Credibility: Theory Meets Regulatory Practice

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1. **Introduction.** The examination process requires actuaries to master the theoretical foundations of credibility theory. Ideally, this knowledge enables the actuary to apply the theory in practical settings. In practice, the actuary may be required to forego independent mathematical judgement in order to follow regulations which prescribe specific exposure or inforce counts for full and partial credibility. In this paper we will give specific examples of such regulation from various states, and discuss the positive and negative features of the regulatory approaches. The major positive feature that we have observed is the establishment of a standard operating procedure for regulated rate filings. This standardization can be helpful for a company with national exposure and a large number of state rate filings. The major negative feature is the fact that the actuary can find it difficult to apply independent judgement that provides a best fit to company experience. This difficulty is compounded by the fact that the regulations specify precise numbers for credibility, but do not contain mathematical derivations.

2. **Medicare Supplement Refund Calculation Credibility Criteria.** Medicare does not cover all of the medical costs incurred by an eligible individual. For example, there is a Part A hospital deductible of $812 and a part B copay of 20% of eligible charges. Medicare Supplement (MedSupp or MediGap) policies provide coverage for some (but not all) of the medical costs which are not covered by Medicare.

   The Omnibus Budget Reconciliation Act of 1990 (OBRA 90) established 10 standard MedSupp plans designated by the letters A-J, and required the attainment of at least a 65% lifetime loss ratio for individual policies and a 75% loss ratio for group policies. Failure to achieve the minimum loss ratio was to trigger a refund to policyholders. The development of detailed regulatory standards for this requirement is described in Peavy and Weller [3]. This was not a simple task, for it was not expected that the lifetime loss ratio be realized immediately. A stylized calculation was developed that calculated a targeted benchmark loss ratio based on premium issue history. Failure to reach the targeted benchmark would trigger a refund.

   The regulations require that refund calculations be done by plan for each state. Many individual refund calculations are based on small numbers of policies and clearly are not credible. To avoid triggering small nuisance refunds, a credibility table based on lifetime exposure was established. The table gave a tolerance that was to be added to the actual loss ratio before comparison with the benchmark.

Medicare Supplement Credibility Table

Life Years Exposed Since Inception	Tolerance
10,000+	0.0%
5,000-9,999	5.0%
2,500-4,999	7.5%
1,000-2,499	10.0%
500-999	15.0%
Less than 500	No credibility

The refund calculation standardizes operations in a simple way. The calculation of the benchmark ratio and the refund amount does not require (or allow) any independent actuarial judgement. The calculation can be put in a production spreadsheet and automated. This is helpful for national operations. Some companies administer MedSupp for different lines with exposure in most states. This can lead to hundreds of state filings each of which covers six or more plans –creating a stack of filings that can be a few feet high.

It is worth noting that the refund filing requirement leads to few refunds. National average loss ratios for individual MedSupp were 79.5% in 2000[1], and this far exceeds the 65% target. The refund calculation filing is often regarded as a bureaucratic task resulting in no action. However this can be taken as evidence that the regulations are having the desired effect.

We have not yet been able to find an actuary who can lead us to the mathematical derivation that was used to establish the credibility tolerance table.

The NAIC model regulation which includes the refund calculation can be found on the Internet at

http://www.carfra.com/products/medsupappendixb.pdf

3 **Medicare Supplement Rate Increase Filing Projections.** The Medicare Supplement refund is retrospective, and attempts to correct past overcharges due to rates that were too high. If rates are too low no refund is required but the company is permitted to file for a rate increase to cover anticipated future medical costs. In a rate increase filing for individual MedSupp, a projection is required to demonstrate that the company will maintain at least a 65% loss ratio for the entire life of the line of business. This demonstration typically relies on a deterministic spreadsheet forecast which uses current (one or two prior years) experience to establish a base loss ratio and forecasts future experience by assuming that:

[1] From the NAIC publication Medicare Supplement Loss Ratios in 2000.

a) Premiums are increased by the requested percent for one year.
b) Claims are increased by a percent equal to medical trend for one year.
c) In all future[2] years premium and trend percentage increases are equal.

