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# Small Talk

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Mark Whitford

### Content Managers

A. Grant Hemphill  
Bruce & Bruce Company  
Lake Bluff, Ill.  
317.509.4789  
[ghemphill@babco.us.com](mailto:ghemphill@babco.us.com)

Mark Rowley  
EMC National Life Company  
Des Moines, Iowa  
515.237.2147  
[mrowley@emcnl.com](mailto:mrowley@emcnl.com)

### SOA Staff

Karen Perry, Publications Manager  
[kperry@soa.org](mailto:kperry@soa.org)

David Schraub, Staff Partner  
[dschraub@soa.org](mailto:dschraub@soa.org)

Jennifer Foster, Section Specialist  
[jfoster@soa.org](mailto:jfoster@soa.org)

Julissa Sweeney, Graphic Designer  
[jsweeney@soa.org](mailto:jsweeney@soa.org)

# In Memory of Norman Hill: Advocate for Small Insurance Companies

By Pam Hutchins and Mark Rowley

As you look through this edition of *Small Talk*, you will notice that something is missing. There is no article authored by Norman Hill. Norm passed away suddenly on Monday, May 4, 2015. His passing is a blow to everyone who knew him well or worked closely with him, especially those in the Smaller Insurance Company Section of the Society of Actuaries. His consistent contributions spanned almost two decades. He was more passionate about small insurance companies than anyone else we have ever met. He passed away in New York City while attending the SOA Life and Annuity Symposium. As usual, he was scheduled to participate in some of the sessions at that meeting. He was doing what he was passionate about until his final days, something many of us won't have the opportunity to do!

Norman Hill was born on August 25, 1939. He graduated from Elmhurst College and received his MBA from the University of Michigan. He was one of only a few people in the world with full credentials as both an actuary and an accountant. He started in the insurance industry at Bankers Life & Casualty, became a partner at Peat, Marwick, Mitchell & Co. and then Coopers Lybrand,

was chief actuary and CFO at a large insurance holding company, and executive vice president and chief actuary of Kanawha Life Insurance Company. After retiring from Kanawha in 2006 after 15 years of service, he formed a unique consulting company, Noralyn, with his wife Maralyn and continued working on various actuarial issues, along with writing about travel and the history of sites which he visited. He also authored a novel, *Winner and Final Chairman*. Norm was an actuary by vocation and a journalist by avocation! After retirement he continued in the industry as a consultant as noted above and was chairman of the Actuarial Committee of the National Alliance of Life Companies (NALC), a small life and health insurer trade association.

There is not room in this article to come close to listing all the contributions Norm made to the insurance industry, and especially to smaller insurance companies. We will list a few of the highlights:

- He worked closely with the Smaller Insurance Company Section, both as a council member and a friend, from 1997 to 2015. He averaged at least one article in each newsletter! He spoke on webinars and at industry meetings.



Norman Hill

- He contributed articles to the Financial Reporting Section Newsletter.
- He was a regular attendee at Life Actuarial Task Force meetings of the NAIC, covering the meeting for the NALC.
- He served on various American Academy of Actuaries committees, most recently on committees related to PBR.
- A search on SOA.org reminded us that he was contributing in various forms to the SOA in the 1960s.

His articles and presentations were consistently interesting and informative. Norm will be missed.

Norm is survived by his wife of 25 years, Maralyn D. Hill, of Arizona; sister Corinne Hill in Illinois; stepchildren Lindsay Brink and Eric Brink; and many friends. The Smaller Insurance Company Section has made a contribution in Norm's honor to the Actuarial Foundation. ■



Pam Hutchins, FSA, MAAA, is senior vice president and chief actuary at Government Personnel Mutual Life in San Antonio, Texas. She can be reached at [aph@gpmlife.com](mailto:aph@gpmlife.com).



Mark Rowley, FSA, MAAA, is vice president, managing actuary with EMC National Life in Des Moines, Iowa. He can be reached at [mrowley@emcnl.com](mailto:mrowley@emcnl.com).

## CHAIRPERSON'S CORNER

By Pam Hutchins

By the time you read this, my year as chair of the Smaller Insurance Company Section (SmallCo), along with my three-year tenure on the council, will be winding down. Being part of SmallCo has been a great experience. It is an opportunity to practice leadership and more importantly, to help make a difference for smaller company actuaries. It is also an opportunity to work with a great group of council members and “friends” of the council. While we have nine council members, I count 27 “friends” of the council on our listserve, with at least one-half of those actively involved in our regular activities. For many years, Norm Hill was one of our most active “friends” (and a former council member). Norm recently passed away while attending the SOA Life and Annuity Symposium. He was a mentor and good friend to me and he will be sorely missed. Norm is the subject of the cover article in this edition of *Small Talk*. I think you would have to look back more than 10 years to find an edition of *Small Talk* where he did not contribute at least one article, so we will all notice his absence.

Our friends and council members contribute in many different ways, some with just a few hours contribution on a specific task and some with many hours on tasks like organizing a webinar or editing this newsletter. It is important to know that we welcome both small and large contributions and that all the contributions contribute to SmallCo's purpose.

The SmallCo bylaws contain a “Purpose” section which states:

The purpose of the **Smaller Insurance Company Section** within the Society of Actuaries is to encourage and facilitate the professional development of its members and affiliates through activities such as meetings, seminars, and the generation and dissemination of literature pertaining to the unique problems which face actuaries employed by small life insurance companies. The section focuses on methods, techniques, and solutions that do not require the more extensive actuarial resources available to large companies, and provides a forum where professionals working in a small company environment can discuss their special concerns.

Your section council continues to keep this purpose in mind and to focus especially on generating practical information to help you do your job as a smaller company actuary.

By the time you read this, SmallCo will have sponsored four webcasts and various sessions at the Life and Annuity Symposium and the Valuation Actuary Symposium, and planned sessions for the annual meeting. While we had plans for five webcasts at the start of this year, additional opportunities to co-sponsor webinars with other sections have arisen so SmallCo will likely have been part of seven webinars by the end of 2015.

SmallCo continues to search for opportunities to participate in research, focusing on research with practical implications that go along with SmallCo's purpose. SmallCo currently participates on two SOA research project POG's—the first related to the Low Interest Rate Environment and the second to New Product practices. Through the webcasts we sponsor, we raise funds that we then spend on research that benefits our members. If you have research ideas, please contact any of the council members.

Thanks to section members who completed the member survey sent out in May. We had excellent participation on the survey and we are actively working on analyzing the information that was gathered. On June 23, we sent emails to those survey participants who won a gift card in the random drawing.

## INTERESTED IN VOLUNTEERING?

We can always use additional volunteers. As noted earlier, you don't have to be an elected member of the council to contribute to SmallCo. We welcome additional volunteers and we will work with you to find a role of interest to you. I plan to continue my involvement after my last year is completed because I find that being involved generates more back to me and my company than I give, and, it is fun and interesting. If you are interested in volunteering, our calls are usually on the third Thursday of each month between 2:00 and 3:00 p.m. central time. Contact Jennifer Foster ([jfoster@soa.org](mailto:jfoster@soa.org)) at the SOA for details and to be added to the contact list. To contact any council member, look for contact information on the [SmallCo Web page](#).

Enjoy this edition of *Small Talk*. ■



Pamela A. Hutchins, FSA, MAAA, is senior vice president and chief actuary at Government Personnel Mutual

Life in San Antonio, Texas. She can be reached at [aph@gpmlife.com](mailto:aph@gpmlife.com).

