Comment on the CAS Working Paper

Sahasrabuddhe [2008]: *Principles of the chain ladder "method" selecting and updating claims development factors.*

by Klaus D. Schmidt

In a recent paper, Sahasrabuddhe [2008] discussed the distinction between methods and models in actuarial mathematics with particular emphasis on the chain-ladder method. In opposition to a paper of the CAS Working Party on Quantifying Variability in Reserve Estimates [2005], he proposed to merge the notion of a model into that of a method.

There is no doubt:

- A method is an algorithm which transforms data.
- A model is a set of assumptions which describe a law according to which the data are generated.

In actuarial mathematics, a model is usually a stochastic model which reflects the randomness of losses; by contrast, a method is an algorithm for the transformation of given data and is independent of the law generating the data.

As an example, let us consider the chain-ladder method. An early source for the chain-ladder method is the paper by Tarbell [1934] in which the chain-ladder method was described as an algorithm to compute reserves from a run-off triangle of cumulative losses. Much later, stochastic models have been proposed which, when combined with a suitable statistical principle of estimation, provide a justification of the chain-ladder method:

- In an unpublished paper, Hachemeister and Stanard [1975] proposed a model in which the incremental losses are independent and Poisson distributed with a multiplicative structure of their expectations, and they showed that in this model maximum-likelihood estimation leads to the chain-ladder estimators.
- Later, Mack [1994] proposed a sequential model consisting of a sequence of conditional linear models for the cumulative losses, and he showed that in this model least-squares estimation leads to the chain-ladder estimators; see also Schmidt and Schnaus [1996].
- It has been shown in Hess and Schmidt [2002] that (except for the irrelevant case in which the losses are non-random) the assumptions of these two models cannot be fulfilled simultaneously.

An assumption shared by the models of Hachemeister and Stanard [1975] and Mack [1994] is the assumption of a multiplicative structure of the expected incremental or cumulative losses. This assumption may be considered as an elementary stochastic model which in a weak sense justifies the chain-ladder method. However, the same assumption can also be used to justify other methods of loss reserving like the Bornhuetter-

Ferguson method, the loss-development method, the Cape-Cod method, and the additive method; see Schmidt and Zocher [2008]. This means that the assumption of a multiplicative structure is not particular to the chain-ladder method.

The discussion of the chain-ladder method shows that

- distinct and even contradictory models can be used to justify a given method and that
- weak models justifying a given method may justify other methods as well.

This means that in general there is no chance to attach to a given method a single model which produces the method.

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