If a company's recent experience in a state is fully credible, the baseline loss ratio and medical trend can be inferred from company data. In the absence of credible experience, these key parameters must be based on reasonable assumptions derived from credible sources.[3] This makes arguments over credibility crucial. For example, a company might have a current loss ratio of 110% for two thousand insureds in a state with only two years of experience. A projection with a baseline loss ratio of 110% will support a rate increase in excess of 50%, but this projection relies on the credibility of company experience. If that experience is not accepted as credible, the actuary might be forced to use a baseline loss ratio of 80% based on national experience and submit a projection that supports a substantially lower rate increase. This can lead to serious losses if rates are truly too low.

The rate filing process varies by state, unlike the refund calculation which has a uniform process with a single credibility table that is used by all states.[4] In most states the determination of credibility for rate increase filings is left to the professional judgment of the actuary. Although this may seem desirable, the rate increase credibility decision can degenerate into an unfortunate argument over subjective impressions in the absence of clearly described criteria. A few states have precluded the subjective approach by including specific credibility guidelines in their regulations. We will discuss the approaches of Florida, Texas and New Jersey.

The state of Florida addresses credibility for Medicare Supplement filings in regulation 4-149.006 (4), quoted in part below:

e) Credible Data: If a policy has 2000 or more policies in force, then full (100%) credibility is given to the experience; if fewer than 500 policies are in force, then zero (0%) credibility is given. Linear interpolation is used for inforce amounts between 500 and 2000. For group policy forms, the numbers in this definition refer to group certificates, not policies. A combination of Florida and nationwide data shall be used only if Florida data is not credible. Specific alternate credibility standards for particular lines of business shall be submitted to the Department by affected insurers no later than 4/1/94.

The regulation provides a reasonable operating approach and prevents arguments based on impression. The Florida DOI has told us that the criterion

[2] The convention is to project a "future" consisting of ten years.
[3] A common approach is to use national experience for the company as the basis for filing in a state whose experience is not credible.
[4] State regulations are initially based on NAIC model regulation, but may have modifications that lead to significant operational differences.

of 2000 inforce policies was derived using confidence intervals. Our own preliminary calculations based on a company data set indicate that the criterion of 2000 in force will give a 95% confidence interval for the loss ratio with an error of plus or minus 5%.

The state of Texas followed the lead of Florida with a similarly worded regulation (TAC 3.3307).

The state of New Jersey addresses credibility in regulation N.J.A.C. 11:4-23(g):

For purposes of complying with (c) and (d) above, premiums and claims shall refer to premiums and claims for insured residents of this state under a specific policy form. However, if the experience is based on fewer than 1,000 life years of exposure for residents of this State, then the premiums and claims shall be a weighted average of the premiums and claims for this State and national experience, where the weighting factor applied to the State experience is the square root of the ratio of "a" to 1,000 ("a" being the number of life years of exposure).

The New Jersey credibility criterion can apply full credibility to much smaller groups of policies than the Florida/Texas criterion. A Medicare Supplement line with an average of only 100 policies in force per year since 1992 will satisfy the New Jersey lifetime exposure rule for full credibility and have 0% credibility in Florida. We have not been able to find any documentation of the derivation of the New Jersey criterion.

4 **Credit Insurance and Credibility.** Borrowers buy credit insurance to cover their loan obligations in the event of death (credit life) or disability (credit disability). Credit insurance rates are state regulated and state prescribed. States publish tables of recommended maximum rates called *prima facie* rates. A company which needs to charge more than the *prima facie* rate must demonstrate this need with analysis based on credible experience.