## EDITORIAL

# An Editor in Search of the Best Practice

By Grant Hemphill

I sometimes see methods described as actuarial Best Practices. It seems these are usually the most computer and data intensive ways of getting an answer. It made me wonder who decides what is an actuarial Best Practice. Who is the judge? Of course, I googled it. Some thoughts about Best Practices and references follow:

“A **best practice** is a method or technique that has consistently shown results superior to those achieved with other means, and that is used as a benchmark.”

One academic author described how to establish a Best Practice [the best practice for setting a Best Practice?] 1. Find examples of smart practices. 2. Compare their outcomes in a range of contexts. The author had six other steps but there is much to be gleaned from these two.

His first point acknowledges that there are other good methods besides the one that might eventually be judged the Best Practice. Another author recommended the use of the more modest term “Smart Practice.” This term does not imply that the method has been compared with all others and been found superior in all cases. Similarly, I found that the IT field has a “[Standard of Good Practice](#)” for security.

One article described [contextual best practices](#) as those that were found to be best in certain situations. This again leads to using another term like smart practice. The actuary should decide which smart practice is right in his situation.

[An interesting article](#) on how USDOT establishes Best Practices said that the only way to judge something as the Best Practice is by consensus. The various stakeholders in a procedure or its outcomes must agree for it to be considered a Best Practice.

The academic research on Best Practice was mostly from the public management arena.

Each of these references implies that the Best Practice is not the latest thing. It takes time for a procedure to be used and judged most successful in a variety of circumstances. One definition of Best Practice just said it has become a [business buzzword](#) with no clear meaning. If someone is advocating a new procedure or method as a Best Practice he is probably using this definition.

I found little of direct application to small company actuaries. There is overlap with the IT standards. If the IT officer

Our work is so varied that no particular tool is best for all situations in all companies.

is responsible for using Best (or Good) Practices in information and systems, those would include actuarial systems. There are some articles on this. There is a best practice for [auditing actuarial work](#). This is provided by the Government Financial Officers Association and is applied to public pension work. Closest to our field was a [CAS paper](#) trying to establish the Best Practice for developing the “best estimate” reserve. The NAIC wanted a best estimate and there was no standard or definition for one. This concerned the P/C LAE or IBNR reserve. The paper acknowledged that there are many methods and developed a process for choosing a reserve in the range of results from the different methods. This was somewhat outdated (1998). I hope they gave it some time and experience before it is crowned Best Practice, if it ever was.

I wrote most of this without considering the parallels with my March *Small Talk* editorial. That was about the relative advantages of decision-making with modeling and heuristics. Modelers, of course, think of modeling as the Best Practice. Advocates of heuristics would admit that modeling is sometimes best in certain situations. As noted above, that doesn't make it a Best Practice.

For small company actuaries, having a choice of methods to use for a particular job is important. A specialist will tend to use his particular skill in any situation. (Ask a prostate surgeon what to do about a prostate problem.) I recall early in my career being with the Chief Actuary who was asked how long it would take to get an estimate of a particular reserve projected a few years forward. He said he could do it in three minutes, or three hours, or three days. Which estimate did they want? I still like that example of involving the stakeholders in the choice of method.

If this rambling deserves a conclusion, it might be that I find no actuarial Best Practice. Our work is so varied that no particular tool is best for all situations in all companies. ■



A. Grant Hemphill, FSA, FCA, MAAA, is senior actuary for Bruce and Bruce Company in Lake Bluff, Ill. He can be reached at [ghemphill@babco.us.com](mailto:ghemphill@babco.us.com).

# Introducing the Representative Scenarios Method (RSM)-Part 1

By Mark Birdsall and Steve Strommen

This article is the first of two articles to address the representative scenarios method (RSM). Part 1 focuses on the motivation and goals for this new reserve methodology, together with a description of how the methodology works and what key information can be derived from the analysis. Part 2 will focus on the field tests that have been undertaken to validate the accuracy and practicality of this methodology. Part 2 is scheduled to be published in the March 2016 edition of *Small Talk*.

## BACKGROUND

A few years ago, the original idea of PBR seemed promising: Embed risk analysis in reserve calculations to “right-size” reserves through a process similar to cash flow testing that allows companies to reflect their unique experience in the reserve calculations. Over time, this concept morphed into a much more complex and daunting set of requirements in VM-20 for life insurance—especially the assumption-setting process and the stochastic valuation calculations. Resources will be required to implement such requirements, and while resources are short everywhere, they are especially short within smaller companies. Also, many smaller companies have stayed

away from the product designs that led to the need for PBR in the first place.

It is with these lower-risk asset and liability profiles in mind that the stochastic exclusion test (SET) was included in VM-20. The basic idea was “less risk-less work.” The test involves modeling a handful of scenarios to demonstrate that full stochastic valuation is of little value because the risks at which it is directed are small. The stochastic exclusion test has now gone through field testing and has proven to be successful in sorting lower risk asset portfolios and liability products from higher risk portfolios and products for which stochastic modeling may be needed to properly value the risks.

It was the success of the SET that started the thought process that led to the Representative Scenarios Method (RSM). Ideally, actuaries would be able to stochastically model all the key risks in a block of business, but this isn’t practical from a runtime standpoint and would be very difficult to audit for the company, its independent auditors and for regulatory reviewers. But what if, like the SET, a small number of specially constructed scenarios could measure not only the interest

It was the success of the SET that started the thought process that led to the Representative Scenarios Method (RSM).

rate/market risk in a product but also apply multiple-scenario techniques to risks besides investment returns in order to better evaluate the total risk profile of a product and properly reflect those risks in the valuation?

So, what is RSM? First of all, it is a valuation methodology that was developed in response to the NAIC Life Actuarial Task Force’s (LATF’s) charge to the American Academy of Actuaries (Academy) Annuity Reserve Work Group (ARWG) to develop PBR for nonvariable annuities. In connection with this charge, ARWG was to prepare a draft of VM-22, the section of the PBR valuation manual that would apply to nonvariable annuities. RSM was developed in response to the challenge of the ARWG chair to not simply cut and paste VM-20 requirements, but rather “advance the ball” in developing the best way possible to calculate PBR reserves. In this way, RSM is the valuation method currently used for the modeled reserve in drafting VM-22 for nonvariable annuities.

Second, RSM approximates the results that would be derived from full stochastic modeling of all key risks associated with a block of business. However, it addresses the practical issues of run time and auditability by being based on a limited number of carefully-constructed

scenarios for each of the key risks associated with a block of business. Being a multirisk approach, RSM has the potential to serve as a valuation methodology that could be used for any long-tailed liabilities, including life insurance, variable annuities, and long-term care, as well as nonvariable annuities. In Part 2 of this article, we will discuss the results of field tests where RSM has been used to calculate modeled reserves for these different product types.

Third, RSM is a methodology that requires the identification and analysis of key risks, both the company’s current anticipated liability assumptions regarding those risks, plus the distribution around the anticipated experience. For asset assumptions reflecting the environment in which all companies operate, there will likely be provisions in VM-22 to ensure consistency in the modeling of those assumptions over which the company has little or no control, such as asset default rates and credit spreads. The basic paradigm is to calculate a central estimate reserve based on current anticipated experience assumptions and statistical variations around those assumptions, together with the calculation of an aggregate margin. The modeled reserve equals the sum of the current estimate reserve and the aggregate margin.

