SOCIETY OF ACTUARIES Investment Section

Risks & Rewards

Actuaries
Risk is Opportunity.®

ISSUE 64 AUGUST 2014

THE USE OF ANNUITIES IN AN OPTIMAL RETIREMENT PORTFOLIO

By Don Ezra

I've reached three major conclusions: on longevity risk, on annuities, and on what an optimal investment portfolio looks like for us.

My thinking is based on the situation that my wife and I are in. And I have to express my proposed solutions in a way that my non-financial wife, and our two non-financial children, can understand. Along the way, I've discovered that our situation is very common, and that other non-financial people appreciate my explanations.

Here's the base situation. We've accumulated an above-average amount of wealth. But the lifestyle we desire is richer than we are. How do I know this? By the simple device of calculating our personal funded ratio.

As a first approximation, I estimate the present value of our lifestyle, after subtracting the income we'll receive from universal plans, and ignoring bequests because we've included in our lifestyle the cost of premiums toward a second-to-die life insurance policy. I use an inflation-indexed joint and two-thirds survivor annuity factor. Call the result our ambition.

I look at the ratio of our assets to our ambition. This is our personal funded ratio, the counterpart to the funded ratio of a defined-benefit plan; though more accurately it's the exact counterpart to the funded ratio of a Dutch-type collective defined-contribution plan, in which the ambition is not guaranteed.

For us, as for so many people, this is below 100 percent. That means we have three dials we can turn.

We can reduce our ambition. I can tell you that, of the three choices, that one ranks third! We can add to our assets—which I'm doing by continuing to work after I have formally graduated from full-time work. And we can take some risk. The typical form is seeking growth via equity

CONTINUED ON **PAGE 5**

Risks & Rewards
ISSUE 64 AUGUST 2014

Published by the Investment Section of the Society of Actuaries

2014 SECTION LEADERSHIP

Officers
Larry Zhao, Chairperson
Frank Grossman, Vice Chairperson
Thomas Egan, Secretary
Thomas Anichini, Treasurer

Council Members
Martin Bélanger
George Eknaian
Angelika Feng
Mike Kirchner
Warren Manners

Board Partner
Evan Inglis

Website Coordinator
Thomas Anichini

Other Representatives
Frank Grossman, *Risks & Rewards* Liaison
Martin Bélanger, 2014 Investment Symposium Co-Chair
Mark Abbott, 2014 Investment Symposium Co-Chair
Ed Martin, 2014 Investment Symposium Co-Chair
George Eknaian, 2014 Life & Annuity Symposium Co-Rep
Ryan Stowe, 2014 Life & Annuity Symposium Co-Rep
Angelika Feng, 2014 Annual Meeting & Exhibit Rep
Steven Chen, 2014 ALM/Investment Symposium Rep

Joseph Koltisko, Newsletter Editor
(Chief Editor of this issue)
New York Life Insurance Co
51 Madison Avenue rm 1113
New York, N.Y. 10010
ph: 212.576.5625 e: jkoltisko@nyl.com

Next Submission deadline Nov. 6

Nino A. Boezio, Newsletter Editor
(Chief Editor of next issue)
Segal Rogerscasey Canada
65 Queen St. West, Suite 2020
Toronto, ON M5H 2M5
ph: 416.642.7790 e: nboezio@segalrc.com

SOA STAFF
Sam Phillips
Staff Editor
e: sphillips@soa.org

Leslie Smith
Lead Section Specialist
e: lsmith@soa.org

David Schraub
Staff Partner
e: dschraub@soa.org

Julissa Sweeney
Graphic Designer
e: jsweeney@soa.org

Published by the Investment Section of the Society of Actuaries

This newsletter is free to section members. Current issues are available on the SOA website (www.soa.org).

To join the section, SOA members and non-members can locate a membership form on the Investment Section Web page at *www.soa.org/investment*

This publication is provided for informational and educational purposes only. The Society of Actuaries makes no endorsement, representation or guarantee with regard to any content, and disclaims any liability in connection with the use or misuse of any information provided herein. This publication should not be construed as professional or financial advice. Statements of fact and opinions expressed herein are those of the individual authors and are not necessarily those of the Society of Actuaries.

© 2014 Society of Actuaries. All rights reserved.

CHAIRPERSON'S CORNER

INVESTMENT SECTION MATTERS

By Larry Zhao

At the 2014 Spring Council of Section Chairs, each section representative had to make a two-minute speech about their section affairs. My speech was straightforward, because we have a clear message and a simple strategy, even though we have organized many activities and taken many initiatives in the past year. That is, any project we take on has to be beneficial to section members, one way or another.

EBSCO

EBSCO Business Source Corporate Plus (BSC+) is a Web-based portal that provides full-text access to thousands of journals, magazines and newspapers. Thanks to a joint effort spearheaded by our past chairperson, Tom Anichini, and the Society of Actuaries (SOA) almost two years ago, Investment Section members now enjoy access to numerous investment-related periodicals such as *Financial Analysts Journal* and *Harvard Business Review*.

Easy to use, EBSCO offers powerful search and clean access to reliable, authoritative, scholarly work. If you did not realize that your $25 annual section membership fee enables you to access many periodicals whose subscription fees are usually in the neighborhood of hundreds of dollars per year, you should try it out.

HONG KONG ALM/INVESTMENT SYMPOSIUM

This year, for the first time ever, our section partnered with the International Section and the SOA to organize and host an investment symposium at an overseas location without using a marketing firm. It was not accomplished without challenges and hiccups—initially we planned to host back-to-back meetings with another conference in the hope of cross-pollination and mutual benefits. The other conference was cancelled at the last minute due to low registration while ours went ahead.

Despite the setbacks and the difficulties of international coordination, we hit our attendance target. Not only did we end up with a nice profit, but also, more importantly, we received positive feedback and evaluations from the attendees on the topics and content. Wai Ling Yung and Steven Chen were really instrumental in ensuring the event was a success; so were Sunil Sen and Genghui Wu, past chair of the International Section and current board member of the SOA.

Furthermore, the lessons we learned from hosting the event—in how to reach out to our section members in Asia, their needs and interests, and how to build connections with local institutions, consulting firms and investment banks—are critical in shaping up our long-term international outreach strategy. Today, five of the 10 largest exam sites are in Asia, the fastest-growing segment of the SOA. The global landscape will look quite different in five years. We want to be ready and adaptive to this landscape change. Currently, 10 percent of the SOA members are from Asia. However, only 5 percent of the Investment Section members are from Asia. The 5 percent gap means we still have lots of work to do.

2014 INVESTMENT CONTEST

A sequel to the successful asset allocation contest in 2013, the 2014 contest expanded by allowing participants two rebalancing opportunities during the six-month holding period (from April to September): at month-end May and month-end July.

Thanks to Tom Anichini and Frank Grossman for their work and coordination, the contest attracted more than 120 entrants, a 20 percent increase in participation from last year. We will award one iPad Mini (or cash equivalent) each for the best outcome in three different investment objectives: maximum return, minimum volatility, and the maximum ratio of return to volatility. Check out our website to find out the latest rankings as well as tie-breaking rules. The winners will be announced before the 2014 Annual Meeting on our website and LinkedIn group.

CALL FOR ESSAYS: INVESTMENT FALLACIES

Over the past decade, the investment world has been buffeted by unprecedented events. Many long-standing beliefs or assumptions held by investment professionals may no longer apply to the new realities. At the same time, many common myths and misconceptions that have been previously debunked continue to influence investors today. Motivated by this concern, we announced a call for essays that help identify and expose these fallacies. We will reward cash prizes to the top three winners, selected by 15 judges through a two-stage, objectively designed process.

Thanks to Evan Inglis, our SOA board partner, for his support and the topic, and David Schraub and Leslie Smith for the coordination and subsequent publication of the e-book.

CHESS EVENT AT THE LIFE & ANNUITY SYMPOSIUM

Chess is a universal sport that relies on logic, analysis, strategy and planning. Chess is also a fun social activity. This is the third time in a row that we collaborated with the Technology Section and the Joint Risk Management Section to co-sponsor this popular event at the Life & Annuity Symposium. The main goal was to help improve engage-

Stormy weather in the Atlanta area and subsequent flight delays did little to dampen the enthusiasm of everyone at the third Thomas C. Barham III Chess Networking Event held on May 18 in conjunction with the 2014 Life & Annuity Symposium. Pictured here are David Schraub, Kyle Retallick, Glenn Hoffman, and WIM Carolina Blanco (from left to right) all hard at work considering their next moves.

Congratulations to second place winner Kyle Retallick, and first place winner Glenn Hoffman (from left to right) seen here receiving their prizes from Woman's International Master (WIM) Carolina Blanco. Kyle was the only actuary to score a victory over WIM Blanco at the event. Plans are already under way for the next TCB3 Chess Networking Event at the upcoming 2014 Annual Meeting in Orlando.

Photos courtesy of Albert Moore.

CONTINUED ON **PAGE 4**

ment and have fun. Thanks to Albert Moore, Frank Grossman, Ryan Stowe and George Eknaian for coordinating and ensuring the event was entertaining and engaging.

2014 MEMBER SURVEY

We are always eager to hear from our members directly what they think about the projects we have done and plan to do, as well as new ideas to improve connection and engagement with members. We carefully constructed a 12-question survey to solicit your opinion and feedback. Your participation is greatly appreciated and valued. Your input will have an impact.

If you miss the opportunity to partake in the survey, you can always write to me or call me directly—my contact information is available in the SOA member directory.

FINAL WORDS

Overall, we have accomplished many things over the past year. It is a team effort. It is a synergy. Indeed, our council members have shown excellent collaboration throughout the year. As volunteers, we all put in tremendous time and effort. It truly is a rewarding experience for me personally. If you are interested in contributing your time and talent in any way, please do not hesitate to contact any of the council members. We want you. We want to enlist your support to ensure that our section remains relevant and continues to matter to you—in the years ahead.

Larry Zhao, FSA, CERA, CFA, FRM, PhD, is an associate vice president at Nationwide Financial. He can be reached at zhaol1@nationwide.com.

I LOOK AT THE RATIO OF OUR ASSETS TO OUR AMBITION.

exposure, which means we can't buy a standard lifetime income annuity.

But if we don't buy the annuity that's implicit in the calculation of our ambition, we also have longevity risk.

I'm an actuary by qualification, and I've spent my life in the investment field. In investments I'm familiar with uncertain returns and ways of attempting to quantify them. Far less work has been done on quantifying the financial impact of longevity uncertainty. So there was no obvious answer, when I asked myself (and others) the obvious question: Which is greater, equity risk or longevity risk?

Investment risk can be expressed as being equivalent to drawing a single outcome from a distribution of possibilities. Longevity risk can also be represented as drawing a single outcome from a distribution of possibilities. I start to compare them by doing a thought experiment.

Consider two hypothetical worlds. In the first world, longevity is fixed (everyone lives exactly to the average age) and returns are variable. In the second world, returns are fixed (everyone gets exactly the average return) and life spans are variable, so the present values of the amount you need for a given life span are also variable. Both these worlds give rise to distributions of dollar outcomes. But which one has the wider distribution?

