Adapted with permission from a two-page GE Intranet article. On the following two pages is appended the course syllabus.

Leigh J. Halliwell

Advanced Reserving Training - An Intellectual Investment

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Advanced Reserving Modeling is like detective work.

Based on the success of the US Advanced Reserving Models course, The Insurance Leadership Institute hosted the Advanced Reserving Model classes for European P&C Valuation Actuaries in Munich last week.

The course trainer Leigh J. Halliwell, FCAS, an external consultant who developed the training together with GE Insurance Solutions representatives, is well aware of the direction that actuaries need to go.

His course is entitled “Advanced Reserving Models,” and in it he shows how actuaries can apply the linear statistical model to actuarial problems, especially to estimating unpaid and IBNR loss reserves. Actuaries typically apply deterministic methods to such problems, and from several point estimates they try to build a distribution of outcomes. But the distribution derives naturally from statistical modeling; this makes it the direct and logical approach.

Here is a short interview with Leigh:

Q: What made you decide to be a training consultant for this type of training?

I began to study and to apply statistical modeling in the early 1990s, while working for insurance companies. In later reinsurance and consulting positions I had less opportunity to use it, even though I wrote four actuarial papers on the subject. When I started my own consulting firm in October of 2004 I consciously decided to concentrate on that which I loved and which I deemed important. It was only natural that actuaries in companies like GE/ERC who had read my articles would want me to teach this subject as tailored to their needs. And the teacher in me is more gratified to share the knowledge than just to practice it.

Q: How did you spot this niche market?

I'm not entirely sure what this question means, so I'll answer in two ways. First, I like being different and putting myself into niches. I don't want to do what the many do, unless I've led the many into doing it. Second, many insurance companies want to specialize in niche risks, and I believe that statistical modeling provides the intellectual tools for dealing with them.

Q: How do you see the training implemented in day-to-day work?

Linear statistical modeling makes demands on the time and energy of actuaries. Even if stock models and software tools are developed, practitioners should never suppose that risks will yield their secrets to a barrage of deterministic methods. Modeling is like detective work; one must patiently search for clues and open-mindedly test hypotheses. But inquisitive actuaries should welcome the challenge, and eventually companies should realize that the underwriting results are worth the intellectual investment.

Q: How do you see this course developing in the future?

I've given the course four times in 2005, and each time I've learned something new and improved some course element. There is room for a Part 2 of the course, which would delve into more detailed and more advanced issues. Most of the course assumes the convenient and familiar framework of the loss triangle; however, it could develop in other frameworks, especially in the ratemaking framework. But like all knowledge, it becomes forgotten if not used. Therefore, in the short run I'd be happy just to help the participants to habituate themselves to statistical-model thinking. Abstraction and wider application will follow from that.

Q: How does it feel to be back in Munich again?

I spent three wonderful years working in Munich, but that ended nearly three years ago. It was wonderful to return; though much was familiar, quite a bit felt strange. Being this time a guest on assignment instead of a resident accentuated this feeling of strangeness. But I renewed some old friendships and formed many new ones. I admire the culture, manners, and training of Europeans, and they warmly receive Americans like me who appreciate and value them. I've visited many attractive cities throughout Europe and the Middle East; but of them all I've been most pleased with Munich.

The training was well received by all European valuation actuaries. Here are quotes from some of the other participants:

- *"A very well presented and interesting course, which has true practical value in the running of our business."*
- *"By introducing methods to help reserving actuaries to make genuine assessments of the variability of reserving estimates, we can improve our understanding of risk and, therefore, our ability to offer appropriate advice to management."*
- *"Very impressive how well Leigh can explain the theory in real world examples. I really enjoyed the good mix between theory and application."*
- *"The training was great. It was well balanced between theory and day-to-day work. The examples demonstrated were suitable for the business as well as for our data. The trainer has great knowledge and is an expert in his field."*

GE Insurance Solutions

Advanced Reserving Models
(Linear Statistical Modeling for Actuaries)
November 9 and 10, 2005

Outline of Preparation and Course

1. Course Preparation

2. First Morning of Course (3.5 hours)
    a. Review of preparation (1.5 hours)
    b. Construction of linear models (0.5 hours)
        i. Design matrix
        ii. Variance structure
    c. Solution of Homework Model (0.5 hours)
    d. Diagnosing the Solution (0.5 hours)
        i. How well are the observations explained?
        ii. Is the residual white noise?
        iii. Can we trust the prediction?
    e. Generalizing the model: heteroskedasticity and autocorrelation (0.5 hours)

3. First Afternoon (4 hours)
    a. Modeling the chain-ladder method (1 hour)
        i. Suitability to real data
        ii. Regression toward the mean
    b. Models versus methods (1 hour)
        i. The design matrix as a thought clarifier
        ii. Parameter estimation
        iii. Two-moment prediction
            1. Process versus parameter uncertainty
            2. What about model uncertainty?
        iv. Confidence Intervals
            1. Obtainable by method of moments
            2. Simulation with robust error distributions (advanced topic)
            3. Probabilistic answers always better than point answers
    c. Models of the BF/SB/Additive family of methods (2 hours)
        i. Simple example for illustration
        ii. First realistic loss triangle

4. Second Morning (4 hours)
    a. Additional BLUE Properties and Insights (1 hour)
    b. WC with even more realism (1 hour)
        i. Non-uniform variance by age (heteroskedasticity)
        ii. Extrapolation beyond the triangle
    c. Using knowledge other data sources (1.5 hours)
        i. Models with restricted parameters
        ii. Nth-to-Ultimate prediction
        iii. Simulation
        iv. Credibility
    d. Modeling a real GE/ERC triangle (0.5 hours)
        i. Thought process in the design
        ii. Solution
        iii. Diagnosis
        iv. Prediction
        v. Testing in Hindsight

5. Second Afternoon (4 hours)
    a. Troubleshooting cantankerous models (1.5 hours)
        i. Adjusting the explanatory factors
        ii. Combining and weighting observations
        iii. A stochastic CL model useful when exposures are truly unknown
    b. Presentation of results to non-experts (0.5 hours)
        i. Deterministic methods as a crutch
        ii. Simplicity to 90% accuracy better than complexity to 99%.
        iii. Appealing diagnostics and graphs
    c. Advanced Directions and Miscellaneous (2.0 hours)
        i. Autocorrelation (see my 1996 *PCAS* paper)
        ii. Parallel triangles and correlation (e.g., loss and ALAE)
        iii. Conjoint models (e.g., paid and incurred losses, as in my paper in the Summer 1997 *Forum*)
        iv. Random prediction design
        v. ULAE Model