## HOW ARE THE SCENARIOS DEVELOPED?

RSM starts with development of a short list of risk drivers specific to the contracts being valued. RSM is built on the idea that each risk driver has a statistical distribution around its anticipated value, and the actuary (perhaps with guidance) can estimate percentile points on that distribution for the contracts being valued. For example, the distribution of mortality cost might be defined as a percentage of a pricing table, with the 50th percentile of the distribution corresponding to 100 percent of the table. For the block of business being valued, the 80th percentile for one year's experience might be at 110 percent of the table, and the 99th percentile might be at 130 percent of the table.

The scenario generator used in RSM creates a small number of scenarios for each risk driver. One is just the anticipated experience scenario. Each of the other scenarios corresponds to a path of that risk driver's actual experience over time. The experience for all other risk drivers is left at the anticipated level, so each scenario involves experience different from anticipated for only one risk driver.

Each generated scenario is intended to approximate experience over time at a specific percentile level for a specific risk driver. When generating a path over time at a percentile level, one must reflect the idea that a scenario where mortality each year is at the 80th percentile level is, in total over a long period of time, at a percentile level much higher than 80. This

is analogous to the idea that flipping a coin and getting five heads in a row is much less likely than flipping it once and getting heads. The scenario generator uses the theory of random walks to adjust for this effect. This is the same theory that was used to develop the scenarios in the stochastic exclusion test.

RSM is intended to include all significant risk drivers, not just investment returns. In order to run RSM scenarios, a cash flow testing model may need to be modified so that a mortality fluctuation specified in the scenario file (say, as a percent of tabular that varies by year) can be simulated within the model.

The whole set of RSM scenarios can then consist of perhaps five scenarios for each risk driver; one at each of the following percentile levels: 99 percent, 84 percent, 50 percent, 16 percent, and 1 percent. The RSM reserve calculation process involves calculating the present value of cash flows for each scenario for each risk driver, and then using those results in a prescribed manner.

## WHAT STEPS ARE INVOLVED IN CALCULATING RSM RESERVES?

The six steps involved in deriving a reserve using the RSM are summarized as follows:

### Step 1:

Identify blocks of business with substantially similar risks. Identify the block's key risk drivers (KRDs), which are those assumptions whose variability can significantly affect the cost of fulfilling the contract.

### Step 2:

Determine the distribution of assumption values for each KRD.

### Step 3:

Generate scenarios for each KRD within its distribution. In the field tests of different products, the five scenarios used for each KRD were the median (a.k.a. anticipated experience), +/-1 standard deviation and +/- 3 standard deviations. The total number of scenarios necessary for the determination of the RSM reserve is equal to  $1 + (\text{number of KRDs}) \times (\text{number of scenarios per KRD} - 1)$ .

### Step 4:

Project asset and liability cash flows. In this step, each scenario is assigned a scenario reserve. The scenario reserve is the level of starting assets required to satisfy all liability cash flows until the contracts expire. This may be estimated as the present value of projected cash flows discounted at the path of book yields, as can be done for the VM-20 deterministic reserve.

### Step 5:

Calculate a central estimate as a weighted average of the scenario reserves. Within each KRD, the scenarios are assigned probability weights. Each KRD is also assigned a weight. Combining the scenario reserves using these weights determines the central estimate of the reserve prior to margins. Note that the central estimate is not the anticipated scenario; it is a weighted average of all scenarios.

### Step 6:

Add an aggregate margin to the central estimate reserve. Two alternate approaches are proposed for calculating the aggregate margin—the cost of capital approach and the percentile approach.

- The cost of capital approach uses the extreme scenarios for each KRD to calculate a target capital amount as of the valuation date. This target capital amount is then projected forward using values produced as part of the anticipated experience scenario. These target capital amounts are discounted back to the valuation date and a cost of capital rate is applied to produce the value for the cost of capital margin. At a high level, the reserve with a cost of capital margin is similar to the concept of a transfer value, wherein the margin represents the compensation that an arms-length investor would require to accept the risks associated with the block of business.
- The percentile approach is more like the CTE 70 methodology in VM-20, VM-21 and Actuarial Guideline 43. The goal of the percentile aggregate margin is to approximate a percentile level in the distribution of the present value of future cash flows across all scenarios. Since the RSM scenarios are each specific to one

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## This could help unify cash flow testing and ORSA analyses.

risk driver, one must aggregate results across risk drivers to approximate this distribution and estimate the desired percentile level.

Part 2 will provide case studies of the application of RSM to nonvariable annuities, term life insurance, universal life with secondary guarantees, variable annuities with guaranteed lifetime withdrawal benefits, and long-term care insurance, including the calculations of the aggregate margins.

### POTENTIAL USES OF RSM

The initial goal for RSM is to provide a simple alternate approach to calculating principle-based statutory reserves. In this context, RSM provides the advantages of reducing the number of scenarios required and thereby making it easier to study each scenario in detail for auditing and for the purpose of making judgments about the assumptions in use and the severity of the stresses being tested.

There is potential for the multiscenario analysis carried out for RSM to be used in a much broader context. If field tests show that RSM is suitable for essentially all long-tail lines of insurance, then it could become the common analytical structure to calculate both reserves and required capital for all long-tail lines of business,

embedding risk analysis that reflects the risk profiles of each product group and each company.

As such, RSM could be used for asset adequacy analysis. It could also serve as a PBR methodology for not only VM-22, but also as a valid approximation method as provided for in AG 43, VM-20, VM-21, and the future valuation manual sections for long-term care and long-term disability. Each of these current valuation manual sections provides for the use of approximation methods, as long as these methods do not produce systematically lower reserves than the specified PBR methodology.

One can imagine the same analytical structure being applied to both new business and existing business. This could help unify cash flow testing and ORSA analyses. Going further, one could use this approach to estimate the embedded value of each block of business and the total company, and help explain changes in that value over time.

Many smaller companies use a multiple of Life Risk-Based Capital as the target capital used in pricing exercises. Using such an estimate is not only theoretically unsound (there is no inherent meaning in a multiple of RBC other than it is more conservative), but also requires a difficult allocation of

RBC to particular products in a top-down approach. As noted before, the more extreme RSM scenarios can be used to calculate target capital for each product type using a bottom-up approach that directly flows from the risk profile of the product group. This measure of target capital could facilitate the allocation of capital to each product group for pricing and to calculate the amount of free surplus that the company has available for its business plan.

### THE NEED FOR TESTING

Here are some of the questions and issues that need resolution:

1. RSM starts from the actuary's estimate of anticipated experience. There are no implicit margins. This means some generally accepted rules regarding statutory reserves would be allowed to be modified. For example:
  - a. A trend of mortality improvement may be recognized for life insurance reserves.
  - b. Reserves, especially central estimates, may be negative in some cases. This issue may be addressed by looking at the total modeled reserve and not the central estimate reserve by itself.
2. Does the small number of scenarios under RSM provide a sufficiently accurate estimate of the results of full stochastic modeling using a large number of scenarios?
3. Are risk drivers for all products expressible in the form of distributions of assump-

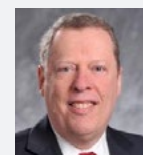
tion values that can be used in a cash flow testing model?