To measure the width, I use the "coefficient of variation," that is, the standard deviation divided by the mean. Essentially, this answers the question: For each unit of average reward, how uncertain is the outcome?

I wrote this up in an article titled "How Should Retirees Manage Investment and Longevity Risk in a Defined Contribution World?" for the Rotman International Journal of Pension Management in 2011, so here I'll just give you an outline of the process and the results.

I originally did the calculations in the world as it existed before financial repression. So I was using a 6 percent interest rate, and a 9 percent expected equity return, with bond and equity standard deviations of 8 percent and 16 percent, respectively. I used the American RP2000 life tables for healthy annuitants, in which the male life expectancy at age 60 is 22 years and at age 75 is something much shorter—closer to 10 years.

Results: Consider the 60-year-old male. Using a 22-year period, with Monte Carlo simulation, the mean accumulation of investing $1 in bonds is $3.65, with a standard deviation of $1.37. So the coefficient of variation for bond accumulation is 0.38.

The mean value of a lifetime income annuity of $1 a year for the 60-year-old male is $11.20, with a standard deviation of $3.14. That comes from seeing what proportion die in the first year and so only need to provide for six months of income, how many die in the second year and need 18 months of income, and so on. I used a pure annuity value, with a bond 6 percent discount rate and no loadings. So the coefficient of variation for annuity provision is 0.28—much lower than the uncertainty of outcomes of investing 100 percent in bonds.

Now consider the 75-year-old male. Adjust the projection period downwards, to reflect the lower life expectancy. Now the coefficient of variation for providing the lifetime income annuity rises to 0.46.

Why is that? Obviously, the cost of an annuity is much smaller at age 75 than at age 60. If you look at the numbers, the standard deviation is also smaller. But the standard deviation doesn't decline as much as the expected value. This reflects the fact that the l(x) curve flattens out, even while it shortens.

So the impact of the longevity uncertainty hasn't come down by as much as the life expectancy. And in fact the

CONTINUED ON **PAGE 6**

THERE COMES A TIME WHEN LONGEVITY RISK DOMINATES EQUITY RISK.

coefficient of variation is now greater than that of the accumulation that results from 100 percent investing in equities over the appropriate time period.

Conclusion: At age 60, longevity uncertainty has less of an impact than investing solely in bonds—so that's a risk I'm happy to take. Sometime before age 75, longevity uncertainty starts to have a greater financial impact than investing 100 percent in equities. Now that's a risk I'm not prepared to take. And therefore it's clear to me that taking longevity risk isn't something I should contemplate either.

(There are a couple of aspects of the calculations themselves that bother me. One is that, given the skewness of the distributions involved, the standard deviation is probably too simplistic a measure of risk. The other may be even more serious. It's that I used accumulation outcomes for the investment distributions, but I used present value outcomes for the annuity distributions. My instinct is that using present values compresses the distribution. If so, longevity risk is larger, compared with investment risk, than my numbers indicate. I'd love the profession's thoughts on those aspects.)

So for me, and almost certainly for most people, there comes a time when longevity risk dominates equity risk, and therefore I should find it too risky NOT to buy longevity protection sometime in the near future.

But I don't think an immediate lifetime income annuity is the best solution, even though that's how the present value of our ambition is calculated. I think insurance, or risk pooling, is indicated where the probability of an event is low, but its financial impact is high. As far as longevity is concerned, a low probability surely means lower than 50 percent. And therefore I don't want to pay for anything that occurs before my current life expectancy runs out. In practical terms, for my wife and me this means something that kicks in at my age 85.

So, what I want is a deferred lifetime income annuity that kicks in around my age 85, and continues for as long as either my wife or I hang around. That's longevity insurance, for me.

I recognize that there are many aspects of defining the ideal annuity that I haven't addressed. Let me deal briefly with two of them.

The first has to do with the price of the annuity.

It's possible that the price of the annuity becomes more than I want to pay. In other words, the loadings become more than the value of risk pooling. Here's how I illustrated the calculation some years ago.

At the time, our joint-and-last-survivor expectancy was 29 years. Looking at the RP 2000 tables for couples of our age, 5 percent of them would have at least one partner still alive after 41 years. Since an annuity value at a 0 percent interest rate is the same as the life expectancy, in an era of financial repression, the ratio of 41 years to 29 years, or a bit more than 140 percent, is also the relative value of the two annuities.

In other words, whatever it would cost us to set aside for 29 years, we would have to set aside 40 percent more than that, to make it last for 41 years (assuming a drawdown fixed in real terms, and therefore the legitimacy of a 0 percent real interest rate). And even then there's a 5 percent chance that we would outlive our savings. So, as far as a joint-and-last-survivor annuity is concerned, it would still have some appeal if the money's worth of the annuity is at least 100/140, or about 70 percent, if we feel that the chance of default by the insurance company is less than 5 percent.

The second aspect is whether it's possible to get longevity protection in a different form. And it is. Possibly the best example of a different form is the guaranteed minimum withdrawal benefit (GMWB) policy, or guaranteed lifetime withdrawal benefit (GLWB), or whatever other name it may be given. This too guarantees an income for life. And

it has the combined advantage and disadvantage of coming with an investment policy attached.

The advantage is that it becomes possible, in one contract, for people like us, who are less than 100 percent funded for their ambition, to take some risk with their investments and still retain ownership of the assets.

I see some disadvantages too. One is that I'd rather customize the risk policy myself. Another is that I'm paying more than I want for active management of assets, of a sort I probably don't want. A third is that pricing is opaque. There's active management, longevity insurance and various kinds of investment optionality built in, and if I can't see the pricing, I won't buy it if there's an alternative form of protection available.

The full title of my Investment Symposium presentation (Session R2, "The Use of Life Annuities in an Optimal Retirement Portfolio") includes the phrase "an optimal retirement portfolio." So let me tell you how we think of that, because I'm told it has a very unusual feature.

We have three goals. The first goal is longevity protection. How long will we live? We don't know. And therefore we need to insure against outliving our assets. We could plan to live to 100 or 120, but that's a very expensive way to get longevity insurance. I know many advisers use that approach. I think it shortchanges their clients, who have to turn down the spending dial unnecessarily.

We need growth. Like so many retirees, even though in absolute terms we might be considered rich, our lifestyle is richer than we are. With low-risk investments, our personal funded ratio is below 100 percent. We are willing to take some risk.

But we want safety too. Like most retirees, we're very risk-averse. To be told, in 2009: "Last year was a bad year; this year you have to turn your spending dial down," would have shocked us. We need at least some notice of that kind of thing.

So here are our three instruments.

For longevity protection, for us the ideal instrument is a deferred income annuity that kicks in if one or both of us survive until my 85th birthday. Then the rest of our assets only have to last until age 85.

For growth, equity-type investments are the obvious approach—lots of different kinds.

And for safety, what works for us is to have five years of spending guaranteed via government bonds and TIPS (or real return bonds, as they're called in Canada), structured to mature regularly over the next five years. If we can afford it, we might protect our essential spending even longer.

The reason this works for us is as follows.

First, that takes care of our uncertain longevity. (I'm oversimplifying, I know.)

Second, we always have at least five years of being able to see what happens to the markets before we have to turn

CONTINUED ON **PAGE 8**

down the spending dial. Yes, we're always at risk over the long term. But not over the short term.

In the five years of safety, we re-evaluate our funded position and see where we think the markets are. Right now we're happy to extend our five-year ladder of safety. In 2009 we wouldn't have been; we'd have chosen to wait, hoping for a recovery. If there hadn't been a recovery, we'd have turned the spending dial down eventually. But we'd have had five years to prepare for it. And as it happens, that would have been enough.

My point is that equities are very risky in the short term. Over the longer term (and there's no magic in choosing five years), yes, they're still risky, but we have time to prepare. We can consider, each year, as we review our funded ratio, how much of our nice-to-have spending is at risk, and which bits are the first to be jettisoned.

And that makes for a much calmer, much less panicky, assessment—even though our equity exposure is about 70 percent, which most people think is insanely high for a retiree. Not for us. For the average retiree, fixed income reduces each year's volatility, and even 50 percent fixed income still leaves a volatile portfolio. For us, fixed income has a different mission statement: buy us five years of time, so we're not troubled by annual volatility. And roughly 30 percent is enough for that.

All of this allows us to remember how lucky we are in the rest of our life abundance portfolio—a concept created by the well-known business coach and author Edward A. Jacobson. I'm using my words now, rather than his; but after listening to Ed, I think of our life abundance portfolio as having seven asset classes: family and friends, work and play, mental health and physical health—and, oh yes, finances. There's more to life than just money, even though that's what we all tend to think about, and get paid to think about.

Jacobson's concept has really changed our perspectives, mine in particular, because until we started thinking this way, as a geek all I thought about was numbers. Now I focus on how lucky and how happy we are.

Don Ezra is a widely published author. In addition to numerous articles and papers, his books include Pension Fund Excellence and The Retirement Plan Solution: The Reinvention of Defined Contribution. Among many awards, he received the Lillywhite Award from the U.S. Employee Benefit Research Institute in 2004 for "extraordinary lifetime contributions to Americans' economic security."

He "graduated" from full-time work almost four years ago. In his post-graduate career, Don is now a member of the investment committee of two American charitable foundations, and continues to act as global director emeritus, investment strategy, for Russell Investments, 30 years after starting Russell's Canadian office and serving Russell in senior positions in Canada, the U.S. and the U.K. Though he hasn't practiced as an actuary for decades, he still maintains his fellowship of the U.K. Institute and Faculty of Actuaries.

ALM TRANSFORMATION

By Eric L. Clapprood, Jeffrey R. Lortie and Kathryn M. Nelson

In a world of uncertainty, there are consistently two sure things—consultants love buzzwords, and consultants love creating solutions. Indulge us for a moment on both of these.

"Finance Transformation" is a buzzword for enabling chief financial officers (CFOs) and finance executives to improve business performance and shareholder value while actively improving the operational effectiveness and efficiency of the finance function mainly through information technology and process redesign.

Within Finance Transformation is "Actuarial Transformation," an effort to address accounting, risk and regulatory requirements by enhancing, among other things, the ability of actuaries to provide analysis of results and business intelligence, through process improvement and enhanced governance.

One of the functions within an insurer where actuarial concepts and contributions interact most significantly (and intricately) with the overall performance and operation of the business is asset-liability management (ALM). ALM is core to an organization, as it is critical to taking calculated risks and leveraging the time value of money through passive asset allocation, active tactical management of opportunities in investment markets and product portfolios, hedging, pricing, and capital structure decisions.

There is no "one-size-fits-all" structure that works, and care should be given in order to optimize how ALM is executed at any given firm, given its strengths and weaknesses, its underlying products, the related functions at the firm (such as Investments, ERM, Treasury and Capital Management), and the history and culture of the insurer. There are, however, certain principles and methodologies that allow for companies to take a fresh look at ALM today, given recent changes in the economy, the regulatory environment and technology. Now we see the dawn of a new buzzword … "ALM Transformation."

