



ACTUARIAL STANDARDS BOARD

Actuarial Standard of Practice No. 25

Credibility Procedures

Revised Edition

**Developed by the
Credibility Task Force of the
General Committee of the
Actuarial Standards Board**

**Adopted by the
Actuarial Standards Board
December 2013**

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December 2013

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 (ASOP) No. 25

This document is the final version of a revision of ASOP No. 25 now titled, *Credibility Procedures*.

Background

The original standard, adopted in 1996, was a product of the Health Committee and the Casualty Committee of the ASB. The scope of the standard was limited to accident and health, group term life, and property/casualty coverages.

In 2011, the ASB asked the Life Committee to consider whether the scope of ASOP No. 25 should be expanded to incorporate additional practice areas. The Life Committee agreed that the scope of the ASOP could be expanded. The Board asked that a multi-discipline task force be formed under the direction of the General Committee to begin drafting an exposure draft. A task force was then created that included actuaries from the life, health, pension, and property/casualty practice areas.

First Exposure Draft

The first exposure draft of this revised ASOP was issued in September 2012 with a comment deadline of December 31, 2012. The Credibility Task Force carefully considered the 20 comment letters received and made changes to the language in several sections in response. The most significant change from the first exposure draft was the revision of section 1.2, Scope, to clarify in what situations the standard applies. In addition, the purpose and use of credibility procedures was clarified, in particular regarding the continued need for professional judgment.

Second Exposure Draft

The second exposure draft of this ASOP was issued in June 2013, with a comment deadline of September 30, 2013. Nine comment letters were received. The Task Force carefully considered all comments received and made clarifying changes to the language in several sections. For a summary of the substantive issues contained in the second exposure draft comment letters and the task force's responses, please see appendix 2. In addition, the task force made a clarifying change to the wording of the scope section to keep it appropriately focused. There were no major changes from the second exposure draft.

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The ASB thanks everyone who took the time to contribute comments on the exposure drafts.

The ASB voted in December 2013 to adopt this standard.

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The ASB establishes and improves standards of actuarial practice. These ASOPs identify what the actuary should consider, document, and disclose when performing an actuarial assignment. The ASB's goal is to set standards for appropriate practice for the U.S.

ACTUARIAL STANDARD OF PRACTICE NO. 25

CREDIBILITY PROCEDURES

STANDARD OF PRACTICE

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

- 1.1 **Purpose**—The purpose of this actuarial standard of practice (ASOP) is to provide guidance to actuaries when performing professional services with respect to selecting or developing **credibility procedures** and the application of those procedures to sets of data.
- 1.2 **Scope**—This standard applies to actuaries when performing actuarial services involving **credibility procedures** in the following situations:
- a. when the actuary is required by applicable law (statutes, regulations, and other legally binding authority) to evaluate **credibility**;
 - b. when the actuary chooses to evaluate the **credibility** of **subject experience**, or states in any related actuarial communication that **credibility** has been evaluated in accordance with this ASOP;
 - c. when the actuary is blending **subject experience** with other experience; or
 - d. when the actuary represents the data being used as statistically or mathematically credible.

If the actuary determines that the guidance in this standard conflicts with ASOP No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*, ASOP No. 35 will govern.

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.

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- 1.4 Effective Date—This standard will be effective for any professional services with respect to **credibility procedures** performed on or after May 1, 2014.

Section 2. Definitions

The terms 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 set of data (*predictive* is used here in the statistical sense and not in the sense of predicting the future).
- 2.2 Credibility Procedure—A process that involves the following:
- a. the evaluation of **subject experience** for potential use in setting assumptions without reference to other data; or
 - b. the identification of **relevant experience** and the selection and implementation of a method for blending the **relevant experience** with the **subject experience**.
- 2.3 Full Credibility—The level at which the **subject experience** is assigned full predictive value, often based on a selected confidence interval.
- 2.4 Relevant Experience—Sets of data, that include data other than the **subject experience**, that, in the actuary's judgment, are predictive of the parameter under study (including but not limited to loss ratios, claims, mortality, payment patterns, persistency, or expenses). **Relevant experience** may include **subject experience** as a subset.
- 2.5 Risk Characteristics—Measurable or observable factors or characteristics that are used to assign each risk to one of the risk classes of a **risk classification system**.
- 2.6 Risk Classification System—A system used to assign risks to groups based upon the expected cost or benefit of the coverage or services provided.
- 2.7 Subject Experience—A specific set of data drawn from the experience under consideration for the purpose of predicting the parameter under study.