4. Can guidance in the development of assumptions and distributions be written to satisfy the needs of actuaries and provide regulators assurance against abuse? What limitations and/or safe harbors will regulators want? To what degree will such limitations or safe harbors amount to implicit margins?
5. Will regulators be comfortable with an "aggregate margin," and if so which form (percentile or cost of capital)?
6. Can the use of a separately calculated margin avoid raising tax concerns through appropriate changes in terminology (e.g. provision for the cost of bearing risk)?

Part 2 of this article will provide results of field testing being done to address some of these issues. ■



Mark Birdsall, FSA, MAAA, MBA, is a consulting actuary with Lewis & Ellis in Overland Park, Kansas. He has been working on a number of initiatives to improve actuarial modeling to properly reflect multiple material risks and establish meaningful margins. He can be reached at [mbirdsall@lewisellis.com](mailto:mbirdsall@lewisellis.com).



Steve Strommen, FSA, CERA, MAAA, is an independent consultant and owner of Blufftop LLC. He has over 35 years of life insurance industry experience and specializes in financial modeling, risk management, and principle based reporting. He can be reached at [stevestrommen@blufftop.com](mailto:stevestrommen@blufftop.com).



# SOX Controls and Risk Focused Examinations

By Leon L. Langlitz

As the NAIC and state insurance departments continue to refine and gain experience in using the risk focused examination methodology in the financial examinations of insurance companies, the importance of sound risk controls in all aspects of insurance company operations continues to gain importance. As can be expected with a relatively new process, the rigor in the application of this risk focused methodology can vary widely from state to state. It can also vary from examiner-in-charge to examiner-in-charge within a particular state. As such the degree to which the following analysis is applied will also vary.

As a quick review, the risk focused examination process is divided into seven phases. In the first phase the examiner is to understand the company and determine what areas should be included in the examination. In phase 2 the examination team identifies and assesses the inherent risks of the company. Phase 3 identifies and evaluates the controls the company has in place to manage its risks. In phase 4 a determination of the residual risk is made. This is the risk that remains even after the controls used to mitigate risk are analyzed. Phase 5

again is what can be considered the traditional examination methodology where, for example, detailed testing of reserves may take place. Phases 6 and 7 involve developing any recommended supervisory plan and the drafting and finalization of the exam report and project. In this article, the prime focus is with phase 3: identify and evaluate risk mitigation strategies.

For an actuary working in a publicly traded company this generally means the risk focused examination is focusing on SOX controls. SOX controls

are those documented processes and procedures which are required by the Sarbanes-Oxley Act of 2002 and are used to mitigate risk. For those companies not subject to SOX, the NAIC Annual Financial Reporting Model Regulation, aka Model Audit Rule (MAR#205) and adopted by almost all of the states, contains many of the same ideas found in the SOX legislation.

These risk mitigation strategies are generally based on the following principles:<sup>1</sup>

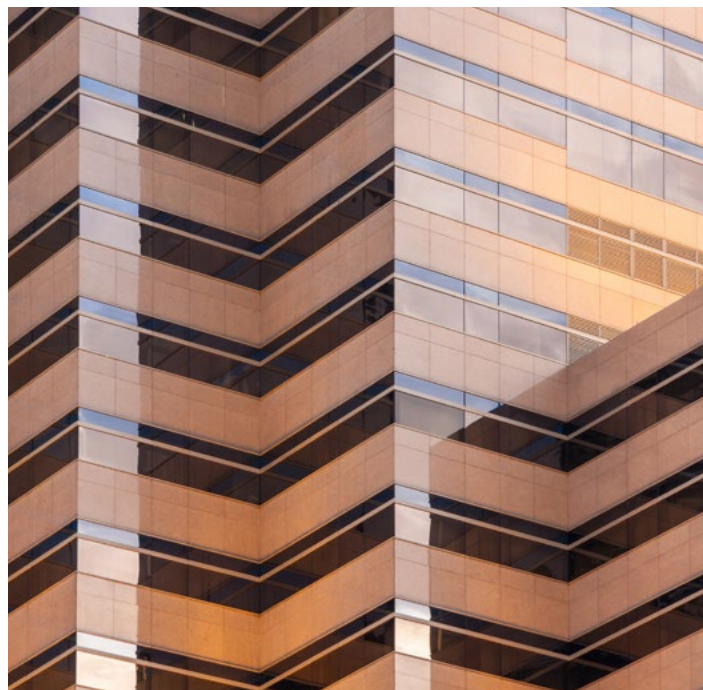
- Active board and management oversight;
- Management information systems which have adequate risk management and monitoring mechanisms;
- Clear policies, procedures and stated limits;
- Comprehensive internal controls; and

- Processes to ensure compliance with laws and regulations.

The first two items above are usually detailed in phases 1 and 2 of the examination. In phase 3 the last three items are analyzed. Generally, the examination team will have identified the key risks to the company and more specifically to the actuarial function (phases 1 and 2). These risks may include those related to pricing & underwriting, reserving, liquidity and operational functions.

For example, when evaluating reserving risk controls some of the issues the examiner may review could include: Do the reserving methodologies established by management reflect a conservative approach? Is the valuation staff responsible for developing the reserves capable and experienced? Are the processes used to evaluate current and prior reserves and reserve trends reliable, accurate and produced on a timely basis? Are the electronic systems from which the valuation information is extracted accurate, dependable and can it be validated? Does the appointed actuary seek out insight from the pricing actuary, claims or underwriting staff regarding product trends and dynamics? If applicable, is reinsurance considered appropriately? In the determination of claim liabilities, is the claim paying function well-documented, validated, and audited? Has the company developed a plan for implementing principle based reserving (PBR)?

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If your company is working under the aegis of SOX or MAR, there should exist extensive documentation of the controls that serve to mitigate reserving risks. This documentation may include narrative descriptions of the processes, checklists, flowcharts, videos, or any other type of documentation that may be pertinent to the specifically identified risk. The examination team will review those controls and determine whether they are functioning as anticipated. The team can rely on the work of the company's external or even internal auditors if they have recently completed testing. The examination team can also perform again control tests to ensure the SOX or MAR controls are functioning appropriately. As an example of a control test ensuring the adequacy of the monthly reserve calculation, consider the following: The SOX control says the valuation actuary reviews

the monthly reserve calculation and signs off each month that the review has been made and the amount approved. In practice, monthly reserves are developed by a member of your staff. When the work is completed, the results are presented to you as valuation actuary. A document is signed, stating the reserves have been reviewed, discussed and agreed with the amounts shown. The control test may be to verify a document exists that has been appropriately signed each month. If the document is verified, there may not be any additional testing of the reserves for that particular block.

How are controls examined for a smaller insurance company where segregation of duties is not possible or SOX or MAR documentation is not required? The answer is not clear cut and will depend on the size, complexity and sophistication

of the company. The actuary may decide to develop his or her own documentation of the valuation or pricing procedures even if not compelled to do so. Obviously, this takes precious time, but having some documentation of the methodology or processes, however rudimentary, may greatly assist the company should something occur where the actuary becomes unavailable to perform his or her duties. The documentation would also assist the examiner in completing phase 3 of a financial examination by minimizing the amount of time the actuary would need in responding to an examiner's requests.

In summary, if there are SOX or MAR controls, they will be reviewed and tested to determine whether they are functioning as described and anticipated. If such documentation does not exist it becomes more difficult for the examiner to de-

termine whether sufficient controls exist to mitigate the risk. If the determination of weak controls is made, much more substantive testing will occur in phase 5 thereby increasing the time and expense of the examination. Therefore, documentation of policies and procedures is always a plus. Good documentation is even better. Not surprising as that has always been the case.

