



RISKS AND REWARDS

THE NEWSLETTER OF THE
INVESTMENT SECTION

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BY THE SOCIETY OF ACTUARIES

Chairperson's Corner

by Douglas A. George

As incoming chair, one of the first things I did was review the work performed by the Investment Section over the last few years. I knew our workload had been increasing in recent years, but I was quite surprised to see how much it had grown. We currently have about two dozen initiatives in place, which is about double the number we had only three years ago. After briefly introducing our section council, I'd like to summarize some of these initiatives in this column. Next to each initiative I have listed the Section Council member(s) taking the lead role. If you have input or would like to participate in any of these, please contact the listed member.

2003 Section Council

I'm chair from the class of 2003. Our vice-chair is Mark Bursinger (class of 2004) and our treasurer is Craig Fowler (2003). Our co-secretaries are Charles Gilbert (2003) and Steve Easson (2005). Rounding out the class of 2004 are Joe Koltisko and Larry Rubin. Rounding out 2005 are Mike O'Connor and Bryan Boudreau. Our council is committed to serving our section and each member takes on specific responsibilities in this regard. In addition, we get excellent support from our SOA staff actuary, Valentina Isakina and Lois Chinnock from our SOA support staff.

Our council serves a strong section. We are one of the largest sections of the SOA with roughly 4000 members. Our financial position is good—as of September 30, 2002, surplus stood at \$166,215.

Risk Management Task Force (Charles Gilbert, Doug George)

We are sponsoring the task force in conjunction with the Finance Practice Area. The task force was initiated last year and will kick into high gear this year under the leadership of Dave Ingram. The task force has grown rapidly since initiation. Current headcount runs about 225 volunteers, most being members of the Investment Section. The volunteers have split into 10 subgroups, addressing topics such as enterprise risk management, RBC covariance, extreme value models, and policyholder behavior in the tail. The subgroups



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- Mark W. Bursinger, Vice-Chairperson
- Craig Fowler, Treasurer
- Steven W. Easson, Co-Secretary
- Charles L. Gilbert, Co-Secretary
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Articles Needed for *Risks and Rewards*

Your ideas and contributions are a welcome addition to the content of this newsletter. All articles will include a byline to give you full credit for your effort. For those of you interested in working in further depth on *Risks and Rewards*, several associate editors are needed. For more information, please call Dick Wendt, editor, at (215) 246-6557.

Risks and Rewards is published quarterly as follows:

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PREFERRED FORMAT

In order to efficiently handle files, please use the following format when submitting articles:

Please e-mail your articles as attachments in either MS Word (.doc) or Simple Text (.txt) files to the newsletter editor. We are able to convert most PC-compatible software packages. Headlines are typed upper and lower case. Please use a 10-point Times New Roman font for the body text. Carriage returns are put in only at the end of paragraphs. The right-hand margin is not justified. Author photos are accepted in .jpeg format (300 dpi) to accompany stories.

If you must submit articles in another manner, please call Joe Adduci, 847-706-3548, or e-mail him at jadduci@soa.org for help.

Please send articles via e-mail or in hard copy to:

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Thanks you for your help.

Investment Speakers Wanted!

The Investment Section is seeking knowledgeable speakers for section-sponsored sessions at the upcoming Society of Actuaries Spring Meeting in Washington, D.C., May 29-30. Sessions with speaker openings as of press time are:

- Credit Risk Modeling for Life Insurers
- So, the Equity Markets Don't Always Go Up? Capital Markets
- Hedging of Variable Annuities and Equity-Indexed Annuities
- Benchmarking Investment Performance
- No Place to Hide—Consolidated Insurer's Exposure to Equity Market Risk
- Investment Risk: The Operational Side
- Economic Scenario Generators
- Risk Management Buzz Group
- Implications of a Low Interest Rate Environment

Please contact Michael O'Connor (mike.oconnor@tillinghast.com) if you are interested in speaking at an Investment Section spring meeting session. ☺

are developing a variety of projects on their respective topics including research studies, practice guides, surveys, literature searches and joint projects with other organizations. Initial results from these projects will become available later in the year.

Meetings and Seminars

Our section sponsors a number of seminars. Our work includes developing themes, fleshing out topics, recruiting speakers, providing financial support and organizing the program. The annual Investment Actuary Symposium (Charles Gilbert) was held in November in Chicago and drew over 100 attendees. This year the symposium will be jointly sponsored with the CIA and held in Toronto. The Basic and Advanced Risk Management Seminars (Larry Rubin) were held in December in New York. We expect to run these again this year as well. The Asset-Liability Management Seminar (Mark Bursinger) was held last July at the Wharton School. A major attraction of the seminar has been participation by Dave Babbel of the Wharton School. Dave is on extended leave and would not participate if we were to go back to Wharton this year, so we may consider changing venues (please contact Mark if you have any input). We are considering holding a Fair-Value Accounting Seminar (Doug George) later this year in conjunction with the Financial Reporting Section. This is a timely subject, and will become more time-critical over the near term.

At the 2003 Spring Meetings of the SOA (Mike O'Connor) we will sponsor 12 sessions. At the 2003 Annual Meeting (Joe Koltisko) we will sponsor another dozen or so. At each meeting we will try to provide at least one session with a "name" speaker coming from outside the actuarial community (please contact Mike or Joe if you have ideas for any such speakers).

Redington Prize (Doug George)

This year, our section will award the prestigious Redington Prize. The award goes to the actuary who has written the best investment-related paper published in a recognized actuarial or financial publication during 2000-2001. Nino Boezio will chair the committee to select the best paper. Nominations are currently being accepted. For more information see Nino Boezio's announcement on the subject.

Risks and Rewards (Joe Koltisko)

In accordance with the new SOA procedures, we plan to publish three newsletters each year in February, July and October. As always, we request our members to write articles addressing current issues of relevance to our

section. The editors and article due dates for each upcoming newsletter are as follows:

- July 2003: Editor – Joe Koltisko.
Articles due May 5
- October 2003: Editor – Dick Wendt.
Articles due August 4

Pension (Bryan Boudreau)

This year we added a permanent "pension seat" to the council. Bryan Boudreau's duties will include serving as liaison with the Retirement Practice Area and developing and coordinating pension-related sessions for SOA meetings. He will serve as our pension expert on the council, and make sure the needs of our members in the pension and retirement fields are met.

Research (Craig Fowler)

We sponsor and participate in a number of research projects. We are always on the lookout for potential projects that would support our mission and benefit our members. If you know of any such projects, please bring them to our attention.

Other SOA Groups

We participate in a variety of SOA committees and task forces. We serve in the Finance Practice Area (Doug George) and Life Practice Area (Mark Bursinger). We liaison with the Long Term Care Section (Larry Rubin) and with Continuing Education at the SOA (Steve Easson). We participate in the SOA's Task Force on Sections and Practice Areas (Mark Bursinger) and on the Task Force Review Group (Doug George). We maintain our Web page on the SOA Web site at www.soa.org/sections/risk.html (Mike O'Connor).

In closing, I want to thank outgoing council members. Each has served the section well. Vic Modugno was liaison for *Risks and Rewards*, was secretary and served as our de facto pension actuary. Dave Ingram served as coordinator for Spring SOA Meetings and Risk Management Seminars and initiated the Risk Management Task Force. Finally, Max Rudolph was our former chair and assisted the section in too many ways to enumerate. Max, your shoes will be hard to fill.

Having first been elected to a one-year term, this is my fourth year on the Section Council and I hope it will be our best. In my first year I served as secretary, in my second year I moved on to treasurer and in the third year I moved up to vice-chair. Will this year prove productive and successful or will Peter's Principle prevail? Time will tell. ☺

Douglas A. George, FSA, MAAA, is senior vice president and actuary at Aon Consulting in Avon, CT, and is chairperson of the Investment Section. He can be reached at Douglas_A_George@aon.cons.com.

Simulation Technology for Managing Risk

by Lilli Segre-Tossani

Editor's Note: This is the second of three articles exploring the new technology offered by Santa Fe, New Mexico-based Assuritech, Inc. (www.assuritech.com) that promises to revolutionize the way insurance companies model and manage risk. In our last edition, we introduced the potential of the emerging technology of simulation in the context of the insurance industry. This time, we describe the development of the applied complex adaptive systems technology behind Assuritech's highly sophisticated program that uses simulation and data mining techniques for accurate, reliable versatile risk modeling.

Reality does not conform to the ideal, but confirms it.

Gustave Flaubert

Simulating Reality

To Plato, the ontos, the ultimate, permanent, eternal, spiritual ideal was the only reality. Earthly phenomena, ideals manifested in matter and time and space, were merely illusions destined to decay and die. For many centuries, however, modern western science has held fast to the concept of a singular reality of matter, time and space. Statistical and mathematical descriptions of phenomena were held to be the key to describing, understanding and, eventually, controlling reality.

In recent decades, scientists have come to believe that, in some instances, there are more accurate and useful ways to talk about reality than linear mathematics. In fact, non-linear, complex systems—things like atoms, molecules and economies—are far better studied through the technology of simulation. Simulation technology has been used in scientific laboratories for several decades.

Practical applications of simulation technology have been proven in the physical and life sciences, in transportation-systems modeling and in the financial services markets, to name just a few. These tools were used at Citibank to uncover over \$200 million of previously unidentified exposure for delinquent credit card payments, and the Internal Revenue Service improved their fraud detection capability by 8000% using this technology.

In the insurance industry, the use of simulation as a decision-making tool is just beginning to emerge, primarily as a result of the work of Assuritech, Inc. Assuritech is an emerging technology company that designs and builds business risk-management tools for

the insurance and financial services industry using adaptive agent-based simulation technology. The technology is derived from decades of work done at supercomputing facilities at the Los Alamos National Laboratory (LANL) in New Mexico.

The Technology of Simulation

The word simulation comes from the Latin word *simulare*, which means to make like or to put on an appearance of. To the Romans, simulacra were shams (Cicero), reflections (Lucretius) or ghosts (Vergil) of what was real—that is, existent in the world. A simulation is commonly thought of as a representation of the operation or features of one process or system through the use of another.¹ In business or science, simulation is understood as a model of a problem or course of events.² Simulation is used to examine a problem because the problem is not subject to direct experimentation.³

Analysts are hampered in their ability to study complex systems like a national economy using traditional experimental methods because it is simply impractical, too expensive or too dangerous to tinker with the system as a whole. But with simulation technology, they can build complete silicon surrogates of these systems inside a computer, and use these “would-be worlds” as laboratories within which to look at the workings and behaviors of the complex systems of everyday life. Simulations can be of the internal processes of an organization and/or all of the external forces that impact it, such as economic, competitive, regulatory, consumer, supplier, natural events and capital market effects. The simulation is validated by comparing known information about common outcomes with the data generated by the simulator about these same outcomes, producing a benchmark by which to determine accuracy. In this way, to paraphrase Gustave Flaubert, reality confirms the simulation.

Simulations are used by decision makers to understand the causal links among the various aspects of internal processes and/or external forces, to identify weaknesses in those links and to understand the optimal tactics or strategies for operating organizations of all kinds. They are not predictive tools or forecasters. They are designed to uncover the often-surprising

1) The American Heritage® Dictionary of the English Language

2) The Cambridge International Dictionary of English

3) Merriam-Webster's Collegiate® Dictionary

emergent behavior that occurs in complex systems and to inform managers of the risks they are taking and the potential consequences of those risks. Simulations provide managers with an environment to test strategies *in silico*, which is much cheaper and faster than testing them *in vivo*.

At one time, the huge amounts of data required to build a useful simulation could only be processed on large supercomputing platforms. Today, the processing power to create a realistic simulation of a restricted environment can be packaged in a personal computer, or even a laptop. In December 2002, for example, the National Oceanic and Atmospheric Administration (NOAA) launched its Science On a Sphere™⁴ exhibit. This exhibit uses four personal computers to synchronize and blend the animated images from global environmental data sets and four projectors to display the blended images on a 68-inch suspended fiberglass sphere. Images include the Earth's topography, bathymetry, weather events, weather prediction models and past and future climate change.

Adaptive Agent-Based Simulation Technology

Assuratech's adaptive agent-based modeling uses self-learning, non-linear technology to simulate the complex system of the insurance industry itself. It allows managers in the industry to narrow their decision-making parameters by rapidly testing the effects of different scenarios on their market position and financial integrity. As is true of many technologies in the United States, defense-funded and defense-oriented research drove the development of simulation technology at the beginning and continues to drive its refinement. One of the "hottest" centers for theoretical and applied research in intelligent systems, distributed systems and advanced computer simulation LANL.

Mathematical Origins

The mathematical foundations of adaptive agent-based simulation technology can easily be traced back to work of John Louis von Neumann and Stanislaw Ulam in the 1940s and 1950s. Von Neumann was a brilliant mathematician who, among other things, worked with scientists at LANL to develop computational solutions to nuclear problems related to the hydrogen bomb using the advanced computing capabilities then available. Ulam is known as the mathematician who solved the problem of how to initiate fusion in the hydrogen bomb. He also devised the "Monte-Carlo method" widely used in solving mathematical problems using statistical sampling.

Their theoretical work was picked up by others and spawned a broad spectrum of new analytical technology, including simulation technology. Chris Barrett,

center leader of the National Infrastructure Simulation and Analysis Center (NISAC) Research and Development at LANL, summarizes it this way: "They were all working on what it means to compute, basically simulate, different kinds of really complicated systems from the bottom up. They looked at discrete methods, self-organization, decision-making and so many other technologies. Even game theory can be traced back to these origins, although John von Neumann was not at the lab when he and Oskar Morgenstern wrote *Theory of Games and Economic Behavior*."

The Developmental Application

In about 1992, Barrett was on a LANL team working on using supercomputers to develop decision support systems with embedded simulations for a national security application. The team was looking for a place to test their theoretical work by applying it to a real-world situation—a way to motivate the purely abstract mathematical and computer science work. The search led them to a project initiated by the Department of Transportation that eventually became known as TRANSIMS.

The TRansportation ANalysis SIMulation System⁵ (TRANSIMS) was developed to help communities meet the Clean Air Act, the Intermodal Surface Transportation Efficiency Act, Transportation Equity Act for the 21st Century and other regulations that impact transportation systems and planning. It is a set of mutually supporting simulations, models and databases that use advanced computational and analytical techniques for transportation and air quality analysis and forecasting. TRANSIMS is used to create an integrated regional transportation system analysis environment that simulates the dynamic details that contribute to the complexity inherent in transportation issues.

In developing TRANSIMS, the first study Barrett's team undertook examined the impact of implementing a commuter public transit solution for Albuquerque, NM. As they developed it, they found that, because transport systems are characterized by complex interdependencies, the results of different scenarios were often counter-intuitive. This led directly to the development of agency-oriented simulation.

"Who is driving is a very complicated issue of relationship in households among individuals, whether they are family or non-family households, the demographics, availability of access to the transport infrastructure," explains Barrett. "Evaluating all of

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4) A full description can be found at <http://www.fsl.noaa.gov/sos/>

5) <http://transims.tsasa.lanl.gov/>

these interactions that wind up putting people on roads, basically devolved into understanding that transit technology is end-to-end simulation of the activities of people, not traffic. Traffic is a by-product.”