ALM Transformation represents the improvement of an organization's ability to carry out these activities in a transparent, sustainable and repeatable manner that applies industry-leading practices, sophisticated technology, clear documentation, and aligned goals and policies that integrate risk limits and profit objectives. As we have seen in our experiences, embracing ALM Transformation leads to a process that is efficient, effective, transparent, and able to support consistent and deliberate ALM decision-making.

WHAT ARE SOME OF THE CATALYSTS OF ALM TRANSFORMATION?

Recent History: Prior to the financial crisis of the late 2000s, the ALM function of insurance companies was considered to be largely effective for the risks and market movements that had been observed. However, the processes in place at many insurers were not robust enough, or focused well enough on the appropriate analyses and metrics, to respond actively and effectively to the economic conditions that were prevalent during the financial crisis, the effects of which are still being felt in 2014. Examples cited by insurance executives who dealt with ALM decision-making during the crisis include a lack of clarity around authority—especially given previously unseen conditions and threats; changes in key indicators such as market value drops, rate levels and implied volatility that had not been sensitivity-tested; and liquidity issues that had no associated contingent mitigation plans. Post-crisis changes are still evolving, including a trend toward clear policies, roles and responsibilities, controls, documentation and accountability.

Expanding Role: While duration management and immunization of the balance sheet continue to be crucial, the interest in accounting-based metrics such as earnings at risk and statutory surplus at risk is increasing for ALM as well as for new product decisions. As an example, it is sometimes said insurers generate return on equity (ROE) from sources such as underwriting margin (investing only in risk-free assets and no leverage), investment margin (earnings above risk-free when holding appropriate capital for

CONTINUED ON **PAGE 10**

the increased risk) and leverage margin (due to financing partly with debt). As growth rates and underwriting margins have fallen, attention has shifted in many ways to generating excess investment returns, at a time when perceived capital requirements are making the denominator of ROE and return-on-capital metrics more challenging. This puts ALM more fully in the center of the value-added puzzle for insurers. ALM becomes a key tool in executing enterprise risk management (ERM) and protecting the balance sheet at an acceptable cost against a range of movements due to plausible external factors.

Increased Scrutiny: Commensurate with the expanding role of ERM are the controls required to ensure the integrity of processes. The Dodd-Frank Wall Street Reform and Consumer Protection Act calls for increased monitoring of Systemically Important Financial Institutions (SIFIs). In particular, the newly created Financial Stability Oversight Council is charged with recommending heightened prudential standards, such as liquidity requirements, single-counterparty risk limits, and the establishment of risk management and risk committee requirements. Additional consideration also needs to be made for the National Association of Insurance Commissioners' (NAIC's) Solvency Modernization Initiative and Own Risk and Solvency Assessment, expansion of New York state's risk assessment and management activities, as well as global SIFI designation. ALM is front and center in many of these prudential standards.

WHAT ARE SOME OF THE CHALLENGES?

Human Resources: In many organizations, ALM responsibilities are assigned in part to individuals who aren't dedicated "full time" to ALM. "Finding someone who understands both sides of the balance sheet is difficult," one CFO who oversees ALM at a large U.S. insurer tells us. With many functions, ensuring appropriate training is important; but with ALM, that training can require multiple rotations—and therefore three to five years—before an individual is truly prepared to make important decisions, depending on the structure of the organization. This is a much longer time than in other rotations for actuaries or other professions. At the same time, demographic trends are leading to friction between the talent pool of young practitioners and seasoned executives.

Technology: Technological advances have increased modeling capabilities, which have, in turn, brought competing trends in approach, and several tough questions to answer. What do you say no to? Do you spend the financial investment in a robust system with longer projections, across more scenarios, with faster run-times and cutting-edge capabilities (e.g., stochastic-on-stochastic calculations) requiring thousands of servers? At what cost? Or, do you focus your efforts on stress testing, which may utilize a less precise model in aggregate, but will allow you to understand the impact of certain specific scenarios and explain a handful of well-understood economic risks and outcomes? The answer, of course, is typically a combination of both, but deciding where on the spectrum of possible approaches to land requires a careful agreement among all ALM-related

THE PEOPLE BEHIND THE ALM PROCESS SHOULD HAVE CLEARLY DEFINED ROLES AND RESPONSIBILITIES IN ORDER TO BE EMPOWERED.

internal stakeholders (from the actuary pricing products to the CFO planning to attribute accounting results to rating agencies).

Reporting: Along with the increased technological capabilities noted above comes the risk of being lulled into a sense of false precision due to voluminous data and reports. It is becoming increasingly important that there exist processes, including controls, which engage all ALM practitioners and motivate them to build consistency around assumption approval, model validation, data integrity, and the interpretation and use of results. A fresh review of ALM-related reports often results in one or more of the following conclusions: Some reports aren't being used; certain dashboard metrics are inconsistent with each other; timing or measurement differences causing confusion can be resolved with a clearly agreed definition of terms that is well-communicated; resources dedicated to reporting are suboptimal in their utilization; and not all internal customers who could benefit from the reports are receiving them.

Alignment: As noted above, ALM is core to the successful operation of the business, with increasing reliance; but it is not always positioned optimally to interact with other functions within the firm's operating model. Areas for improvement sometimes include:

(1) The need to formalize a product approval process that incorporates a clear ALM strategy, and, conversely, the need to eliminate ALM analysis performed not for implementation but only to win product approval.

(2) A desire to more effectively develop an aggregate portfolio management strategy that takes into account offsetting risks and optimizes a combination of sales, cash flow matching and profits.

(3) Room for improvement with respect to projecting the impact of ALM decisions or approaches on accounting and capital results.

Competing Objectives: Conflicting accounting and capital bases, and multiple stakeholders (regulators, agencies, analysts and policyholders), can cloud the fundamental objectives of the ALM function and lead to suboptimal decision-making such as holding on too long to carry trade "hedges" that generate net investment income (NII). A central starting point to determining whether objectives within the ALM function are clearly determined and communicated is to ask what the goals of ALM within the organization are. The answers typically include defeasing liabilities, assisting product development ideas, contributing to profit and beating benchmarks, but too often there is not a clear articulation of the prioritization of these objectives or how competing objectives are resolved.

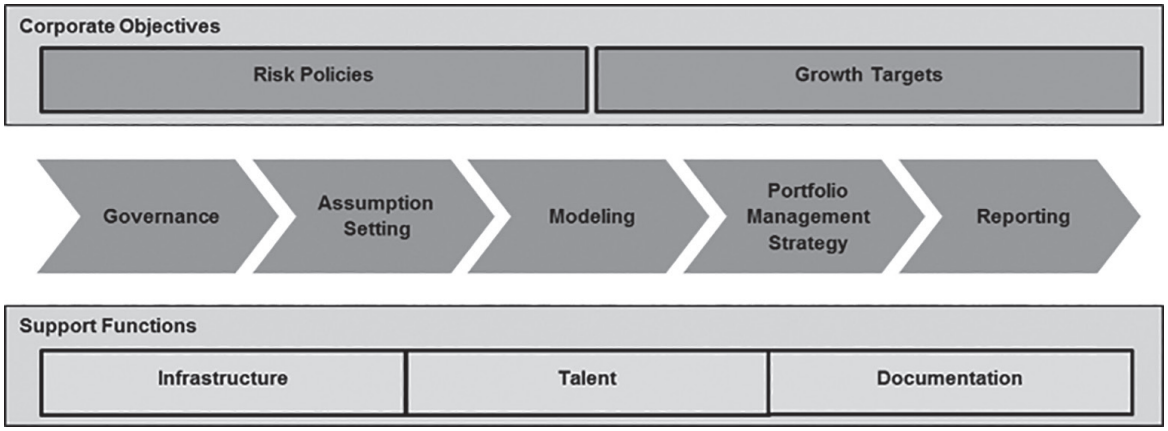
WHAT ARE SOME OF THE KEYS TO SUCCESS?

ALM Vision: Effective ALM leaders have usually established and communicated a clear vision for their operating model. Every transaction—including not only buying or selling assets but also committing to, say, credited rates on liabilities either new or in force—can be traced to authority chains and policies the transactions acted within. Communication between the business units and the enterprise level in regard to the ALM strategy is consistent, clear and efficient. Also, risk limits are clearly established for the business units, and management within those limits is delegated.

Roles and Responsibilities: The people behind the ALM process should have clearly defined roles and responsibilities in order to be empowered. This should include escalation processes, challenging, setting limits and authority. Because of a culture of openness and accountability, decision-making roles are open to talent. It is relatively clear which decisions are successful or not and who made them.

Incentives: Having a company's objectives and incentives aligned encourages and reinforces the desired outcome of

CONTINUED ON **PAGE 12**



the ALM structure. Metrics should be established for each specific role and be reported on a regular basis to measure performance and promote accountability. The performance measures should strike a balance between both short-term and long-term objectives to achieve the desired ALM vision.

Defined Structure: As we noted earlier, ALM does not take the same form in each organization, nor should it. There are, however, certain themes behind many successful operating models, as described below.

- **Governance**: Establishing governance of the ALM function through a clear agreement and communication of an operating model is a critical first step. Concepts that can be used in establishing the governance framework include a committee structure, with charters that establish the roles, responsibilities (including decision-making) and membership, as well as policies, process and procedure documents, key metrics and risk limits.

- **Assumption Setting:** The roles and responsibilities regarding assumption setting should be clearly defined in order to establish proper governance and ensure those responsible have proper authority and expertise to be setting such assumptions. For example, the setting of assumptions requires approval of policyholder behavior and other assumptions that will define the portfolio benchmark as well as approval of capital markets assumptions embedded in scenario generation that establish the risk-reward trade-offs.

- **Modeling:** One specific principle is the identification and quantification of individual model risks (e.g., assumptions, source data and materiality) and aggregate risks (interaction and dependencies between models, common assumptions usage and methodology). There should be ongoing monitoring and reporting of changes to the models, as well as validation activities.

- **Portfolio Management Strategy:** The ALM strategy should be comprehensively vetted, reviewed and approved by the responsible parties. It should take into account all risk limits, and there should be clear documentation. Frequent review of the strategy is as important as initial development. An escalation process should be set up and there should be timely approval and execution of changes to the ALM strategy.

- **Reporting**: An efficient and robust reporting process develops reports that are clear, consistent, well-docu-

AN EFFICIENT AND ROBUST REPORTING PROCESS DEVELOPS REPORTS THAT ARE CLEAR, CONSISTENT, WELL-DOCUMENTED AND APPROPRIATE FOR THE AUDIENCE.

mented and appropriate for the audience. One goal of risk reporting is to summarize risk positions that the company has taken, at a given time. Another critical function is to attribute gains and losses in a recent period to market drivers and management decisions. Reports should be usable; that is, they should help in facilitating and driving both the company's decision-making process as well as the overall ALM strategy. Responsible parties should meet frequently to discuss if current metrics still hold value and evaluate if new metrics should be added in order to better manage new risks the company might take. Managers should implement regular, actionable reporting at appropriate frequencies, align reporting to internal and external risk factors, and establish interpolation estimates for interim reporting.