For more information on risk-focused exams see the cover article by the same author in the [September, 2014 edition](#) of *Small Talk*. ■

#### ENDNOTE

<sup>1</sup> NAIC Financial Condition Examiners Handbook



Leon Langlitz, FSA, MAAA, is senior vice president in the Kansas City office of Lewis & Ellis, Inc. He can be reached at [llanglitz@lewisellis.com](mailto:llanglitz@lewisellis.com).

# Liability Durations for Premium Paying Products

By James Ward

Asset/liability management (ALM) has become an ever-increasing discipline within the actuarial profession. The development of sophisticated insurance products in an increasingly complex economy has necessitated an ever evolving analytical framework to measure and monitor risks being born by insurance companies. This evolution has gotten the attention of state insurance departments as well as rating agencies that have a growing interest in monitoring company ALM programs. And while smaller insurance com-

panies are not on the forefront of product innovations driving the increased focus on ALM, they are getting swept up in the requirement to develop and enhance their ALM programs to the satisfaction of regulators and rating agencies.

While ALM covers a broad set of risks, interest rate risk is generally the most commonly addressed and monitored risk within implemented ALM disciplines primarily because it is one of the most identifiable and applicable risks facing insurance companies. Plus there ex-

ist metrics that provide (at least on the surface) quantifiable analytics that are practical to implement. The most common of these metrics is duration.

Duration is a measurement of a change in market value (price) for a change in interest rates. Most of the theoretical development and practical application of duration as a metric revolves around fixed income securities. As such, calculating the 'A' part of a duration-based ALM strategy is fairly straight forward.

Despite the increased prevalence of ALM programs, the theoretical and practical approaches to calculating duration for liabilities are undeveloped. In other words, the 'L' of ALM can be more of a challenge. The rest of this article will discuss practical approaches to calculating liability durations.

For purposes of this article, the formula used to calculate (effective) duration will be

$$D^{Eff} = (P_{-i} - P_{+i}) / (2 \times \Delta i \times P_0)$$

where,

$P_0$  is the average present value of liability cash flows at base interest rates,

$P_{-i}$  is the average present value of liability cash flows with interest rates shocked down,

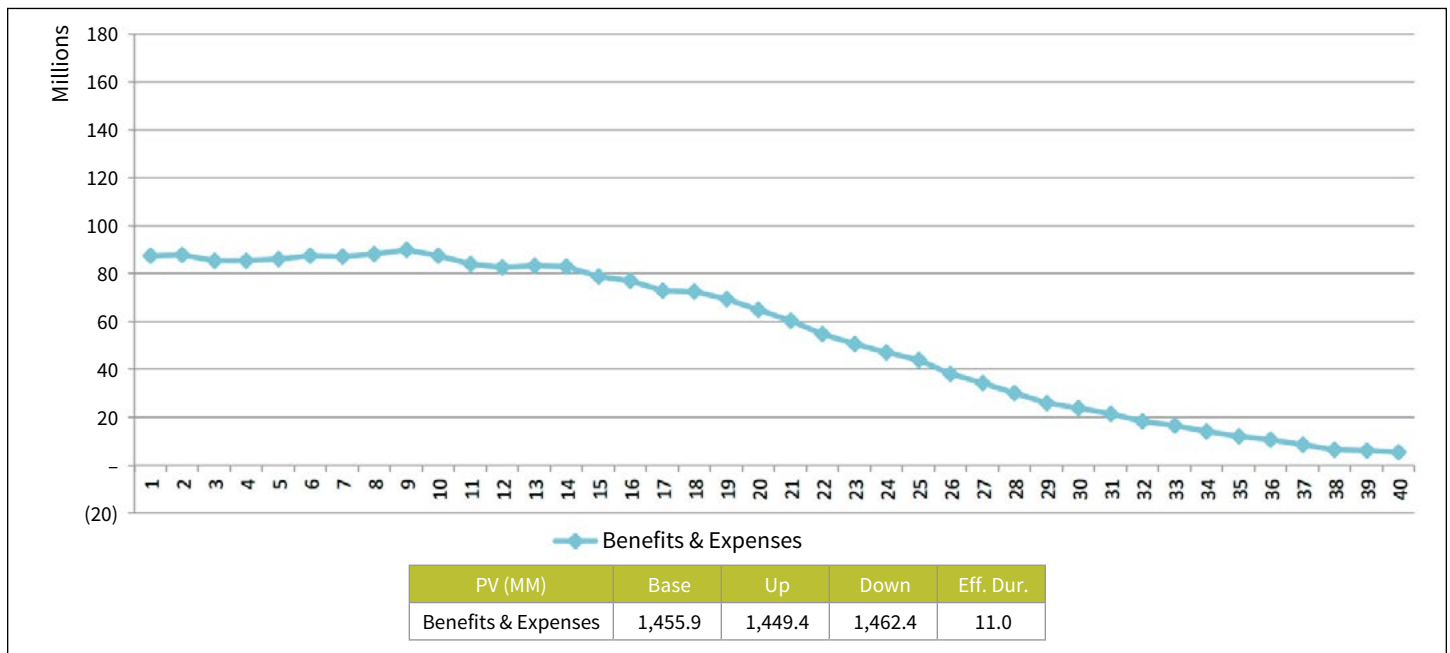
$P_{+i}$  is the average present value of liability cash flows with interest rates shocked up, and

$\Delta i$  is the amount of the interest rate shock.

## LIABILITY DURATIONS FOR SINGLE PREMIUM PRODUCTS

For illustrative purposes, the projected cash flows for a hypothetical block of deferred annuities in a payout phase are represented in figure 1.

Figure 1



CONTINUED ON PAGE 12

The graph shows 40 years of projected benefits and expenses. The table below the graph shows the present value of those cash flows discounted at the base interest rates. We move the interest rate scenario up and down by a small increment, just 4 basis points in this case constrained by the low short-term rates in the starting yield curve. If the cash flows are interest sensitive, we would project them again and discount them at those adjusted interest rates to determine the up and down present values. Then using the formula for effective duration where we take the difference between the up and down present values, divided by the product of the base present value times two times the interest rate differential, 4 basis points, we arrive at the result of the effective duration of 11.0 as shown.

As previously stated, duration was initially developed as a metric for fixed income securities. A characteristic of these securities is that the cash flows are all in one direction. The owner of a bond expects to receive coupons and, at the maturity date, the par value of the bond. Using those expected cash flows, one can calculate the duration of the bond. And that metric also works very well for liabilities where the cash flows are all in one direction, such as a block of single premium deferred annuities or a block of payout annuities or structured settlement annuities.

LIABILITY DURATIONS FOR PRODUCTS WITH RENEWAL PREMIUMS

What if a liability block that a company wants to include in their ALM analysis includes renewal premiums? What happens to the duration? Well, that

depends on the magnitude and timing of the premiums in relationship to the cash outflows. They may have very little impact, or their impact may be significant. Renewal premiums can reduce the present value of the net cash flows to near zero or even cause it to be negative. And since the present value of the net cash flows is in the denominator of the formula of effective duration, a present value near zero can cause the effective duration to be artificially high. If the present value of the net cash flows is negative, then the formula can produce a meaningless negative result for effective duration.