The Agent

Thus, for TRANSIMS, Barrett’s team built households of individuals synthesized from census and marketing data and placed them in households based on demographic data and land use information. The relationships between the people were evaluated from very small sample activity surveys. At the conclusion of this stage, the team had virtual individuals, who, if sampled, returned the same census and the same marketing survey data and were associated into households through relationships to one another that were all consistent with the original data.

What they had accomplished was to transform the demographic information into a form that enabled it to interact with a planned roadway, a change in policy, a change in land use or any other change scenario. Agents pursue activities that are consistent with their constraints, their demographic structure and their relationships to each other. “All along the way,” says Barrett, “we were inventing new technologies: disaggregation, data fusion systems, information integration, data mining where the engine is actually a simulator pulling together information that was never intended to be pulled together and mapping it onto agents.” Now, these technologies are being used in other commercial and non-commercial applications throughout the world.

Next, the team had to route the agents through the system so they could pursue their activities. Again, new technology was created to develop a highly complex router—formal language constraint path-finding, based on graph grammars. Like many other pieces of the total TRANSIMS, the router developed in the context of transportation turned out to have myriad applications in widely divergent fields. It’s been used to design VLSI wire routing on integrated circuits and to look for pathways through chemical reactions.

In routing the agents through the router, they found that some of the non-unique solutions produced “crazy” plans, so they had to develop feedback mechanisms to test the plans to validate that the interaction of the agent program and the router program yields feasible results. Again, Barrett says, “So when we simulate these cities, we have millions of people [agents]. And the first time you try to run a micro simulation of traffic using a plan set that matches the activity patterns, that matches the demographics, that maps into the land use and the network of the city, the traffic won’t go!

Because it’s a computer and the computer is stupid. And so we iterate between driving and planning, planning and activities, activities and the demographics to find solutions that are consistent with the input data that’s being fused, but also that actually produces traffic of the kind that you actually see when you do measure traffic.”

Other new technologies related to testing were developed out of this iterative process. The large parameter spaces and non-linear interactions that characterize complex simulations make understanding such models using traditional testing techniques extremely difficult. To test these extremely complex systems, Barrett and his team built a theoretical program that drew, again, on the foundations of the fathers of modern computing science. In the tradition of the analysis of computational complexity and algorithmic complexity described by Hartmanis and Stearns, they developed a method to use algorithmic semantics to examine the validity of the computations.

From Transportation to Insurance

TRANSIMS is now in the process of being commercialized and will shortly be put into use in its first practical application, where scenarios will be run not by super-computing experts or mathematicians, but by urban transport planners. The collaborative work of scientists, mathematicians and theoreticians from LANL and the Santa Fe Institute,⁶ a private, non-profit, multidisciplinary research and education center, has also led to the evolution of other commercial applications of this research, including *Insurance-World*TM from Assuritech.

In fact, Barrett was one of the original collaborators in the development of *InsuranceWorld*TM. Some of the things scientists learned from TRANSIMS were different ways of understanding the agency. They also learned how activities can be characterized and taken from aggregate statistical models to understandable agency-oriented simulations. As these notions began to be discussed in the scientific and mathematical community, one of the people Barrett conversed with about these ideas was John Casti.

Casti is a globally recognized science writer, mathematician and complexity science expert and one of the scientists who serves on Assuritech’s board of directors. In 1995, Casti was a speaker at a meeting that had been put together with the aim of providing a forum for some research-oriented people in the catastrophe reinsurance industry to explore with a number of scientists what science might have to offer the reinsurance

⁶ <http://www.santafe.edu>

world. The Center for Oceanic Research in Bermuda was a principal participant. "Folk wisdom at the time was that the most important thing that science could tell the reinsurance industry was where and when hurricanes were going to occur," says Casti. "I didn't believe that this was the most important problem that reinsurance would be facing or that science could shed some light on. Rather, I felt that a much more interesting and important question was: 'How do you understand your place as a firm within the overall industry?'"

Casti envisioned a tool that would represent the entire catastrophe insurance system—the consumers of the product, the suppliers of the product, the primary insurers, the reinsurers and so on—all gathered together into one integrated system on an insurance executive's computer. Decision-makers in the industry could then ask such a system various kinds of questions, ranging from the effect on the financial standing of insurance companies in the market of a force five hurricane hitting Miami to the effect on the market position of one company of a 10 percent improvement in the accuracy of its performance predictions.

Intrigued by the potential of such a tool, Casti proposed a consortium of reinsurance companies, insurance companies and research institutions and companies to fund research aimed at developing a simulator that would represent the catastrophe insurance world. In 1997, the Insurance World consortium came together and the project began.

The Enterprise as Agent

Barrett and Casti had already been exploring how the TRANSIMS work on agency-oriented simulations would naturally lead to concepts like symbolic representation of an enterprise and the activities of that enterprise and its interactions. They now had the opportunity to build such a simulation for the insurance industry. It could display capital stratification by the net result of agency interactions and activities, whether the agencies are competing or cooperating enterprises in a market, or collections of people within a business that are contributing to the enterprise by performing the functions they perform, and whether or not the scenario is impacted by a natural event.

To round out the scientific team, Barrett and Casti approached Roger Jones, now chairman of the board and chief scientific officer of Assurtech and one of the company's co-founders. Well-known in the advanced computing academic and scientific communities, Jones had been at LANL since 1979. During his tenure at LANL, he founded the Nonlinear Adaptive Computation effort, which focused on developing

software data mining and control systems that had the capacity to learn from data as they interacted with it. Jones led the successful development of solutions for global financial corporations that suffered from the effects of the Latin American debt crisis, and, at the time the idea for the Insurance World consortium was forming, was founding the Center for Adaptive Systems Applications (CASA), which focused on assisting clients in the financial sector manage and protect against risk.

Insurance World 1

While simulation technology existed and had been proven on a supercomputing platform, the Insurance World consortium had the ambitious goal of recreating it on a platform that would be accessible in any decision-maker's office. The team chose Microsoft Excel, a choice that, while very convenient from a user's point of view, was very inconvenient from a programming point of view. Nonetheless, Casti says, "The major technical hurdle, I think, was not a hardware or even a software issue, it was an intellectual issue—how to get all the various relationships that link the actions of all these various decision-makers in the system to make the simulation reasonably realistic, to bear some resemblance to what enterprises actually do."

As with the first TRANSIMS scenarios, initial versions of the Insurance World simulator produced "silly" results. This was the purpose of the consortium, whose members had committed not only to fund the research, but also to participate in a series of five meetings, two months apart. During these meetings, representatives of Ernst & Young Actuarial Division, Swiss Re, Zurich/Centre Re, ACE Limited, CAT Limited, Wintherthur and others critiqued the program and squeezed out, one after the other, the logical gaps in the code. When they were done, the Insurance World simulator produced results that not only made sense to everyone sitting around the table, but also to people in the insurance industry.

The first Insurance World simulator was essentially a "toy model" of the real world of catastrophe insurance, incorporating only two types of catastrophes—hurricanes and earthquakes—occurring in three geographic regions: Japan, California and the Gulf Coast. There were five primary insurance firms and five reinsurers. The simulation extended over a 10-year period, in steps of one quarter each.

The program allowed a user to set parameters for the external economic climate, estimates of the physical climate and earthquake conditions and the various

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factors distinguishing one firm from another. The simulation then traced out the implications of the decisions each firm made in regard to developing market share, repayment of loans, attitudes toward risk, amount of risk assigned to reinsurers, etc. Users could try various management strategies in response to different scenarios, and, through the familiar representation of a financial report, see if decisions they made led to success, survival or extinction.

Insurance World 2

The Insurance World simulator was successful, but it was a very limited representation of reality. It had served the research purpose—to demonstrate that the technology could successfully be applied to the insurance industry. Now what was required was to develop a simulator that could represent a comprehensive picture of the entire risk environment within the industry.

In every endeavor, whether we are speaking of the defense of the country or the management of a business, senior executives manage enterprise-wide operations from a conceptual or a macro perspective. The search for management tools for accurately assessing strategies and initiatives at the macro level—decision-support systems—drove the development of the technology at LANL. The same objective drove the formation of the Insurance World 2 consortium in 2000.

The new iteration of the simulator was to focus on issues associated with managing the total risk within an enterprise. This would include not only insurable risks (including those associated with large losses and catastrophes), but also financial and investment risks. The Insurance World 2 simulator, which eventually reached the commercial market, considerably enhanced, as Assuritech's *InsuranceWorld*TM, was designed to provide answers to these questions:

- How do the frequency, magnitude and geographical distribution of natural catastrophes affect the balance sheet of a (re)insurance company?
- How is business/exposure spread among companies?
- What is the effect of different pricing strategies on the industry as a whole and on individual companies?
- How does the consumer affect the business of companies?
- What effect does the availability of capital have on the strategy of a company?

- What is the effect of marketing strategies?
- What is the effect of the desired retention under the given (re)insurance structure?

The Insurance World Agent

In the Insurance World simulator, the agents are not individuals, but individual enterprises. Each agent has four goals:

1. To achieve its desired net combined ratio—the ratio of expected annual retained losses R plus costs C to retained premium π
2. To achieve its desired premiums to total assets
3. To achieve its desired efficiency of capital use—the ratio of subscribed capital to total assets
4. To achieve its desired market share

The goals are defined mathematically as:

1. $CR = (R + C) / \pi$
2. $\gamma = \pi / TA = (R + C) / (TA * CR)$
3. $\eta = SC / TA$
4. $F = f (CR; \gamma; \eta; dMS)$

The Insurance World Interactions

Each agent (company) achieves its best performance in the simulation through a mechanism of interaction that works on three different key levels:

- Simulation of natural catastrophes and their impact on the considered insurance and reinsurance markets in terms of amount
- Simulation of the technical components of developing company growth and their vulnerability to natural catastrophes
- The impact of the natural catastrophes on the (re)insurance companies' balance sheets, following the strategy of each company (market, investment, etc.)

The mechanism of interaction was based on three principal factors—price, desired supply of capital and desired risk retention. The simulation incorporates a wide variety of external parameters such as regulatory requirements, fixed and variable costs, inflation, outstanding losses, premium reserve, etc.

Insurance World Simulation

The output of the simulation is a complete set of company balance sheets and earnings statements at quarterly intervals over a 10-year period. In detailed format, the decision-maker can see the effect of the company's investments strategy in terms of fixed/current assets and derived interest, losses and premiums according to each single market, etc.

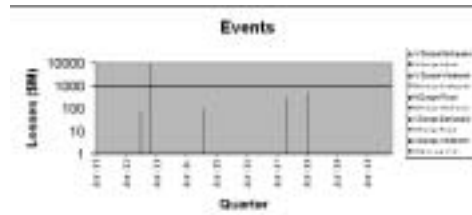
InsuranceWorld™

The commercial product, *InsuranceWorld™*, provides industry decision makers a means to model their total enterprise risk. The simulation can be populated by five or more primary insurers and five or more reinsurers and operates in 10 user-defined regional catastrophe markets. It incorporates all of the complex economic models identified by the Insurance World 2 consortium (fixed and variable costs, inflation and recession, outstanding losses, company solvency requirements, antitrust legislation, etc.) as well as a wide choice of capital markets (bonds, stocks, real estate, catastrophe bonds).

The software runs on a laptop computer and requires no technical expertise to operate. It is expertly packaged so that a non-technical user can begin to develop scenarios immediately, and the simulations run in a matter of seconds.

The user begins a simulation by defining a scenario—either a default scenario, or a new one created on the spot. Each scenario may represent an existing or potential corporate strategy. The scenario defines the space (the geographical location and type of hazard), the interacting agents or objects, the rules (represented by individual company operating, market, investment, pricing and debt strategies), the random events, and the time frame to be modeled.

InsuranceWorld™ Screen: Event Timeline



As catastrophes occur, the simulator calculates resulting financial and market share effects on each of the primary and reinsurance companies being modeled. The simulator output is in the form of detailed balance sheets, earnings statements, financial ratios and solvency data, quarter by quarter over the period being modeled. The user can stop the simulation and insert new strategies as it moves along the time line. In addition to calculating the financial effects of strategies, it also models their effects on market share and it calculates reinsurance contracts.

InsuranceWorld™ Screen: Accessing Results



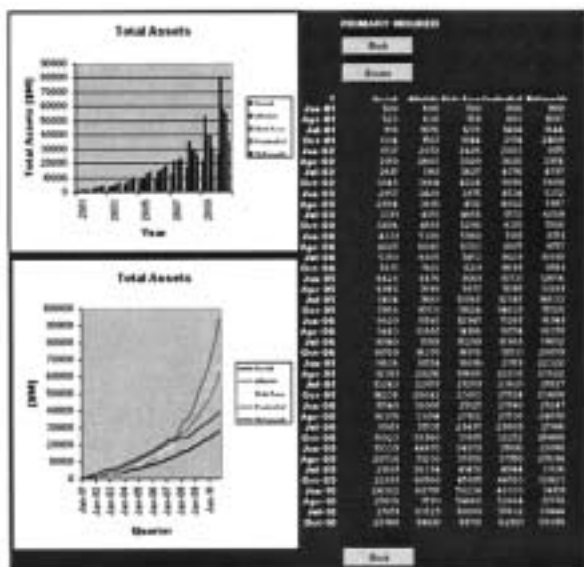
InsuranceWorld™ Screen: Building a Custom Scenario



Events may be created by a random seed process, or set manually.

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InsuranceWorld™ Screen: Presentation of Total Assets After Simulation



InsuranceWorld™ thus provides management with a bird's-eye view of their entire environment and the ability to understand outcomes over time. As mentioned above, this technology is about narrowing decision-making parameters. It is not a predictive tool, but a complete decision-support system. A company's already developed micro analytics and other sophisticated systems including DFA and ERM applications can be integrated into the *InsuranceWorld™* environment to provide increased resolution and fidelity.

The insurance industry has huge stores of data that can be mined for patterns. The data-mining techniques that we have described reveal patterns overlooked by traditional analyses. The data need not be integrated—the data fusion technology mines all the data sources and extracts patterns from the entire flow, without regard for the source. Using the patterns, the system forecasts a data output stream that can be compared to the actual output data stream. If the two do not match, the system adjusts the parameters until they do—it “learns” from the comparison.

Using the described patterns, *InsuranceWorld™* then builds the simulation and populates it with agents who behave independently according to the predefined patterns and those identified by the mining techniques. The agents begin to behave according to the identified patterns, including reacting to the behavior of their neighboring agents—interactions or correlative behavioral patterns.

The interactions among the agents in the simulation cause them to react together, learn and adapt their behavior, duplicating real world interactions. This constantly adapting, collective behavior is the force that drives bottom-line business profitability and may pose danger to capital. Companies using adaptive agent-based simulation are able to see emerging capital exposures as well as profitable opportunities that would otherwise not be revealed to them.

