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The Model Audit Rule—It's Not SOX, But It Has a Punch!

By Lisa Cosentino and Philip Ferrari

Although not as cumbersome as compliance with the Sarbanes-Oxley Act of 2002 (SOX), the National Association of Insurance Commissioners (NAIC)'s Annual Financial Reporting Model Regulation (the Model Audit Rule or MAR) does require significant effort on the part of companies. In addition, the deadline for compliance with MAR is quickly approaching. Hopefully, your company has rallied the troops and begun to take action to comply with the new MAR. If some version of a "MAR Readiness Plan" has not already been developed and begun its initial execution phase in your company, time could be running short. But don't panic. How your company approaches MAR could make implementation less painful than you might expect.

Compliance with MAR has several deadlines, beginning with the requirements over auditor independence and corporate governance (such as audit committee independence), which were effective Jan. 1, 2010. The most time-consuming of the MAR requirements—management's report of internal control over financial reporting—is effective with the reporting period ending Dec. 31, 2010, with the first report due to the state insurance department on Aug. 1, 2011.

This internal controls report requirement, sometimes referred to as SOX-Lite, requires manage-

ment of insurance companies with \$500 million or more in direct and assumed premiums (and certain RBC thresholds) to file a report with the state insurance department regarding the insurance company's assessment of its internal control over statutory financial reporting. The report, among other things, includes management's assertion regarding the effectiveness of internal control over financial reporting to the best of its knowledge and belief after diligent inquiry. Additionally, unlike SOX, the external auditors are not required to opine on management's process. These two areas afford insurance companies flexibility in their approach to compliance with MAR. It is important to note that a SOX compliant company can file its SOX Section 404 report including an addendum on material elements of the statutory accounting process.

With the deadline just around the corner, company management should focus on a streamlined sustainable approach tailored specifically to their organization. Consultants can provide valuable insight and structure to your company's MAR project, but be careful of the SOX-experienced consultant with a one-size-fits-all approach. This is the time to incorporate some "out of the box" thinking in crafting your MAR implementation plan. Insurance companies should consider the following as they develop their tailored approach to MAR compliance:

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Chairperson's Corner Help Regulate or Be Regulated

By Joeff Williams



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"If you have ten thousand regulations you destroy all respect for the law."

—Winston Churchill

"A little government involvement is just as dangerous as a lot—because the first leads inevitably to the second."

—Harry Browne (1996 and 2000 nominee of the Libertarian Party for president of the United States)

This issue of *smalltalk* has several articles dealing with regulatory issues that impact insurance, and, in particular, smaller insurance companies. The insurance industry has always been a highly regulated industry. For many of us, the constant changes in the regulatory environment guarantee job security even in these difficult times. Two major regulatory issues, health care reform and financial regulatory reform, have been on the forefront of daily news stories.

Health Care Reform

As of the writing of this article, health care reform had just been enacted into law, yet there seems to be no end to the debate as we learn more about the implications of the new law. The American Academy of Actuaries (the Academy) has dedicated an entire section of its website to health care reform: http://www.actuary.org/issues/health_reform.asp. I would encourage you to visit this site regularly to see what activities the Academy is involved in to keep the public and legislators educated about the issues surrounding health care reform. The Health Section of the Society of Actuaries (SOA) has also

contributed greatly to the ongoing discussion of health care reform. They have presented several webcasts and worked on joint projects with both the SOA and the Academy to prepare reports dealing with specific issues in the health care reform debate.

Financial Regulatory Reform

After the financial crisis in 2008, the Academy formed a task force focused on educating and working with governmental bodies to help them understand the ramifications of any financial regulation reform. The ongoing challenge for this task force has been how to coordinate discussions and input when dealing with issues that change daily: financial crisis regulation, federal vs. state regulation of insurance and systemic risk regulation. Many volunteers have spent countless hours reading through proposed regulations and monitoring daily the myriad of congressional hearings that deal with how Congress wants to handle possible changes in financial regulation.

Both these issues have been very prominent in the national press, and one was the focus of the administration's agenda for most of the past year and a half. Actuaries have provided valuable nonpartisan insight into the workings of both these issues. These regulatory issues have major future ramifications for the whole insurance industry.

Recent Smaller Insurance Company Section Activities

The Smaller Insurance Company (SIC) Section of the SOA

conducted a membership survey at the end of 2009. Results from that survey are outlined in this issue. One topic that was mentioned frequently was the need for continuing education on regulatory issues. We work with smaller company actuaries to help them stay on top of the challenges of the regulatory environment. The section has had numerous articles in *smalltalk* and a variety of sessions at meetings dealing with the specific regulatory issue of principle-based approach (PBA) and what impact this will have on smaller insurance companies. This major regulatory change is still in the development stages, but progress is being made and change is inevitable. The amount of volunteer time that has been devoted to this is staggering by any measure.

This issue of *smalltalk* has an article that discusses some of the perceived shortcomings of principle-based capital and reserves. Members of the section have also been actively involved in helping guide some of the discussion around this new regulation. An important development in this area was a recent proposal by Katherine S. Campbell, FSA, MAAA, the Alaska Division of Insurance actuary, to simplify the exclusion approach for principle-based reserves (PBR) on certain product lines. The section worked quickly to disseminate this information to our membership in order to get their feedback to the Life and Health Actuarial Task Force (LHATF).

This issue also contains a regulatory article dealing with the recent adoption by the National Association of Insurance Commissioners (NAIC) of the Financial Reporting Model Regulation (the Model Audit Rule). Recently, I heard someone refer to this as “SOX for SAP.” The article discusses the ways in which this regulation will impact our membership.

As part of the Committee for Life Insurance Research (CLIR), the Smaller Insurance Company Section initiated a research project last year to look at the cost and effort required to implement a PBA. Along with the Product Development Section, Financial Reporting Section and Reinsurance Section, this survey, conducted by Towers Watson, should help companies evaluate the unique costs and additional resources necessary

to be ready for PBA. When the survey results become available, the section will inform the membership.

In the past year, our section cosponsored a webcast with the Financial Reporting Section that covered a variety of topics dealing specifically with year-end 2009 issues. Many of the topics were regulatory in nature and were timely to the needs of actuaries working in small company environments. We hope to make this an annual event to help actuaries be up-to-date with all the regulatory issues surrounding year-end work. We have also started sending out periodic blast e-mails updating our membership on current NAIC and LHATF regulatory issues and happenings.

Know What’s Happening on the Regulation Front

All this emphasizes how important it is for small insurance company actuaries to get involved in what is happening in Washington, their respective states and our own industry with regard to future regulation, so that our viewpoint is appreciated and understood. So often, the small insurance company actuary is left to figure out what regulation means and how it impacts his/her job instead of actually shaping regulation.

One thing I have come to appreciate since becoming a member of the Smaller Insurance Company Section Council is how many volunteers are active and sincerely concerned about what impact regulations have, and how we can communicate the smaller insurance company perspective in a constructive and pertinent manner. The quotes at the beginning of this article are not intended to argue for or against the merits of regulations, but to challenge us to consider the ways in which we as actuaries can actively participate in the regulatory process that will go on with or without our involvement.

I welcome your comments, your ideas and your involvement. Contact me at jwilliams@actmanre.com.

Enjoy the issue! ●

NEW REPORT:

COST OF IMPLEMENTING A PRINCIPLE-BASED FRAMEWORK FOR DETERMINING RESERVES AND CAPITAL SURVEY RESULTS

Review the results of a survey on life insurer perspectives and preparedness levels for implementing a principle-based framework for determining reserves and capital. Forty-eight companies participated in the study and offered insight into the stages of their planning, expected cost levels and concerns for implementing the new approach. The report also details additional observations Towers Watson obtained through follow-up interviews with some of the study participants.

View the report today at <http://www.soa.org/pbasurvey>.

- Involve the appropriate company personnel in the process and establish process owners. Support from top management is essential. Additionally, process owners in all significant areas such as actuarial, investments, claims, premiums and information technology must be involved.
- Assess accounts/processes using both quantitative and qualitative measures when reviewing accounts/processes for materiality. The materiality that you use is not strictly a quantitative measure.
- Focus on the high risk areas first. Management must only report on those controls not remediated by Dec. 31, 2010, so identifying and testing controls in high risk areas is imperative to minimize unremediated material weaknesses reported at year-end.
- Use a centralized repository for control documents. Review and evaluation of results and deficiencies will be streamlined. Additionally, custom reports can be created from the centralized repository to assist you in all review and monitoring efforts.
- Develop realistic remediation plans and implementation strategies based on risk and available resources. Unrealistic expectations without buy-in from management and process owners are doomed to fail.
- Utilize SAS 70 reports to your advantage. An SAS 70 is an independent comprehensive assessment (under AICPA standards) of internal controls over business processes. Take advantage of the ones you issue and those issued by

- your vendors. Some typical areas include general computer controls and controls related to claims processing.
- Take advantage of SOX efforts within your organization. Keep in mind, however, that SOX is for financial statements prepared in accordance with generally accepted accounting principles (GAAP), while MAR relates to those statements prepared in accordance with statutory accounting principles. This means that if you have already documented and tested key controls for your GAAP reserves, your statutory reserving methodologies will now need to be addressed.
- Ensure that you have a comprehensive understanding of the permitted practices surrounding aggregation of affiliates.
- Obtain input from your external auditors but do not let them dictate the project.
- Utilize the assessment of controls on financial reporting requirement as a positive. Audit your financial models for accuracy and implement efficiencies in the results analysis and reporting processes.
- Establish a monitoring process for continued evaluation and compliance in subsequent years. Create a steering committee that includes management to keep track of progress.
- Integrate the monitoring process into the day-to-day operations and over the internal control environment of your organization. Opportunities for efficiencies with other projects and requirements exist if the importance of maintaining controls for operations is emphasized over a single compliance focus.