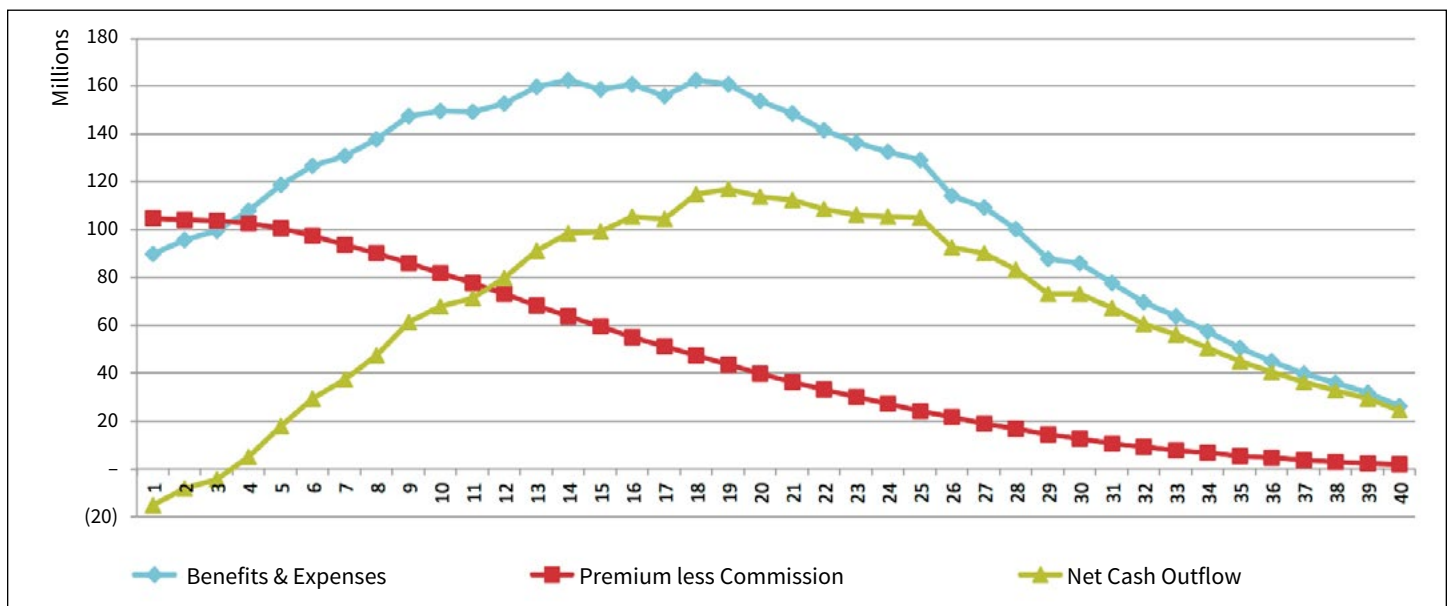
So what does one do with these blocks? There are three general approaches that are utilized:

1. Use the net cash flows as they are, and let the duration be extended.

2. Ignore the periods of net cash inflow, that is, if the net cash flow for a period is an inflow to the company, treat the cash flow as zero for that year.
3. Project the liability assuming no renewal premiums are received, which can work for a product such as a flexible premium deferred annuity where renewal premiums are not required.

An example of a liability with renewal premium characteristics would be a mature FPDA block where a significant amount of value has been accumulated and a significant amount of premium continues to be received on an annual basis. Figure 2 represents the cash flows from a hypothetical block such as this.

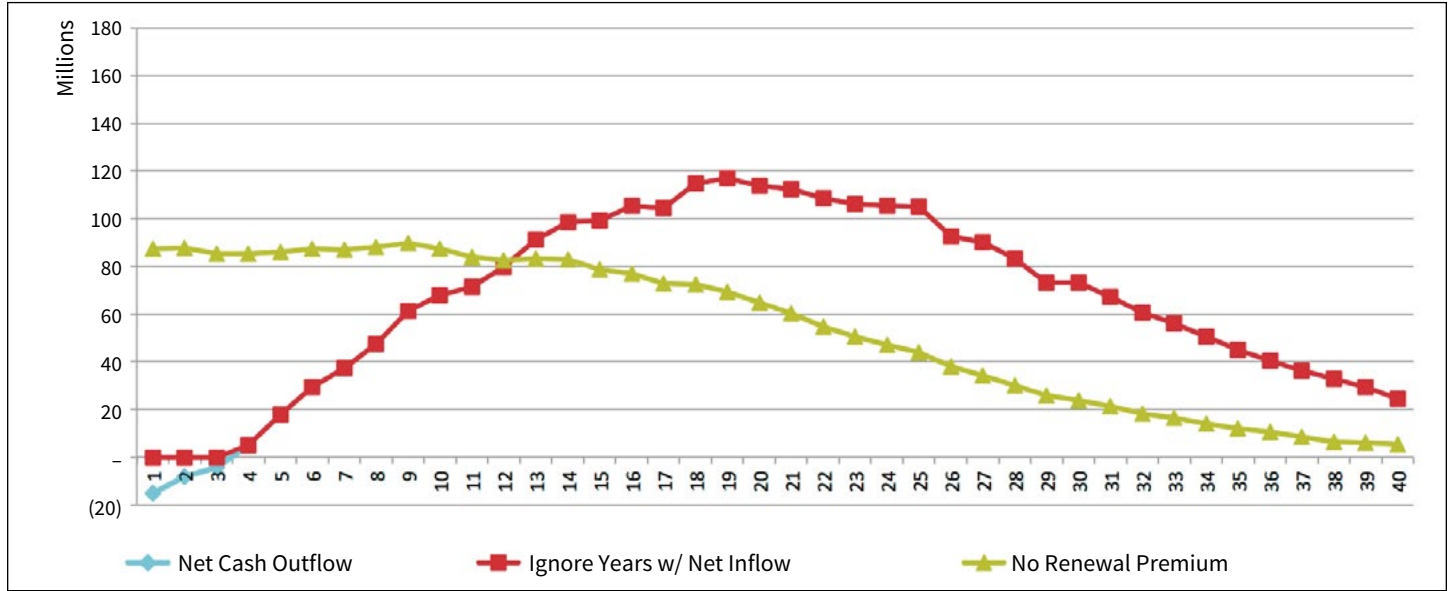
Figure 2



The line that starts highest and finishes near zero represents the projected renewal net premium, that is, premium less commission. The line that peaks highest represents the projected withdrawals and surrenders plus expenses. The line that starts as negative is the net cash outflow.

Figure 3 represents the cash flows used by each of the three approaches.

**Figure 3**



Note that for this particular example, there are only three years of net cash inflow (negative net cash outflow). So the result of approach two differs only a little from approach one. The third approach (no renewal premium) is based on a separate projection of the liability block assuming no renewal premiums are received. Since this is an FPDA block and premiums are not required for the liability to remain in force, such a projection is possible. Since there are no renewal premiums, the net cash flows occur relatively earlier.

