass A&H coverages. In the process, the draft was also expanded to apply to group term life and to address applications of credibility to subjects other than ratemaking. This revised draft was reviewed by the full Casualty Committee and the full Health Committee, and some changes were indicated. The two task forces addressed the committee members' comments and made revisions to the document, which was then sent again to the full operating committees for approval to submit it to the ASB for exposure. The board approved the exposure draft at its April 1994 meeting.

Adoption

The proposed standard was exposed to the profession in April 1994, with a comment deadline of August 31, 1994. A total of thirty-three comment letters were received. The comment letters were reviewed by representatives of the Casualty and Health Committees (a newly formed task force) and the text was revised in response to these comment letters. Summaries of substantive issues from the comment letters, and the drafting task force's responses to such issues, are summarized in appendix 2.

Format Changes

A number of format changes have also been made since publication of the exposure draft. The ASB voted in May 1996 to change the format of all future actuarial standards of practice. Thus, sections 3 and 4 of the exposure draft now form an appendix titled, Background and Current Practices. (Appendix 1 of this standard contains sections 3 and 4 of the exposure draft.) Further, sections 5 and 6 of the exposure draft have now been renumbered as sections 3 and 4. The new sections 3 and 4, along with sections 1 and 2, now form the actual standard of practice. The heading *Preamble*, which used to apply to the first four sections of the standard, has been deleted. The board made these format changes to help the reader distinguish between a standard's substantive requirements and language intended for general information.

The ASB voted in October 1996 to adopt the final standard.

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ACTUARIAL STANDARD OF PRACTICE NO. 25

CREDIBILITY PROCEDURES APPLICABLE TO ACCIDENT AND HEALTH, GROUP TERM LIFE, AND PROPERTY/CASUALTY COVERAGES

STANDARD OF PRACTICE

Section 1. Purpose, Scope, Cross References, and Effective Date

1.1 Purpose—The purpose of this standard of practice is to provide guidance to actuaries in the selection of a credibility procedure and the assignment of credibility values to sets of data including subject experience and related experience.

1.2 Scope—This standard of practice is applicable to accident and health; group term life; property/casualty coverage; and other forms of non-life coverage. This standard also applies to other financial security systems, such as self-insurance, that provide similar coverages. This standard is applicable to ratemaking, prospective experience rating, and whenever else credibility procedures are used, including but not limited to reserve analysis, solvency testing, and asset/liability management. This standard does not apply to annuities and pension plans.

If the actuary departs from the guidance set forth in this standard in order to comply with applicable law (statutes, regulations, and other legally binding authority), or for any other reason the actuary deems appropriate, the actuary should refer to section 4.

1.3 Cross References—When this standard refers to the provisions of other documents, the reference includes the referenced documents as they may be amended or restated in the future, and any successor to them, by whatever name called. If any amended or restated document differs materially from the originally referenced document, the actuary should consider the guidance in this standard to the extent it is applicable and appropriate.

1.4 Effective Date—This standard will be effective with respect to work performed after March 1, 1997.

Section 2. Definitions

The definitions below are defined for use in this actuarial standard of practice.

2.1 Credibility—A measure of the predictive value in a given application that the actuary attaches to a particular body of data (*predictive* is used here in the statistical sense and not in the sense of predicting the future).

2.2 Full Credibility—The level at which the subject experience is assigned full predictive value based on a selected confidence interval.

2.3 Ratemaking—The process of determining estimates of the expected value of future costs per unit of exposure for a group of risks.

2.4 Related Experience—Premiums, losses, exposures, expenses, and other relevant data for coverage analogous to the coverage under consideration. Other data may include established rate levels or differentials. Such data might also be external to the client or the insurance industry, such as information on trends in claim costs or patterns of claim frequencies.

2.5 Subject Experience—Premiums, losses, exposures, expenses, and other data relevant to the coverage under consideration.

Section 3. Analysis of Issues and Recommended Practices

3.1 Purpose and Use of Credibility Procedures—The purpose of credibility procedures is to blend information from subject experience with information from one or more sets of related experience when the subject experience does not have full credibility in order to improve the estimate of expected values, or to determine when the subject experience should have full credibility and blending is unnecessary. Credibility procedures should be used in ratemaking and prospective experience rating and may be used for other purposes. When such procedures are used, this standard applies.