1. Management's statement on internal controls is based upon diligent inquiry which provides for flexibility in the company's approach.

2. Adopt a risk-based approach. Focus truly on those risks that impact financial reporting and financial statements and stay away from the "other" transactional controls. This is the time to incorporate some "out of the box" thinking in crafting your MAR implementation plan.

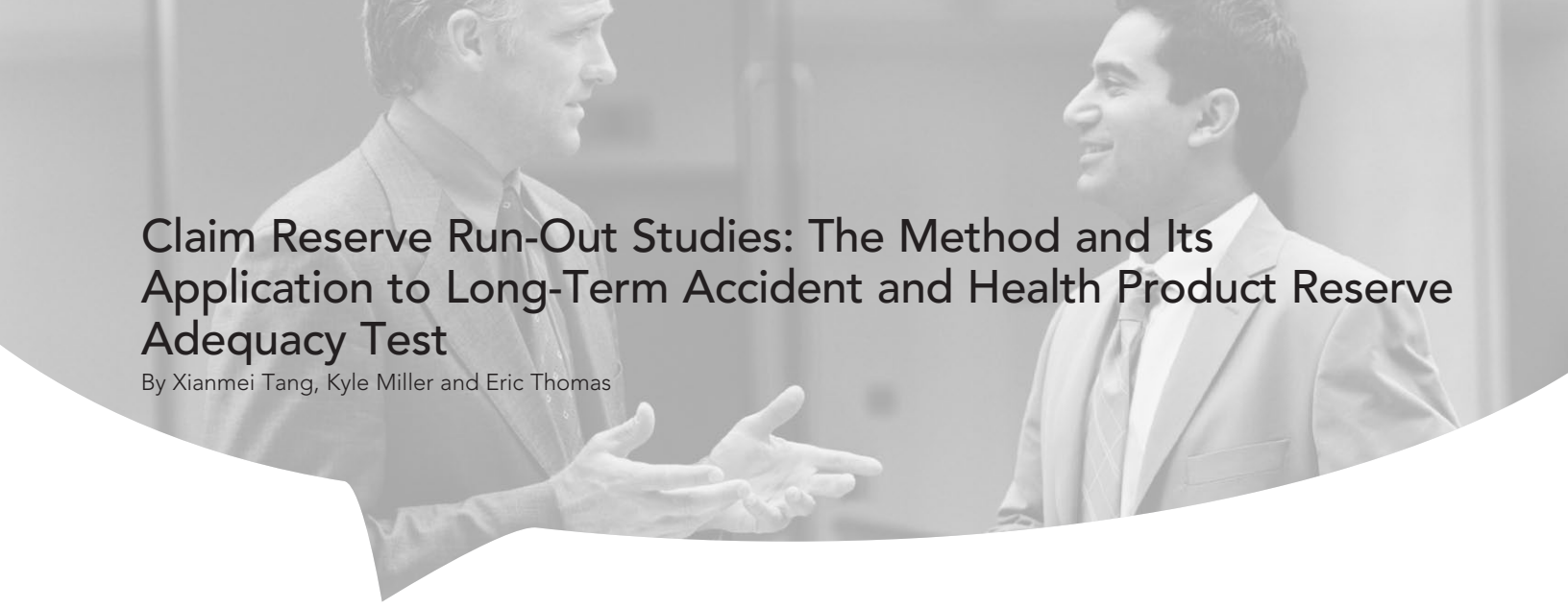


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Even though a creative customized and tailored approach to MAR can streamline the compliance process, implementation issues are sure to arise. Areas such as educating top management on the MAR requirements and obtaining their support, educating and establishing process owners, establishing a method of continuous evaluation and communication of updates of key controls, and developing and adhering to the strict timeline all take time and resources which can put additional strains on the already stressed smaller insurance company. However, it is critical for these companies to focus on the fact that MAR is not SOX; it's SOX-Lite. Have the confidence to buck the early trends of those companies who began implementing their MAR project plan years ago. Tendencies have been to turn MAR compliance into an intensive undertaking and draining "here we are on day one of SOX" type effort. Comprehending the flexibility inherent to MAR over SOX is key to achieving a successful and streamlined implementation. Application of diligent inquiry and the utilization of a top-down, risk-based approach are critical concepts in uncovering and incorporating that flexibility. With an appropriate understanding of MAR, a path to a successful and timely implementation does exist. But don't delay. Now is the time to start. ●



Claim Reserve Run-Out Studies: The Method and Its Application to Long-Term Accident and Health Product Reserve Adequacy Test

By Xianmei Tang, Kyle Miller and Eric Thomas

“There are neither two suns in the sky, nor two sovereigns over the people.”

— Confucius

“If valuation actuaries are tired of having over 50 regulatory authorities to please, they need only to remember one thing: reserves ought to be adequate!”

— An Anonymous Actuary

Background

When talking about valuation in the United States, people have a feeling that it is all about government prescription. To regulatory authorities, the insurance company is acting like a naughty first-grader who resists doing homework with the excuse of not getting enough instructions. Then, the government/teacher comes up with a clear solution: use this interest rate, use that mortality table, apply such a method, and then just subtract one value from another. The valuation requirement appears crystal clear for most insurance products.

For long-term accident and health (A&H) products, e.g., individual disability income (IDI), however, it is not the case. For example, the standard valuation law (SVL) has such words as “the commissioner shall promulgate a regulation containing the minimum standards applicable to the valuation of health [disability, sickness and accident] plans,” which effectively says nothing about the reserving. For claim reserves or disabled life reserves (DLR), the Health Reserve Model Regulation states “... assumptions regarding claim termination rates for the period less than two (2) years from the date of disablement may be based on the insurer’s experience, if such experience is considered credible ...,” which effectively leaves the assumption up to the company. As a matter of fact, the prescribed morbidity assumptions (e.g., 85

CIDA for IDI), whether incidence or claim termination, ironically have proved not conservative relative to actual industry experience. So, at the end of the day, what really matters is the adequacy requirement.

There are a range of techniques to assess a company’s reserve adequacy, such as gross premium valuation (GPV), cash flow testing (CFT), rule of thumb (or “educated” guess, “actuarial” judgment), etc. Just like those standard statistical methods used to set up reserves, e.g., the chain ladder and Bornhuetter-Ferguson methods in automobile insurance, the claim reserve run-out study, as a statistical tool, has been commonly used to test appropriateness of reserves for some short-term health product lines. It has also been introduced to long-term accident and health products such as IDI, but there are some confusing and complicated issues that users tend to muddle through as addressed later.

Regardless of the technique, doing the test is only half the issue. The real question is what the company must do if the reserve proves inadequate. GPV and CFT typically place a deficiency reserve that may flip the sign of income from positive to negative (e.g., Line 3 of Exhibit 6 of the National Association of Insurance Commissioners (NAIC) blue book). The claim reserve run-out study typically uncovers the neces-

Continued on **page 6**

sity to change valuation assumptions and strengthen reserves accordingly, which may wipe out the capital (e.g., Exhibit 5A). Due to the long-term benefit period of these products, what matters to claim reserve run-out is termination rates. As a result, companies typically slow down claim termination to secure reserve adequacy.

In this article, we demonstrate the use of the claim reserve run-out test for the long-term A&H products. First we present the method of this test, focused on the calculation of reserve margin with claim reserve run-out triangles based on reserve valuation date and claim development period. Then we present a numerical illustration to show interpretations of testing results. And finally we discuss the limitations of this technique in applying to long-term product lines.

The Magical Claim Reserve Run-out Triangle

For an open claim, the adequate reserve at any time point is expected to cover the future claim payments over the lifetime of the claim (i.e., run-out). For a given observation period before the claim runs out, the starting reserve is expected to cover the claim payments during the observation period and the ending reserve. This can be expressed by a recursive formula shown as **Equation 1**.