Real World Uses

InsuranceWorld™ can be used to test diversification scenarios and hedging strategies, identify previously unrecognized risks, understand growing debt at a customer and portfolio level, run budget simulations to track the affects on company capital up to 10 years in the future and model the effect of extreme events such as catastrophes and terrorism on the capital base of a company or its competition.

The technology supplements actuarial models based on linear, statistical analyses and provides realistic, independent scenarios to evaluate management initiatives. It is fully customizable, allowing companies to analyze and project outcomes of scenarios related to specific risk environments. Because adaptive agent-based simulation technology builds a modeling system that permits the modeler to keep track of and modify the behavior of each individual in a synthetic population, the simulations can easily be adjusted in response to changing environments, be they altered by inside or outside influences.

Terrorist behavior, for example, is non-linear and these technologies are being used today to enhance the national security by modeling terrorist behavior and potential reactions to it. Terrorist events can be inserted into an *InsuranceWorld™* environment just as natural catastrophes are. Analytically, Casti and Jones agree, a terrorist event is analogous to a natural catastrophe. With federal terrorism insurance legislation in the formative stages, organizations will need flexible tools like *InsuranceWorld™* to rapidly assess and model terrorism risk within a changing regulatory landscape.

In our next article, we will explore applications of the adaptive agent-based simulation technology in the financial and insurance markets, including new modules to address the risks of terrorism. ☞



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Windy City Hosts Investment Actuary Symposium

by Max J. Rudolph and Peter D. Tilley

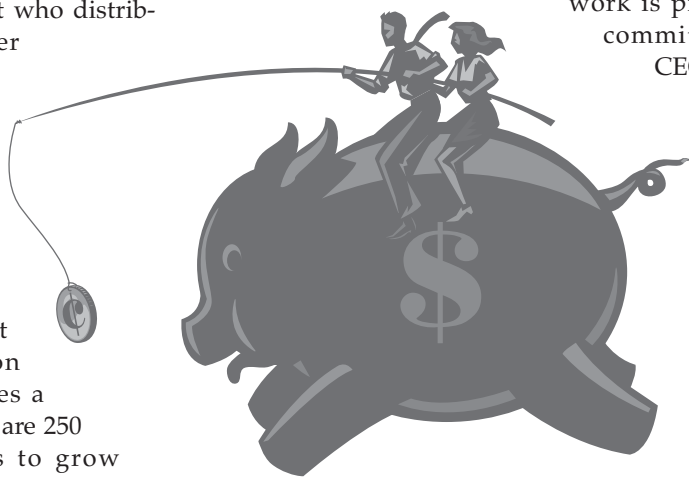
At the largest Investment Actuary Symposium (IAS) to date, 160 attendees enjoyed a wide variety of topics and speakers on November 7-8, 2002. In a successful experiment, the IAS offered two networking receptions on both the previous evening and the night of the full-day event. Next year, the day-and-a-half seminar will be held in Toronto November 10-11 and will be co-sponsored by the SOA and CIA. The Canadians have run equally successful seminars in the past. It looks to be a very good opportunity to network with actuaries and other investment professionals that normally don't interact on a regular basis, as well as learn about a variety of investment topics.

The co-chairs for this seminar were Frank Sabatini of Ernst & Young and Max Rudolph of Mutual of Omaha. Many thanks go to all the speakers and committee members, especially Jay Glacy, for recruiting the general session speakers. Look for the session hand-outs on the SOA Web site.

General Session: Economic Outlook

Speaker: Dennis Gartman—The Gartman Letter

The opening general session featured Dennis Gartman, an economist who distributes a daily newsletter discussing a wide variety of markets. He is hesitant to share his opinions...NOT. He doesn't believe in efficient markets, or in most government statistics and thinks that European regulation gives the United States a huge advantage. There are 250 pages of regulations to grow asparagus in Belgium vs. none in the United States. If you raise pigs, you are required to play with each of them, individually, for at least eight minutes a day...with toys. He is very bullish on stocks, mentioning manufacturers of things that hurt your foot when you drop them like cars and steel. Mr. Gartman expects baby boomers to save a huge amount in the next 10 years now that their kids have moved out



and they have survived a major blow to their existing assets. He also predicts a six-hour war in Iraq, followed by a glut of oil that will drive the price below \$10 per barrel. In his estimation, Russia wins in this scenario now that they are building infrastructure to move the oil. While Mr. Gartman was very entertaining, it will be interesting to see how his predictions play out.

State of the Art Risk Management

Speakers: Wayne Stuenkel, FSA, MAAA—Protective Life and Harry Miller, FSA, MAAA—ING

Both Wayne Stuenkel and Harry Muller stressed the iterative nature of implementing risk management and said that it improves each year. Both stressed the need to coordinate risk management at the corporate level while leaving ownership of product risk with the business units.

Protective Life performs periodic interviews of each function down several management layers to get an understanding of the risks involved in a specific product line and whether they are being managed effectively. One tool they use is a two-dimensional grid likelihood (low, medium or high) and impact (LMH) to help prioritize their risk plans. Wayne's work is presented to the board audit committee and he meets with the CEO quarterly to discuss industry topics of interest.

Harry Muller stressed the communication aspect of the job, going beyond report creation to action oriented discussions detailing management choices. He spends most of his time generating principles, leaving it to others to determine specific guidelines. ING's ALM Committee (ALCO) meets quarterly with each SBU head, CFO and actuary. Their product line ALCO's meet regularly as well. Harry Muller focuses on graphs and statistical distributions of results (especially the shape). He focuses on making the

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risks being taken transparent and using clear, simple terms to describe results.

Dynamic Spread/Private Placement of Default Study

Speakers: Bill Pauling, CFA—Tillinghast and Peter Tilley, FSA, MAAA—Great-West Life and Annuity

Bill Pauling is responsible for his firm's global capital markets scenario generator. His presentation covered credit spread modeling considerations. While current credit yields are quite low, the spread over Treasuries is relatively high compared to historical spreads. Pauling showed historical spreads from Moody's covering 1977 to 2002, with separate graphs for Baa, A, Aa, and Aaa rated bonds. He then used the statistics from the historical data to develop a stochastic model for credit spreads using a Wiener Process with mean reversion. Using the transition matrix from Moody's study of

public bond defaults, the risk of market value changes in the bond due to credit spread changes was analyzed. Bill concluded that, while defaults are a concern, downgrades are a more significant risk for investment grade portfolios.

Peter Tilley is a member of the SOA's Private

Placement Bond Default Experience Study Committee. He presented the results of the most recent study covering 1986-1998. The study measures credit risk events, looking at the probability and severity of an event separately (similar to looking at the incidence of a claim and the average size of a claim for health insurance). The study compares private placement bond defaults to public bond experience published by Moody's and S&P500. Private bonds have higher incidence rates than public bonds for ratings that are investment grade, but the reverse is true for below-investment-grade bonds. The experience study committee believes that private placements show value relative to publics, possibly due to the extra monitoring on privates and the ability to negotiate with the borrower in work-out situations, where extra collateral may also be negotiated. Tilley presented two theses that were developed by the committee based on the study experience. First, defaults are higher on bonds with higher coupons. This is true even after adjusting for the quality rating of the bond. Second, there is a "seasoning" effect where bonds have low default rates just after issue (similar to the select mortality on a recently underwritten life insurance policy), default rates climb for a few years and

then decrease again as the bond makes it through a seasoning period. This effect is evident even after removing the effects of the general economic environment. The full study is available on the SOA Web site at: http://www.soa.org/research/86-98_report.html

The committee strongly encourages companies to contribute data to the next round of the study, which will cover 1999-2002.

Embedded Value

Speakers: Charlie Ford, FSA, CFA, MAAA—CGU Life and Mike McLaughlin, FIA, FSA, MAAA—Ernst & Young

Charlie Ford discussed some of the implementation issues that he has run across with embedded value, while also sharing the basic assumptions and methodology. Embedded value does a good job of measuring the company's actual economic value at a point in time, taking into account capital requirements but not future business. For this reason, distributable earnings are often used in acquisition work.

Mike McLaughlin compared embedded value models to those being considered for fair value accounting and showed how to reconcile the two methods. He went on to share the natural extension of EV, stochastically generating results and performing analysis across the entire distribution of results. Companies that develop this ability first will be able to exploit this knowledge to their competitive advantage.

RBC C-3 Phase 2/Fair Value Developments

Speakers: Tim Hill, FSA, MAAA—Milliman USA and Mike McLaughlin, FIA, FSA, MAAA—Ernst & Young

Tim Hill shared the current status of the American Academy of Risk Based Capital C-3 Phase 2 project, which is developing capital requirements for equity based products like variable annuities. The focus, rather than developing factors, is to use a company's own product interactions to determine the appropriate capital level. While the current work focuses on products like GMDB and GLB, the leap to fair value is getting shorter. This represents another big step in that direction. The CTE method used is described quite thoroughly in a paper developed by the CIA (available on their Web site) and attached as an appendix to the task force's December 2002 report to the NAIC. It is designed to measure more effectively the impact of fat tails. Regime switching models have been used to generate equity scenarios.

Mike McLaughlin gave an update on international fair value accounting standards. The goal is to

Embedded value does a good job of measuring the company's actual economic value at a point in time, taking into account capital requirements but not future business.

have financial statements that are useful, help to assess timing, amount and uncertainty, and inform the user about the effects of resources and claims against resources. Fair value helps to match both sides of the balance sheet using stochastic methods, making it more relevant than current methods. It should improve comparability between companies and provide early warning of a company's changing financial condition. As financial model experts, FASB's recent consideration of principle-based approaches would provide a great opportunity for actuaries. There are many open issues. This is a great opportunity to have input to methodologies that will be used for many years.

Understanding Equity Risk Premium

Speaker: Dick Wendt, FSA, CFA—Towers Perrin

Dick Wendt expanded on his award-winning article from the February 2002 Risks & Rewards. Much has been written recently regarding the equity risk premium (ERP), and adds new insights to the discussion. He compares the total return on the S&P 500 relative to 30-year Treasuries. He focuses on data since 1960 since the data seems to fit a distribution in that time frame much better. This is also comparable to the time the S&P 500 has existed. Within this period the ERP has been two-four percent most of the time. Wendt found that three percent + 30 percent x (three percent - ERP for the past five years) does a pretty good job of describing the results for the next 11 years, while admitting that 1999-2001 is unmodelable. This will skew the results over the next few years. He found that this formula agrees with real world experience, as the results revert fairly quickly to three percent.

Credit Risk Management

Speaker: Peter Davis—Ernst & Young

Peter Davis gave an overview of the functions of credit risk management, models that measure default risk and models that measure the credit risk in a portfolio. A common challenge in managing credit risk is our heavy reliance on external ratings, which may lag and may be inconsistent with the current market view of the credit quality of a bond. The infrastructure of managing credit risk is a constant circle

of management, underwriting, approval, monitoring and administering. The management continuum runs from individual transaction management to proactive portfolio management. Market-based models for early warning systems are used to monitor bonds that are the "biggest movers," have the largest rating discrepancies, and are in high risk industries. There are several different approaches to modeling credit risk. Davis covered four different types of models and finished with a case study on a Collateralized Debt Obligation.

General Session: Enron—Secrets of Destruction

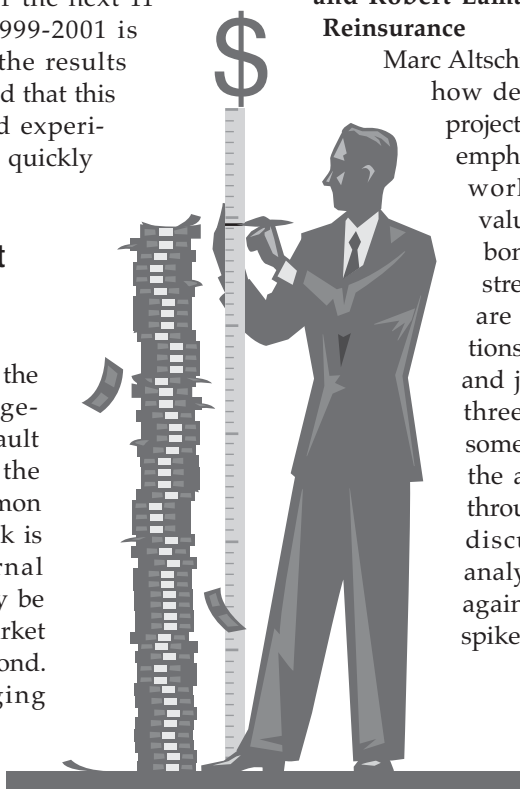
Speaker: Crista Boyles—Retirement Specialists Inc.

As someone who advises 401(k) participants from Houston, Crista Boyles brings a unique perspective to her research of the Enron meltdown. By focusing on the years leading up to the implosion and the parties involved, she was able to provide insights into how the management strategies of the 1990s could go too far and create a disaster. Since returning from the seminar I have read Boyles's book titled *Enron Proof Your 401(k): Steps to Keep Your Money Safe*. While the investment professional will find it a very easy read, so will the person looking for some guidance in their 401(k)

Pricing Implications of Default

Speakers: Marc Altschull, FSA, MAAA—Tillinghast and Robert Lamarche, FSA, FCIA, MAAA—RGA Reinsurance

Marc Altschull and Robert Lamarche discussed how defaults should impact pricing and projection work. They noted an increased emphasis on the salvage value of a bond, working in advance to estimate the value based on any assets backing the bond or mortgage. Altschull suggested stress tests with default scenarios that are high (four times annual expectations), doomsday (500 bps in year three) and junk downgrade (145 bps in years three and beyond). He also discussed some options for passing along (or not) the actual experience to policyholders through the credited rate. Altschull also discussed the need for UL dynamic analysis to include mortality selection against the insurer when interest rates spike and healthy lives lapse.



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Lamarche suggested lower purchase limits for lower rated bonds due to the higher probability of default and lower recovery value. It's important to look at not only gross, but net yield as well. With a steep yield curve, he suggests investing at the long end of duration constraints.

Hedging Liability Risks: Micro and Macro Approaches

Mike O'Connor, FSA, MAAA—Tillinghast and Leo Tilman—Bear Stearns

Modeling variable annuity features is a very active environment. With increased scrutiny driven by equity losses and the resulting increased exposure for GMDB and other VA product features, Mike O'Connor discussed ways to mitigate the risk and lessen the volatility to insurers. He shared a GMDB case study, shared some findings from recent projects and discussed practical considerations of implementing a dynamic hedging strategy. He described strategies ranging from no hedging to sophisticated hedging, providing pros and cons of each.

Leo Tilman presented a new paradigm for insurers led by higher volatility, lower expected returns, fight for market share and riskier balance sheets. He described why economic recessions make book yield an even worse proxy for expected returns than in more stable economic times. Credit risk (higher concentrations and lower quality), prepayment/reinvestment risk, options on assets, volatility risk, more embedded options in liabilities and the resultant asset/liability gap are driving the need for a senior management position responsible for firm wide hedging.