As we noted earlier, there is no "one-size-fits-all" approach to ALM, as different situations and risks will necessitate different processes. Some of the differences to consider include:

- Life insurers are more dependent on ALM and therefore require more complex interaction, whereas health and property and casualty (P&C) carriers/lines can take a given conservative assumed earned rate and work off an underwriting model for their pricing and product development.

- Larger insurers will be more likely to have a centralized ALM function, whereas small and medium insurers need more often to rely on committees like an ALCO to not only make larger strategic decisions but oversee tactical functions.

- Companies with a safer surplus position (however that is defined) are more likely to determine that some components of surplus can be treated as excess and therefore have a different ALM strategy around them.

- Firms that have more complex liabilities (e.g., fair value embedded derivatives) will by nature typically require more robust technology (speed and processing capability) that can then be leveraged for more sophisticated ALM decision-making above and beyond what the technology was originally tasked to do.

WHERE DO WE GO FROM HERE?

In this article, we have outlined the general concepts and principles underlying ALM Transformation. We hope this has provided some food for thought. Organizations, regardless of sophistication and product mix, could benefit from ALM Transformation, particularly from the perspective of those who have implemented such initiatives in other companies and who can help motivate and engage stakeholders toward more successful business processes.

Eric L. Clapprood, FSA, CERA, is a principal for Deloitte Consulting LLP in Hartford, Conn. He can be contacted at eclapprood@deloitte.com.

Jeffrey R. Lortie, FSA, MAAA, is AVP – Annuity Valuation and Financial Reporting for Resolution Life in Rosemont, Ill. He can be contacted at jeff.lortie@resolutionlife.com

Kathryn M. Nelson, FSA, CERA, MAAA is a senior consultant for Deloitte Consulting LLP in Minneapolis, Minn. She can be contacted at katnelson@deloitte.com.

THOUGHTS FROM THE 2014 INVESTMENT SYMPOSIUM

By Avi Freidenreich

When the iPad first was released, I was a skeptic. Yet, ever since my wife bought me one, I see why they are so popular. It enriched my experience at the symposium by allowing me to integrate my thoughts from the symposium with the presentation slides, making it easier to ponder at a later time.

I enjoyed the conference and its various sessions. I learned some new methods and gained valuable insights, even if at first it seemed hard to apply much to my current responsibilities of building stress-testing scenarios. While that was initially disappointing, there are a few seemingly unrelated nuggets of knowledge that I gleaned from the symposium that may bear fruit in the future.

A very simple example was from the session titled "Inflation or Default." Here, the speakers provided various macroeconomic relationships that may assist me in thinking about designing an integrated scenario that reflects the historical relationship between interest rates, inflation and gross domestic product (GDP). More importantly, understanding various demographic, cultural and economic differences between countries will help in tailoring a relationship specific to various economies.

It's important to look past the topic itself and realize that there are various concepts from each session that can be combined with other ideas to form something useful. For example, there were additional techniques discussed in two of the sessions that could be leveraged for solving other, perhaps unrelated, problems.

In "New Techniques in Quantitative Portfolio Management," Richard Michaud offered not one, but really two provocative approaches. The Michaud method for developing efficient frontiers utilizes simulations and resampling in order to develop more stable frontiers. These simulation methods help the user deal with the uncertainty in the parameters, which ultimately causes the optimal portfolio implied by the frontier to only be one representation of possible optimal portfolios given the data. Sampling is then used to create a better representation of the various optimal portfolios that would make up the "universe" of possible optimal portfolios.

With that universe comes the Michaud-Esch method. The need was to determine the right time to rebalance a portfolio. With one optimal portfolio that is highly unstable, rebalancing would occur often. However, recognizing the fact that your optimal portfolio is only one possible instance of the true optimal portfolio, it may not truly be correct to rebalance. By looking at the simulated "universe" of portfolios one can determine how likely it is that the current portfolio is no longer optimal and then react more efficiently.

Another session offered a few memorable techniques to improve the speed of stochastic-on-stochastic calculations. These include compression of a portfolio into representative policies and the use of polynomial models for interpolation. Interestingly, this technique is based on Kriging, which is a statistical interpolation technique extensively used in geostatistics.

There were also various minor concepts, which, while not being the main focus of the presentation, could help provoke new thoughts of possible emerging risks, which may be useful in developing forward-looking stresses or certain endogenous relationships between factors. For example, in the first session on regulatory updates one item mentioned was about a change that Dodd-Frank will have on the collateral requirements of various companies. Essentially, as a result, there will be a much greater reliance on Treasurys, which may have a further impact on liquidity premiums embedded in Treasury yields. As another example, Robert Merton, in his keynote address, offered his view that many homeowners will ultimately need a reverse mortgage to fund their retirement as they may not have enough savings otherwise. The question that can be posed is: What will be the ultimate impact on the housing market and its relationship to other markets? This, of course, is not a sudden

BY USING AN INFERIOR MEASURE, THE INDIVIDUAL GETS THE WRONG MESSAGE AND CANNOT REACT APPROPRIATELY.

impact, but something more gradual that may play out over time. Finally, one item mentioned during the "Economic and Market Update" session led me to wonder: What will be the ultimate impact on the economy of the huge growth in student debt that may crowd out further uses of debt by that cohort? There are, of course, other examples as well.

A final observation from two of the sessions, that may not be directly relevant to my work, instead reinforces an appropriate mentality of any actuary. First of all, in the session on risk parity, the idea of decomposing asset classes into their risk factors is an important concept. Not that this is a new concept, but it's important to remember that when we measure something, the units of measurement matter.

One of the main points of Merton's address was that savers need to be concerned over future real income units and not account value in a retirement fund. Merton's example was that a decrease in interest rates could theoretically boost account values; however, this will also increase the price of an annuity at retirement (the ultimate objective) and thus an individual may be worse off in those times. By using an inferior measure (account value), the individual gets the wrong message and cannot react appropriately (by saving more). This is something that everyone who provides measurements for analysis needs to consider, and for myself in risk management, it is a mindset that I must espouse.

So, in actuality, there was a lot of material that could be useful to me; but it takes a second look and additional thought to develop. In the end, it may be better that way, as it will ultimately lead to further improvements and innovations by provoking active thought as opposed to passive learning. Therefore, having time for the attendees to mingle and to discuss what they have just learned is useful since it will help stimulate those new thoughts.

This perspective also provides a motivation for ensuring the presentation slides and either recordings or transcripts are available online. These tools allow those in attendance to return to the material in order to make those additional connections and add to what was presented. Indeed, having the slides on my iPad was a significant help. I was able to tote around my tablet. It wasn't too bulky or heavy; it fit in my bag very easily; it was quick to shut off and on between sessions; and it had enough battery life to last the whole day. For those presentations that were available (unfortunately, some weren't), my notes are now integrated as part of the PDF slides themselves. Not only did this help me during the presentation itself, it improved my ability to return to it in the future (like as I write this). Thus, innovations will beget innovations as hopefully the thoughts from the symposium will help to create new ideas in the future.

Avi Freidenreich, FSA, CERA, is a director and actuary in MetLife's Market Risk and Derivatives Strategies department. He can be reached at afreidenreic@metlife.com.

SOA 2014

SOCIETY OF ACTUARIES
Annual Meeting & Exhibit

Oct. 26-29, 2014
Rosen Shingle Creek
Orlando

Through the profession,
collaboration, research, education and
our members…

Invent
Change
Adapt
Learn
Build
Innovate
Perform

TOGETHER **WE** PROGRESS

SOAAnnualMeeting.org

25+ PRODUCTIVE NETWORKING OPPORTUNITIES

300+ DEDICATED PRESENTERS

100+ INSIGHTFUL SESSIONS

1,800+ INNOVATIVE MEMBERS

DOLLAR COST AVERAGING RISK

By Salil Mehta

Think of a security holding that one wants to sell over a period of time, being cognizant of the price risk associated with not selling the entire security immediately. For example, one can decide near a market top to sell securities over a half-year period, without properly hedging for the loss in security value during that time. Or one can imagine a hedging mechanism in reverse to, for example, acquire fixed amounts of a commodity across equal intervals of future time.

For this article, we use the baseline of an investment manager who wants to sell holdings of 30 shares of General Motors (GM) stock. The investment manager may consider selling the shares over time, for the purpose of reducing the liquidity risk that would come from selling all the shares at once on a somewhat arbitrary date. So we will try an approach of selling one share weekly, over 30 weeks. Now the traditional formula for understanding the cumulative risk for spreading out this sale over time assumes a *fixed* standard deviation (σ) for GM stock, for the entire 30 weeks. We will show that it also works by continuously summing the risk for the entire balance weekly, as this balance diminishes by one share weekly. And we'll discuss the drawbacks of this modeling approach. Later we'll explore how to think about a model, where σ instead increases or decreases by a fixed rate. For the baseline we start with a weekly standard deviation of 3 percent.

First we show the traditional formula for the extra risk (realized price variance) of trying to evenly liquidate a balance over a number of time periods n.

$$variance = k*\sigma^2*q^2*(P_0)^2$$

Where:

$k = n/3*(1-1/n)(1-1/2n)$

q = *number of shares*

P_0 = *initial price*

For the GM baseline example, we have:

$k = 30/3*(29/30)(59/60)$

$= 9.5$

$k*\sigma^2*q^2 = 9.5 * (3\%)^2 * 30^2$

$= 7.7$

$variance = 7.7*(P_0)^2$

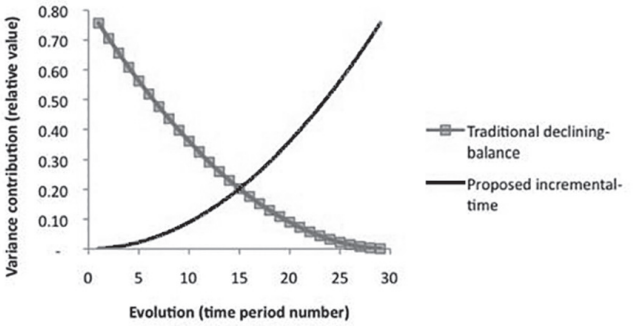
This formula is also shown in popular risk books such as *Value at Risk* by Philippe Jorion.[1] In the formula one will notice that q, and P_0 are both constants, squared alongside the σ^2 that remains constant. The traditional formula shows that the focus for the total risk calculation is that it grows in proportion to the cube of n as n appears three times in the formula for k.

The reference for this formula is "declining-balance approach." But in this article we propose a newer theoretical methodology that helps a manager to gain a more intuitive feel for how total risk builds over lengthy trials (or in this case, lengthy amounts of time). We use instead an "incremental-time approach" that assesses the marginal contribution of each period to the total variance. Intuitively, risk is greatest for the last payment, not the first one. This insight can be applied to price a variety of term-risk contracts (e.g., how much capital to reserve away to hedge the risk of an expected payment such as an inheritance or bonus, or a large expense such as estimated taxes or college tuition, or the risk of systematic liquidation of a guaranteed investment contract).