Equation 1

$$V^{(m)}_t = \sum_{k=0}^{n-m} \left[B_k * \frac{1 - d_{t+k}}{(1+i)^{k+0.5}} * \prod_{j=0}^k (1 - d_{t+j-1}) \right] + V^{(n)}_{t+n-m} * \frac{\prod_{k=0}^{n-m-1} (1 - d_{t+k})}{(1+i)^n}$$

V = Tabular reserve

B_k = Benefitor claim payment in period k

d = Claim decrement, i.e., termination (including recovery and death for IDI)

t = Claim duration since incurrance at beginning of study period

n = Study period, e.g., 5 for annual data from year 2003 to 2008

m = Valuation date point indicator

$m = 0, 1, 2, \dots, n$. (e.g., $m = 0$ for valuation date 2003; $m = 5$ for valuation date 2008)

i = Valuation interest rate

Correspondingly, with a claim pool where the number of claims at duration t is $J^{(t)}$, the total reserve for claims at duration t in a given observation period n can be expressed as **Equation 2**.

Equation 2

$$\sum_{m=0}^n \left(\sum_{j=1}^{J^{(m)}} V^{(m),j}_t \right) = \sum_{m=0}^n \left\{ \sum_{k=0}^{n-m} \left[\sum_{j=1}^{J^{(m)}} \left(B^{(j)}_k * \frac{1 - d^{(j)}_{t+k}}{(1+i)^{k+0.5}} * \prod_{j=0}^k (1 - d^{(j)}_{t+j-1}) \right) \right] \right\} + \sum_{m=0}^n \left[\sum_{j=1}^{J^{(m)}} V^{(n),j}_{t+n-m} * \frac{\prod_{k=0}^{n-m-1} (1 - d^{(j)}_{t+k})}{(1+i)^n} \right]$$

Define $V_t = \sum_{m=0}^{n-1} \left(\sum_{j=1}^{J^{(m)}} V^{(m),j}_t \right)$, i.e., to exclude the ending reserve from the total reserve, then we have **Equation 3**.

Equation 3

$$V_t = \sum_{m=0}^{n-1} \left\{ \sum_{k=0}^{n-m-1} \left[\sum_{j=1}^{J^{(m)}} \left(B^{(j)}_k * \frac{1 - d^{(j)}_{t+k}}{(1+i)^{k+0.5}} * \prod_{j=0}^k (1 - d^{(j)}_{t+j-1}) \right) \right] \right\} + \sum_{m=0}^{n-1} \left[\sum_{j=1}^{J^{(m)}} V^{(n),j}_{t+n-m} * \frac{\prod_{k=0}^{n-m-1} (1 - d^{(j)}_{t+k})}{(1+i)^n} \right]$$

Suppose each starting reserve $V^{(m),j}_t$ and its corresponding ending reserve $V^{(n),j}_{t+n-m}$ are valued with the same assumptions. Then, the difference of the actual claim termination between experience and valuation assumptions during that period determines if the starting reserve is adequate. For example, if the actual claim termination is slower, then more claim payments are made during the period than those assumed by valuation. Therefore, the starting reserve proves to be inadequate. In other words, if the starting reserve appears inadequate, it indicates that the assumed claim termination rate by valuation is not conservative compared with the actual claim termination experience during the observation period. This is the foundation of how a claim run-out study determines reserve adequacy.

In reality, choosing an observation period raises reliability and credibility issues. If the observation period is too short, many claims won't reach run-out status; therefore, the study won't show a full story. If the observation period is too long, the tail data may be insufficient. Ideally, the run-out study observation period is set to be the maximum coverage period for short-term coverage (e.g., two years). For long-term coverage:

- The benefit period can be lifetime, and it may take over 30 years for a claim to run out. Therefore, the observation period is typically set at five to 10 years for annual data, and three to five years for quarterly data.
- For the assumed claim duration, note that most claims end before 10 years. Therefore, people usually assign a conservative overall assumption for durations 11 and later while tracking the detailed experience only in the earlier claim durations. However, this practice may cause a reserve inadequacy as mentioned later.

Let's get back to the method. With claim experience, we test if the starting reserve supported the future claim payments and ending reserve. If yes, it proves the valuation claim termination rate d is appropriate in the aggregate. If not, it proves that the termination assumption is not supported by experience. For this purpose, we define:

- Reserve Margin (MG) as the difference between the starting reserve and the present value of future claim payments and ending reserve;
- $MG\%$ as the ratio of Reserve Margin to starting reserve;
- $\tilde{V}^{(m,t)}_{t+m}$ as the total experience reserves at valuation date m for the open claims at duration t as of beginning observation period;
- $\tilde{B}^{(m,t)}_k$ as the total claim payments in the k -th year since the beginning observation date for those open claims at duration t as of valuation date m .

Suppose reserves for claim duration T and later are appropriate. Then the reserve margin for claim durations before T can be derived from a recursive formula shown as **Equation 4**.

Equation 4

$$MG_t = \sum_{m=0}^{n-1} \left(\tilde{V}^{(m,t)}_t - \sum_{k=1}^{n-m} \tilde{B}^{(m,t)}_k * (1+i)^{-(k-0.5)} - \tilde{V}^{(n,t)}_{t+n-m} * (1-MG\%_{t+n-m}) * (1+i)^{-(n-m)} \right)$$

Where

$$MG\%_t = \frac{MG_{t+1}}{\sum_{m=0}^{n-1} \tilde{V}^{(m,t)}_t}, \quad t < T$$

$$MG\%_t = 0, \quad t \geq T$$

$\tilde{V}_t * (1-MG\%_t)$ is the expected adequate reserve at duration t .

For example, let $T=11$. Then **Equation 4** can be rewritten as durational formulas (see **Rewritten Equation 4**), which can be tabulated as triangles.

Rewritten Equation 4

For Claim Duration 10:

$$\begin{aligned} MG_{10} &= \tilde{V}^{(0,10)}_{10} \\ &- \left(\frac{\tilde{B}^{(0,10)}_1}{(1+i)^{-0.5}} + \frac{\tilde{B}^{(0,10)}_2}{(1+i)^{-1.5}} + \frac{\tilde{B}^{(0,10)}_3}{(1+i)^{-2.5}} + \frac{\tilde{B}^{(0,10)}_4}{(1+i)^{-3.5}} + \frac{\tilde{B}^{(0,10)}_5}{(1+i)^{-4.5}} \right) \\ &- \tilde{V}^{(5,10)}_{15} * 100\% * (1+i)^{-5} \\ &+ \tilde{V}^{(1,10)}_{10} - \left(\frac{\tilde{B}^{(1,10)}_1}{(1+i)^{-0.5}} + \frac{\tilde{B}^{(1,10)}_2}{(1+i)^{-1.5}} + \frac{\tilde{B}^{(1,10)}_3}{(1+i)^{-2.5}} + \frac{\tilde{B}^{(1,10)}_4}{(1+i)^{-3.5}} \right) \\ &- \tilde{V}^{(5,10)}_{14} * 100\% * (1+i)^{-4} \\ &+ \tilde{V}^{(2,10)}_{10} - \left(\frac{\tilde{B}^{(2,10)}_1}{(1+i)^{-0.5}} + \frac{\tilde{B}^{(2,10)}_2}{(1+i)^{-1.5}} + \frac{\tilde{B}^{(2,10)}_3}{(1+i)^{-2.5}} \right) \\ &- \tilde{V}^{(5,10)}_{13} * 100\% * (1+i)^{-3} \\ &+ \tilde{V}^{(3,10)}_{10} - \left(\frac{\tilde{B}^{(3,10)}_1}{(1+i)^{-0.5}} + \frac{\tilde{B}^{(3,10)}_2}{(1+i)^{-1.5}} \right) \\ &- \tilde{V}^{(5,10)}_{12} * 100\% * (1+i)^{-2} \\ &+ \tilde{V}^{(4,10)}_{10} - \left(\frac{\tilde{B}^{(4,10)}_1}{(1+i)^{-0.5}} \right) \\ &- \tilde{V}^{(5,10)}_{11} * 100\% * (1+i)^{-1} \\ MG\%_{10} &= \frac{MG_{10}}{\tilde{V}^{(0,10)}_{10} + \tilde{V}^{(1,10)}_{10} + \tilde{V}^{(2,10)}_{10} + \tilde{V}^{(3,10)}_{10} + \tilde{V}^{(4,10)}_{10}} \end{aligned}$$