Risk Management Task Force and ALM Specialty Guide

Speakers: Valentina Isakina, ASA, MAAA—Society of Actuaries and Warren Luckner FSA, CFA, MAAA—Benedictine University

Valentina Isakina discussed the activities and direction of the Risk Management Task Force. The RMTF's goal is to encourage risk management as a regular part of

actuarial practice while providing the tools and recognition so that actuaries are considered first for these projects. By sponsoring seminars, developing educational materials and suggesting research projects, the RMTF with its 11 subgroups and 250 volunteers are well on their way to success. A buzz group session at the Annual Meeting in Boston drew 100 attendees and the SOA Strategic Planning Committee has requested input from the group. Check the RMTF Web site often to keep up to date on this active group.

Warren Luckner heads the ALM Specialty Guide Task Force. This guide is currently being updated, with scheduled completion date of early 2003. The specialty guide is designed to provide guidance to someone with basic asset and liability skills who would like to know more about ALM. It will update references as well as incorporate new fields of study created since the initial version of the guide.

Closed Block Securitization

Speakers: Jackie Keating, FSA, MAAA—Milliman USA and Melissa Rice—Goldman Sachs

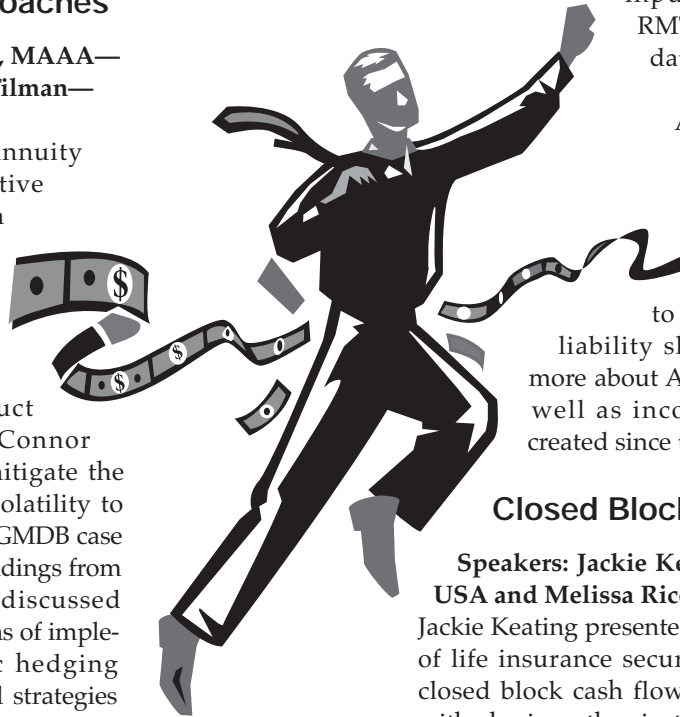
Jackie Keating presented an example of the primary use of life insurance securitizations to date, transferring closed block cash flows to the capital markets, along with sharing other instances where life insurance cash flows either have been or could be securitized.

Melissa Rice described the transaction structure and motivation. The transaction adds value to the shareholders by increasing liquidity and flexibility, allowing the firm to redeploy capital to businesses earning a higher ROE. While debtholders have covenant protections, investors must balance the risks against the potential returns.

Leveraging Cash Flow Testing Models

Speakers: David Weinsier, FSA, MAAA—Tillinghast and Max Rudolph, FSA, CFA, MAAA—Mutual of Omaha

At this session, risk management tools were developed from existing models. David Weinsier shared a recent Tillinghast survey on cash flow testing. He described the primary differences from CFT models as using year-end data, best estimate assumptions, including target surplus, consolidated models, new business, refined and alternative investment strategies, stochastic scenarios and the need to use GAAP. Risk management can be



greatly enhanced by using models that already have been verified for products like VA and long term care.

Max Rudolph stressed the need to focus on cash flows and automation for risk management work. He shared several graphical presentations to share results. As other speakers have done, he suggested that a corporate area has advantages looking at risk from above the silos and sharing best practices across the business units. He is concerned that companies don't seem to be using their models to measure the solvency risk from rising interest rates. The option-adjusted duration of a company is driven by the duration mismatch of its assets and liabilities and the leverage created by having a large market value of assets relative to surplus. A company that primarily sells SPDA with a multi-year mismatch would be especially vulnerable to this scenario.

General Session—Current Issues Faced by Investment Managers

**Speaker: John Foehl, CCM, CFP—
Summit Strategies Group**

John Foehl provided background behind the recent investment environment, focusing on bonds, residential mortgages and equities. He discussed threats to equity-based alpha, including the large number of competitors, large portfolio sizes, reduced maximum percentage for a single holding and increased volatility. He discussed his views on real estate, private equity and hedge funds. Overall, he believes that a real return assumption of five percent provides a ceiling for future results.

Liquidity/FHLB

Speakers: Donna Claire, FSA, MAAA—Claire Thinking and Tom Grondin, FSA FCIA, MAAA—Aegon Institutional Markets

Donna Claire chaired the AAA's Life Liquidity Working Group. Liquidity is perceived as a much larger risk than previously due to the additional thought and research devoted to it recently. Negative publicity has surrounded off balance sheet guarantees, put options in GICs, unrestricted surrenders and derivatives. By anticipating liquidity risk exposures through stress testing, the risk can be managed. The New York circular letter is being used as a guide for an NAIC recommendation. Having a formal liquidity plan is encouraged. A good liquidity summary is that a company should focus on the risks associated with having too little liquidity and the costs of having too much. Each company's risk profile is unique. A feedback loop is mandatory.

Membership in the Federal Home Loan Bank system provides a source of liquidity not available

elsewhere. Tom Grondin described how funding can come from overnight advances, Repo advances or long-term advances (over six months). In return the member purchases FHLB stock and pledge assets as collateral. While there are risks, the product provides a low cost of funds.

What Does a Chief Risk Officer Do?

Speakers: Zafar Rashid, FSA, MAAA—AIG American General and Philip Gath, FSA, MAAA—Nationwide

Many actuaries would like to be involved as their company's risk officer. This session discussed how this role can be implemented. As chief risk officer at AIG, Zafar Rashad described his role as including risk policy, governance issues and organization/ implementation. Risk policy focuses on defining objectives, risk prioritization, risk standards and establishing the firm's risk appetite.

Governance includes policy approval (by management/board), approval of risk standards and

appetite, managing the reporting structure and risk committee management. AIG focuses on market, credit, pricing, legal/regulatory, operations and strategic risks. The CRO creates information to manage/control risks, facilitate appropriate risk/reward choices and maximize risk-adjusted shareholder value. The corporate risk management department provides centralized analysis where necessary, facilitates business unit risk/reward choices, provides enterprise wide consistency, selects global parameters and recognizes contagion/diversification (very difficult). Creating transparency encourages local management of risk and may necessitate some units taking more risk. A good objective for a risk management area is to "Use caution to enhance, not impede, progress."

Phil Gath said that, although Nationwide has no CRO, a risk committee meets quarterly. Reports are created for discussion at these meetings, and minutes provide documentation. Recent meetings have discussed hedge funds, equity exposure, credit experience, annual line of business risk reviews, business disaster recovery, hedging and counterparty exposure. The lines of business must fully understand and be accountable for their ALM position. The enterprise helps out by facilitating development of modeling techniques and hedging tools. Line of business models at Nationwide are developed using one

Hedging becomes dynamic when positions are rebalanced regularly.

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common framework in order to create total company risk profiles.

Hedging in Practice

**Speaker: Dr. K. (Ravi) Ravindran—
Annuity Systems Inc.**

Dr. Ravindran discussed implementation issues involved in dynamic hedging. He described risk management as a control cycle including risk quantification, risk transferring and risk monitoring. Hedging becomes dynamic when positions are rebalanced regularly. He described an example where several hedging strategies were considered. He is working with the SOA to co-brand a seminar in spring 2003, so watch for details.

Regime Switching Generator

**Speaker: Dr. Mary Hardy, FIA, ASA—
University of Waterloo**

Dr. Hardy presented regime-switching models to the group. This model works very well to describe the fat tails of equity returns in Canada and the United States, making it one of the popular models to use for segregated funds and VA capital testing. She has found that the 2-regime model using monthly data gives the best value relative to complexity. A teaching version of this model can be found at the SOA Web site. Simulations using this model move between two distributions. The distributions are not required to be of similar type. The base model is usually lognormal. The model moves between the two regimes using a Markov process. Regime 1 is low volatility, high mean and high persistence. Regime 2 is high volatility, low mean and low persistence. The model spends most of its time in regime 1. Regime-switching lognormal models with two regimes (RSLN-2) are intuitive, flexible, easy to simulate and a good fit for econometric data. Dr. Hardy describes these methods in an *NAAJ* article (April 2000) and has written a book (*Investment Guarantees: Modeling and Risk Management for Equity-Linked Life Insurance*—Wiley) due out in February 2003.

Hedge Funds for Insurers

**Speakers: Mark Hunt, FSA, MAAA—Hartford Life
and Chris Rutten, FIA—MaxRe**

Mark Hunt gave an overview of hedge funds, including examples of the relative value, event driven and directional strategies. For a portfolio, hedge funds can provide diversification benefits. While there are hurdles to overcome, insurers can apply hedge funds to specific opportunities. These include the surplus account, long duration liabilities and participating products.

Chris Rutten described how to implement a combination offshore business model with alternative asset strategies. He presented that, over the recent past, alternative asset classes have provided benefits for both diversification and risk-return results. He stressed the importance of manager and counterparty selection.

Canadian and other International Issues

**Speakers: Ken Mungan, FSA, MAAA of Milliman
USA and Charles Gilbert, FSA, FCIA, CFA of Nexus
Generations**

Ken Mungan described how globalization is creating opportunities for investment actuaries, since investment considerations are critical and knowledge transfer is key. A global strategy allows risk management to take diversification benefits to a higher level, expanded growth strategies and the ability to transfer knowledge across borders. He explained how you can take advantage of credit spreads that vary by nation and how actuaries can become active in equity risk management. He concluded with an example showing how ALM is used to determine reserves in Chile.

Charles Gilbert shared the results of a recent CIA survey on ALM practices in the Canadian life insurance industry (available on the CIA Web site). Respondents said ALM included risks due to interest rates, liquidity, equity, credit, currency and insurance pricing. While there is a wide range of practice on many fronts, ALM is being viewed as a value-added exercise. Most companies have created either a corporate risk management and/or ALM team, and many have a chief risk officer and ALM Committee. Almost all have a statement of principles and objectives for ALM. Most Canadian companies use both deterministic and stochastic scenarios, with modified duration, convexity, dollar duration, liquidity ratio, partial duration, economic capital and value at risk among the metrics used. Going forward, he reported that companies expect to improve their ALM process by providing more detail and making the process more formal. Other projects will include reviewing hedging strategies, improving models and a focus on universal life models.

Ask the Experts Panel

**Speakers: Dr. Robert Reitano, FSA, MAAA—John
Hancock Financial Services, Peter Tilley FSA,
MAAA—Great-West Life and Annuity and Alton
Cogert CFA of Strategic Asset Alliance**

This very interesting discussion included dynamic assumptions, fair value and interaction of assumptions based on economic scenarios. For more details you will have to attend the seminar! ☛



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A Balanced Outlook:

The Latest Views of Jack Bogle

by Richard Q. Wendt

The tenor of the popular media has recently suggested that current market conditions are pretty dismal and that expectations for future stock market returns should be scaled back. One of the primary proponents of conservatism is Warren Buffet, who dropped the expected return for his pension fund to 6.5 percent.

Jack Bogle, former chairman of The Vanguard Group, had a very busy October as he gave three major speeches that month. Readers are urged to check the web site at the Bogle Financial Markets Research Center for copies of his speeches (www.vanguard.com/bogle_site/bogle_home.html).

I found all three October speeches to be very well written and to present a more moderate view of market expectations. This article will provide a capsule review of Bogle's latest speeches.

The first speech, "Don't Count On It!: The Perils of Numeracy," may resonate with some actuaries. Bogle's premise is that society places too much trust in numbers. In his words, "*Numbers are not reality*" [emphasis in original]. Ironically, he holds actuarial tables up as a standard for accurate data—if he only knew the truth!

One of his major criticisms is that projecting future returns at past historical rates is foolish. Unfortunately, it's a practice that's all too common. He also points out that the historical data may be more theoretical than real; the data may grossly overstate the capturable returns.

The second speech is titled "After the Fall: What Lies Ahead for Capitalism and the Financial Markets?" Here, Bogle shares his thoughts on recent market history and on the outlook for the future. He points out that the 45 percent drop in stock prices since January 2000 may have corrected almost all of the speculative bubble that peaked in early 2000. His expectation is for stock market returns in the seven to ten percent range.

The third speech is titled "The Investment Dilemma of the Philanthropic Investor." Although geared to an audience of private and public foundations and includes some of the same material as the prior speech, there are some tasty nuggets. For example, Bogle points out that there has historically been significant long-term mean reversion in the stock market by stating, "When past returns are exceptionally low (say, below two percent per year), future returns are apt to rise."

Be sure to check out these speeches and bookmark your Web browser to check for future additions. ☛



Richard Q. Wendt, FSA, CFA, is principal at Towers Perrin in Philadelphia, PA. He can be reached at wendtd@towers.com.

SOA Offers New Insurance Coverage Products To Members

We are pleased to announce that the Society of Actuaries is offering new insurance coverage products to its members to be administered through Marsh Affinity Group Services.

By purchasing insurance programs through the SOA, members can take advantage of a wide variety of benefits. These programs have been researched by the SOA and have been proven to be an excellent source of protection for members. Also, with the mass-purchasing power of the SOA, members can benefit from the group rates offered.

Insurance plans currently being made available to SOA members will be launched throughout 2003 and include:

- Professional liability insurance
- Disability Income Insurance
- Term life insurance
- 10-Year term life insurance
- Catastrophe major medical insurance
- Major medical market basket

Marsh is a full-service insurance broker and administrator for affinity groups. A pioneer in the concept of association-sponsored insurance plans since 1949, Marsh Affinity Group Services has earned a reputation for the innovative design and administration of a wide range of insurance and financial products, and has become a leading provider of insurance program management and underwriting services in North America. Marsh Affinity Group Services is a part of Marsh & McLennan Companies, a multinational corporation and one of the world's foremost leaders in insurance administration.

Look for more information in future communications as the programs become available. Members who have any questions, or who would like more information, may contact the insurance administrator:

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Expensing Executive Stock Options:

An Economic Middle Ground

by Jeremy Gold

Until recently, the corporate mantra was that stock options were not worth anything (in a financial reporting sense) until they were exercised. Shareholder-side theorists argued, very practically for the theorists, that they must be worth something or executives would not be so anxious to receive them. Per the theorists, the correct value of the options was to be determined by a suitably calibrated Black-Scholes model and the value should be expensed when the option was granted.