CONTINUED ON **PAGE 18**

Figure 1

Theoretical marginal risk contribution to fixed total risk



We'll be able to visualize through the illustration below that the logic of the traditional formula is that it assumes individual weeks are all contributing equally to the total risk. For this illustration we show the newer proposed approach as well, and we again use the baseline practical weekly σ assumption 3 percent (roughly 20 percent annualized).

The proposed mathematical method has the advantage of forcing one to appreciate the incremental risk, associated with a marginal increase in the time n, of a balance liquidation. On the other hand, the traditional approach seems to imply risk is lowest at the end of the liquidation period, at the latest time it discretely approximates as n-1, when in fact it is of highest risk then.

Let's explore what makes these mathematical properties work. It comes down to the formula for the variance of a series of independent and identically distributed, normal random variables. This is different from the approach Newton Bowers uses in *Actuarial Mathematics* to price annuities and life insurance. In the article here, the payment amounts are variable but the time period is fixed.

Let's explore the manipulation of the variance mathematics further. Suppose the variance per period of a single share is σ^2, and we start with n shares to liquidate. By the ordinary properties of variance:

Total variance =
$$[(n-1)/n]^2\sigma^2 + [(n-2)/n]^2\sigma^2 + \ldots + [1/n]^2\sigma^2$$

The theoretical variance associated with the total risk is relative to the fixed sizes of n-1 shares, to one share. Or σ^2/n^2 times the sum of: $(n\text{-}1)^2+\ldots+3^2+2^2+1^2$. We make one adjustment partway into the solution, since we assume no marginal volatility contribution associated with the first immediate share sale, from the total relative size of n shares. We also now algebraically rearrange this expression and demonstrate the flexibility of its usage.

Start with the special geometric growth series:
$$1^2+2^2+3^2+\ldots+n^2$$
$$= n(n+1)(2n+1)/6$$
$$= (2n^3+3n^2+n)/6$$

We can substitute (n-1) for n, and the sum:
$$1^2+2^2+3^2+\ldots+(n-1)^2$$
$$= (2n^3-3n^2+n)/6$$
$$= n(n-1)(2n-1)/6$$

And the constant proportional weights imply $1/n^2$ times each term above:
$$n(n-1)(2n-1)/6n^2$$
$$= n/6*[(n-1)/n][(2n-1)/n]$$
$$= n/3*[(n-1)/n][(2n-1)/2n]$$
$$= n/3*(1-1/n)(1-1/2n)$$

Given the linear connection between the sum, and the sum of these variances, we can reconstruct and describe this final formula using the proposed approach. See the traditional declining-balance approach on the left of the illustration in Figure 2 at the top of page 19. Then see the proposed incremental-time approach, which comes to the same total amount, as shown on the right side of Figure 2.

INTUITIVELY, RISK IS GREATEST FOR THE LAST PAYMENT, NOT THE FIRST ONE.

To be sure, the first and last vertical bars on the left of the illustration (top, right), for the traditional approach, the variance contribution is:
$((\boldsymbol{n}\text{-}1)/\boldsymbol{n})^2*\sigma^2*q^2*(P_0)^2$, and $(1/\boldsymbol{n})^2*\sigma^2*q^2*(P_0)^2$, respectively.

While the first and last vertical bars on the right of the illustration (top, right), for the new proposed approach, the variance contributions are reversed:
$(1/\boldsymbol{n})^2*\sigma^2*q^2*(P_0)^2$, and $((\boldsymbol{n}\text{-}1)/\boldsymbol{n})^2*\sigma^2*q^2*(P_0)^2$, respectively.

And both triangular bars again sum to $9.5*\sigma^2*q^2*(P_0)^2$, or the $7.7(P_0)^2$ we showed in the initial math for the GM baseline example.

Now the second advantage of the proposed incremental-time approach, besides the intuition of incremental variance per extra unit of time $\boldsymbol{n}$, is that one can also disaggregate and select the individual terms for hedging. For our 30-week GM stock example, we can propose that the security doesn't maintain a fixed σ, but we can instead assume an example later where the σ may increase by 4 percent weekly instead of 0 percent. And we may want to understand the value to offset the risk of specific terms to manage liquidity (e.g., to offset a tax payment, or hedge a special dividend announcement).

Now empirical evidence shows that markets are not always a fair random walk. Sometimes there is unusually strong serial correlation, similar to that which we have seen over 2013 and year-to-date in the U.S. stock market. But keep in mind that this autocorrelation would bias the results only slightly for the traditional baseline risk formula as well. And the underestimation of risk by not considering it makes understanding of the newer proposed risk approach that much more valuable.

Here too the traditional declining-balance approach could not handle these additional illustration requirements, even though the mathematics seemed fairly benign at the start of this note. This can be shown more completely through a

FIGURE 2

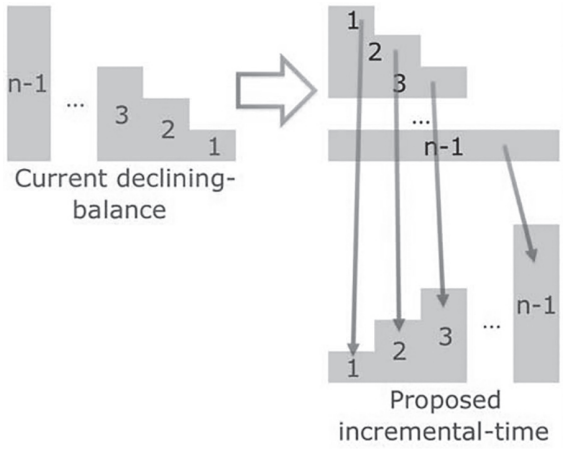
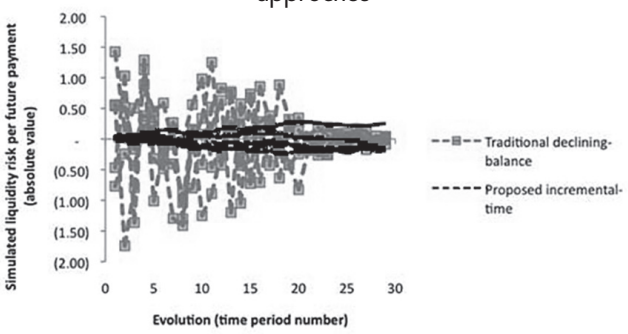


Figure 3 Using Fixed σ

Simulated liquidity risk per future payment, using both approches



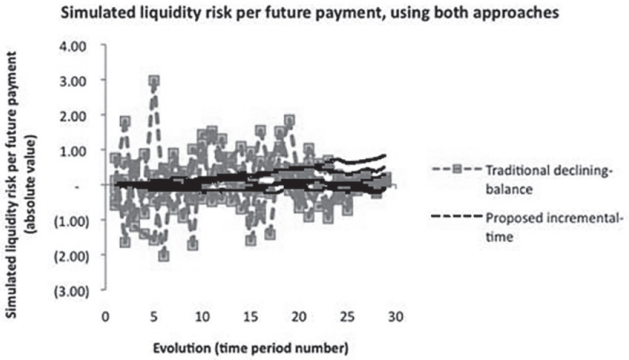
stochastic *simulation* model. See the illustration above (bottom, right) where we simply simulate the baseline example, where we see the effect of thinking about the amount of risk relative to when the payment is made. Then in the illustration in Figure 4 on page 20, we allow σ to vary over time. Notice the dashed lines (since there we show simulations) are exponentially growing, but are far more stable. This shows the disadvantage of using the traditional declining-balance approach versus the cleaner proposed approach.

CONTINUED ON **PAGE 20**

As noted above, if the σ doesn't *vary* at all, then these collapse to our normal baseline, and both of the simulation approaches (and both theoretical approaches) all agree. Total variance for the traditional declining-balance approach, or the proposed incremental-time approach, both also equal 7.7, which we would multiply of course by $(\boldsymbol{P}_0)^2$. The simulation runs many samples, and the sums of the first five shown in the chart are 0.4, -2.9, 5.1, -3.4 and -3.5. The variance among this broader sample is 7.7 regardless. But, for example, in the new proposed approach we can see a steadier and more intuitive build-out evolving over the liquidation time, for the five sample values.

But as we change σ, the additional variance from the proposed approach begins to grow in a convex fashion. At 2 percent (with $\boldsymbol{n}$=30), there is more than a 50 percent difference in total risk estimate. And at 4 percent, as we show in the chart below, there is about a 175 percent difference. Notice first that the axis scale is now enlarged versus the simulated baseline chart. Of course again this new simulation runs many samples, and the sums of the first five shown in the chart are -2.1, -0.1, 4.7, 6.8 and 0.7. The variance among this broader sample is 16, or greater than 100 percent difference from the 7.7 (baseline approach). For the proposed approach the corresponding totals are -3.8, 0.1, 7.2, 10.3 and -0.6. The variance among this broader sample is 36, or greater than 100 percent difference from the 16 (the traditional approach).

Figure 4 Using Increasing σ



Note change of scale versus Figure 3

Bear in mind that an aggressive 4 percent weekly increase in the σ was illustrated above. In most practical cases we would see assumptions about one-half of this, and the differences would be about one-third of what is illustrated above. We show this broader range to illustrate the differences in variance approximation that exist between these two approaches, which are designed to answer different types of risk management questions against changing σ regimes.

To summarize, the proposed mathematical approach of building total variance from the incremental contribution of each payment comes with no downside versus the traditional approach. But the proposed approach offers a cleaner and more reliable insight into time-specific risk contribution, and allows one to consider the real-world usefulness of varying the σ risk over the uniform liquidation period.

THE PROPOSED APPROACH OFFERS A CLEANER AND MORE RELIABLE INSIGHT INTO TIME-SPECIFIC RISK CONTRIBUTION, AND ALLOWS ONE TO CONSIDER THE REAL-WORLD USEFULNESS OF VARYING THE RISK OVER A UNIFORM LIQUIDATION PERIOD.

For further details, visit *https://sites.google.com/site/statisticalideas/home/term-risks-math* for "Term Risks Math" on the free "Statistical Ideas" resource portal for academics and practitioners alike. It lets the users explore the traditional and proposed risk methods, using the fixed or varying σ assumptions, and in theoretical form or simulation. Instructions are provided on the Web portal.

ENDNOTES

[1] Page 344, third edition, McGraw Hill.

Salil Mehta is a statistician and risk strategist, as well a lecturer at Rutgers and Georgetown University. He served for two years as the group Director of Analytics, in the U.S. Department of the Treasury for the Administration's $700 billion TARP program. Salil is also the former Director of the Policy, Research, and Analysis Department in the Pension Benefit Guaranty Corporation. He is a CFA and candidate member of the SOA. He is the author of Statistics Topics (http://statisticalideas.blogspot.com/p/book.html) which provides an interesting discussion of various statistical applications.