Continued on page 8

For Claim Duration 9:

$$\begin{aligned}
 MG_9 = & \tilde{V}^{(0,9)}_9 - \left(\frac{\tilde{B}^{(0,9)}_1}{(1+i)^{-0.5}} + \frac{\tilde{B}^{(0,9)}_2}{(1+i)^{-1.5}} + \frac{\tilde{B}^{(0,9)}_3}{(1+i)^{-2.5}} + \frac{\tilde{B}^{(0,9)}_4}{(1+i)^{-3.5}} + \frac{\tilde{B}^{(0,9)}_5}{(1+i)^{-4.5}} \right) \\
 & - \tilde{V}^{(5,9)}_{14} * 100\% * (1+i)^{-5} \\
 & + \tilde{V}^{(1,9)}_9 - \left(\frac{\tilde{B}^{(1,9)}_1}{(1+i)^{-0.5}} + \frac{\tilde{B}^{(1,9)}_2}{(1+i)^{-1.5}} + \frac{\tilde{B}^{(1,9)}_3}{(1+i)^{-2.5}} + \frac{\tilde{B}^{(1,9)}_4}{(1+i)^{-3.5}} \right) \\
 & - \tilde{V}^{(5,9)}_{13} * 100\% * (1+i)^{-4} \\
 & + \tilde{V}^{(2,9)}_9 - \left(\frac{\tilde{B}^{(2,9)}_1}{(1+i)^{-0.5}} + \frac{\tilde{B}^{(2,9)}_2}{(1+i)^{-1.5}} + \frac{\tilde{B}^{(2,9)}_3}{(1+i)^{-2.5}} \right) \\
 & - \tilde{V}^{(5,9)}_{12} * 100\% * (1+i)^{-3} \\
 & + \tilde{V}^{(3,9)}_9 - \left(\frac{\tilde{B}^{(3,9)}_1}{(1+i)^{-0.5}} + \frac{\tilde{B}^{(3,9)}_2}{(1+i)^{-1.5}} \right) \\
 & - \tilde{V}^{(5,9)}_{11} * 100\% * (1+i)^{-2} \\
 & + \tilde{V}^{(4,9)}_9 - \left(\frac{\tilde{B}^{(4,9)}_1}{(1+i)^{-0.5}} \right) \\
 & - \tilde{V}^{(5,9)}_{10} * (1 - MG\%_{10}) * (1+i)^{-1} \\
 MG\%_9 = & \frac{MG_9}{\tilde{V}^{(0,9)}_9 + \tilde{V}^{(1,9)}_9 + \tilde{V}^{(2,9)}_9 + \tilde{V}^{(3,9)}_9 + \tilde{V}^{(4,9)}_9}
 \end{aligned}$$

For Claim Duration 1:

$$\begin{aligned}
 MG_1 = & \tilde{V}^{(0,1)}_1 - \left(\frac{\tilde{B}^{(0,1)}_1}{(1+i)^{-0.5}} + \frac{\tilde{B}^{(0,1)}_2}{(1+i)^{-1.5}} + \frac{\tilde{B}^{(0,1)}_3}{(1+i)^{-2.5}} + \frac{\tilde{B}^{(0,1)}_4}{(1+i)^{-3.5}} + \frac{\tilde{B}^{(0,1)}_5}{(1+i)^{-4.5}} \right) \\
 & - \tilde{V}^{(5,1)}_6 * (1 - MG\%_6) * 100\% * (1+i)^{-5} \\
 & + \tilde{V}^{(1,1)}_1 - \left(\frac{\tilde{B}^{(1,1)}_1}{(1+i)^{-0.5}} + \frac{\tilde{B}^{(1,1)}_2}{(1+i)^{-1.5}} + \frac{\tilde{B}^{(1,1)}_3}{(1+i)^{-2.5}} + \frac{\tilde{B}^{(1,1)}_4}{(1+i)^{-3.5}} \right) \\
 & - \tilde{V}^{(5,1)}_5 * (1 - MG\%_5) * (1+i)^{-4} \\
 & + \tilde{V}^{(2,1)}_1 - \left(\frac{\tilde{B}^{(2,1)}_1}{(1+i)^{-0.5}} + \frac{\tilde{B}^{(2,1)}_2}{(1+i)^{-1.5}} + \frac{\tilde{B}^{(2,1)}_3}{(1+i)^{-2.5}} \right) \\
 & - \tilde{V}^{(5,1)}_4 * (1 - MG\%_4) * (1+i)^{-3} \\
 & + \tilde{V}^{(3,1)}_1 - \left(\frac{\tilde{B}^{(3,1)}_1}{(1+i)^{-0.5}} + \frac{\tilde{B}^{(3,1)}_2}{(1+i)^{-1.5}} \right) \\
 & - \tilde{V}^{(5,1)}_3 * (1 - MG\%_3) * (1+i)^{-2} \\
 & + \tilde{V}^{(4,1)}_1 - \left(\frac{\tilde{B}^{(4,1)}_1}{(1+i)^{-0.5}} \right) \\
 & - \tilde{V}^{(5,1)}_2 * (1 - MG\%_2) * (1+i)^{-1} \\
 MG\%_1 = & \frac{MG_1}{\tilde{V}^{(0,1)}_1 + \tilde{V}^{(1,1)}_1 + \tilde{V}^{(2,1)}_1 + \tilde{V}^{(3,1)}_1 + \tilde{V}^{(4,1)}_1}
 \end{aligned}$$

In other words, termination rate assumptions in **Equation 3** are tested with real world claim terminations reflected by the actual claim payments. One side of the real world equation is the beginning reserve. The other side is the present values of ending reserve and intermediate claim payments. Within the observation window, the claim payments and ending reserve are what they are, and there is nothing we can do about them.

But the beginning reserve depends on termination rate assumptions during the observation period. An adequate beginning reserve indicates that claims have terminated as fast as the valuation assumption anticipated. If claims terminated more slowly than the rate used in reserving, the beginning reserve won't be adequate, reserve strengthening is required at the valuation date, and termination rate assumptions used in reserving must be adjusted to ensure reserves are adequate in the future.

A Numerical Illustration

For demonstration purposes, an illustration is presented below (*see Table 1 on page 9*). Concerning the appropriateness of claim termination rates for durations up to 10, the illustration tracks tabular reserves and claim payments for all open claims of a sizable block of business at duration 1 to 10 as of year-end from 2003 through 2008, assuming reserves for duration 11 and later are just right. **Table 1** shows the experience data according to **Equation 4** with reserve margins calculated for individual claim durations. **Table 2** and **Table 3** summarize the reserve margins for each claim duration and valuation date.