The executive side had theories as well. In addition to denying any value for newly issued out-of-or-at-the-money options, they argued that restrictions on exercise and forfeiture on quit diminished the value to the executives. To this they added a well-founded economic argument: the value of any good to an individual (his or her marginal utility) diminishes as more of the good is acquired. Executives are always over-exposed to their company's performance and stock and would always prefer another cash dollar to another dollar's worth of company stock (tax and other considerations aside).

Suppose that the Black-Scholes value of a particular option is \$100. The executive-side arguments about utility and restrictive rules imply that the value to President Smith is only \$60; by which they mean exactly this: Mr. Smith would accept \$60 in additional compensation in lieu of the option.

Part of this diminished value may be described as "actuarial." Suppose Mr. Smith has a 20 percent chance of forfeit by quitting and that his tenure is unrelated to the performance of the company and its stock.¹ Taking advantage of this independence and relying on Møller (2001) (NAAJ), we would recognize that for

every five Mr. Smiths, only four would survive the forfeiture rules and thus the actuarially adjusted Black-Scholes value of the option would be only \$80.

The remainder of the value discount we may attribute to Mr. Smith's over-exposure to company stock and to exercise restrictions. We note that regardless of Mr. Smith's preferences, the after-actuarial-adjustment cost to the shareholders of the options granted is \$80 while the value to Mr. Smith is no greater than \$60.

Why would rational contractors (shareholders and executives) be so wasteful? Why not just give Mr. Smith the \$60 and be done with it? Now the theorists on both sides should be able to agree: "it's the incentive effects, stupid." Restricting Mr. Smith's option rights and over-loading him with securities tied to the firm will motivate him to stay with the firm and to perform more productively. How much will these incentives produce for the shareholders? If the negotiators have been sufficiently shrewd, the answer is \$20.²

With this background we are ready to reach the accounting middle ground implied by the subtitle of this article. After the actuarial adjustment, the cost to the shareholders is \$80 and that must be the credit entry for the transaction. The debit entries include compensation of \$60 (which Mr. Smith would have been paid in cash, absent options) and an asset (human capital) of \$20. The \$60 becomes a current charge against corporate income. The \$20 asset must be written down in a fashion that reflects the periodic diminution of Mr. Smith's forward-looking motivation. Under the fair value accounting paradigm (likely soon



1) If this were not the case we would not call this contingency "actuarial" and we would have to parse the associated discount into actuarial and "market or company-related" parts.

2) The negotiators will have to be shrewd indeed to deduce Mr. Smith's marginal utility (particularly in the case where options are layered on top of previously issued stock and options) and in estimating how motivated he is likely to be.

to replace the historic cost paradigm), the option would have to be marked-to-market at each reporting date with gains or losses (both actuarial and those attributable to recalculating the Black-Scholes value) becoming shareholder income or expense. To the extent that market value changes also affect Mr. Smith's incentives, appropriate adjustments would be made to the fair value of the human-capital asset.

Acknowledgments

The author wishes to thank Lawrence Bader who began this conversation earlier this year; Benjamin Feller, who introduced the actuarial adjustment; and

Keith Ambachtsheer (who, in turn, cites Brenner and Luskin), who made me aware of the human-capital asset.

References

Ambachtsheer, Keith P., *The Ambachtsheer Letter* #199, August, 2002.

Møeller, Thomas, "Hedging Equity-Linked Life Insurance Contracts," *North American Actuarial Journal* Vol. 5, No. 2, April, 2001, pp. 79-95.



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Redington Prize Nominations Due May 31

To promote investment research, the Investment Section sponsors a biennial prize of \$2000 (U.S.) for the best paper on an investment-related topic written by an SOA member. The prize is named after F. M. Redington, the eminent British actuary who coined the term "immunization" in a 1952 paper that was published in the *Journal of the Institute of Actuaries*. The council has awarded six prizes since its inception:

1. "The Risk of Asset Default" *TSA XLI* (1989): 547-582 by Irwin T. Vanderhoof, Faye Albert, Aaron Tenenbein and Ralph Verni.
2. "Multivariate Duration Analysis," *TSA XLIII* (1991): 335-376 by Robert R. Reitano.
3. "Multivariate Stochastic Immunization," *TSA XLV* (1993): 425-461 by Robert R. Reitano.
4. "Interest Rate Risk Management: Developments in Interest Rate Term Structure Modeling," *NAAJ Vol. 1 No. 2* (April 1997) by Andrew Ang and Michael Sherris.
5. "Quasi-Monte Carlo Methods in Numerical Finance," *Management Science* (1996) and reprinted in Chapter 24 of *Monte Carlo: Methodologies and Applications for Pricing and Risk Management* (1998) by Corwin Joy, Phelim Boyle and Ken Seng Tan.
6. "Term Structure Models: A Perspective from the Long Rate," *NAAJ, Vol. 3, No. 3*, (1999) by Yong Yao.

The council is now seeking nominations for the next award. The criteria for selection are as follows:

Publication Years: The paper must have been published during the calendar years 2000 or 2001.

Author: A member of the SOA must have written the paper. In the case of a paper with multiple authors, a member of the SOA must be a major contributor to the paper.

Content: The topic must be judged to be timely, primarily of investment nature and of substantial value to SOA members.

Source: The paper may appear in any recognized SOA format, including *North American Actuarial Journal*, *Transactions*, *ARCH*, study notes and section newsletters. The paper may appear in non-actuarial journals or publications deemed to be of at least comparable quality by the Prize Committee. Such publications include, but are not limited to, *The Journal of Portfolio Management*, *Financial Analysts Journal*, *Journal of Finance and Journal of Financial and Quantitative Analysis*. If the paper is a result of an SOA seminar or colloquium, it must have been published either in a conference book available to the membership or in an acceptable journal. The journals, books and newsletters should be published in 2000 or 2001.

Judging: The selection criteria will include factors such as investment content, originality, practical significance, timeliness, relevancy and educational value to the membership. A prize will be awarded only if the Prize Committee deems the best eligible work to be of sufficient merit to justify an award. The Prize Committee members are Nino Boezio, Paul J. Donahue, Steven Easson, Luke Girard, Jeremy Gold, David Li, John Manistre, Robert Reitano, Michael Sherris, Elias Shiu, Ken Seng Tan, Richard Wendt and Yong Yao. The final decision for any award will rest with the Investment Section Council.

Submission: The paper must be submitted prior to May 31, 2003. The submission should be e-mailed to nboezio@sympatico.ca.

Taking Stock—

What Really Has Changed In The Past Two Years

by Nino A. Boezio

Even though many of our readers are aware of what has changed in both the economic environment and in the world during the past two years, it still may be useful to summarize what we have seen. These underlying themes have made important contributions to our volatile equity markets and will continue to dominate for some time to come:

- **Investment management is still an art, not a science.** With the proliferation of models, new behavioral research, risk management techniques, analytics and the elevated discussions addressing corporate governance, one may have gotten the impression that investment losses would have been mitigated in the current market decline—instead we may now be thinking that, after all the fuss, we simply just learned to lose money in a more disciplined manner (perhaps losses were indeed some what mitigated, we just do not know how market performance would have looked like if such tools and approaches were absent). We still have a long way to go in understanding investment activity.
- **The new paradigm, new economy or new era was probably just wishful thinking—again.** The technological advances, economic and societal changes that took place in the past decade did improve financial performance and productivity, but their relative impact was too overblown; especially in equity valuations. We were also told that the stock market would be strong to the end of this decade because baby boomers were still saving for retirement (the demographic argument).



We were hoping that the incredible advances in technology and the use of the Internet would transform our economy and way of life to something simpler, more profitable and much more productive, and this would continue to filter through the economy and the markets for a very long time. Similar thoughts dominated the strong market advances of prior generations, only to disappoint later. These arguments induced people to buy more equities than they otherwise would have been comfortable with.

- **The equity markets cannot solve all our financial problems.** The stock market was being seen as the opportunity of the lifetime and the best and safest place to park one's money. Anyone who stayed out of the market was being too conservative. Perhaps the most graphic illustration of this thinking was in the area of public Social security programs where the markets could even promise to grow assets so fast that deficits could be eliminated. For example, some proposed successfully that the Canada/Quebec Pension Plan move part of its assets from low-yielding fixed income government securities to equity investments, using opportunity cost-type arguments, only now to see such assets falling far short of where they would have been had such a push never been adopted in the first place. Those voices promoting more equity investments have now become silent (now it is probably the time when they should really become audible—contrarian thinking does have its place).

- **We were not market geniuses after all.** Rising markets made many people feel like they were on top of the world and that they were market mavens. We all probably know someone who quit their job to become a professional day-trader. Now such former day-traders change the

subject when you bring up that stage in their life, for it is somewhat embarrassing to discuss.

- **Perhaps our jobs are not so bad after all.** The goal of many was to retire as soon as possible with as much wealth as possible. Now with several years of bad equity returns and hence smaller personal portfolios, people may feel that their job is actually not so bad (and happy to have a job), that another five years or so of working may not be so painful (it may actually be fun) and all that free time after retirement could be over-rated (we will be bored). Therefore, many now look for more ways to enjoy our work.
- **Surpluses have changed to deficits.** Even though this is not a new phenomenon, we were, however, getting accustomed to seeing regular surpluses in government and public programs, including public and private pension plans. For example, once a surplus arose in pension plans, it would often continue to grow in excess of actuarial assumptions. There was a temptation to employers (even if pressure was not coming from employees) to improve plan benefits or use the surplus for down sizing via early retirement windows; especially since such surplus was not easily accessible to corporate operations due to regulation and legislation, and since the surplus was perceived to be a permanent gift from the markets (and/or arose from expert investment management). Insurance companies also got lured by the strong equity markets of the past 20 years into giving various floor guarantees on fund investments. Now every one running an financial program will be looking over their shoulder for the next 10-20 years before they spend a surplus, realizing that it can disappear quickly.
- **Technological advances have outpaced our current needs.** Do we really need a 2.4-gigahertz CPU, 60-gigabyte hard drive, 256mb RAM CD R/W notebook computer to run our Microsoft Office, when our machine of three years ago can still do the trick? And if we wait a year, we can get a 3.2-gigahertz CPU, 100 gigabyte hard drive, 512mb RAM DVD R/W notebook (plus some more add-on gadgets) for about the same money than we would spend today. Also, how small does our cell-phone really have to be, and how clearly do we want to hear that pin drop as we see on commercials? The phrase 'significant improvement' is not so significant right now. There is this continued - mental struggle to buy that advanced technology now, versus the dread of it becoming slightly out-of-date in as little as six months time (patience is a virtue). We see the rapid changes in technology

now also affecting cameras, hand-held devices and media players.

- **The world is probably not buying the American dream.** Even though the United States has been the dominant economy of the past 10 years, people and nations perhaps admired the United States because that was where the action was, not because that was where they wanted to be, or what they wanted to be. All this talk about terrorism has raised national concerns because the rest of the world does not seem to think the way we do in North America, even though we thought (or hoped) they did. The rest of the world perhaps wanted to enjoy part of our prosperity without becoming like us.
- **The United States now has undertaken the tough job of keeping the world from falling apart.** Can a nation of 300 million people prevent chaos in a world of six billion? Can the United States physically and financially afford it? Will such 'service' be appreciated? (The world is often unwilling to

All this talk about terrorism has raised national concerns, because the rest of the world does not seem to think the way we thought they did.

admit that the United States and the United Kingdom often accounted for much of the global stability in the 20th century). There are many forces of disruption in the world that are more interested in destroying rather than building, or picking up the pieces afterwards. If such forces are successful, then the whole world suffers. It makes one worry more today about holding the S&P 500 futures long overnight. Also the United States has a tough task of promoting its political, social and economic values to the rest of the world, when other countries may argue that the United States is not a moral example nation either.

- **The Internet is still a fuzzy tool.** There were times when people had a clear vision of what the Internet would add to our life and our economy, and this helped fuel the dot-com rage. Now the whole subject has an element of confusion to it. The Internet is excellent for getting information and viewing products online, but I do not get the sense that too many know what its ultimate role or economic value will be in our society.

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- **Non-economic factors cannot be ignored.** Investments have tended to be made primarily based on financial attributes, since other factors were difficult to determine and hence, incorporate into the decision making process. Behavioral research has noted that investors tend to think of factors that impact an investment decision in compartments, and are not often assimilating such factors together correctly to make a proper decision. Hence we may have invested based on economic and financial factors, ignoring or down playing major political problems that would have made our decision somewhat different or have inadvertently allowed our biases to improperly weight various attributes. Based on the uncertainty in today's world, we have to do a better job of putting all of these attributes together.

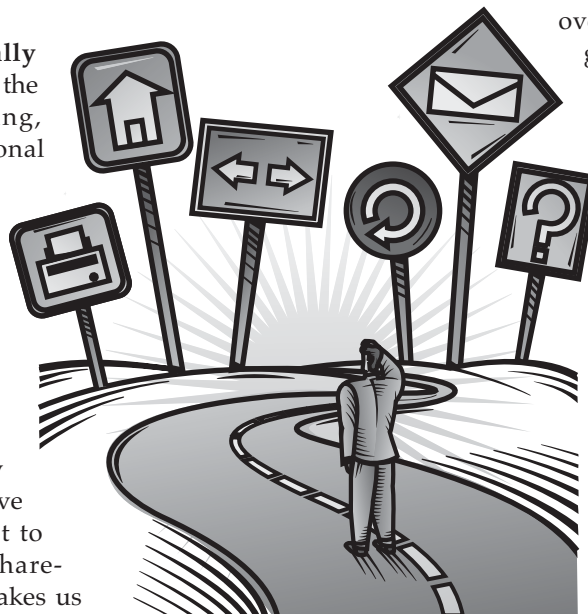
- **We learned that we often could not tell the difference between good corporate marketing, optimistic projections, a good story or simply, bold-faced lying.** We put a great deal of trust in the nobility of our corporate leaders, advisors, analysts and our institutions; since the financial world is very large, very complex and we simply do not have the ability, the time nor the expertise to monitor everything. We often took what we heard about a company, its prospects and its activities as being very close to the facts. The confidence that we always hear the truth has now been undermined and shaken. We are now finding that we cannot delegate the entire investment function, especially on the personal level, to others with complete assurance that everything will work out alright.

- **Are professionals really professional?** With all the professional training, emphasis on professional standards, regulation, government watchdog organizations and emphasis on ethics and honesty, we have found professionals who are willing to wiggle through loopholes to satisfy clients, satisfy themselves or to achieve certain objectives—not to serve the public or shareholders. It certainly makes us

worry about where things could have gone wrong, since we, in North America, have prided ourselves as being far advanced when compared to the rest of the world on how our companies and people do things, and we have prided ourselves as nations of good law and behavior.

- **The Middle East continues to be a focal point.** Ever since the fall of the Ottoman Empire after World War I, when the nations of the Middle East became 'free' from Turkish rule, there has been escalating unrest in that region. As long as oil and gasoline are dominant factors in the world economy, the Middle East will always be a source of concern for much of the world, and always poses a danger if the wrong people come into power. The late-1990s gave us the impression that peace was finally blossoming forth when we saw various former enemies shaking hands, only to see it all unravel two years ago. Unfortunately, we hate to mix religion with economics, but it is a reality we always have to keep in mind when planning investments, as we only like to consider factors that have a numeric value and not intangible impact. Peace can be an illusion as history shows. Unlike other economic factors, countries such as the United States simply cannot control that part of the world, and yet, it is so vital to world stability and prosperity.