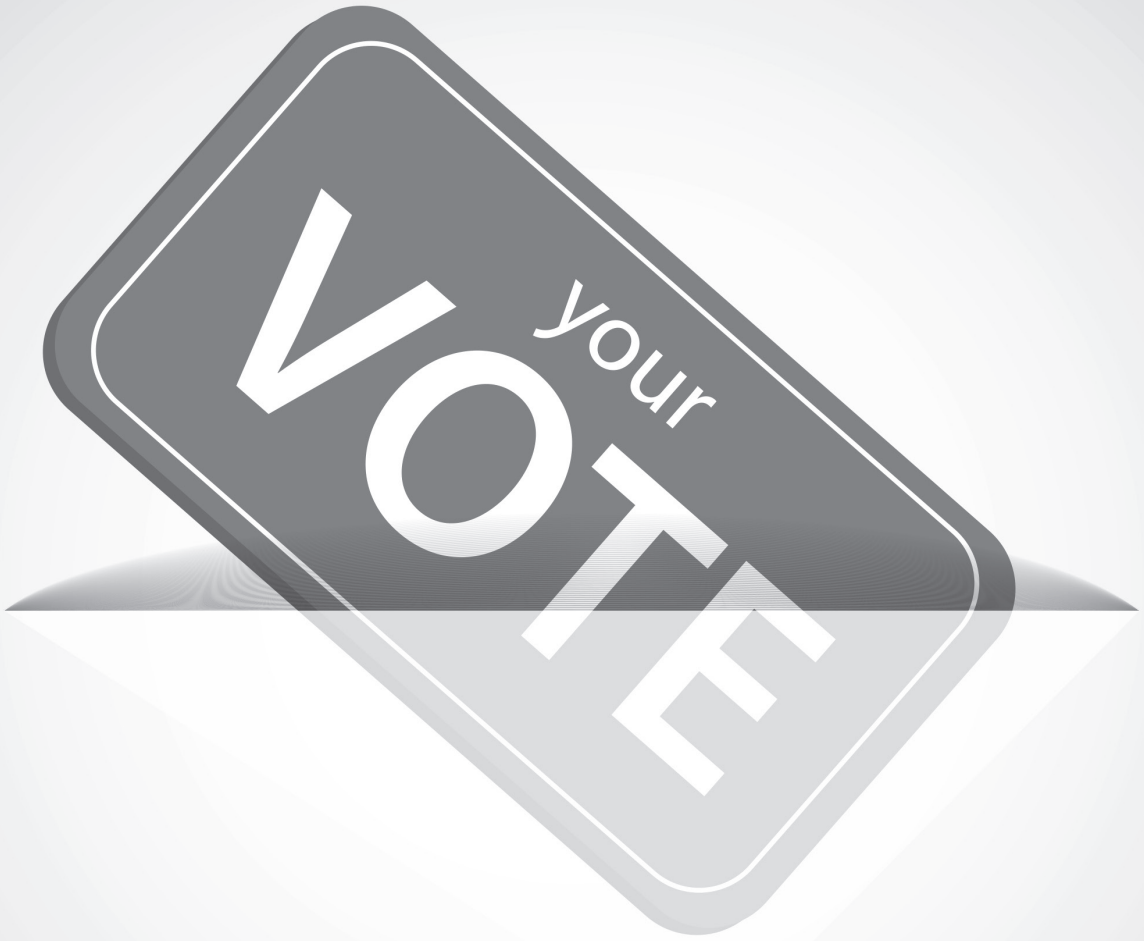
2014 SOA Annual Meeting, Orlando Fla., Oct 26-29

INVESTMENT SECTION-SPONSORED SESSIONS

38 L Economic Capital: Key Modelling Considerations
77 Investment Section Hot Breakfast
87 PD Smart -- and Dumb -- Things About Smart Beta
101 PD Use of Efficient Frontiers in Strategic Asset Allocation Analysis
118 PD Variable Annuity and Indexed Annuity Risk Management Strategies
133 PD Tail Risk Hedging
172 PD Investment Strategies and Alternative Investments in Insurance and Pension Portfolios
183 PD Predictive Modeling for Actuaries: Machine Learning, Predictive Modeling and Insurance Risk Management

Looking forward to seeing you at the Section breakfast!
And don't forget the 2015 Investment Symposium early next year.

SOA ELECTIONS 2014



CALLING ALL ELIGIBLE VOTERS

This year, elections open August 18 and close September 5 at 5 p.m. Complete election information can be found at ***SOA.org/elections***. Questions?

Send them to ***elections@soa.org.***

THE MYTH OF "THE MYTH OF TIME DIVERSIFICATION"

By Rowland Davis

Editors Note: *The following two articles were submitted in response to the Investment Section's call for essays to explore and expose investment fallacies. The editors chose them as being generally suitable for the newsletter, but contest winners have not yet been selected as Risks and Rewards goes to print. The Section is in the process of reviewing all the essays received and determining the winners in accordance with the contest criteria.*

In 1963 Paul Samuelson published a paper titled "Risk and Uncertainty: A Fallacy of Large Numbers." Thus was born the phrase: "the myth of time diversification."

The purpose of this essay is not to challenge the accuracy of Samuelson's work, but to challenge the expansive misuse of his findings—an abuse that has substantial implications for actuaries. As an example, a Google search of the phrase yields this quote:

> It sounds nice in principle, but it's actually an example of the "time diversification" fallacy. Investments do not become safer the longer they are held. Time reduces the variance in the average *annual* return, but it actually increases the variance in the cumulative return. In other words, smoothing won't bring more certainty to retirement savings. For any given portfolio, collective DC plans face the same risk-return tradeoff as ordinary 401(k) plans.
> —Jason Richwine in the *National Review* blog

To understand the abuse occurring here, we must return to Samuelson's work. The specific application to investment risk was first developed in his 1969 paper "Lifetime Portfolio Selection by Dynamic Stochastic Programming." It was, in fact, a mathematical proof—of the general nature "***if this***, then ***that***," where ***that*** is essentially the statement that time horizon should not affect an investor's risk tolerance. (The corollary to this is more frequently used—that the risk of stock investing does not decrease with longer time frames.)

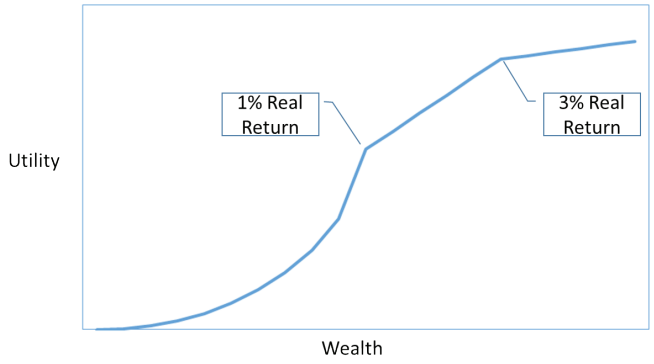
Unfortunately, the ***if this*** conditions are almost universally ignored, and the proof only holds with those conditions in place. There are two important conditions that Samuelson uses to frame the whole analysis: 1) that the investor's utility function is isoelastic (i.e., a single continuous utility function covers the entire spectrum of outcomes, without conditional sensitivity to any particular values of the outcome); and 2) that the only issue at stake is an individual investor's terminal wealth based on the investments alone. In this case, and only in this case, is it wrong to assume that stringing together a sequence of risky bets is superior to a single risky bet (i.e., time does not diversify risk)?

Actuarial work involves collective systems, so can the same logic be applied? Is it wrong for a group of investors saving for retirement to collectively take more risk over a longer time frame than they would over a shorter time frame? This essay shows that it is ***not*** wrong to do so in the real world (i.e., free of the narrow constraints on the Samuelson proof).

Since I am not an academically trained economist, I will construct an actual example to make the point. Although the words used are somewhat opaque to a non-economist, Samuelson acknowledges that real-world investors might indeed have more risk tolerance in the early stage of their career: "Note: if the elasticity of marginal utility … rises empirically with wealth, and if the capital market is imperfect as far as lending and borrowing against future earnings is concerned, then it seems to me likely that a doctor of age 35-50 might rationally have his highest consumption then, and certainly show his greatest risk tolerance then—in other words be open to a 'businessman's risk.' But not in the frictionless isoelastic model!" (The reference here to a "businessman's risk" is explained elsewhere in the paper as the ability to take more investment risk.) Because the "frictionless isoelastic model" is not very relevant in the real world, the door is immediately open to investment policies that do, in fact, depend on time frame. Target date funds are one simple example, based on the concept of including the value of human capital as part of the investor's wealth.

My example will assume two assets: a safe asset with an expected real return of 2 percent and a standard deviation of 5 percent; and a risky asset with an expected real return of 4.5 percent and a standard deviation of 20 percent. For the Samuelson base case, I use a standard risk-averse utility function that meets his ***if then*** conditions: $U(w) = ((w^{\lambda})-1)/\lambda$, with $\lambda = -2$. With this function, utility is maximized with a risk asset allocation of around 25 percent. And as Samuelson proved with his equations, a stochastic simulation verifies that this same allocation is the utility-

CONTINUED ON **PAGE 24**



maximizing allocation with both a 10-year horizon and a 30-year horizon.

Now we move into the real world. First we develop a new utility function that reflects an investor (or a group of stakeholders in a collective plan) with a 3 percent real return target. For this investor, real returns in excess of 3 percent have a decreased marginal value, and real returns less than 1 percent become painful very quickly. Here is a graph of the utility function I use for this case.

This kind of utility function has been shown by behavioral finance research to represent the way that humans make decisions in the real world (i.e., prospect theory, developed by Kahneman and Tversky).

With this utility function, a 10-year investor will maximize utility with a risk asset allocation of about 20 percent—very similar to the Samuelson base case. But a 30-year investor will maximize utility with a risk asset allocation of about 60 percent. For this investor, the time frame does matter, with more risk becoming appropriate over longer time frames. (For a similar example see, "The Fallacy of Large Numbers Revisited" by De Brouwer and Van den Spiegel, *Journal of Asset Management,* 2001.)

Now let us proceed to the issue of human capital. Assume that this investor, seeking a 3 percent real return, adopts a strategy of dynamic adjustment for his saving plan. After 10 years, if savings fall below 90 percent of his real return target, he will make additional contributions over the next five years with a total value equal to the shortfall relative to the 90 percent threshold. If savings after 10 years exceed 120 percent of the real return target, then part of the surplus will be withdrawn. The amount withdrawn is sensitive to the asset allocation, but will always be set so that the expected value of the adjustment process is zero (i.e., expected withdrawals will equal expected additional contributions). The investor is comfortable with this adjustment strategy because his human capital is sufficient to absorb any required additional contributions.

With this dynamic adjustment process, the 30-year investor will now find maximum utility with a 75 percent risk asset allocation, instead of 60 percent. Interestingly, even with the standard utility function this adjustment process will move the optimal risk asset allocation for the 30-year investor up to 35 percent, from the 25 percent level that applies to the 10-year investor with no adjustment process. Once again, real-world details matter when thinking about the relationship between risk and time frame.