Table 1. Illustration of Claim Reserve Run-out Triangles

Starting Claim Duration t (1)	Valuation Date (2)	Starting Valuation Date Point m (3)	Ending Valuation Date Point n (4)	Ending Claim Duration t+n-m (5)	Starting Reserve $\tilde{V}^{(m,t)}$ (6)	Present Value of Claim Payments $\tilde{B}^{(m,t)}_k$					PV Ending Reserve $\tilde{V}^{(m,t)}_{t+n-m}$ (12)	Reserve Margin MG (13)	Reserve Margin % MG% _{t+n-m} (14)
						k = 1	2	3	4	5			
						(7)	(8)	(9)	(10)	(11)			
10	2003	0	5	15	42,164,219	4,778,426	4,339,752	4,068,224	3,623,577	3,310,147	27,253,421	(5,209,327)	0.00%
10	2004	1	5	14	41,483,938	4,971,352	4,710,293	4,287,191	3,929,000		29,624,142	(6,038,040)	0.00%
10	2005	2	5	13	38,449,876	4,941,992	4,571,597	4,078,266			30,594,064	(5,736,043)	0.00%
10	2006	3	5	12	53,633,803	5,853,732	5,393,577				47,272,912	(4,886,418)	0.00%
10	2007	4	5	11	57,593,941	6,658,733					52,724,625	(1,789,417)	0.00%
10	Subtotal:				233,325,777	27,204,234	19,015,219	12,433,681	7,552,577	3,310,147	187,469,164	(23,659,244)	-10.14%
9	2003	0	5	14	43,420,882	4,956,887	4,594,807	4,738,179	3,961,429	3,629,281	27,802,947	(6,262,649)	0.00%
9	2004	1	5	13	40,879,319	4,990,791	4,631,670	4,284,533	3,969,650		28,019,967	(5,017,292)	0.00%
9	2005	2	5	12	56,406,720	6,172,573	5,618,789	5,054,898			45,491,238	(5,930,779)	0.00%
9	2006	3	5	11	61,905,130	7,129,991	6,318,597				53,392,902	(4,936,360)	0.00%
9	2007	4	5	10	68,976,460	8,131,322					63,817,107	(9,443,026)	-10.14%
9	Subtotal:				271,588,511	31,381,565	21,163,863	14,077,610	7,931,079	3,629,281	218,524,160	(31,590,106)	-11.63%
8	2003	0	5	13	44,792,690	5,096,730	4,593,606	4,340,834	4,015,495	3,720,384	26,705,606	(3,679,966)	0.00%
8	2004	1	5	12	59,143,972	6,375,136	5,786,028	5,265,969	4,839,311		43,746,922	(6,869,394)	0.00%
8	2005	2	5	11	63,534,411	7,150,787	6,649,873	5,894,528			51,214,380	(7,375,157)	0.00%
8	2006	3	5	10	73,074,924	8,248,897	7,576,562				63,239,763	(12,402,812)	-10.14%
8	2007	4	5	9	75,259,087	8,601,402					68,271,226	(9,554,581)	-11.63%
8	Subtotal:				315,805,083	35,472,952	24,606,069	15,501,331	8,854,806	3,720,384	253,177,897	(39,881,910)	-12.63%
7	2003	0	5	12	61,420,817	6,546,408	5,974,823	5,422,706	4,935,304	4,535,437	41,694,841	(7,688,703)	0.00%
7	2004	1	5	11	67,099,650	7,407,954	6,765,042	6,247,010	5,636,563		49,082,288	(8,039,206)	0.00%
7	2005	2	5	10	77,523,042	8,420,610	7,787,820	7,164,003			61,953,402	(14,084,871)	-10.14%
7	2006	3	5	9	78,127,431	8,861,258	7,983,612				67,351,078	(13,902,529)	-11.63%
7	2007	4	5	8	78,755,744	9,592,099					70,669,354	(10,430,293)	-12.63%
7	Subtotal:				362,926,683	40,828,330	28,511,297	18,833,719	10,571,867	4,535,437	290,750,962	(54,145,602)	-14.92%
6	2003	0	5	11	70,899,996	8,395,360	6,972,220	6,359,176	5,869,428	5,296,916	47,092,689	(9,085,793)	0.00%
6	2004	1	5	10	80,640,052	8,651,762	7,859,778	7,271,622	6,778,230		59,306,398	(15,241,409)	-10.14%
6	2005	2	5	9	84,640,215	9,798,467	8,435,339	7,463,054			64,942,547	(13,553,054)	-11.63%
6	2006	3	5	8	83,857,941	9,822,035	9,291,124				70,073,357	(14,177,893)	-12.63%
6	2007	4	5	7	106,599,526	11,813,058					93,477,822	(12,637,457)	-14.92%
6	Subtotal:				426,637,730	48,480,682	32,558,461	21,093,852	12,647,658	5,296,916	334,892,814	(64,695,605)	-15.16%
5	2003	0	5	10	86,872,501	9,141,953	8,206,063	7,373,394	6,816,306	6,353,289	56,758,693	(13,532,531)	-10.14%
5	2004	1	5	9	90,443,364	10,097,902	9,341,860	7,945,410	7,031,468		62,471,838	(13,711,591)	-11.63%
5	2005	2	5	8	89,121,385	10,680,922	9,356,906	8,738,135			67,682,459	(15,884,415)	-12.63%
5	2006	3	5	7	115,308,563	11,945,270	11,099,254				94,190,472	(15,978,857)	-14.92%
5	2007	4	5	6	111,273,624	10,354,757					104,192,574	(19,073,533)	-15.16%
5	Subtotal:				493,019,437	52,220,803	38,004,083	24,056,939	13,847,774	6,353,289	385,296,035	(78,180,927)	-15.86%
4	2003	0	5	9	97,672,204	10,824,647	9,504,997	8,670,167	7,434,687	6,581,319	59,914,816	(5,258,428)	0.00%
4	2004	1	5	8	95,342,220	11,923,468	9,875,728	8,673,746	8,148,742		65,054,423	(8,333,888)	0.00%
4	2005	2	5	7	115,789,668	12,402,279	11,055,807	10,261,140			88,742,327	(19,911,492)	-14.92%
4	2006	3	5	6	120,228,373	11,500,227	9,705,173				105,038,759	(19,280,761)	-12.63%
4	2007	4	5	5	131,741,136	12,628,683					120,214,569	(15,085,001)	-11.63%
4	Subtotal:				560,773,599	59,279,304	40,141,705	27,605,053	15,583,429	6,581,319	438,964,893	(67,869,570)	-12.10%
3	2003	0	5	8	100,375,332	11,906,686	11,114,938	9,253,815	8,186,061	7,611,318	62,082,600	(9,780,085)	0.00%
3	2004	1	5	7	120,679,588	13,171,317	11,587,223	10,452,479	9,728,896		86,213,422	(10,473,749)	0.00%
3	2005	2	5	6	126,846,830	13,073,708	10,886,953	9,593,911			100,470,036	(7,177,779)	0.00%
3	2006	3	5	5	140,259,432	13,880,325	12,247,906				120,068,668	(5,937,467)	0.00%
3	2007	4	5	4	140,149,218	13,825,240					132,027,509	(21,682,618)	-12.10%
3	Subtotal:				628,310,401	65,857,275	45,837,021	29,300,205	17,914,957	7,611,318	500,862,236	(55,051,699)	-8.76%
2	2003	0	5	7	129,604,587	15,450,429	11,958,793	11,166,614	9,442,319	9,104,165	79,648,501	(19,049,120)	-14.92%
2	2004	1	5	6	131,840,967	15,830,159	12,037,472	10,226,089	8,779,447		94,753,103	(24,153,722)	-15.16%
2	2005	2	5	5	147,651,823	15,439,527	12,529,715	10,438,507			107,561,467	(15,374,032)	-15.86%
2	2006	3	5	4	143,063,414	15,721,256	12,699,241				130,696,464	(31,871,539)	-12.10%
2	2007	4	5	3	161,757,873	18,565,084					154,128,847	(24,440,616)	-8.76%
2	Subtotal:				713,918,664	81,006,455	49,225,220	31,831,210	18,221,766	9,104,165	566,788,381	(114,889,028)	-16.09%
1	2003	0	5	6	73,263,709	8,434,521	6,406,341	5,579,729	4,635,777	3,979,589	43,438,201	(5,797,443)	-15.16%
1	2004	1	5	5	90,007,113	12,629,075	7,958,976	6,794,694	5,616,064		64,870,527	(18,149,117)	-15.86%
1	2005	2	5	4	87,777,788	11,151,322	8,268,516	7,324,561			69,188,356	(16,528,727)	-12.10%
1	2006	3	5	3	80,279,847	10,775,990	8,168,321				68,770,555	(13,460,600)	-8.76%
1	2007	4	5	2	75,762,808	10,867,262					66,913,135	(12,785,742)	-16.09%
1	Subtotal:				407,091,265	53,858,170	30,802,154	19,698,983	10,251,842	3,979,589	313,180,773	(66,721,629)	-16.39%

(13) = (6) - [(7)+(8)+(9)+(10)+(11)] - (12)*[1-(14)]
 (14) is derived recursively for starting claim duration t, where
 (14) = (13)/(6) for each t = 10, 9, 8, ..., 2, 1; and
 (14) = 0 if (t+n-m)>10

Continued on page 10

Table 2. Sum of Reserve Margins by Claim Duration

Claim Duration	Current Reserve	Reserve Margin	Expected Reserve	Expected Reserve %
1	407.09 M	-66.72 M	473.81 M	116.39%
2	713.92 M	-114.89 M	828.81 M	116.09%
3	628.31 M	-55.05 M	683.36 M	108.76%
4	560.77 M	-67.87 M	628.64 M	112.10%
5	493.02 M	-78.18 M	571.20 M	115.86%
6	426.64 M	-64.70 M	491.33 M	115.16%
7	362.93 M	-54.15 M	417.07 M	114.92%
8	315.81 M	-39.88 M	355.69 M	112.63%
9	271.59 M	-31.59 M	303.18 M	111.63%
10	233.33 M	-23.66 M	256.99 M	110.14%
Total	4,413.40 M	-596.69 M	5,010.08 M	113.52%

Table 3. Reserve Margin for Individual Valuation Date by Claim Duration

Valuation Date	Current Reserve	Reserve Margin by Claim Duration										Subtotal	%Reserve
		1	2	3	4	5	6	7	8	9	10		
2003	750.49 M	-5.80 M	-19.05 M	-9.78 M	-5.26 M	-13.53 M	-9.09 M	-7.69 M	-3.68 M	-6.26 M	-5.21 M	-85.34 M	-11.37%
2004	817.56 M	-18.15 M	-24.15 M	-10.47 M	-8.33 M	-13.71 M	-15.24 M	-8.04 M	-6.87 M	-5.02 M	-6.04 M	-116.03 M	-14.19%
2005	887.74 M	-16.53 M	-15.37 M	-7.18 M	-19.91 M	-15.88 M	-13.55 M	-14.08 M	-7.38 M	-5.93 M	-5.74 M	-121.56 M	-13.69%
2006	949.74 M	-13.46 M	-31.87 M	-5.94 M	-19.28 M	-15.98 M	-14.18 M	-13.90 M	-12.40 M	-4.94 M	-4.89 M	-136.84 M	-14.41%
2007	1,007.87 M	-12.79 M	-24.44 M	-21.68 M	-15.09 M	-19.07 M	-12.64 M	-10.43 M	-9.55 M	-9.44 M	-1.79 M	-136.92 M	-13.59%
Total	4,413.40 M	-66.72 M	-114.89 M	-55.05 M	-67.87 M	-78.18 M	-64.70 M	-54.15 M	-39.88 M	-31.59 M	-23.66 M	-596.69 M	-13.52%

In this example, assuming reserves at claim durations 11 and later are alright; claims at duration 10 show that duration 10 reserves have a 10.14 percent deficiency. When determining the reserve margin for claims at duration 9, the adequate ending reserves must be used. That is, the duration 10 reserves used for calculating duration 9 reserve margin must be adjusted (i.e., increased by 10.14 percent). This produces a reserve margin of 11.63 percent for duration 9 reserves. Then, these margins are used to determine duration 8 reserve margin, etc. (see Table 1). Overall, the necessary reserves for the observation period appear to be at least 113.52 percent of the reserves valued (Table 2). There are variations among the different valuation dates, with the current valuation (i.e., valuation date 2007) having 13.59 percent deficiency (Table 3). All this requires an adjustment to the 2008 valuation termination rate assumption. This results in an immediate reserve strengthening of \$136.92 million.