The need for regulators to provide numerical tables with credibility guidelines is put bluntly by Gary Fagg in his book *Credit Life and Disability Insurance* [1]. "Credibility theory is helpful, but it has limited applicability to the real world without expertise and the time and ability to apply this complex statistical process. Few credit insurers have personnel with this expertise. Even most actuaries have limited knowledge about this field of statistics. In most cases, credit insurance business decisions are made by people without the availability of this expertise and are based on intuition or reliance on the few methods adopted in state regulations –methods which evolved based on available data and practical compromise rather than reliance solely on a theoretical framework."

The NAIC adopted a credibility table for its 1979-80 Model Regulation. This table gave recommended life years of exposure for a range of credibility levels for both credit life and disability. The disability insurance was broken out according to the number of days of disability required to qualify for the insurance. This table was adopted by the state of Texas for its regulation TAC 3.5603, with the addition of a 90 day column to the original table. The table from the Texas regulation is given below.[5]

Credibility Table

AVERAGE NUMBER OF LIFE YEARS

Credit Life	7 Day	14 Day	30 Day	90 Day	Incurred Claim Count	Credibility Factor Z
1	1	1	1	1	1	.00
1,800	95	141	209	327	9	.25
2,400	126	188	279	429	12	.30
3,000	158	234	349	536	15	.35
3,600	189	281	419	643	18	.40
4,600	242	359	535	821	23	.45
5,600	295	438	651	1,000	28	.50
6,600	347	516	767	1,179	33	.55
7,600	400	594	884	1,357	38	.60
9,600	505	750	1,116	1,714	48	.65
11,600	611	906	1,349	2,071	58	.70
14,600	768	1,141	1,698	2,607	73	.75
17,600	926	1,375	2,047	3,143	88	.80
20,600	1,084	1,609	2,395	3,679	108	.85
25,600	1,347	2,000	2,977	4,571	128	.90
30,600	1,611	2,391	3,558	5,464	153	.95
40,000	2,106	3,125	4,651	7,143	200	1.00

The state of Tennessee adopted a similar table.

This table was derived for the NAIC by an ad hoc committee. Notes on the construction of the table are available in the NAIC proceedings -1980, Vol.II pages 651-654 and 1981, Vol. I pages 489-505. Note that a) credibility is based on claim count only (implying an assumption of constant claim amount) and b) full credibility is given to experience with 200 incurred claims. The committee's notes indicated that the incurred claim count of 200 that was given full credibility was obtained from a case which was calculated to give an 84% probability that the observed count would be within 10% of the true

[5] The table remains in Texas regulations, but is now less used due to a new Texas regulation which allows up to 30% deviations from *prima facie* without supporting calculations.

expected count.[6] The committee acknowledged that "Two hundred claims was picked as a "political" compromise as the basis for credibility."

5 **Discussion.** Credibility theory enables the actuary to apply expert judgment to determine how company experience should be used in analysis of rating structures. In practice, the required level of expertise may not be available or there may be a need to simplify operating procedures with explicit guidelines. State regulation may provide detailed numerical criteria for credibility for this reason. We agree with the spirit of the attempts to provide guidance and clarity. We are concerned that regulatory guidelines can be found through standard channels, but the derivations of those guidelines are more difficult to find. The need for readily available derivations is more apparent if we consider actuarial standards of practice. ASOP 25 (3.4) states that "Any credibility procedure requires the actuary to exercise informed judgment, using relevant information."

References.

1. Fagg, Gary. Credit Life and Disability Insurance. CLICO Management Inc., Springfield, Ohio. 1986.
2. Herzog, Thomas. Introduction to Credibility Theory. Second Edition. ACTEX Publications, Inc.1996
3. National Association of Insurance Commissioners. Medicare Supplement Loss Ratios in 2000.
4. Peavy, Mark and Weller, Bill. Medicare Supplement Policies –Changes from OBRA 90. The Actuarial Update. January, 1992.

[6] Using the terminology of Herzog [2], we have $_{0}$=200 with error percent c=.10 and (1-_)=.84. In contrast, Herzog states (page 60) that the value $_{0}$=1082 with error percent c=.05 and (1-_)=.90 "is frequently cited in the actuarial literature as the minimum number of expected claims required for full credibility."