3.2 Selection of Credibility Procedures—The actuary should be familiar with and consider various methods of determining credibility. The models selected may be different for different applications. The selection process involves testing the tentatively selected model and possibly revising the model. The actuary should recognize those instances where it may not be cost-effective to perform this selection process. Additional calculations may be made to satisfy applicable regulations and statutes.

The actuary should select credibility procedures that do the following:

a. produce results that are reasonable in the professional judgment of the actuary,

b. do not tend to bias the results in any material way,

c. are practical to implement, and

d. give consideration to the need to balance responsiveness and stability.

3.3 Choice of Related Experience—The actuary should use care in selecting the related experience that is to be blended with the subject experience. Such related experience should have frequency, severity, or other determinable characteristics that may reasonably be expected to be similar to the subject experience. If the proposed related experience does not or cannot be adjusted to meet such criteria, it should not be used. The actuary should apply credibility procedures that appropriately reflect the characteristics of both the subject experience and the related experience.

3.4 Informed Actuarial Judgment—Any credibility procedure requires the actuary to exercise informed judgment, using relevant information. The use of credibility procedures is not always a precise mathematical process.

3.5 Homogeneity of Data—In carrying out credibility procedures, the actuary should consider the homogeneity of both the subject experience and the related experience. Within each set of experience, there may be segments that are not representative of the experience set as a whole. Credibility can sometimes be enhanced by separate treatment of these segments.

Section 4. Communications and Disclosures

4.1 Disclosure—Whenever appropriate in the actuary's professional judgment, the actuary should disclose the credibility procedures used. Any material changes from prior credibility procedures should be disclosed and supported. The actuary should also include the following, as applicable, in an actuarial communication:

a. the disclosure in ASOP No. 41, *Actuarial Communications*, section 4.2, if any material assumption or method was prescribed by applicable law (statutes, regulations, and other legally binding authority);

b. the disclosure in ASOP No. 41, section 4.3, if the actuary states reliance on other sources and thereby disclaims responsibility for any material assumption or method selected by a party other than the actuary; and

c the disclosure in ASOP No. 41, section 4.4, if, in the actuary's professional judgment, the actuary has otherwise deviated materially from the guidance of this ASOP.

Appendix 1

Background and Current Practices

Note: This appendix is provided for informational purposes, but is not part of the standard of practice.

Background

Classical Credibility Procedures—Classical credibility procedures make assumptions as to the form of the underlying probability distribution. From this probability distribution function, the appropriate number of claims, amount of premium, or other measure of volume is calculated such that the probability that the subject loss experience is within a specified percentage (k) of the expected value is equal to a specified parameter (P). This measure of volume is the full credibility standard.

Empirical Credibility Procedures—Empirical credibility procedures measure the statistical relationships of the subject experience to its mean and to comparable experience of prior experience periods, without reference to the underlying distribution.

Bayesian Credibility Procedures—Bayesian analysis procedures merge prior distributions representing the statistical information of the related experience with the statistical information of the subject experience to produce posterior distributions that reflect both. Bayesian credibility procedures provide a least squares approximation to the mean of the a posteriori distribution that would result from a Bayesian analysis.

Historical Development—The concept of credibility has been a fundamental part of actuarial practice since the beginning of the profession. Applications of credibility procedures have recognized the traditional concerns regarding the proper balance between responsiveness and stability. Early discussions of credibility tended to focus on estimating mean claim frequency using classical and empirical credibility procedures. The earliest recorded paper on this subject, "How Extensive a Payroll Exposure Is Necessary to Give a Dependable Pure Premium," was published by Albert H. Mowbray in Volume I of the *Proceedings of the Casualty Actuarial and Statistical Society* (published by the Casualty Actuarial Society in 1914). Later writers have developed formulas for the credibility of claim severity and for the credibility of total losses including Bayesian credibility procedures. Credibility concepts have also been used in other actuarial work.

Current Practices

Historical Bases—The most commonly used bases for determining credibility are numbers or amounts of claims, losses, premiums, and exposures.

Credibility Procedures for Ratemaking—The sample size required for full credibility may be based on the variance of an assumed underlying probability distribution. If using an assumed frequency distribution, the actuary usually adjusts the required sample size to recognize variation in claim size or other factors.