The results of the three approaches are as follows:

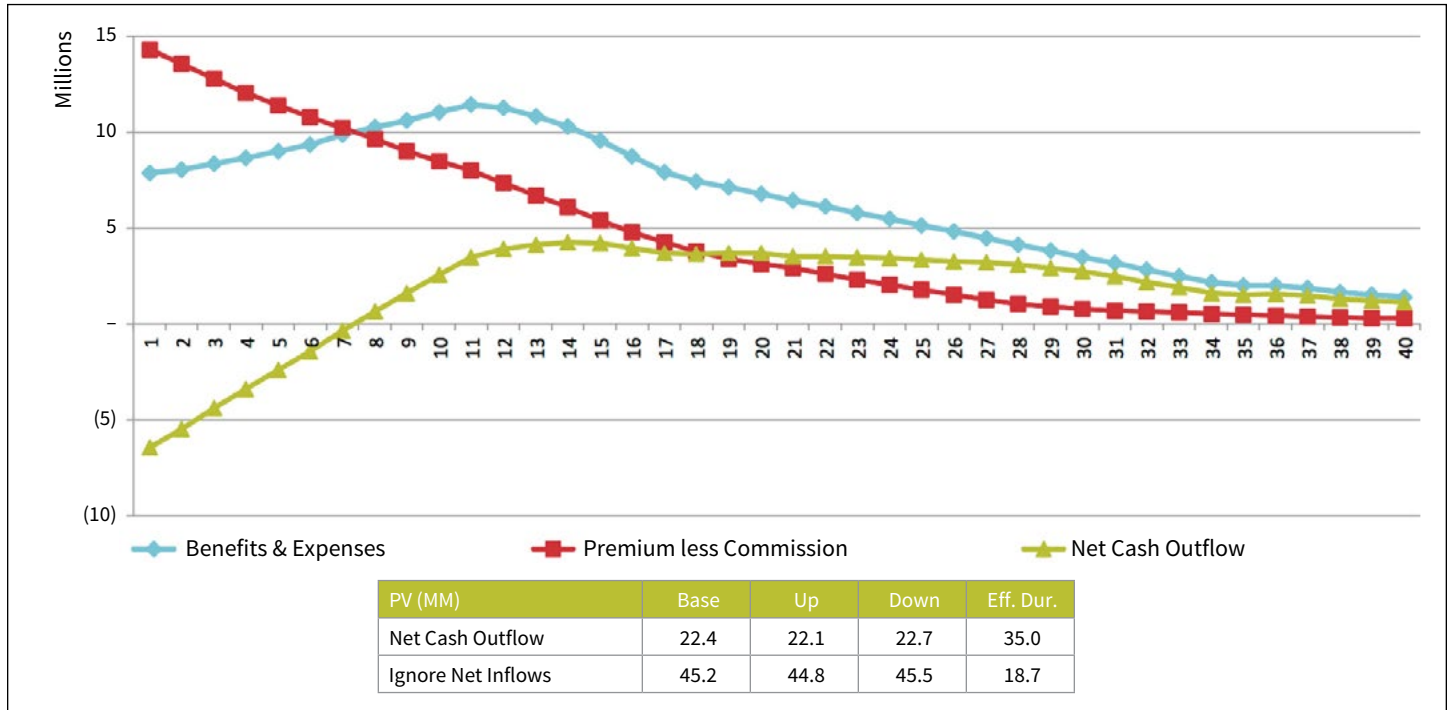
PV (MM)	Base	Up	Down	Eff. Dur.
Net Cash Outflow	1,306.3	1,296.6	1,316.2	18.4
Ignore Net Inflows	1,333.4	1,323.7	1,343.3	18.1
No Renewal Premium <sup>1</sup>	1,455.9	1,449.4	1,462.4	11.0

The duration on the net cash outflow in this example is 18.4. Ignoring the first three years of net inflows reduces the duration only slightly to 18.1. For approach three, since the net cash outflows occur relatively earlier with no assumed renewal premium, the duration is 11 rather than 18.

CONTINUED ON PAGE 14

While some flexible premium products like FPDA's allow the option of projecting cash flows without renewal premium, life insurance liabilities often do not. In looking to apply approaches one and two to a life insurance block, the hypothetical cash flows represented in Figure 4 are utilized.

Figure 4



These cash flows might be typical of a relatively young whole life block. In this example, the inflows exceed the outflows for the first seven years.

The net cash outflows, represented by the line that is negative at the start of the projection, have a duration of 35.0. If we floor the net cash outflow at zero during the first seven years, the resulting duration is 18.7.

Ignoring years of net inflow does have an impact and reduces the duration. But the reality is that this entails ignoring what might be a significant part of the model with no theatrical justification for doing so.

The third approach is not a viable option for a typical life insurance segment where renewal premiums are required. Even when projecting a model without renewal premium is possible, as in the case with FPDA's, if this is outside of realistic actuarial expectations, is it justifiable?

AN ALTERNATE APPROACH

The two prior approaches that modify the net cash outflows ignore some aspect of the model. Rather than have an approach where something is ignored, an alternate approach is presented here that uses the information in a meaningful way. This approach is as follows:

1. Separate the cash outflows—the benefits and expenses—from the cash inflows.
2. Treat the cash inflows as if they are part of the asset portfolio of the company.
3. Use these separate components to determine a target duration for the assets that back the reserve balance for the liability segment.

Another way of saying this is that the assets backing reserves have a duration, and the premium inflows (another asset) have a duration, and the combined weighted duration should be compared to the duration of the cash outflows of the liability.

Utilizing the hypothetical life insurance block from above, where the inflows were shown separately from the outflows, the duration for each of those cash flow elements is as follows:

PV (MM)	Base	Up	Down	Eff. Dur.
Benefits & Expenses	165.5	164.7	166.3	11.7
Prem less Comm.	143.1	142.6	143.5	8.0
Net Cash Outflow	22.4	22.1	22.7	35.0

The question trying to be answered in all of this analysis is, “What is the target duration for the assets that support the reserve for this segment?” In this example, the reserve is 55.3 million.

In looking to answer that, it should be noted that the projected premiums, which have already been reduced for any commission payable upon their receipt, are available to cover cash outflows, but they are also a source of profit. As such, the entire premium inflows should not be considered as part of the asset portfolio in this analysis; thus, it is appropriate to reduce the weight of this premium asset as it is used to determine the target duration for the invested assets supporting the reserve. In other words, only enough of the present value of inflows to cover the difference between the present value of the outflows and the reserve is needed.

$$PV[\text{Outflows}] - \text{Reserve} = k \times PV[\text{Inflows}]^2$$

$$k = (PV[\text{Outflows}] - \text{Reserve}) / PV[\text{Inflows}]$$

$$k = (165.5 - 55.1) / 143.1 = 77.15\%$$

In other words, assets backing reserves plus 77.15 percent of the present value of premiums are necessary in order to cover the benefits and expenses of the block.

With this information, it is possible to find the target duration for the assets backing the reserves:

$$PV[\text{Outflows}] \times \text{Dur}[\text{Outflows}] - k \times PV[\text{Inflows}] \times \text{Dur}[\text{Inflows}] = \text{Reserve} \times \text{Target Duration}$$

$$\text{Target Duration} = (165.5 \times 11.7 - 0.7715 \times 143.1 \times 8.0) / 55.3 = 19.0$$

Putting all of the numbers neatly in one chart:

	PV	Eff. Dur.
Outflows (Benefits & Expenses)	165.5	11.7
Inflows (Premium less commission less profit), adj	110.4	8.0
Reserve and Target Duration for supporting assets	55.3	<b>19.0</b>

CONTINUED ON PAGE 16

Applying this same approach to the FPDA example presented earlier results in a target duration of 18.1. The following table summarizes the results from the various approaches:

Duration Approach	Liability Segment	
	FPDA	Life
Net Cash Outflows	18.4	35.0
Ignore Years with Net Inflows	18.1	18.7
Project without Premium	11.0	n/a
Treat Net Premium as an Asset	18.1	19.0

### FINAL CONCLUSIONS AND CONSIDERATIONS

For these two example segments, this alternate approach happens to produce a result similar to that produced by ignoring years with net inflows, yet there are many advantages of this approach. It arrives at a meaningful result without ignoring what might be a material element of the liability model, and it enables the ALM professional to apply a common approach across diverse liability segments.