Collective systems involve spreading risks among stakeholders and across age cohorts in ways that allow for efficient risk-taking. Human capital is not only recognized, it is pooled—within a single closed cohort, human capital diminishes in value over time, but the aggregate human capital across the full range of cohorts remains constant. Unlike the fund for an individual investor, which builds from a level of zero to ever-larger dollar totals, a mature collective fund is expected to remain relatively constant in real terms. A dynamic self-adjustment process (through variable contribution inflows and/or variable benefit outflows) can create a sustainable fund where the risky bet can be repeated time after time with controllable risk. There will always be risk over any specific time frame, but a properly designed system can manage these risks through time in a sustainable way. Risk is no longer measured simply by some value of terminal wealth (as in the Samuelson paper),

COLLECTIVE SYSTEMS INVOLVE SPREADING RISKS AMONG STAKEHOLDERS AND ACROSS AGE COHORTS IN WAYS THAT ALLOW FOR EFFICIENT RISK-TAKING.

but by more complicated metrics of ongoing financial risk exposure to various cohorts of stakeholders. Samuelson never said anything different.

The bottom line on this is that critics have the right to say that risks do exist, and need to be carefully measured and managed. And critics also have the right to express their honest opposition to collective systems (i.e., those involving intergenerational risk-sharing) on political grounds.

But they do not have the right to invoke Samuelson's proof within any blanket statement asserting that collective systems can't work because they are based on a fallacy. Implicit in any argument of this type is an assumption that a collective system can be simply decomposed into segments consisting of "classical" individual investors—but then they are no longer talking about a collective system, which is far more complicated in its risk dynamics.

Rowland Davis is a nationally known actuary and pension consultant who heads his own firm—RMD Pension Consulting, created in 1997—that specializes in asset/liability modeling, risk management and asset allocation studies for pension funds. In addition to his consulting activities, Rowland has recently engaged in a number of activities related to public policy for retirement systems, including the Retirement 20/20 project sponsored by the Society of Actuaries. He is a Senior Fellow at the Center for American Progress specializing in retirement policy issues. Formerly a Vice President and consulting actuary at Towers Perrin Forster & Crosby, he was also the national director of the asset and liability forecasting practice at TPF&C. Prior to this national role, Rowland was the Senior Actuary in TPF&C's Chicago office and lead consultant for several of their largest clients. He can be reached at RowlandDavis@mindspring.com.

TECHNICAL ENDNOTE:

Samuelson himself acknowledged in a 1989 paper ("The √N Law and Repeated Risktaking" included in *Probability, Statistics, and Mathematics, Papers in Honor of Samuel Karlin*) three separate cases, using different assumptions, where time frame would change a rational investor's risk tolerance. One of these is the simple one of including human capital in wealth. A second one recognizes that the original argument does not hold if markets are mean-reverting (and there is substantial evidence that they are). The third involves an assumption set using a utility function that incorporates some minimum required threshold for terminal wealth, similar in concept to the one used in this essay. Samuelson was well aware of his own ***if then*** criteria.

THE FALLACY OF THE FED MODEL

By David R. Cantor, Adam Butler and Kunal Rajani

Managers responsible for asset allocation decisions rely on a variety of models to forecast future equity market returns. These forecasts inform policy portfolios and tactical shifts, and are used for budgeting purposes.

Most equity market valuation techniques rely on comparisons between current equity market values and equity market values observed over many decades in the past. For example, the trailing price-to-earnings (P/E) ratio is often compared with long-term average P/E ratios. James Tobin proposed an adjusted balance sheet measure called the Q Ratio (combined market value of all companies should be about equal to their replacement costs), while Warren Buffett claims to watch the level of aggregate corporate earnings to gross domestic product.

In contrast, the so-called Fed Model is distinguished from other common models by its reliance on a comparison between equities and bonds. Specifically, the Fed Model compares the earnings yield (E/P) on the stock market with current nominal yields observed on 10-year Treasury bonds (Y), so that the value of a Fed Model valuation is calculated as (E/P) – Y.

Proponents of the Fed Model argue that stocks and bonds are competing assets so investors should prefer stocks when stock yields are high relative to bonds, and bonds when bond yields are high relative to stocks. Many augment these assertions by noting that equity prices should reflect the discounted present value of future cash flows; as the discount rate (Treasury yields) declines, so should equity valuations increase. Indeed, strategists might be forgiven for entertaining the above notions given that equity market valuations tracked interest rates quite reliably for over four decades from 1960 through 2007.

Unfortunately, the Fed Model does not hold up under more rigorous theoretical and empirical scrutiny. In fact, as we will endeavor to demonstrate in this article, the Fed Model has very little theoretical support, leads to poor allocation decisions, and is not significantly predictive of future stock market returns.

THE FED MODEL IS BASED ON A FAULTY THEORETICAL PREMISE

While it might appear to the casual investor that the Fed Model deserves attention on the basis of sound intuition, the financial literature is consistent in its condemnation.

Let's take for example the suggestion that, because stocks and bonds are competing assets, investors will compare the yield on stocks, as measured by the E/P, to the nominal yield to maturity on 10-year Treasurys, and favor the asset with the highest yield. Presumably, capital would then flow from bonds into stocks, thus lowering stocks' E/P until equilibrium is achieved.

However, it is not obvious that E/P is the appropriate measurement of yield for stocks. Earnings yield as applied in the Fed Model is not comparable to the equivalent bond yield, as only a portion of the earnings is actually distributed to shareholders. Rather, the dividend yield or total shareholder yield including share buybacks and share retirement might represent a more comparable proxy.

In addition, Asness (2003) illustrated how yield equivalency would rarely result in equivalent total returns because of the impact of inflation and growth in corporate earnings. Assume nominal bond yields are 8 percent, the equity market P/E is 12.5 (1/0.08), inflation is 6 percent, and expected real earnings growth is 2 percent. Under the standard Dividend Discount Model, it can be shown (holding payout ratios constant at 50 percent) that stocks are expected to deliver 12 percent nominal returns, implying 4 percent excess returns relative to Treasurys.[1]

However, in the event inflation falls to 1 percent while nominal bond yields fall to 3 percent (preserving their 2 percent real yield) real growth rates remain constant at 2 percent. As a result, nominal earnings growth falls to 3 percent. Recall the Fed Model assumes that the earnings yield will drop to

THE FED MODEL HAS MINIMAL PREDICTIVE ABILITY OVER TIME HORIZONS OF FIVE AND 10 YEARS.

3 percent in line with contemporaneous Treasury yields, which translates to a P/E ratio of 1/0.03 equal to 33.33. If we feed these new assumptions into our Dividend Discount Model, we observe that expected stock returns have now fallen to 4.5 percent, just 1.5 percent more than bonds.

Under the Fed Model, stocks and bonds compete for capital, yet Asness' analysis illustrates how simple shifts in inflation expectations would result in a logical inconsistency, which invalidates the basic premise of the Fed Model. Why should a shift in inflation cause expected returns to stocks to drop by more than bonds if the two should be valued exclusively on the basis of relative yields?

Moreover, why should investors expect stock earning yields to adhere to Treasurys' gravitational pull? Isn't it just as likely that Treasury yields are mispriced, and will correct to the level of earnings yields? This is an especially acute point in the current environment, where central banks have explicitly stated to artificially lower rates across the curve.

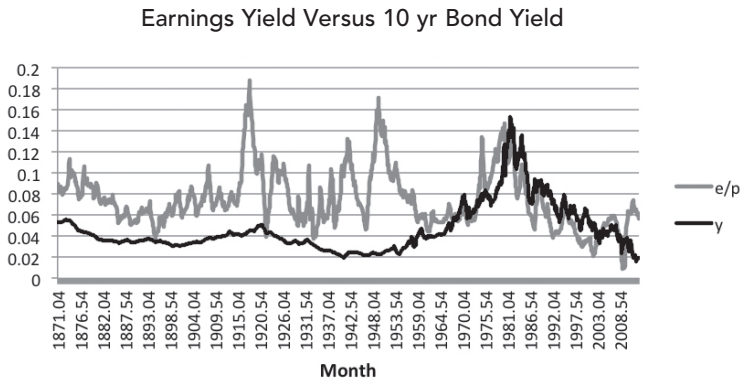
Another argument often used to support the Fed Model is that low interest rates suggest a high present value of discounted cash flows and therefore a high P/E. The problem is that all else is not equal when interest rates are low. When interest rates are low, prospective cash flows to investors are also likely to be low. The decline in prospective cash flows offsets the decline in the discount rate. Therefore, it is not necessarily true that low interest rates justify a higher P/E (i.e., lower the E/P).[2,3]

THE FINAL ARBITER: FED MODEL AS A FORECASTING TOOL

Setting aside for a moment the weak theoretical foundation of the Fed Model, we must acknowledge that proponents of the technique appear to have a meaningful empirical argument given the strong relationship between E/P and Treasury yields over the period 1960 to 2007. However, it is worthwhile exploring whether this relationship was unique to the dominant interest rate regime over this period.

In fact, reasonably good data exists for both U.S. equity market E/P and 10-year Treasury constant maturity yields dating back to 1871, and even further with some databases. When this longer period is used, the Fed Model relationship does not hold (Exhibit 1). While the r-squared coefficient for a regression of monthly E/P on 10-Year Treasury yields between 1960 and the present is 0.49, we observe much lower explanatory power in the historical record back to 1871, with an r-squared value of just 0.03. This observation is consistent internationally: Analogous data, sourced by Estrada (2005), for several other large countries demonstrated that the insignificant statistical link between E/P and government bonds is universally persistent.[4]

Exhibit 1



While regression analysis implies a spurious and non-stationary relationship between earnings yields and Treasury yields, the true arbiter of validity must be how well the Fed Model forecasts stock market returns. To test, we regressed forward total nominal and real returns to stocks over a variety of forecast horizons against contemporaneous Fed Model values. For comparison, we also regressed forward returns against simple trailing E/P ratios with no adjustment for the level of interest rates (Exhibit 2).

CONTINUED ON **PAGE 28**

Exhibit 2

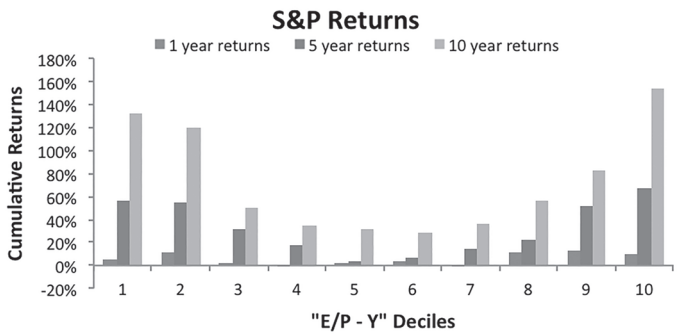
	Regression of Nominal S&P Returns Against Fed Model and Earnings Yield							
	1871-Present				1960 - Present			
	E/P		E/P-Y		E/P		E/P-Y	
S&P return	coeff	R^2	coeff	R^2	coeff	R^2	coeff	R^2
1yr	0.95	1.9%	0.32	0.3%	1.03	3.0%	0.66	0.7%
5yr	4.64	6.2%	0.94*	0.4%	4.90	7.2%	-5.04	3.7%
10yr	13.59	18.2%	3.33*	1.6%	19.54	32.7%	-3.76*	0.6%

*The coefficients obtained also have a p-value higher than 0.1 and are thus not significant

The regression analysis shows the Fed Model has minimal predictive ability over time horizons of five and 10 years. In fact, univariate regression using just the E/P does a much better job in forecasting future stock market returns. If anything, adjusting for the level of interest rates destroys any predictive ability achieved by using the simple earnings yield alone.