Section 3. Analysis of Issues and Recommended Practices

- 3.1 Purpose and Use of Credibility Procedures—**Credibility procedures** covered by this standard are used for two purposes: 1) to evaluate **subject experience** for potential use in setting assumptions without reference to other data; and 2) to improve the estimate of the parameter under study. **Credibility procedures** may be used for tasks such as pricing, ratemaking, prospective experience rating, and reserving.

- 3.2 Selection or Development of Credibility Procedure—The actuary should use an appropriate **credibility procedure** when determining if the **subject experience** has **full credibility** or when blending the **subject experience** with the **relevant experience**. The procedure selected or developed may be different for different practice areas and applications. Additional review may be necessary to satisfy applicable law.

In selecting or developing a **credibility procedure**, the actuary should consider the following criteria:

- a. whether the procedure is expected to produce reasonable results;
- b. whether the procedure is appropriate for the intended use and purpose; and
- c. whether the procedure is practical to implement when taking into consideration both the cost and benefit of employing a procedure.

The actuary should apply **credibility procedures** that appropriately consider the characteristics of both the **subject experience** and the **relevant experience**. The actuary should consider the predictive value of more recent experience as compared to experience from earlier time periods.

- 3.3 Selection of Relevant Experience—The actuary should exercise professional judgment and use care in selecting and using **relevant experience**. Such **relevant experience** should have characteristics similar to the **subject experience**. Characteristics to consider include items such as demographics, coverages, frequency, severity, or other determinable **risk characteristics** that the actuary expects to be similar to the **subject experience**. If the proposed **relevant experience** does not meet and cannot be adjusted to meet such criteria, it should not be used.

The actuary should consider the extent to which **subject experience** is included in **relevant experience**. If **subject experience** is a material part of **relevant experience**, the actuary should use professional judgment in deciding whether and how to use that **relevant experience**.

In some instances, no **relevant experience** is available to the actuary. In this situation, the actuary should use professional judgment, considering available **subject experience**, in setting an estimate of the parameter under study.

- 3.4 Professional Judgment—The actuary should use professional judgment when selecting, developing, or using a **credibility procedure**. The use of **credibility procedures** is not always a precise mathematical process. For example, in some situations, an acceptable procedure for blending the **subject experience** with the **relevant experience** may be based on the actuary assigning full, partial, or zero **credibility** to the **subject experience** without using a rigorous mathematical model.

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- 3.5 **Homogeneity of Data**—In carrying out **credibility procedures**, the actuary should consider the homogeneity of both the **subject experience** and the **relevant experience**. Within each set of experience, there may be segments that are not representative of the experience set as a whole. The predictive value can sometimes be enhanced by separate treatment of these segments. The actuary should also consider the balance between the homogeneity of the data and the size of the data set.

Section 4. Communications and Disclosures

- 4.1 **Disclosure**—Whenever appropriate in the actuary’s professional judgment, the actuary should disclose the **credibility procedures** used and any material changes from prior **credibility procedures**. 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

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

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 was, “How Extensive a Payroll Exposure Is Necessary to Give a Dependable Pure Premium,” by Albert H. Mowbray (see 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

A variety of approaches are used in credibility procedures. In some cases, the approach is based on judgment; in other cases, mathematical models are used. Some selected mathematical credibility procedures are discussed below.

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 (r) of the expected value is equal to a specified parameter (p). This measure of volume is the full credibility standard.

One such approach that assumes that claims follow a Normal distribution is Limited Fluctuation Credibility. In this approach, partial credibility assigned to the subject experience is based on the square root of the ratio of actual claims to 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 relevant 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.