- **Things can either change very quickly or very slowly.** I wrote an article in *Risks & Rewards* in 1995 where I had a slight negative bias towards the equity markets, since equities broke most former (fundamental) measures of overvaluation. I felt the market was going to be in trouble within the next couple of years. I was wrong. Overvaluation only became a major focus in early 2001. On the other hand, we saw equity crashes within a few months of the market making a major top, which bothers those academics that argue that the market is rational. We simply cannot do straight-line-type projections on how the markets will perform; reactions are very slow or very swift, even though signs may or may not be evident in advance.



- **What is truly important in life?** Change makes us reflect on the past. The economic downturn has caused us to re-evaluate our lives in the prior economic boom—whether our lifestyle was wise, whether we got carried away with the mood of the times either in what we bought or did not buy and how we balanced our work versus family. People relationships are now being seen as being more important than physical possessions and status.
- **Information overload.** Recently my computer crashed which initially made me depressed. I managed to save my client files, but lost much of what I had accumulated over the past three years on various subjects (which I thought might be useful someday). Ironically, I am very happy now that I lost those other files. I had so much junk stored on my computer that I probably could not find any saved information easily even if my life depended on it. Much of it was out-of-date and I also get so much new stuff daily, that I would never re-read that old stuff again anyway. If I need to look for something, I can simply search the Internet and get current, up-to-date and more useful information that I had before. I have come to realize that sometimes we accumulate information because we think knowledge is power; yet if we accumulate too much, we can no longer see

straight. Too much information can confuse us, waste our time and slow us down in making decisions. Also saving things that ‘might’ be useful someday is often just not worth it. We live in an age where so much information is available and is ever increasing that we have to set priorities on what we will bother with. Time is becoming a more valuable commodity than information is, and a valuable skill is not knowing something in advance, but knowing where to find that something when we need it and knowing how to apply it. I would often get troubled when I heard portfolio managers boast about all the information they had at their finger tips, but when I would ask how they use such information, their eyes would glaze over and they would begin fumbling for an answer.

Overall, the world is not difficult to understand, but it is hard to weigh all the factors in order to make an investment decision. Unfortunately right now, this uncertainty is something that cannot be wrung out of the system that easily, it is expected to hold back equity performance somewhat and keep yields on fixed income securities lower than what otherwise would have been expected. But uncertainty and confidence have traded places often in history, and we must always be prepared to handle these shifts. ☛



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Looking Back...Investment Section Council Photos

Members of the 2002-2003 Investment Section Council bidding farewell to outgoing chairperson, Max Rudolph, at the SOA Annual Meeting in Boston

Left to right—Larry Rubin, Craig Fowler, Steve Easson, Mike O'Connor, Max Rudolph, Doug George, Joe Koltisko, Mark Bursinger

Missing Council Members – Charles Gilbert, Bryan Boudreau



Doug George (right), incoming Investment Section chairperson, presenting the “Bull and Bear” statue to Max Rudolph, retiring section chairperson, in appreciation of a job well done.

Risk Management and Actuaries—

SOA Risk Management Task Force Update

by David Ingram and Valentina Isakina

Why risk management and why now?

If you have not yet heard about the SOA's risk management initiative, you have probably been deleting the SOA emails from your inbox without reading them! The SOA Risk Management Task Force (RMTF), chaired by Dave Ingram, is actually almost two years old. It was created under the Finance Practice Area of the SOA as an effort to improve the educational and professional opportunities as well as the availability of tools for actuaries in the area of risk management.

At the beginning, the RMTF consisted of only about a dozen dedicated actuaries interested in a number of risk management issues. By the spring of 2002, it was clear that additional resources were needed to address the growing concerns of the profession regarding risk management. The RMTF received a major boost of "new blood" in March of 2002, when a blast email was sent out to the SOA membership with a call for additional volunteers. The resulting interest was overwhelming, and today, the 10 different subgroups and over 200 members of the RMTF are working to address various issues via new research proposals, surveys, seminars, and a task force Web site hosted out of the SOA Web site.

The RMTF—The "Grass Roots" Efforts

Although the initiative to form the RMTF originated from the Finance Practice Area of the Society, the subgroups of the RMTF have been emerging as a purely "grass roots" effort of its members. The RMTF leaders give a green light to a new subgroup whenever at least a couple of RMTF participants develop an interest to pursue a particular topic or issue. As a result, the various initiatives being addressed by the subgroups are of critical interest to the actuaries practicing in today's unsettling economic and regulatory environment. Moreover, some of these subjects are typically quite new for actuaries with the current industry knowledge in those disciplines either still emerging or even lacking.



The subgroups of the RMTF can be broadly classified as those pursuing various technical topics and those addressing more strategic issues relevant to the advancement of the actuarial profession in the risk management arena. The subgroups are currently as follows:

- | | |
|--|-------------------------|
| 1. RBC Covariance | Leader: Jim Reiskytl |
| 2. Policyholder Behavior in the Tail | Leader: Jim Reiskytl |
| 3. Extreme Value Modeling | Leader: Tom Edwalds |
| 4. Economic Capital Calculation and Allocation | Leader: Hubert Mueller |
| 5. Risk Management Metrics | Leader: Dave Ingram |
| 6. Pricing for Risk | Leader: Todd Henderson |
| 7. Equity Risk Modeling | Leader: Josephine Marks |
| 8. Health Risk Management | Leader: John Stark |
| 9. Risk Management Position and Strategy | Leader: Dave Ingram |

10. Enterprise Risk Management (incorporates the Chief Risk Officer subgroup)	Leader: Mark Shaw Leader: Juan Kelly
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At this point, each subgroup has established a devoted nucleus of about a dozen particularly active members who are the main driving force behind the progress. Other RMTF members participate by following the subgroups' progress via listserves (e-mail distribution lists established for the ease of communication) and stepping in when a particular issue strikes their interest.

Anyone with enough enthusiasm is welcome to join in. The extent of participants' experiences ranges from expert-level to none. While this may seem as possible drawback, the mix is actually proving to be one of the key ingredients for the resulting success of the RMTF. The immense enthusiasm for learning and readiness to dive into projects serves as an excellent complement to expertise.

Projects Update

While the subgroups are in various stages of progress in their work, overall, a tremendous accomplishment has been made since this spring, when the majority of the current volunteers came on board. The following paragraphs will briefly describe the subgroups and their key undertakings.

RBC Covariance

As you have probably experienced in your actuarial practice, the subject of risk identification, natural risk hedges and how various risks may interplay with each other arises in actuarial work quite frequently. However, from a practical perspective, there has not been much developed in this area to be of any use to an actuary. The RBC Covariance subgroup, therefore, undertook the initiative to consider what can be done at the SOA level on this subject. The broad goal of the subgroup is to determine the covariance and correlation among the various insurance and, possibly, non-insurance risks to guide the actuary in establishing surplus targets that meet pre-determined goals—such as at a 99 percent confidence level. As a result, the subgroup is developing various research ideas on the topic and shepherding them through the necessary process to obtain the recognition as SOA research initiatives and become funded for research.

One such idea on the subject of dynamic covariance and correlations (covariance and correlations as a

function of time and degree of uncertainty) has been recently accepted by the SOA and exposed to industry researchers. The subgroup is currently in the process of evaluating the proposals that came in from the industry in response to the research request and then forming a project oversight group (POG) to begin the research process. For more information on this topic, go to http://www.soa.org/research/rbc_covariance_rfp.html.

Another research initiative that is currently in the works will address the issue of a risk aggregation and disaggregation at a company or industry level. The goal of this potential project is to provide actuaries with both a theoretical background and practical approach in addressing:

1. the basis for aggregating individual risk factors into broader risk categories, or disaggregating a company or the industry into broad risk categories
2. the covariance among these broad-risk categories as a measure of the overall risk reduction through the benefits of diversification of risk.

Policyholder Behavior In the Tail

The subject of evaluating potential policyholder behavior and identifying possible drivers of such behavior is of an utmost interest to the insurers. This is even more relevant now, considering the recently experienced extreme fluctuations in the economy and the resulting hike in utilization of various options by policyholders against the insurance carriers.

The subgroup dealing with this topic aims to address the development of such assumptions and identify possible ways to model policyholder behavior for various insurance and annuity risks under different economic conditions. Where such practical models do not exist, the subgroup's goal is to establish research initiatives for their development and, where some theoretical models exist but are not directly applicable to actuarial practice, to solicit adaptation of such theory to practical actuarial use.

Currently, the subgroup is in the process of developing several research proposals addressing modeling of surrenders, lapses and withdrawal behavior of policyholders in extreme scenarios for several products, including variable annuities, universal life insurance and long term care. Given the extent of research work needed on such topics and the fact that many behavioral models are data-driven, collecting the necessary

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policy-level information for such research is a project of its own. Therefore, the subgroup is starting this undertaking by surveying the industry carriers for their potential interest in contributing to an anonymous data bank to be used for the purposes of modeling policyholder behavior under extreme conditions.

Extreme Value Modeling

When setting distribution assumptions in their day-to-day actuarial work, defining a distribution of a random variable to be normal is a common method used by practicing actuaries to simplify modeling techniques and various calculations. However, very few insurance

At the enterprise level, Economic Capital is typically defined as "sufficient surplus capital to meet negative cash flows at a given risk tolerance level."

risks are truly normally distributed. To raise the awareness of actuaries on this topic, the Extreme Value Modeling subgroup decided to address the "fat tail" phenomenon of the insurance business.

In particular, the subgroup is striving to ascertain what potential impact on solvency such an assumption of normality might have in regard to various insurance risks. To address this rather complex issue, the subgroup is currently surveying the existing theoretical literature on the subject of extreme values with the hope to find practical answers to this problem and, where none exist, develop research proposals to address the gaps.

Economic Capital Calculation and Allocation (ECCA)

Recently, the concept of economic approach to accounting for insurance cash flows has been receiving increasingly greater attention within the insurance. In November 2002, the ECCA subgroup conducted an extensive survey on the subject of economic capital. The survey was distributed to the members of the RMTF, as well as the Investment Section, International Section and Financial Reporting Section membership. In response to the survey, about 500 responses were collected, compiled and carefully analyzed.

While the exact definition of economic capital is still up for debate, 81 percent of the survey respondents agreed ("strongly agreed" or "somewhat agreed") on a strawman definition of the economic capital.

To further address this issue, the ECCA subgroup is incorporating the survey results into a comprehensive specialty guide to introduce the concept of economic capital to practicing actuaries. The specialty guide will provide information on the current industry approaches to calculating economic capital, what risks it is typically designed to cover and possible case studies illustrating uses of economic capital in the industry. In addition, the subgroup is conducting a review of the existing literature on the subject, and the EC specialty guide will include a bibliography of the applicable literature on this topic.

Risk Management Metrics

Identification of various risks is not a complicated concept for an actuary. Measuring the risks that have been identified is a completely different matter. Some of the risks can be extremely difficult, if not impossible to ascertain accurately, and the question of what risk measures to use under what circumstances is also a challenging one.

To address some of these issues, the Risk Management Metrics subgroup is working on the development of a risk metrics guide for actuaries. This comprehensive guide is intended to provide the actuaries with a practical tool that describes and evaluates various risk management metrics applicable to the insurance business. The risk metrics currently under the subgroup's considerations range from traditional measures, such as duration and convexity to conceptually newer measures, such as Value at Risk (VAR) and Conditional Tail Expectations (CTE). The guide will define a range of risk-management metrics commonly used today and address their actionability through illustrations of how to utilize the metrics in a company decision-making process.

Pricing for Risk

At the heart of the Pricing for Risk subgroup's interest lies the question about the effectiveness of various pricing techniques used by insurers in capturing product risks. In particular, the subgroup is trying to establish a range of methods used by the industry to quantify risks

associated with the sale and administration of insurance products.

The subgroup's work is directed toward developing a comprehensive guide on pricing for risk that would analyze the existing practices and provide discussion of methods used. A survey of such practices and methods was completed and the subgroup is in the process of analyzing the results.

Equity Modeling

During the period of booming equity markets, the industry introduced a variety of new insurance product designs directed to accommodate customers' desires for equity-market participation. This created enormous capital markets exposure for the industry, resulting in equity risk becoming the dominant market risk for the insurance companies' portfolios.

To address the challenges an actuary faces in trying to establish ways to cope with this recent phenomenon, the aim of the Equity Modeling subgroup is to assess the availability of modeling tools and techniques to measure and manage equity risk for actuarial purposes. The subgroup began working toward its goal by looking into available resources on various modeling techniques. One particular challenge identified immediately was the extremely theoretical nature of the existing literature on the subject of equity modeling, which is of little practical use to actuaries. Once the analysis of the available literature is completed and gaps in knowledge are identified the subgroup may

start working on formulating potential research initiatives to advance the practical applicability of existing theory on the topic.

The ultimate objective of the subgroup is to develop a specialty guide on equity modeling that would equip an actuary with practical tools on the subject. The guide may provide analyses of various modeling options available to deal with equity risk, including description of these models' assumptions and parameters. In addition, the subgroup is hoping to address advantages and limitations of various equity-risk models and provide commentary on possible ways to approach management of equity risks in an insurance company setting.

Health Risk Management

Actuaries practicing in health-related disciplines seem to be facing a number of unique challenges, such as dealing with a hybrid of risks similar in characteristics to both the property/casualty industry and life insurance industry. The "grass roots" nature of the RMTF provided an opportunity for health actuaries interested in risk management to form a separate subgroup to address those challenges.

The Health Risk Management subgroup decided to split into smaller segments to address such topics as:

- Solvency issues in health insurance
- Availability of tools and modeling techniques for health risks
- Development of a specialty guide for actuaries on health risk management.

Ultimately, the subgroup is seeking to expand the current knowledge of health actuaries in the arena of risk management by initiating various research initiatives geared to advance the availability of tools and techniques of health actuaries in the arena of risk management.

Enterprise Risk Management

The concept of an integrated or enterprise-level approach to risk management is currently one of the hottest topics for the insurance industry. The consequences of the Enron-related scandals to the broader financial services sector and the resulting actions by Congress propelled this already emerging trend to the

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new heights. Seemingly, no other topic is generating greater interest of the industry leaders than the concept of the enterprise risk management (ERM).

The ERM subgroup is aiming to address this growing interest by working towards the development of a comprehensive framework on identifying, measuring, monitoring and managing uncertainty within the ERM framework. The task is certainly not trivial, and the subgroup began its efforts by establishing broad industry contacts—both in the United States and abroad—aimed at consolidation of already existing work on the ERM subject that was accomplished outside the SOA realm.

The CRO job function is also a relatively new concept and appears to go hand-in-hand with the concept of ERM. A separate group of RMTF members is taking a closer look at the developing trends on this front and is trying to define a range of functions a CRO serves as well as the role of a CRO within the ERM framework.