It should be noted that when calculating the weight of the present value of premiums to include in the asset portfolio, this approach combines present values on a market value basis with reserves on a book value basis. Care should be taken to review results for this approach.

It is not clear how widely this alternate approach is utilized in the industry. The only instance where I have found a similar approach mentioned in literature is the 2007 research report, “Interest Rate Hedging on Traditional Life and Health.”<sup>3</sup> As I have shared this approach with industry colleagues, I have found that some are already using this type of an approach, and I have found that others have been looking for a meaningful approach to calculate the duration for liability segments with renewal premiums. My goal in writing this article is to share an idea that can spur collaboration to advance ALM methods available to our industry. ■

### ENDNOTES

- <sup>1</sup> An astute reader will note the graphs, present values, and Duration of the No Renewal Premium FPDA is identical to the earlier graph represented as a hypothetical deferred annuity block in payout phase.
- <sup>2</sup> This formula correlates to the standard net premium reserve formula: Reserve = PV[Benefits] – k x PV[Premium].
- <sup>3</sup> “Interest Rate Hedging on Traditional Life and Health,” by Craig W. Reynolds and David Wang of Milliman, Inc., is available from the SOA: [www.soa.org/research/research-projects/finance-investment/research-interest-rate-hedging-life-hlth.aspx](http://www.soa.org/research/research-projects/finance-investment/research-interest-rate-hedging-life-hlth.aspx)



James T. Ward, FSA, MAAA, is vice president and life valuation actuary at American Fidelity Assurance Company in Oklahoma City, Okla. He can be reached at [James.Ward@AmericanFidelity.com](mailto:James.Ward@AmericanFidelity.com).



# Smaller Insurance Company Annual Meeting Sessions

By Steve Chamberlin

The Smaller Insurance Company section is sponsoring four sessions at the Society of Actuaries Annual Meeting in Austin, Texas. We'll start on Monday morning (Oct. 12) at 7 a.m. for our section breakfast. Section chair Pam Hutchins will provide an update on current section activities and Brad Shepherd will talk

about the benefits of volunteering with the section. It is also a good opportunity to network with your peers.

On Monday afternoon (3:30 p.m.), Tim Cardinal and Alice Fontaine will speak on principles based reserve (PBR) issues for smaller insurance companies. They will provide an up-

date on the impact of PBR, with emphasis on the small company exemption, experience reporting and the impact on products.

On Tuesday morning (8:30 a.m.), we are cosponsoring a session with the Product Development Section on mandatory expense reporting for life and health insurance companies. PBR requires actuaries to develop company specific expense assumptions while actual expense is used by insurance regulators in the assessment of insurer performance. Leon Langlitz and Tom Rhodes will discuss whether a change in life insurer expense reporting is needed, and if so, how it should be accomplished.

Our last session is on Tuesday afternoon (3:45 pm), and is a buzz group session with opportunity to interact with other smaller insurance company actuaries. Discussions will range from the impact of the existing economic situation to the state of regulation. You'll be able to interact with your peers and share what is working and not working in your companies. ■



Steve Chamberlin, FSA, MAAA, is a consulting actuary with Chamberlin Consulting, LLC. He can be reached at [scc\\_61\\_92@mediacombb.net](mailto:scc_61_92@mediacombb.net).



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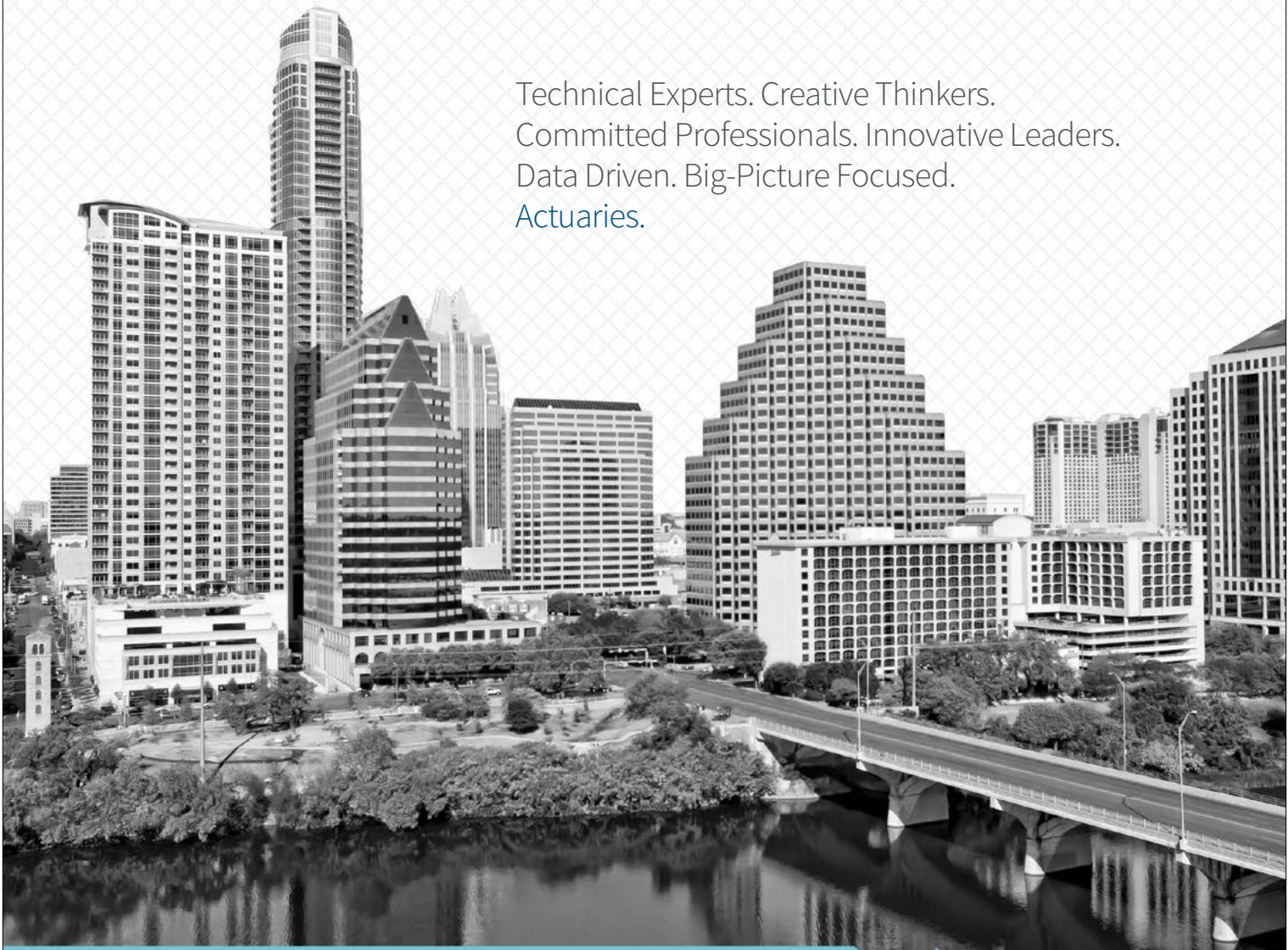


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