One example of the application of Bayesian credibility is Greatest Accuracy Credibility, which is also referred to as linear Bayesian credibility or Bühlmann credibility. In Greatest Accuracy Credibility, partial credibility is assigned to the subject experience using formulas of the form $n/(n+k)$, where n is the volume of subject experience and k is a parameter that may be derived from variances in the subject and relevant experience.

Emerging Practice Involving Statistical Models

More recent advancements in the application of credibility theory incorporate credibility estimation into generalized linear models or other multivariate modeling techniques. The most typical forms of these models are often referred to in literature as generalized linear mixed models, hierarchical models, and mixed-effects models. In such models, credibility can be estimated based on the statistical significance of parameter estimates, model performance on a holdout data set, or the consistency of either of these measures over time.

Credibility Bases

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

Credibility Procedures for Ratemaking/Pricing

The sample size used for full credibility sometimes is 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.

More Information

Expanded discussion of the use of credibility procedures by actuaries setting assumptions can be found in various publications of the American Academy of Actuaries, the Society of Actuaries, the Casualty Actuarial Society, and other similar actuarial professional organizations.

Appendix 2

Comments on the Second Exposure Draft and Responses

The second exposure draft of ASOP No. 25, *Credibility Procedures*, was issued in June 2013 with a comment deadline of September 30, 2013. Nine comment letters were received, some of which were submitted on behalf of multiple commentators, such as by firms or committees. For purposes of this appendix, the term “commentator” may refer to more than one person associated with a particular comment letter. The Credibility Task Force and the General Committee of the Actuarial Standards Board carefully considered all comments received, and the General Committee and ASB reviewed (and modified, where appropriate) the changes proposed by the Task Force.

Summarized below are the significant issues and questions contained in the comment letters and the responses.

The term “reviewers” in appendix 2 includes the Task Force, General Committee, and the ASB. Also, unless otherwise noted, the section numbers and titles used in appendix 2 refer to those in the exposure draft.

GENERAL COMMENTS	
Comment	One commentator stated that the ASOP does not discuss instances when applicable law requires the actuary to depart from the guidance of the ASOP.
Response	The reviewers made no change and refer the commentator to the last paragraph of section 1.2 and section 4.1(a) as well as ASOP No. 41, <i>Actuarial Communications</i> .
Comment	One commentator suggested that the ASOP should contain more specific discussion on how to consider different data sources, how to assign predictive value and reliance, and other guidance.
Response	The reviewers made no change and note ASOPs are intended to give general guidance rather than specific “how to” instructions.
Comment	One commentator suggested that wording be added to require a disclosure when the credibility of data has not been evaluated.
Response	The reviewers made no change, as they believe this would broaden the ASOP to mean that actuaries always need to consider the use of credibility procedures when the intent of section 1.2 is to limit the applicability of the ASOP to certain situations. Note: ASOP No. 23, <i>Data Quality</i> , provides guidance on selection of data.

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SECTION 2. DEFINITIONS	
Section 2.3, Full Credibility	
Comment	One commentator suggested specifying that “[a]t full credibility, the relevant experience is assigned no predictive value beyond what is already provided by subject experience.”
Response	The reviewers believe section 2.3 is sufficiently clear and made no change.
Comment	One commentator suggested that there should be a requirement that when the term “fully credible” is used, it should “be appropriately modified by describing the error tolerance and confidence level which was used to test for full credibility.”
Response	The reviewers believe the definition is sufficiently clear and made no change.
Section 2.4, Relevant Experience	
Comment	One commentator suggested defining the phrase “parameter under study.”
Response	The reviewers do not believe it is necessary to define this term.
Section 2.5, Risk Characteristics	
Comment	One commentator suggested changes to the definition.
Response	The reviewers believe that the definition is appropriate and also consistent with ASOP No. 12, <i>Risk Classification</i> , section 2.8, and, therefore, made no change.
Section 2.6, Risk Classification System	
Comment	Two commentators suggested changes to the definition.
Response	The reviewers note that the definition is appropriate and also consistent with ASOP No. 12, section 2.10 and, therefore, made no change.
SECTION 3. ANALYSIS OF ISSUES AND RECOMMENDED PRACTICES	
Section 3.1, Purpose and Use of Credibility Procedures	
Comment	One commentator suggested adding more guidance about the use of subject and relevant experience.
Response	The reviewers believe that section 3.3 provides appropriate guidance.
Comment	Two commentators point out that “valuation” is a life insurance term and suggest adding “reserving” to the list.
Response	The reviewers note that the list is not intended to be all inclusive, but note that “reserving” is likely to be correctly interpreted by all. Therefore, the reviewers are replacing the word valuation with reserving.
Comment	One commentator suggested substituting a new term for “expected value” in section 3.1, since the term is undefined and unused in the definition section.
Response	The reviewers agree and replaced the term with wording that is consistent with wording used in the definition section.