As the subgroup is zeroing in on the available ERM resources and beginning to evaluate them. It has identified two valuable documents that may become the essential ingredients of the direction the subgroup takes on the ERM framework. These key sources are:

1. Implementing Turnbull from the Institute of Chartered Accountants of England and Wales
2. Casualty Actuarial Society Advisory Committee on Enterprise Risk Management Final Report

While the work of the subgroup on the ERM framework is only at its beginning stages, the above two documents can serve as a valuable initial resource for actuaries interested in gaining some background on the enterprise-level approach to risk management.

Risk Management Strategy Group


Risk management has clearly emerged as a subject that evokes a strong response from many SOA members. Task force members have said that they are giving their time to this effort because they see risk management as the future of the profession. The Risk Management Strategy Group was formed for the dual purpose of supporting the efforts of the SOA Strategic Planning Committee regarding positioning the profession to our best advantage in the area of risk management and for planning future activities of the RMTF. This group was

started in October 2002 and has begun by committing to develop materials that support the proposal that actuaries are well-positioned to be a primary group involved in risk management in the insurance industry.

The Future

The RMTF has no future without continuing support and interest from its members. Keeping the subject matter relevant and important to practicing actuaries is the key to achieving such interest and support. The “grass roots” structure of the RMTF serves this objective well, and, as the RMTF members develop additional areas of interest they would like to pursue, more subgroups may be created to accommodate the emerging interest.

The RMTF is attempting to make the SOA membership aware of its activities and findings. As a part of the effort, the organization of separate seminars focusing on risk management, as well as participation in regular SOA meetings are some of the goals the RMTF has been very successful in achieving thus far. In addition, the RMTF has enjoyed the continued support from the sections—in particular, the Investment Section—whose many members are active participants on the RMTF.

Clearly, the subgroups of the RMTF are working on projects of varying importance and critical need for the profession. The only way to make sure the RMTF is addressing the right questions is to get involved and become an active participant in its efforts. If you would like to learn more about the Risk Management Task Force in general or any of its subgroups in particular, contact Dave Ingram at david.ingram@milliman.com or Valentina Isakina at visakina@soa.org. 

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Measuring Fair Value for Participation Units of Stable Value Pooled Funds

by Paul J. Donahue

Introduction

Stable Value Pooled Funds are a popular vehicle, particularly for smaller plans to add the benefits of stable value to a defined-contribution benefits plan. However, some defined-benefit plans also use stable value pooled funds for asset allocation purposes.

Measuring the “fair value” of units of participation in a stable value-pooled fund is necessary for a variety of purposes. The valuation of units of a pooled fund held by defined-benefit plans is governed by FAS 110, and the units must be valued at “fair value.”¹ For purposes of determining the performance of managers of pooled funds according to the standards endorsed by the Stable Value Investment Association, it is necessary to establish the “fair value” of the units.

In this article, I conclude that the readily available and convenient answer to the question of fair value is also theoretically the soundest—the best estimate of fair value is book value.

Characteristics of a Stable Value-Pooled Fund

Stable value-pooled funds are bank-maintained common funds, exempt from registration under both the Securities and Exchange Act and the Investment Company Act, which are tax exempt by complying with Revenue Ruling 81-100. This organizational framework allows a stable-value pooled fund to accept deposits from an unlimited number of plans qualified under ERISA. All transactions of a pooled fund are in cash. While some pooled funds may provide for in-kind distributions, it is generally not feasible to pay out a departing plan with an in-kind transfer of a piece of each asset of the plan.² Each plan is generally a small proportion of the pool and transaction costs and the impossibility of division of assets like GICs make in-kind transfers essentially impossible.

As with separate account stable value funds, pooled funds must make cash available to honor participant transactions permitted by the investing plans on a daily basis at book value.³ However, quite unlike separate account stable-value funds, the need to preserve the value of a participant’s account on transfer of a plan to a new funding vehicle means that when the plan is paid out, the plan must also receive book value

in cash. Therefore, all pooled fund transactions take place in cash at book value.

The Risk of Disintermediation

Stable value as an investment vehicle is made possible by guarantee contracts “wraps” which assure that funds will also be available to make all payments required by contract to be made at book value.⁴ The primary risk to the issuer of the guarantee contract is the disintermediation risk. When rising interest rates depress the market value of assets underlying a stable value fund below their book value and enable money-market plans to offer higher rates, massive transfers to money-market funds could force issuers to advance funds to honor their guarantees.

Stable value-pooled funds protect themselves against the risk of disintermediation at the level of participants in the investing plans the same way separate account stable value funds generally do. The pooled fund Trust Indenture would normally restrict participation to plans either without other short duration fixed income funds or that impose a 90-day “equity wash” on transfers from the stable value option.

Stable value separate-account funds protect against “investor” (plan) level disintermediation by in-kind transfers. The book and market values of the account are both transferred to a successor manager. Of course, if the transfer is to any option other than another stable value fund, only the market value of the assets is relevant.

Since the operational realities of a pooled fund require a transfer in cash at book, the pooled fund must

1) See PAUL J. DONAHUE, *What AICPA SOP 94-4 Hath Wrought: The Demand Characteristics, Accounting Foundation and Management of Stable Value Funds*, 16:1 BENEFITS QUARTERLY 44:46-47 (First Quarter, 2000), and accompanying notes.

2) Some Stable Value pooled funds retain the theoretical right in the governing Trust Indenture to pay out plans in-kind, but the practical difficulties make this a right that would in practice be impossible to exercise.

3) This protects the pooled fund from the disintermediation risk, *see below*, at the level of participant activity.

4) See PAUL J. DONAHUE, *The Stable Value Wrap: Insurance Contract or Derivative? Experience Rated or Not?* 37 RISKS AND REWARDS 18 (Investment Section of the Society of Actuaries, July, 2001)

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adopt some alternate mechanism to protect the fund against the risk of adverse selection by plans. The usual way pooled funds guard against plan-level disintermediation is for the pooled fund to reserve the right to delay the redemption of units put by a plan back to the pooled fund by up to 12 months.

Measuring Fair Value

What is the fair value of units with these characteristics on a given valuation date? There is no market for the units of the pooled fund other than the fund, so the most straightforward measure of fair value—a market price—is not available. FASB Statement 140, *Accounting for Transfers and Servicing of Financial Assets and Extinguishments of Liabilities*, states:

If quoted market prices are not available, the estimate of fair value shall be based on the best information available in the circumstance. The estimate of fair value shall consider prices for similar assets and liabilities and the results of valuation techniques to the extent available in the circumstances. Examples of valuation techniques include the present value of estimated future cash flows, option-pricing models, matrix pricing, option-adjusted spread models, and fundamental analysis. . . .

Estimates of expected future cash flows, if used to estimate fair value, shall be based on reasonable and supportable assumptions and projections.⁵

Actuarial valuation is specifically cited as an example of what FASB intends to move toward with the Concepts Statement 7, *Using Cash Flow Information and Present Value in Accounting Measurements*.⁶

In the analysis below, I set out a generalized estimate for the fair value of units of a stable value-pooled fund that fully complies with the requirements as set out by FASB.

Valuation Using Expected Cash Flows

As soon as we attempt to formulate the possible patterns for redemption of the units of a stable value-pooled fund, we begin to see how complex our

valuation problem is. Consider first of all that the defined benefit plan (DB) is required to report its units at fair value. A DB plan could justify considering annuity payments from the fund, or participant cash-outs, as “participant-initiated benefits.” However, pooled-fund rules would only allow the plan to redeem the proportion of its units of the pooled fund that the pooled fund was to assets of the entire plan, likely to be a small percentage. As a practical matter, DB plans do not draw on pooled-fund units for participant activity, and the valuation question simplifies to the plan exercise of its redemption of its units, or its exercise of the “put” right.

For the defined contribution plans (DC), which more commonly invest in Stable Value pooled funds, the units currently owned beneficially by participants need not be redeemed until the last surviving participant has died, which could be 70 years or more in the future.

There are really only two plausible candidates for the value of the units of the stable value-pooled fund—the market value of the assets other than wraps underlying the fund, or the book value. This article limits by hypothesis the selection of a fair value to one or the other of these two values.

There are three “states” relevant to valuation, and two lengths of time. A plan has either already put its units to the stable value-pooled fund, or has determined a date at which it will put its units to the pooled fund, or has no firm plan to put its units to the pooled fund. There are two significant time intervals, the one-year put period and the duration of the portfolio of assets other than wraps. Let us consider the significance of the duration of the portfolio first.

Duration

In an internal study, *Stable Value Product Volatility—A Simplified Model*, Miloje S. Makivic⁷ of INVESCO’s Quantitative Analysis unit used a simplified model of interest rate dynamics, market portfolio, account crediting rules and Monte Carlo simulation to compute ratios of standard deviations of the market and book-value accounts. The particular result of that study important for our purposes here is that beyond the duration of the portfolio, the expected value of the market and book value accounts converges. If we restrict our solution set for the fair value of units of a pooled fund to the interval bounded by the fair value of the assets other than wraps in the underlying portfolio and the book value of the units, the expected value converges to future book value at all points beyond the duration. Further, beyond the duration, total return on the market portfolio will have

5) Quoted in *Measuring Fair Value*, JOHN M. FOSTER AND WAYNE S. UPTON, 3:1 UNDERSTANDING THE ISSUES 1:4-5 (Financial Accounting Standards Board, June, 2001).

6) EDWARD W. TROTT AND WAYNE S. UPTON, 1:1 UNDERSTANDING THE ISSUES 1:2 (Financial Accounting Standards Board, May, 2001).

7) Mr. Makivic, CFA, received his Ph.D. in physics from the California Institute of Technology.

converged with credited return on the book value account. It is therefore appropriate to consider the present value of all cash flows resulting from the redemption of a unit occurring beyond the duration of the portfolio as the current book value of the unit.⁸

Put Period

The plan has a right to receive book value for the units in no more than 12 months, and in fewer than 12 months if the units have already been put to the fund. Let us assume the plan has put the units and that the plan has the right to receive book value in no more than x days. The plan will receive book value on some day α , $0 \leq \alpha \leq x$. The value of α is uncertain, and depends on what the investment manager of the pooled fund believes is in the best interests of the remaining pool participants. The exact value of α will never be information available to the person performing the valuation.

In general, when the market value of the assets underlying the wraps in a pooled fund exceeds the book value, the investment manager will pay out funds immediately. However, even in this situation, the manager will sometimes delay this for purposes of managing the liquidity of the fund.

Conversely, when the market value of the assets is less than the book value, the investment manager will generally delay payment until adjustments to the crediting rate have narrowed the gap. However, there may be times when the fund has excess liquidity and the investment manager chooses to pay out the departing plan.

If we knew day α with certainty, the value today of a book value payment to be received on day α would be the book value today accumulated at the crediting rate for each day between today and day α discounted back to today by today's rate on the appropriate credit/yield curve.

Consider the following simple crediting rate formula, widely used.

Portfolio yield = Y

Market yield = R_0

Duration = D

Crediting rate = $R_0 + (Y - R_0)/D$

8) Of course, I could as accurately have said "market value" for the period beyond the duration, since the expected values are equal.

9) A fund manager could not consistent with the manager's fiduciary duty under ERISA to all pooled fund participants make a commitment to pay out a sum on a particular date. On that date, if the notice period had not expired, and a payout was not in the interests of continuing pooled fund participants, the manager could not honor any such commitment imprudently made.

The purpose of this formula is to amortize any difference between book and market over the duration of the underlying portfolio. For any value of a less than D , there will still be a difference of the same sign between the book value and the market value on the date the payment will be made. The discounted value of the book value payout must be closer to the current book value than to the current market value, since if $m > n$, then $m \cdot v^a > n \cdot v^a$.

The result of this calculation will generally be that the calculated value exceeds book value, though not in periods of interest rate inversion, since the crediting rate will generally exceed the discount rate.

However, α is not known, and even if it were, the value of the crediting rate over the period from now to α is not known. Based on the actual experience of pooled funds, in general, the value of a will be less than three months. Clearly, the shorter the time until the investment manager will pay out the fund, the smaller the difference between current book value and the discounted future book value due to the difference between crediting rate and discount rate.

However, we have not yet reached the final step. The calculated value must be reduced to account for the uncertainty of the date of its receipt, a "liquidity adjustment," if you will. The amount of this adjustment would also be subjective and uncertain. It could easily offset any excess generated by the difference between the crediting rate and the discount rate.

When the plan has not yet put the units, but has a plan to put the units, the time frame of the analysis above is extended. However, as the point for redemption of the units approaches the duration of the portfolio, the difference between the crediting rate and the appropriate discount rate will diminish in all but the most extraordinary interest rate environments, and the difference between current book and discounted future book will not grow meaningfully larger than in the illustration above. As above, the only plausible estimate of fair value is book value when taking uncertainty into account.

Conclusion

What is the conclusion to which this analysis leads? The only sensible, practicable estimate for the fair value of the units of a pooled fund is that fair value equals book value!

This analysis confirms the appropriateness of the actual treatment by DB plans of units of stable value-pooled funds. These plans have universally reported the fair value of their holdings, as required by FAS 110, as equal to book value. Our analysis confirms the soundness of their judgment. δ

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The Case Against Stock in Corporate Pension Funds

by Lawrence N. Bader

A company has \$1 million of stock in a pension fund. The liability can be matched with a \$1-million dedicated bond portfolio. What are the consequences of shifting the pension fund from stock to bonds?

Current accounting

Current accounting rules favor equity investment by recognizing future risk premiums in advance, while concealing risk through smoothing techniques. The stock-to-bonds shift will lower the company's reported earnings—which of course disqualifies the shift from further consideration at many companies.

This article focuses on the real economics rather than GAAP accounting. For this purpose, we assume a transparent financial system, in which shareholders have full information about corporate pension funds and recognize that they experience the risks and rewards of these funds. Needless to say, today's system falls well short of that standard, but it is advancing rapidly in that direction, as the accounting profession progresses toward a market value paradigm and the financial community improves its understanding of pension plans.

No first-order change in value

After the stock-to-bonds shift, the company expects to earn less on its pension assets, giving up the chance of a surplus reversion. There is, though, no "first-order" change in corporate value, because the \$1-million bond portfolio has the same value for shareholders as the \$1-million stock portfolio that it replaces. The company's reported earnings (and expected economic earnings) will be less. The company, though, has reduced its risk, so investors will require less expected return.¹ Put another way, companies add no value for shareholders by doing what the shareholders could do for themselves—investing in publicly traded securities.

Shareholder response

If the company's stock-to-bonds shift is transparent, astute shareholders will observe the need to reoptimize their personal portfolios. Suppose that a shareholder held a personal portfolio of equity and bonds that was

optimal for his risk preference. Because the company's stock now has a lower risk and lower expected return, the shareholder's portfolio no longer reflects his risk preference. To reoptimize, he should buy whatever equity the company has sold and should sell bonds equivalent to the company's new immunized portfolio. (This adjustment should be in proportion to his fractional ownership of the company's equity. It should also reflect the corporate tax rate, as we shall see below.) His portfolio, including the indirect ownership through the pension fund, would then be restored to its previous position.