Discussions

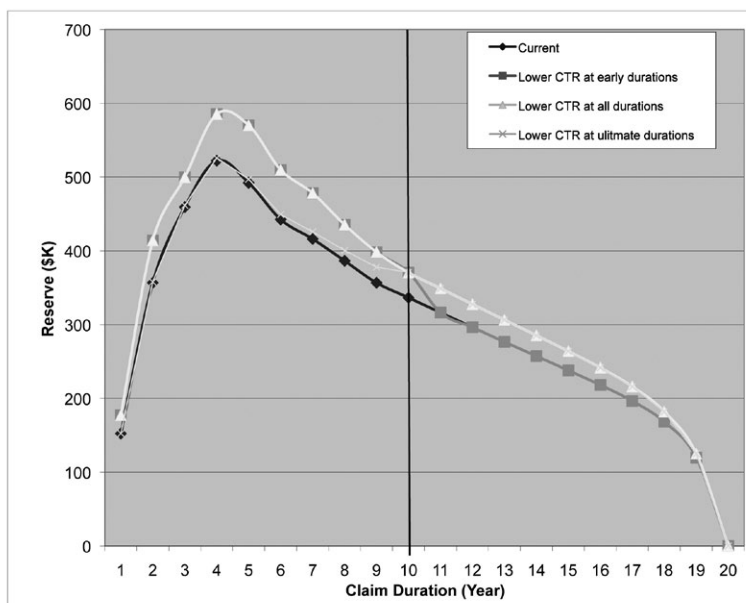
Whenever a reserve inadequacy is uncovered (as in the case demonstrated above), companies usually strengthen the reserves by lowering their assumed claim termination rates (CTR), often in the ultimate durations (e.g., 11 and later). The regulators may be immediately pleased seeing the higher reserve; however, despite the new assumptions, reserve inadequacies may re-emerge in the future. This is because the reserve margin concerns merely the *difference* between starting reserve and ending reserve of an observation period, not the *whole* reserve itself. By looking at the reserve calculation regime, we see that simply lowering ultimate CTR is a short-sighted way to strengthen reserves. The impact of CTR rate change to reserve is illustrated in **Graph 1** for a typical long-term A&H claim. With the different ways to slow down the CTR, the reserve increase for claims at different durations can be quite different. Therefore, the impact on reserve margins is uncertain.

Another issue is credibility. A company may not have a large claim volume. Even with a sizable total claim volume, there are probably very few claims at a particular duration, especially later durations such as 10 or 11. As a result, the margin factors used for adjusting the ending reserves in **Equation 4** may be based on insufficient experience and therefore inappropriate. If so, the margin, whether positive or negative, and regardless of its magnitude, shouldn't have meaningful implications to reserve adequacy.

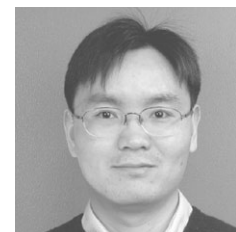
To sum up, claim reserve run-out study is an effective way to test reserve adequacy. However, it is valid only if the actuary knows the products and sees the implications of the numbers. We must make sure not only to do the right test, but also to truly understand, interpret and use the testing results properly. ●

Note: The authors thank Paul Margus, FSA, MAAA, of Margus Consulting, Tyngham, Mass., for reviewing the draft of this article.

Graph 1. The Impact of CTR to Reserve Amounts at Different Claim Durations
(Duration 11 and later as Ultimate Durations)



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Enterprise Risk Management for Small Insurers—Blessed Be the Tie that Binds (to Reality)

By Norman E. Hill

The actuarial profession has made some strides in raising the consciousness of its members about enterprise risk management (ERM). Even though the recent financial crisis primarily affected banks, its connection with AIG and other financial institutions has seemingly raised the absolute necessity of keeping company risks under control.

Actuaries who have not thought in depth about ERM still often are charged with related responsibilities. These include reserve and asset adequacy and making future performance projections under a variety of assumptions. Such tasks deal directly with determining the risks undertaken by the company and possible future risks from a variety of activities.

Recent near-fatal problems with banks have pointed out many negative aspects of their activities and shortfalls in proper risk management and modeling. Similar activities of investment banks and the primary noninsurance affiliate of AIG have exhibited negative results. Therefore, the actuarial profession could learn from mistakes in these areas. Although the research could be considered negative, it could provide lessons and result in a positive learning process.

Lessons from *The Quants*

Reporter Scott Patterson has written a fascinating new book, *The Quants*. In a Jan. 23, 2010 summary in the *Wall Street Journal*, headline descriptions of his book read, “The minds behind the meltdown—how a swashbuckling breed of mathematicians and computer scientists nearly destroyed Wall Street.”

The quants described by Patterson were a relatively small group of traders who often referred to themselves as “financial engineers.” Many quant firms were subsidiaries of banks; some were affiliated with the large investment banks. The main point is that their picks for stock purchases and sales did not seem to rely on performances of individual companies—earnings trends, balance sheet strengths, debt coverage and the like. Instead, they used mathematical formulas and reliance on powerful computers to make what Patterson calls “bets on which stocks were going up or down.”

In the summer and early fall of 2007, the housing market in the United States started to fall apart. Banks and hedge funds with large mortgage portfolios could no longer automatically sell these assets to Fannie Mae and Freddie Mac. When they started to sell off stocks to offset these losses, results undid the models of quant firms. The latter firms had not built into their models any possible links between two markets: housing and stock.

The quants tried to deal with rapid stock price declines by selling. Unfortunately, this only led to further declines.

Patterson describes how hedge funds and quant firms tried to figure out which one of them was responsible for the price meltdown. One quant manager contacted the top management of his bank holding company. He tried to pin them down as to how much financial loss in the current stock slide was acceptable. Since they didn’t understand how the quant traders worked, and had never been informed about possible risks, they could not give an answer. In fact, their quant subsidiary was apparently a complete mystery to them.

The top management attitude is parallel to one I heard about some years ago. Its context was slightly different, but the effect was the same. Top management of a parent insurance company told one subsidiary, “We don’t know what you’re doing, but keep up the good work.” In other words, “Just remain as profitable as you’ve been; that’s the only thing required by your parent.”

In Patterson’s narrative, the quant firm was left on its own. The firm’s head saw the chaotic condition of the stock market and decided that massive selling was required. The author’s words are eloquent, “The entire . . . finely wrought creations of the quants spun out of control.” As realized losses continued to spiral, the description is vivid, “Nearly every single quantitative strategy, thought to be the most sophisticated investing ideas in the world, was shredded to pieces. . . .”

Temporarily, stocks that had been shorted by quant firms reported huge gains. But this was an illusion, one that did not

last long. Again, in Patterson's words, "Mom and pop investors ... had no way of knowing about the massive computer power and decades of quant strategies that were ... making a dash of their 401ks. ..."

Errors in the quant firm strategies and modeling may be too numerous to mention, but a summary could be as follows:

1. Patterson shows how more than a little arrogance had crept into the quants' use of models and reliance on strategies without anything resembling robust, accurate projections of future events.
2. Stock trading strategies relied on price movements and market trends in a broad sense. Apparently, analyzing long-term stock performance of individual companies in terms of basics, earnings and earnings trends, balance sheet strength, etc., was deemed to be inconsequential.
3. Maybe worst of all, top management was out of the loop. They seemed to be mesmerized by high-powered modeling techniques used by the quants. They never demanded some in-depth explanations of model workings and strategies of their subsidiaries. They were never shown detailed ranges of projections of future events, including possible favorable and unfavorable outcomes. Top management was never asked to define its appetite for risk; in other words, how much loss would be tolerated over defined periods.

Lessons from Lanchester Article—Model Inadequacies in General

Another recent *Wall Street Journal* article (January 2010) references a book by John Lanchester, entitled *I.O.U.—Why Everyone Owes Everyone and No One Can Pay*. The author of the *WSJ* article, Edward Chancellor, notes in his review of Lanchester's book that Lanchester provides some caustic comments worth considering. Chancellor contends that Lanchester blames prevalent mathematical models for notable incorrect assessments of risks. First, mortgage loans sold by banks to quasi federal agencies, Fannie Mae and Freddie Mac, reduced concerns about whether they would ever be repaid. However, ultimate inability of the latter agencies to absorb more loans would eventually impact the banks directly. Effects spilling over to the stock market could drastically impact prices. These risks were never part of model calculations.

Lanchester refers to most models as not just flawed, but "philosophically flawed." Their managers believed sharp downturns in the housing market were impossible and, even if occurring, could not affect stocks. He describes this characteristic as constituting a "break with common sense."

He describes a 2007 U.K. study of banking models, carried out by the Royal Bank's chief risk officer. The study describes how bankers ignored known weaknesses in models and persisted in using them, as long as they generated profits.