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Section 3.2, Selection of Credibility Procedure	
Comment	One commentator suggests replacing “when blending” with “when blending or grading.” Another commentator suggests moving to “when combining.”
Response	The reviewers disagree and made no change as they believe that grading is the result of blending with factors that vary by duration.
Comment	One commentator believes the wording should be expanded to address predictive modeling.
Response	The reviewers disagree and made no change. The reviewers note that this standard addresses traditional credibility theory. While predictive modeling is addressed in the appendix, it is not explicitly referenced in the standard. To the extent traditional credibility theory per the scope of this standard is used as part of predictive modeling analysis, it is up to the actuary to determine if such work is covered by the standard.
Comment	One commentator suggests a cross reference to section 4.1(a) in regards to when methodology is prescribed by law.
Response	The reviewers note that the scope section includes a reference to section 4 for the case where methodology is prescribed by law, and made no change.
Comment	One commentator suggests moving “the actuary should consider the predictive value of more recent experience” to section 3.3.
Response	The reviewers made no change and note that this guidance applies to both subject experience and relevant experience.
Comment	One commentator suggested adding a sentence describing possible alternatives to credibility procedures, which may include statistical modeling approaches.
Response	The reviewers made no change and note that descriptions of various approaches are in appendix 1.
Section 3.3, Selection of Relevant Experience	
Comment	One commentator suggests adding underwriting to the list of considerations.
Response	The reviewers believe that underwriting is implicitly included in the category of “other determinable risk characteristics” and made no change.
Comment	One commentator questions how predictive modeling fits into the discussion.
Response	The reviewers note that predictive modeling is not explicitly addressed by this standard. However, to the extent credibility procedures within the scope of this standard are used as part of predictive modeling, the standard applies.
Comment	One commentator suggests that relevant experience be required to be fully credible.
Response	The reviewers disagree and note that fully credible experience does not always exist.
Comment	Many commentators addressed the appropriateness of the second paragraph in section 3.3.
Response	The reviewers believe that the consideration is an important one, but have removed specific guidance other than to note that professional judgment is called for.

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Comment	One commentator suggested defining the word “material,” which appeared in front of the phrase “part of relevant experience.”
Response	The term “materiality” is discussed in ASOP No. 1, section 2.6, and therefore the term was not added to the definitions section in this standard.
Comment	One commentator suggested that wording should be added to “direct the actuary to assess the degree to which the relevant experience is predictive.”
Response	The reviewers disagree and made no change, and refer the commentator to section 3.4.
Section 3.4, Professional Judgment	
Comment	One commentator suggests removing the reference to zero credibility here and from the standard entirely.
Response	The reviewers disagree and note that the scope statement specifically includes certain cases of zero credibility.
Section 3.5, Homogeneity of Data	
Comment	One commentator suggests that additional wording be added to address the balance between the size of the data set and the homogeneity of the data.
Response	The reviewers agree and made the change.
APPENDIX 1	
Comment	One commentator objected to the use of the phrase “greatest accuracy credibility,” suggesting that it was not appropriate language and may sound grandiose to statisticians.
Response	The reviewers made no change to the terminology “greatest accuracy credibility” as this is the primary name given to the credibility approach that is also referred to as the Bühlmann approach (in multiple sections of the American Academy of Actuaries’ July 2008 Credibility Practice Note).
Comment	One commentator recommended changing the title “Emerging Practice Involving Generalized Linear Models” to “Emerging Practice Involving Statistical Models.”
Response	The reviewers agree and made the change.