We now consider the second-order effects of the overall changes, taking into account the shareholder's response to the company's pension fund reallocation.

Notation and assumptions

We use the following notation and assumptions:

- The shareholder pays personal income taxes at effective rates of τ_{ps} on stock and τ_{pb} on bonds. Generally $\tau_{pb} > \tau_{ps}$, because capital gain tax rates are lower than ordinary tax rates and are deferred until gains are realized.
- The company pays taxes at a rate of τ_c . Therefore \$1 earned in its pension fund (whether on stock or bonds) has an after-tax value *to the company* of $(1 - \tau_c)$. That $(1 - \tau_c)$ has an after-tax value *to the shareholder* of $(1 - \tau_{ps})(1 - \tau_c)$.
- The actual (stochastic) investment return is \tilde{r}_s on stock and \tilde{r}_b on bonds.
- The shareholder owns one millionth of the company's equity.

Income tax effects

Here is the income tax effect on the shareholder of the overall transaction, reflecting his fractional ownership of the company and the offsetting change he should make in his personal portfolio.

1) For example, investors may require only a five percent return on a safe Treasury bond investment. At the same time, they may require an expected (but risky) ten percent return on a specific stock.

Change in	Pension Fund	Personal Portfolio
1. Holdings	+\$1 bonds – \$1 stock	$(1-\tau_c)(+\$1 \text{ stock}-\$1 \text{ bonds})$
2. Corporate Earnings	$(1-\tau_c)(\tilde{r}_b-\tilde{r}_s)$	
3. Shareholder net income	$(1-\tau_{ps})(1-\tau_c)(\tilde{r}_b-\tilde{r}_s)$	$(1-\tau_c)[(1-\tau_{ps})\tilde{r}_s-(1-\tau_{pb})\tilde{r}_b]$
4. Total of Line 3	$(1-\tau_c)\tilde{r}_b(\tau_{pb}-\tau_{ps})$	

Line 1: The shareholder's pro rata share of the pension fund buys \$1 of bonds and sells \$1 of stock. The shareholder offsets this shift by buying $(1-\tau_c)$ of stock and selling the same amount of bonds. The $(1-\tau_c)$ adjustment may not be intuitively obvious, but Line 4 will show its correctness.

Line 2: The pension fund earnings reflect \$1 of bonds rather than \$1 of stock. To arrive at the after-tax value to the company, we multiply by $(1-\tau_c)$.

Line 3: We further adjust the company's tax-adjusted pension fund earnings to reflect their after-tax value to the shareholder. We similarly tax-adjust the change in the return of his personal portfolio.

Line 4: Note that \tilde{r}_s does not appear. This shows that the shareholder has hedged the company's transaction and restored his previous risk level. The total effect on the shareholder's net income is positive, because $\tau_{pb} > \tau_{ps}$. (On a mark-to-market basis, \tilde{r}_b may be negative in any one year, but on a dedicated portfolio it must be positive over its horizon.)

Offsetting pension change at the company level

The illustration above is based on Tepper (1981), who shows that companies should sell their pension fund equities to permit their shareholders to increase their personal equity holdings. Black (1980) suggests a different way to offset the pension fund restructuring, at the company level rather than the shareholder level. The company can sell (or issue) bonds and buy back its own stock, thus restoring its previous overall bond and equity exposure. Its holdings of its own stock create no tax liability, but the bond issuance creates a new tax deduction. So again, keeping the equity exposure outside the pension plan reduces income taxes. Boots PLC is following a similar path, see Ralfe (2002).

The Black transaction exchanges a diversified equity portfolio for an undiversified holding of company stock. This exchange is consistent with the finance principle that shareholders gain no value when companies diversify, because the shareholders can do that themselves in their own portfolio construction. Shareholders should prefer the option of buying "pure" shares of a single business, rather than "pre-diversified" shares that combine businesses. On the other hand, the Black transaction can destroy value if this concentration increases the company's own risk to a dangerous level.

Black mentions an alternative of issuing bonds and investing the proceeds in a tax-managed diversified equity portfolio.² The stock portfolio would generate some taxable income, but the interest deduction on the bonds would more than offset it, leaving a net tax saving.

Company ownership of a diversified stock portfolio makes little sense in corporate finance terms, because that's not what shareholders are paying management to do. But both the leveraged stock repurchase and this alternative illustrate the financial gains available from the pension fund restructuring. The pension fund restructuring by itself gives the company more debt capacity (or cheaper rates on its existing debt level) that it can use in various ways. The most natural is probably further investment in its own business, which management commonly regards as superior to stock repurchase. Such managements should regard pension fund restructuring plus borrowing to invest in the business as superior even to the demonstrable gains of pension fund restructuring plus a leveraged stock buyback.

2) A tax-managed portfolio could include high-dividend stocks to take advantage of the corporate dividend exclusion. It would also minimize turnover and try to time its sales to balance realized gains and losses.

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Excise taxes

The company is exposed to an excise tax upon plan termination if the pension fund holds stock that outperforms the immunizing portfolio and therefore the liability. If the equity risk is taken instead by the shareholder directly (Tepper, 1981) or on the company's balance sheet (Black, 1980), the shareholder gets the full benefit of superior stock performance without liquidity problems or excise taxes.

Participants' right to surplus

The excise tax is not the only claim on surplus generated by stock held in the pension fund. If the participants can assert a legal or moral claim to the surplus, they too may share the benefit of superior stock performance. The company may also devote some of the surplus to additional pension benefits simply to minimize its excise tax upon reversion.

PBGC risk-related premiums

Holding stock in the pension fund exposes the fund to greater potential for risk-related PBGC premiums, which are minimized by immunization.

Benefit security

With the immunized bond portfolio, participants enjoy full benefit security regardless of the performance of the stock markets. They may attach a higher value to their more secure pensions.

Default risk

There is finally an advantage for holding stock in the pension fund—the company may be able to pass off losses to others! If the company goes bankrupt after a period of poor equity performance, the PBGC and the participants might absorb some of the losses. There is no such possibility if the pension fund is immunized.

Of course, the plan participants do not see this as an advantage and may devalue the pension plan as a part of their total compensation.³ The PBGC likewise does not see this as an advantage—hence the risk-related premiums.

In conclusion

As the title indicates, this article presents a one-sided view of pension fund investment and neglects the joys of equity investment. Perhaps a few readers will undertake to repair this neglect.

When doing so, they should not simply point to the superior long-term performance characteristics of

equity and the diminution of risk that they believe takes place over the extended horizons of pension funds. I do not suggest that equity is an inferior investment because of its risk—*only that it is an inferior investment for corporate pension funds*. In a transparent financial environment, equity risk taken in a pension fund is not “free.” It raises the return demanded by shareholders and creditors. It comes at the expense of similar risk that could be taken elsewhere with more tax efficiency and full benefit of upside performance—in shareholders' investment portfolios, or in the company's capital structure or business risk.

Financial economists understand that shifting pension funds from equity to bonds raises the expected pension cost. Pension actuaries must understand equally well why it can, at the same time, raise shareholder value. Companies better serve their shareholders *and* their pensioners when they use their businesses rather than their pension funds as platforms for taking risk and building value. **♣**

Acknowledgment

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References

- Black, F., “The Tax Consequences of Long-Run Pension Policy,” *Financial Analysts Journal*, July-August 1980, pp. 21-30.
- Gold, J., “Economic Design of Cash Balance Plans,” 2001 SOA Cash Balance Symposium Monograph M-RS02-3, Chapter I, http://www.soa.org/library/monographs/retirement_systems/M-RS02-3/M-RS02-3_1.pdf.
- Ralfe, J., Comment on “Reinventing Pension Actuarial Science,” *Pension Forum*, January 2003.
- Sharpe, W. F., “Corporate Pension Funding Policy,” *Journal of Financial Economics* 3, June 1976, pp. 183-193.
- Tepper, I., “Taxation and Corporate Pension Policy,” *Journal of Finance* 36-1, March 1981, pp. 1-13.

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3) See Sharpe (1976).

Use of Structured Advances in Risk Management

by Jay Glacy, Jr.

Editor's Note: This report has been prepared from original sources and data believed to be reliable, but no representation is made as to its accuracy, timeliness or completeness. Please consult with your investment professionals, tax advisors, accounting experts or legal counsel as necessary before relying on this material.

Life and health insurers often issue policies that obligate them to accept a stream of renewal premiums that may extend far into the future. Long-term care insurance (LTC) and long-term disability income insurance (LTD) are good examples of such products. Since such an insurer is required to invest future premium dollars at uncertain interest rates, it must utilize conservative interest assumptions in product pricing as a means of protecting itself. This conservatism may either harm the product's appeal in the marketplace or cause it to deliver diminished value to the policyholder. Further, resort to the usual armada of interest rate risk-management tools can fail because the renewal premiums of these products are "off balance sheet" and hence may not appear in duration and convexity statistics in the insurer's asset/liability reports.

An insurer exposed to this form of interest rate risk suffers "margin compression" should interest rates decline, especially for sustained periods of time. The earnings rates on its investments slide as lower-yielding assets are added to the portfolio at the same time higher-yielding assets mature or prepay. The insurer's ability to reprice the product through premium rate increases or credited rate reductions may be limited due to contractual or regulatory reasons. And policyholders, understanding that their policies are now priced above market, become more hesitant to lapse or otherwise curtail renewal premiums.

Historical Mitigation Methods

An insurer facing this situation might enter into an interest-rate swap to convert uncertain future interest rates to a fixed basis. (An interest-rate swap is an arrangement whereby two parties agree to exchange periodic interest payments.) A number of insurance companies are active users of swaps and other derivative contracts in the swap family for managing interest rate risk. An LTD writer, for example, might enter into a swap that requires it to pay a floating rate (usually LIBOR-based) and receive a fixed rate of interest. However, for other companies, the use of derivatives may be inappropriate or undesirable. These companies may not possess the infrastructure or expertise needed to manage derivatives or may be unable to comply with

the challenging FAS 133 requirements for achieving favorable financial statement presentations.

As an alternative, companies may pursue so-called holistic risk solutions that attempt to locate or create offsetting positions elsewhere in the balance sheet. For example, the LTD writer may also decide to enter the deferred annuity markets understanding that these annuities exhibit countervailing risk dynamics. As rates decline and the LTD product suffers margin compression, deferred annuities begin to develop capital gains. This derives from the fact that deferred annuities typically require assets to have longer duration than liabilities as the price of market entry. Conversely, as market interest rates increase, deferred annuities underperform while LTD writers enjoy higher than anticipated investment rates.

In reality, holistic solutions are difficult to achieve since the objective of arranging the balance sheet to realize holistic benefits may conflict with a company's business objectives, its administrative capabilities or its actual sales statistics. Fortunately, alternative risk management solutions exist for LTD writers that may be preferable.

FHLB Advances As a Solution

Thanks to recent passage of the *Gramm-Leach-Bliley Act*, insurers now have access to low-cost loans called "advances" offered by the 12 individual banks of the Federal Home Loan Bank (FHLB) system. To access FHLB advances, an insurer must pledge high-quality mortgage or other real estate-related assets as collateral in the amount of the desired advance. These are assets that typically already reside in the insurer's balance sheet in significant numbers. Banks can then satisfy the particular financing needs of the insurer by structuring advances at specific maturity points.

Many insurers are already familiar with the use of FHLB advances for backstop liquidity purposes or to grow the balance sheet through strategic reinvestment of advance proceeds. But FHLB advances can also supply valuable risk management benefits. By carefully structuring an advance to mature coincident with the anticipated premium inflows generated by insurance products, a company can largely eliminate future net cash flows and consequently the need to invest them in uncertain capital markets.

How Structured FHLB Advances Protect

An example bests illustrate this concept.

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Structured Advanced Illustration

	A	B	C	D	E	F	G	H
1		Advance	Discount	Product	Advance	Bond	Net	Net
2	Year	Spots	Factors	5.50%	3.98%	6.50%	Cash Flow	Income
3	0				475	-475	0	
4	1	3.00%	0.9709	100	-131	31	0	12
5	2	3.50%	0.9334	100	-131	31	0	16
6	3	4.00%	0.8890	100	-131	31	0	21
7	4	4.50%	0.8384	100	-131	31	0	26
8	5	5.00%	0.7833	-458		506	48	31
9								
10								
11								
12								

Consider a simplified and hypothetical five-year insurance product that requires premium payments of \$100 at the end of the first four years followed by a benefit payment at year five equal to the premiums accumulated at 5.50 percent. The insurer knows that if interest rates fall and remain low over the five-year period this could harm its ability to meet the agreed-upon benefit payment of \$458. So, working with its local FHLB, it structures an advance such that the stream of renewal premiums from the insurance product, together with interest income from the investment of advance proceeds, are sufficient to repay the staggered advance maturities. Net future cash flows are eliminated. In this way, the insurer becomes indifferent to the path future interest rates take.

In this example above, the advance maturities (the stream of \$131 repayments to the bank) are solved-for amounts. The advance of \$475 taken by the insurer is deployed in a bond assumed to yield 6.50%. At the end of the five-year period positive net cash flow appears. The Net Income column depicts how the transaction might appear in an income statement. Note that these earnings depictions only represent the performance of the advance/bond package and exclude the economics of the insurance product.

This application of FHLB advances to reshape liability profiles critically depends upon the predictability of cash flows. Policy lapsation or premium suspension can disrupt the expected pattern of product cash flows, especially in response to elevated levels of market interest rates, and cause net negative cash flows to materialize. Conversely, should rates fall, a callable bond purchased with advance proceeds could be retired prematurely.

Additional Benefits of Structured FHLB Advances

The foregoing illustrates the potential for structured advances to serve as potent risk management tools.

Beyond the power of structured advances to reshape the liability profile, their use can confer potential additional benefits upon an insurer.

First, since the individual banks of the FHLB system are exempt from federal and state income taxes and from registration of their securities with the SEC, they are able to pass along this “subsidy” in the form of lower cost of funds. While pricing among the twelve Banks varies, sometimes widely, advance pricing can be superior to competing alternatives, especially for insurers lacking top-rung credit ratings.

Second, the combination of structured advances and the simultaneous investment of advance proceeds is the linchpin in reshaping the liability profile. Since the bond purchased in this trade does not back an insurance liability, less liquid issues like asset-backed securities, can be utilized. This can often be at an attractive yield spread.

Finally, advances can be more benign liabilities than insurance liabilities. Excepting convertible advances, banks do not have the right to put the liability back at inopportune times for the borrower. Because of this, advances typically are more capital-friendly than insurance liabilities.

Conclusion

Commercial banks and thrifts have long recognized the benefits of establishing relationships with the FHLBS. Increasingly, insurance companies are learning about these benefits as well. When used to reshape its liability profile, FHLB advances offer the life or health insurer a rare win-win—the opportunity to reduce its interest rate risk exposure while simultaneously enjoying attractive investment returns on advance proceeds. This is an opportunity that every insurer should consider. ☛

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