Credibility Procedures for Prospective Experience Rating—Prospective experience rating formulas assign credibility to actual experience of a single risk or a group of risks (the subject experience). In some instances, the subject experience may be subdivided into different components, for example, primary and excess losses, with different credibility levels appropriate for each piece.

Partial Credibility—Partial credibility is used in a weighting process to combine the subject experience with relevant related experience when the subject experience is determined to be not fully credible. Several common practices are used to determine partial credibility. A common practice is to use a selected fractional exponent of the ratio of the volume of subject experience—such as claims, expected losses, premiums, or exposures—to the full credibility standard. Another common practice is to use a ratio $N/(N + K)$, where N is the volume of subject experience and K is a constant that may be derived from variances in the subject and related experience. The $N/(N + K)$ formula is sometimes modified for those applications where the possibility of attaining full credibility is desired.

Appendix 2

Comments on the Exposure Draft and Committee Responses

The proposed standard of practice was exposed for review in April 1994. Thirty-three comment letters were received. A task force of representatives from the Casualty and Health Committees reviewed these comments and reached the following conclusions. Summaries of substantive issues raised in the comment letters are in lightface, and task force responses are in **boldface**.

Section 1. Purpose, Scope, and Effective Date

Section 1.2, Scope—Concerns were expressed that the scope was too restrictive and should be expanded to all actuarial practice that relies on experience data. **Although the scope was modified slightly, the substance of the text was not changed since it was found to be adequately inclusive. In response to other concerns, the text was streamlined.**

Section 2. Definitions

Section 2.1, Credibility—It was suggested that *credibility* should be defined such that it is relative to another body of data. **In order to avoid eliminating the use of classical credibility, the text was changed to include these ideas, but to still permit the use of classical credibility.**

Section 2.2, Experience Period—**Since this definition is not used within the standard, the task force decided to remove it from the definitions section.**

Section 2.3, Full Credibility (now section 2.2)—Concerns were expressed that no data will have sufficient volume to have full credibility. **The text was changed to clarify that full credibility is based on a selected confidence interval.**

Section 2.4, Manual Ratemaking (now section 2.3 and titled Ratemaking)—Concerns were expressed that sections 2.4 and 2.6 were inconsistent. Also, the reference to "subject experience" was considered unnecessary. **The term defined was changed from *manual ratemaking* to *ratemaking*. The reference to "subject experience" was removed, and the definition in section 2.6 (*rate*) was incorporated into the definition of *ratemaking* (see section 2.3 of this text).**

Section 2.5, Process Variance—As noted by several individuals, this term is not used in the standard. **The term was deleted. The remaining sections were renumbered.**

Section 2.6, Rate—**Since this term is not used in the standard, it was deleted. The remaining sections were renumbered.**

Section 2.7, Related Experience (now section 2.4)—Concerns were expressed about the type of data that could be used as related experience and whether the phrase *with predictive value* was necessary. **To help clarify the data question, the term *relevant* was added before *data* in the first sentence of the definition. The phrase *with predictive value* was deleted.**

Section 3. Background and Historical Issues (now in Appendix 1 under Background)

Section 3.1, Background—It was suggested that a section describing the goal of the use of credibility procedures be included. **This section was merged with the old section 3.5 into a new section, Historical Development, which can be found in appendix 1. The purpose of credibility procedures is discussed in the new section 3.1.**

Section 3.2, Classical Credibility Procedures (this section can now be found in appendix 1)—Suggestions were received recommending that the probability distribution should be identified as underlying the subject experience. Suggestions were also received that the method of determining the full credibility standard should be more precisely described. **The task force changed the text in response to these comments.**

Section 3.3, Bayesian Credibility Procedures (this section can now be found in appendix 1)—It was suggested that the terms *Bayesian* and *classical* are out-of-date and should be replaced with *least squares* and *limited fluctuation*. **The terms *Bayesian* and *classical* are more widely understood, particularly in a historical context.**

It was also suggested that the description of Bayesian credibility was actually a description of Bayesian analysis, and that Bayesian credibility procedures produce a least squares approximation to the results of a Bayesian analysis. **The task force changed the text in response to this comment.**

Section 3.4, Empirical Credibility Procedures (this section can now be found in appendix 1)—Suggestions were received questioning the need for a discussion of empirical credibility. **The discussion of empirical credibility distinguishes *distribution free* methods from nontraditional Bayesian credibility procedures that require assumptions about the underlying distribution.**