Lessons from RMA Article and Risk Appetite

In a March 2010 article in the *RMA Journal* (of the Risk Management Association), "Institutions Need to Better Understand Their Risk Appetite," the consulting firm, Oliver Wyman, conducted a joint bank research project with RMA. The article presents a definition of risk appetite, "... the amount and type of risk that an institution is willing to undertake in pursuit of a desired financial performance." While the research was confined to banks in North America and Europe, it contains a variety of implications for insurance companies as well.

One key conclusion from the article reads, "Senior management cannot afford ad hoc approaches to stress testing and must be aware of all the consequences involved in following a certain stress-testing framework." In other words, senior management as well as boards of directors must have some overall knowledge of how models work, their assumptions and the ranges of financial results generated from models.

Another conclusion of the research is one I would question in part. It suggests that board members should ask about "Black Swan events" and "end of the world scenarios" in model projections. In my opinion, ranges of projections have to include unfavorable outcomes, but not so dire as to go well beyond the organization's risk appetite.

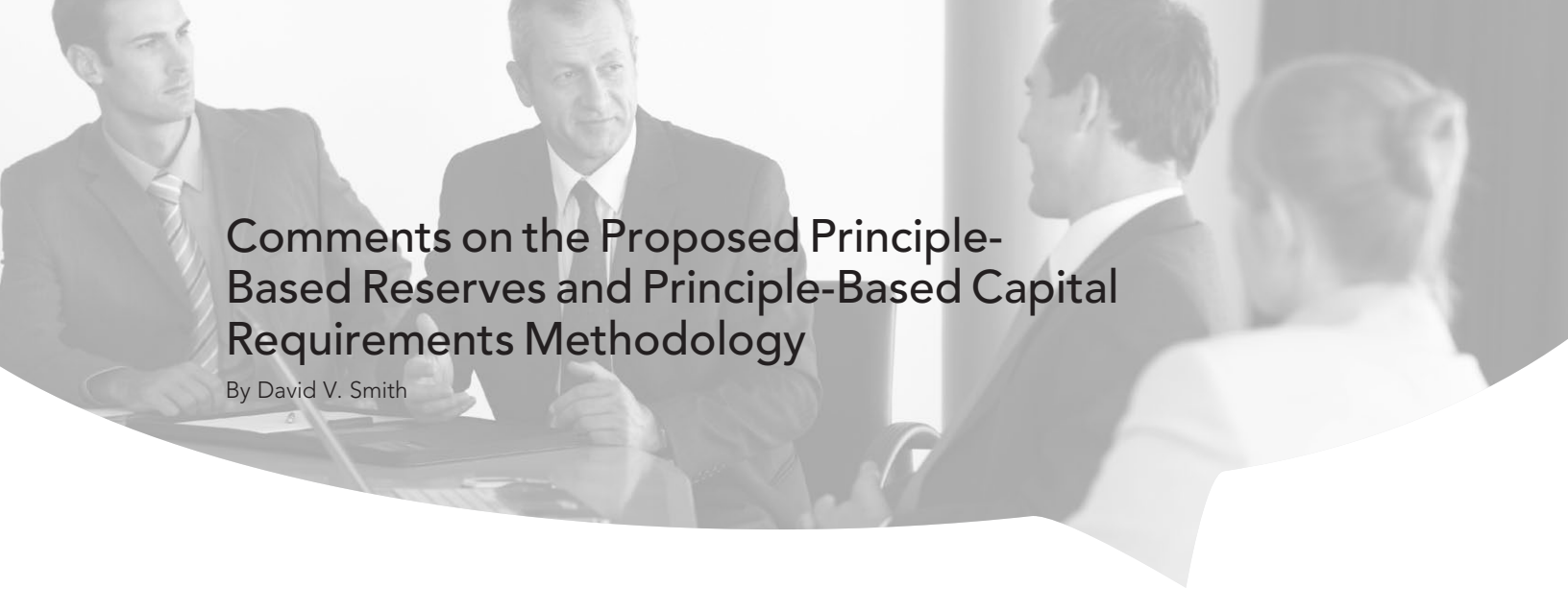
Conclusion

While these stories of past horrific outcomes may all be negative, they have positive potential lessons. The actuary, in overseeing risk management for his organization, must look at the totality of its risk exposure. Confining analysis to more glamorous aspects will simply not do. To the greatest extent possible, the actuary must strive to be free from tendencies and influences to sugar-coat possible outcomes.

Actuarial models and assumptions should be closely tied to his company's actual portfolio of assets, liabilities and products, both currently in force and contemplated. Probably most important, the actuary should strive to communicate to senior management and boards of directors the results of his model projections. He should do so in terms as understandable as possible, often aimed at informed laymen. He should make sure that his ranges of projections tie in with announced parameters previously communicated from these senior officials. To avoid a key pitfall, the board of directors must be kept in the loop. In this way, the actuary's ERM activities and responsibilities can remain tied to reality. ●

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Comments on the Proposed Principle-Based Reserves and Principle-Based Capital Requirements Methodology

By David V. Smith

The currently proposed principle-based capital and reserve methodologies devolved from the Unified Valuation System (UVS) proposal. UVS sought to determine the level of assets required by a company to remain solvent at a given level of tail risk. The original UVS incorporated all of the material obligations of an insurance company for the full duration of those obligations. The current principle-based approach (PBA) is limited to certain life and annuity products and only stochastically varies the interest rates and other dependent variables such as lapse and policyholder behavior. The current PBA approach cannot directly quantify the probability of insolvency due to the limited breadth of the products covered and the limited variables that are stochastically tested.

This article will view the principle-based methodologies largely from a future perspective, in which aspects of a company are considered on both a capital and reserve basis. It will attempt to identify some inconsistencies in the proposed approach, and present some simpler and more consistent alternatives.

The following aspects of principle-based capital and reserve methodologies will be reviewed:

1. The use of value at risk (VAR) rather than conditional tail expectation (CTE).
2. The discount rate of 105 percent of the scenario-specific after-tax one-year Treasury rate for capital requirements and a before-tax rate for principle-based reserves (PBR).
3. Whether PBR adds any value from the regulator's perspective or the insurer's perspective.
4. Should regulators use VAR levels rather than risk based capital (RBC) levels to determine regulatory action levels?

5. Whether to include multivariate stochastic analysis for the major independent variables in cash flow projections. In other words, stochastically model not just interest and equity returns but mortality, morbidity, lapses and other pertinent policyholder behavior. Some of these may be made functions of one another.

For the purpose of this discussion, certain assumptions have been made. Full principle-based capital and reserve methodologies have been implemented for all products of a company. Total assets required (TAR), which must be sustained in order to avoid state control are at CTE(90). PBRs are calculated at CTE(70).

To calculate TAR using the PBA approach for principle-based capital, accumulated cash flows are projected. This calculation is done on an after-tax basis using anticipated experience assumptions with added margins for all non-stochastically modeled variables. It also uses one of the stochastically generated investment yield scenarios. Any accumulated cash flow deficiencies within a given economic scenario are discounted back to the valuation date. The greatest present value of the deficiencies is the scenario TAR. This scenario TAR is stored, and another scenario TAR is generated and stored. This process is repeated for each investment yield scenario. The scenario TARs are ordered from smallest to largest. The CTE(90) is the average of the largest 10 percent of the scenario TARs. Currently, the CTE(90) is used as the measure to determine the minimum PBA capital TAR. The CTE(70) is used as the minimum reserve under PBR. This value is calculated similarly to the TAR for capital; but on a before-tax basis and using different margins. The largest 30 percent of the calculated amounts are averaged; this is the CTE (70) PBR.

The use of an after-tax calculation for capital TAR is necessary to incorporate all future cash flows. The reason is that for a company to remain solvent, the existing assets must cover any future operating deficiencies including tax expenditures. The pretax nature of PBA reserves is logical in that taxes are calculated using tax reserves, and tax reserves must relate to PBA reserves in that tax reserves must be less than or equal to PBA reserves. Likewise, tax reserves must be greater than or equal to any cash values. Using pretax reserves would be double-counting the effect of taxes. A more rigorous explanation of this topic is in an article by Ed Robbins in the February 2008 issue of *TAXING TIMES* (Volume 4, Issue 1).

The use of the CTE blurs the meaning of the TAR assets associated with it because of the distribution of the tail assets and the possibility of some extreme outlier TARs in the last few scenarios. Including these outliers in the TAR calculation makes little sense because there is no possibility of having enough assets to account for them or even a small percentage of them if they are too large.

Value at risk (VAR) is the scenario TAR value that would approximate the amount of assets required to limit the probability of insolvency to a given percentage, in this case about 5 percent. An alternative and perhaps improved metric is to use an approximate 95 percent VAR calculated by averaging all TARs between and including 94 to 96 percent. This approximate 95 percent VAR would remove much of the variability that would result from using a single TAR for the 95 percent VAR.

An alternative to the use of the CTE(90) measure for TAR would be the approximate 95 percent VAR described above. This method of calculating the VAR would eliminate the noise that may result from using a single number. The use of a VAR measurement has the advantage of quantifying the asset associated with a given probability of bankruptcy.

Currently, RBC-based action levels are determined by the multiples of authorized control level of RBC maintained by the company. A consistent approach under a principle-based capital methodology would be to set regulatory action levels based on VAR TAR measures, such as 95 percent VAR for a no action level and corresponding VAR TAR metrics.

The original methodology used to calculate the scenario TAR was an iterative approach. Because of the intensive calculations required to do the stochastic projections, the current approach was proposed. This approach begins the cash flow projection with a given amount of starting assets, then subtracts from that value the smallest discounted value of any accumulated asset values at the end of each projection year. If this value is calculated by discounting the year-end asset values at 105 percent of the one-year Treasury rate for each year of the scenario and subtracting the minimum value from the starting assets, then this value becomes the TAR for this scenario. This calculation is done only once per scenario, and the amount of the resulting TAR is significantly influenced by the starting value.

A more theoretically correct TAR may be calculated by an alternate method of starting with a beginning asset large enough that there are no future negative accumulated cash flows, then discounting the minimum assets at the net earned after-tax interest rate path, rather than 105 percent of the Treasury rate for the scenario duration. Subtract this discounted value from the starting assets; that is the scenario TAR.

“The use of the CTE blurs the meaning of the TAR assets associated with it because of the distribution of the tail assets. . . .”

The TAR under PBA capital is the minimum amount of assets the company must possess to continue to operate without state supervision. In other words, any assets above the amount of the TAR are eligible to be distributed as a corporate dividend, subject to state dividend restrictions. The

same cannot be said about assets in excess of the PBA reserve, or factor-based statutory reserves for that matter. Assets in excess of reserves calculated on any basis, whether PBR or statutory, but less than TAR, may not be distributed as dividends. The capital requirements are unchanged, regardless of the level or method of calculation of reserves, except to the extent reserves affect policyholder dividends, or to the extent that a corresponding change in tax reserves affects the company’s operating results due to the change in the level of federal income tax. Tax reserves also determine the qualification of an insurance company as a life insurance company for federal income tax purposes.

There is value added for regulators and management in using a PBA to capital requirements. This value results from being able to quantify the amount of assets needed to ensure

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solvency for a given scenario or grouping of scenarios, and being able to associate a probability of default with a given level of assets. This allows management to design investment strategies to mitigate unfavorable results of a scenario. It also allows regulators a more effective yardstick to measure a company's financial strength and the overall default risk of a company. No further benefit is derived by calculating reserves on a principle-based methodology. The use of PBR merely creates more expense for the company. In addition, the IRS has concerns about the level of tax reserves that will be calculated under the PBA approach. Additionally, from the insurance company's viewpoint, if PBA reduces reserves,

this will result in increased federal taxable income and increased income tax expense for the company.

Currently, only interest and equity returns are stochastically modeled. This limits the variability of the TAR, which may not be captured by an increased load on other variables. Stochastically modeling any variable with significant variability will capture these variances in the TAR calculation, and enhance the value of the principle-based analysis. ●

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Who Are We? Survey Results Provide an Inside Look

By Jerry Enoch

The Smaller Insurance Company Section Council conducted a survey of its section members in December 2009. Response was excellent—127 respondents out of a membership of approximately 600 participated. Furthermore, many respondents provided very thoughtful responses to the short answer questions. Both facts indicate that the section is important to our members.

The section council is grateful and excited about the responses to the survey, and has already begun determining how to use the results to better serve the membership. While the section council is examining the responses from that perspective, I am writing this article to inform the membership what the survey tells about who we are and what we think.

Responses

Meeting Topics

The question about meeting topics, “What topics would you most like to see presented at a meeting?” provided six options for meeting topics, plus “other,” with multiple choices allowed. The average respondent selected three topics, so interest in meeting topics is high. The leading selections were current principle-based approach (PBA) topics, stochastic modeling and cash flow testing (CFT). Managing the actuarial function, enterprise risk management (ERM) and product development were all selected by at least 38 percent of the respondents.

Webcast Topics and Participation

The question about preferred webcast topics, “What topics would you like the section to present via webcast?” provided 20 options, from which respondents could choose up to five. The top three selections were PBA, stochastic modeling and ALM. PBA and stochastic modeling are consistently important to small company actuaries. On this question, CFT fell to

number nine. Simplified issue, guaranteed issue and pre-need products came in close to third place, being selected by 34 percent of the respondents. Survival of smaller companies ranked fifth, followed by experience studies, ERM and the effective use of consultants and software. Best practices in disclosure of financial results ranked 10th, being selected by 20 percent of the respondents. The average respondent selected 4.4 topics. Sixty-three percent of the respondents have attended an SOA webcast in the past year.

smalltalk

The section newsletter, *smalltalk*, is generally published in June and November each year in print. Eighty-two percent rated the section’s newsletter as good or excellent. Twenty-six percent read most articles of every issue, and 41 percent read some articles of every issue. Only 8 percent rarely or never read it. The comments about how *smalltalk* could be more useful provide insight about the needs of small company actuaries. Respondents want timely information and explanation of complex developing events. They also want to know what other companies are doing. The majority of members are ready to receive the newsletter electronically.

How the Section Can Better Serve Its Members

These short answers provide additional insight into our needs. Busy people need summaries of articles and other mechanisms to help us get information quickly. We need to keep up with new issues. We need more health topics, more webcasts, more practical help and more networking opportunities.

Demographics

Seventy percent of the respondents were FSAs; 27 percent were ASAs. Sixty-five percent work for insurance companies and 25 percent are consultants.

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Sources of Information

Our respondents provided an overwhelming list of resources that are the best sources of information for their work. A partial listing of the sources follows:

Society of Actuaries	Section newsletters, website, <i>The Actuary</i> , meetings and networking, webcasts, exam DP and CSP textbooks, e-mail blasts, SOA research, SOA library, PowerPoint slides of sessions at meetings.
Other Actuarial Bodies	Websites and publications of the American Academy of Actuaries (including Actuarial Standards of Practice and Practice Notes), the Casualty Actuarial Society, the Canadian Institute of Actuaries, the Institute of Actuaries and the International Actuarial Association. Local, regional and other actuarial groups.
Consulting Firms	Consultants, websites, newsletters, software vendors and auditors.
Non-Actuarial Organizations	Kaiser, LIMRA, ACLI, NAIC, rating agencies, state insurance department websites, Chartered Financial Analyst Institute, America’s Health Insurance Plans and Bloomberg.
Other Publications	<i>Wall Street Journal</i> , Fisher Annuity Index, WestLaw, <i>National Underwriter</i> , <i>The Economist</i> , accounting manuals.
Other Websites	SNL Financial database, www.cdc.gov , www.census.gov , www.nih.gov , www.usasearch.gov , www.medicare.gov and www.ingenix.com , local public library online research website, Actuarial Outpost, IRS and Google.
Other	Peers, networking opportunities, meetings.

After reading the responses, I wanted to go research something!

Top Challenges

One thing I learned from this survey is that if you want to get small company actuaries talking, ask them about their top challenges! Staying on top of changes in regulation and industry developments was the greatest concern, followed by resource issues of manpower and money. Systems and software were also frequently mentioned.

Miscellaneous

- Forty-one percent said they have an unmet need for a group of peers with whom they can spontaneously discuss actuarial issues; 59 percent do not.
- Fifty-six percent volunteer for some actuarial activity.

Wrapping Up

I hope you share my interest in learning about our peers and that this knowledge will make us more effective in our jobs. In some of the short answer questions, people indicated an interest in volunteering in some manner, but did not include their names with that response. Since the survey was anonymous, the section council doesn’t know whom to contact. If you have an interest in volunteering in any manner, please contact our section chair, Joeff Williams, at jwilliams@actmanre.com to explore the possibilities. We have a lot to do, and we need a lot of help. Every potential volunteer is very important. ●



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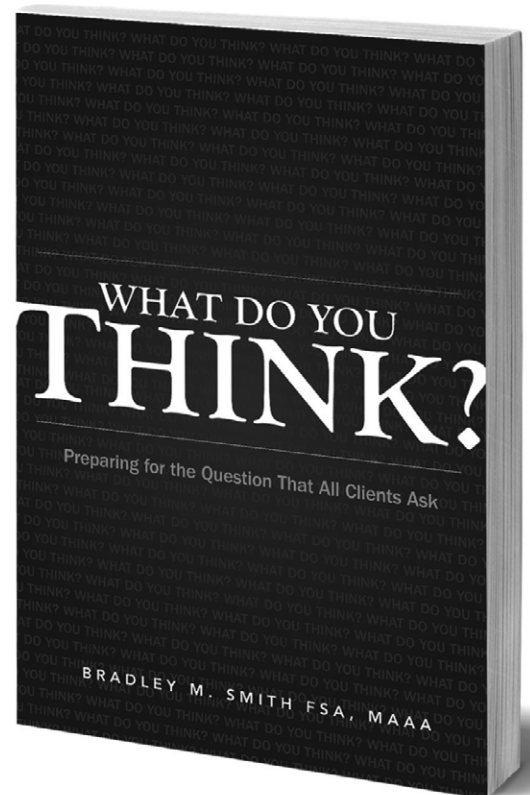
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