Section 3.5, Historical Development (this section can now be found in appendix 1)—Some felt that this section was biased in favor of Bayesian credibility procedures. **The section has been revised to eliminate any real or apparent bias.**

Section 4. Current Practices and Alternatives (now in Appendix 1 under Current Practices)

Section 4.1, Historical Bases (this section can now be found in appendix 1)—Concerns were expressed that the text implied that other bases are not acceptable. **The text was revised to enumerate the most common bases and to omit any comment about other bases.**

Section 4.2, Credibility Procedures for Manual Ratemaking (this section can now be found in appendix 1 under the heading, Credibility Procedures for Ratemaking)—Concerns were expressed about the paragraph referring to the variance of a cumulative loss distribution. **This paragraph was deleted. The first paragraph was revised to eliminate the differentiation between frequency and cumulative losses. The term *manual* was removed from the section title.**

Section 4.3, Credibility Procedures for Experience Rating (this section can now be found in appendix 1 under the heading, Credibility Procedures for Prospective Experience Rating)—As noted by several individuals, greater homogeneity of the related experience used in experience rating does not imply smaller required sample sizes. **The sentence referring to this matter was deleted. The term *prospective* was added to the section title.**

Section 4.4, Partial Credibility (this section can now be found in appendix 1)—Concerns were expressed regarding the term *credibility measure*. **The text was revised to use the phrase *volume of subject experience*.**

It was also suggested that generalizations of $N/(N + K)$ be mentioned and that it be specified that other practices may also be acceptable. **The text was revised to clarify that several practices are common.**

Section 4.5, Data Homogeneity—Numerous concerns were expressed that this section was potentially misleading and unnecessary. **The section was deleted.**

Section 5. Analysis of Issues and Recommended Practices (now Section 3)

Section 5.1, Estimating Future Costs (now section 3.1)—The consensus of comments received was that section 5.1 should be deleted and replaced with section 5.3, and that the language relating to *costs* and the references to the lines of business should be clarified. **Section 5.1 is now section 3.1, Purpose and Use of Credibility Procedures, and the old section 5.3 was merged with the former section 5.1. References to costs and lines of business were dropped.**

Section 5.2, Selection of Credibility Procedures (now section 3.2)—Several comments referred to Bayesian credibility and the absence of other methods. Other comments expressed concern that certain words might make compliance very difficult. The words *distort* and *any known* in section 5.2(b) were of particular concern. Other language changes were also suggested. **In addition to making several wording changes, the task force deleted the reference to Bayesian credibility. In addition, section 5.2(b) (now section 3.2(b)) has been revised to be consistent with the suggestions.**

Section 5.3, Credibility Procedures Should Reflect Experience Characteristics—**This section has been deleted and the remaining sections renumbered.**

Section 5.4, Choice of Related Experience (now section 3.3)—**The last sentence of the old section 5.3 was added to the new section 3.3.**

Section 5.5, Informed Actuarial Judgement (now section 3.4)—The suggestions indicated that the first sentence was not clear, especially the phrase beginning with *on past insurance*. **That portion of the first sentence was deleted, and the type of information required was clarified to be *relevant information*.**

Section 5.6, Homogeneity of Data (now section 3.5)—There were several suggestions on how to improve the readability of the first sentence as well as other minor language suggestions for the remainder of the section. In addition, one individual suggested that the last sentence of this section confused credibility with classification ratemaking. **The section has been rewritten, incorporating several suggestions. The last sentence was deleted.**

Section 6. Communications and Disclosures (now Section 4)

Section 6.1, Other Relevant Standards of Practice—**This section was deleted.**

Section 6.2, Credibility Selection—Several comments expressed concern that there is no single "degree of credibility" suggested by subject data. **This section was deleted.**

Section 6.3, Disclosure (now section 4.1)—Concerns were expressed that this section requires disclosure beyond the requirements of Actuarial Standard of Practice (ASOP) No. 9. **The task force does not believe that this section creates a disclosure requirement that exceeds that of ASOP No. 9.**

Both the Casualty and Health Committees thank everyone who took the time and made the effort to write comment letters. All of the letters were helpful in developing the final standard.