One other way to demonstrate the fallacy of the Fed Model in making useful investment decisions is to perform a decile analysis. We sorted Fed Model readings into deciles and calculated the average forward returns to stocks over one-, five- and 10-year horizons for each decile. If the Fed Model exhibited forecasting ability, we would expect to see a somewhat linear relationship between starting Fed Model valuation level and average forward returns. In fact, there is no obvious linear relationship whatsoever (Exhibit 3).

Exhibit 3



From Exhibit 3 we see that nominal stock market returns are high when the Fed Model indicator signals extreme levels of equity market *under-(decile 1)* or *over*-valuation (decile 10). There may in fact be a meaningful signal there, but clearly it is inconsistent with the theoretical foundations of the model.

Perhaps the Fed Model's most profoundly misguided signal came in 1982. The Fed Model suggested the market was fairly priced precisely when more reliable indicators suggested markets were cheapest on record. Of course, subsequent returns over horizons from one through 20 years were well above average.

CONCLUSION

The Fed Model implies that high stock market multiples are not a cause for concern for investors because these multiples are justified by low interest rates. Unfortunately, investors relying on such logic to invest in the stock market are likely to be very disappointed in the coming years. While low interest rates may *explain* why investors assign such high stock market multiples, low rates do not *justify* such high multiples.

Investors would be better served by heeding the many more reliable valuation metrics currently signaling caution. Moreover, those responsible for institutional portfolios should prepare for a lower return future for equity markets from current levels.

REFERENCES:

Asness, C. Fight the Fed Model. *Journal of Portfolio Management*. Fall 2003.

Buttonwood's Notebook. *A Misleading Model.* Economist.com. Aug. 3, 2013.

Buttonwood's Notebook. *Burying the Fed Model.* Economist.com. Nov. 29, 2012.

Estrada. J. *The Fed Model: A Note.* IESE Business School. November 2005.

WHILE LOW INTEREST RATES MAY EXPLAIN WHY INVESTORS ASSIGN SUCH HIGH STOCK MARKET MULTIPLES, LOW RATES DO NOT JUSTIFY SUCH HIGH MULTIPLES.

Hussman, J. *Explaining is Not Justifying.* July 11, 2005, Weekly Market Commentary.

Hussman, J. *Inflation, Correlation, and Market Valuation.* May 29, 2007, Weekly Market Commentary.

Hussman, J. *Long-Term Evidence on the Fed Model and Forward Operating P/E Ratios*. August 20, 2007, Weekly Market Commentary.

Keefe, T. *Breaking Down the Fed Model.* Investopedia.com. Feb. 22, 2013.

Leuthold Group. *The Fed's Stock Valuation Model.* June 1999.

Ritter, J. The Biggest Mistakes We Teach. *Journal of Financial Research*. Summer 2002.

ENDNOTES

1 Under the Dividend Discount Model, the expected return on the market equals the current dividend yield plus the long-term nominal growth rate of dividends. The dividend yield can be expressed as the payout ratio multiplied by earnings. If we assume a constant percent of earnings then growth rate of dividends equals the growth rate of earnings. We can then express the return on the market to equal: payout ratio multiplied by the earnings yield plus the growth in nominal earnings.

2 This also ignores changes in the risk premium associated with stocks. The risk premium can also be time-varying and affect the pricing of stocks.

3 In fact, if the P/E ratio in the numerical example given above remains at 12.5, not 33.33 as implied by the Fed Model, the 4 percent expected return of stocks over bonds would actually be preserved.

4 Estrada argues that co-integration is a better measure of dependency between E/P and Y. Estrada finds the two series are not co-integrated. Estrada concludes "…the Fed Model properly describes the relationship between earnings yields and bond yields in only 2 out of 20 countries considered."

David R. Cantor, CFA, FRM, ASA, is director at PriceWaterhouseCoopers in New York, N.Y. He can be reached at david.r.cantor@us.pwc.com

Adam Butler, CFA, CAIA is senior vice president and portfolio manager at DundeeGoodman Private Wealth, Toronto, Canada. He can be reached at adbutler@dundeegoodman.com.

Kunal Rajani is a senior associate at PriceWaterhouseCoopers in New York, N.Y. He can be reached at kr386@cornell.edu.

MEASURING THE COST OF DURATION MISMATCH USING LEAST SQUARES MONTE CARLO (LSMC)

By Casey Malone and David Wang

Duration matching is perhaps the best-known strategy for asset-liability management (ALM) in insurance companies today. Duration is a measure of the sensitivity of an asset or liability to a change in interest rates. Matching the duration of the assets in a portfolio to the duration of the liabilities backed by that portfolio immunizes the company's equity to changes in interest rates.

Duration matches are transitory—the durations of the assets and the liabilities change as time passes and interest rates change (due to convexity). Generally, companies rebalance their asset portfolios to recalculated liability durations on a monthly, quarterly, or perhaps even less frequent basis. The duration mismatch between rebalancing leads to ALM breakage, and there is a cost associated with this, especially when there is a large change in rates, and the company's equity is subjected to unwanted interest rate risk.

Knowing the daily mismatch position may help quantify how much ALM breakage the company is exposed to. Least-squares Monte Carlo (LSMC) proxy modeling provides a methodology for generating daily liability values including duration, convexity, and other higher-order sensitivities if needed. The company can use this information for setting and monitoring rebalancing thresholds and measuring the impact of the ALM breakage over a reporting period. Knowing the financial impact of ALM breakage thus enables the company to incorporate ALM risk into its ERM framework.

LSMC is a proxy modeling approach that replaces stochastic calculations with closed form solutions. With the closed form solution (or polynomial in this case), an instantaneous calculation replaces a full-blown stochastic run. This can be used to monitor a stochastic calculation in real time or to replace a nested stochastic calculation when runtimes are prohibitive.

A number of mathematical techniques are used to reduce the required runtime and increase the speed of convergence of the polynomial to the model results. The process begins with smart selection of calibration scenarios. You must understand your model and what factors move the results, so that the proxy model can survive a wide range of future environments. On the back end, the polynomial is fit to avoid econometric pitfalls such as collinearity and overfitting.

In this article, we will focus on using LSMC to measure and manage ALM breakage due to duration mismatch. For the following case study, we modeled a hypothetical $1 billion fixed deferred annuity block as of May 31, 2013. We calibrated a polynomial for present value of future benefits (PVFB) as a function of key swap rates. We tested the one-year, two-year, three-year, four-year, five-year, seven-year, 10-year and 30-year key swap rates. For intermediate points on the starting yield curve, we used a cubic spline technique for interpolation. The PVFB is assumed to be the average over 1,000 stochastic interest rate scenarios, generated with parameters consistent with the starting yield curve. Our polynomial replaces the 1,000-scenario stochastic calculation so that PVFB calculations can be performed in real time. Below, we track the block over the following month.

Our calibrated proxy is a 39-term polynomial. It should be noted that we use Legendre polynomials since they are orthogonal to each other on the range [-1, 1]. This is how we correct for collinearity between explanatory variables. The table below shows the coefficients in the left column and the degree of the Legendre polynomials for each key rate to the right.

OUR CALIBRATED PROXY IS A 39-TERM POLYNOMIAL. ... [W]E USE LEGENDRE POLYNOMIALS SINCE THEY ARE ORTHOGONAL TO EACH OTHER. ...

Table 1: Coefficients for Proxy Function Polynomials

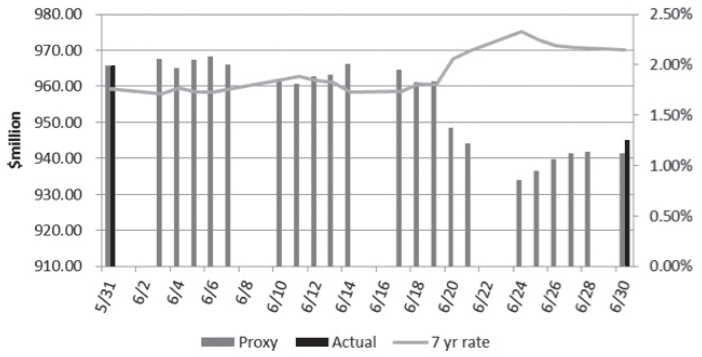
$mil	Exponents							
Coefficient	**kr1**	**kr2**	**kr3**	**kr4**	**kr5**	**kr7**	**kr10**	**kr30**
900								
1	1							
-71						1		
-50					2			
32				1				
-29							1	
43				1		1		
15					1			
53				1	1			
48					1	1		
-27				1			1	
-14						2		
-14				2				
18						1	1	
23				2	2			
8		1						
-21		1				1		
24				1	1	1		
-18				2	1			
12		1			1			
8							2	
-11	1				1			
-2						2	2	
8			2					
-30			2		1			
17					2	2		
-12		1			2			
8	1						1	
-11				1		2		
-10				1	2			
6						3		
-15					1	3		
9			2	1				
9					2		1	
9					1		2	
11				2		2		
10			2		2	0		
8	1					2		
9			2				2	

For example, the last term of the polynomial is:
9 * L(kr3, 2) * L(kr10, 2), where
L(X, y) is the Legendre polynomial of degree y for variable X.

This polynomial may seem daunting at first, but it is very easy to code into MS Excel or any modeling software, and a computer can calculate this value in a trivial amount of calculation time. Each of these terms is statistically significant, as we use the Akaike information criterion (AIC) for model selection. The AIC is a common measure to quantify the trade-off between model fit and model complexity. This is how we avoid over-fitting the model.

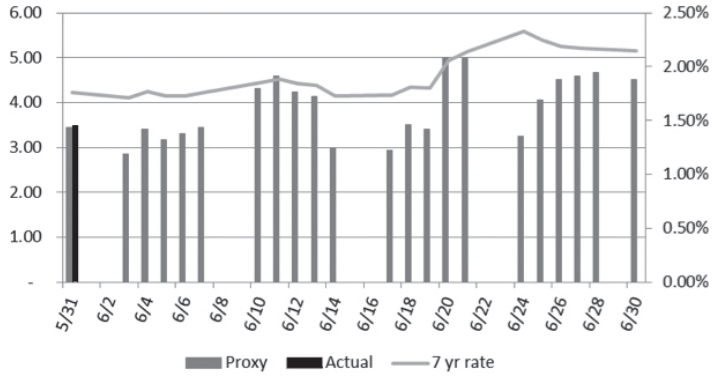
The following graph shows our daily proxy values for PVFB, as well as the seven-year swap rate for reference. The darker bars at the beginning and end of the month show the full stochastic values for validation of the proxy model. The difference at the end of the month will be due to sampling error in scenario selection and model drivers that are not adequately captured by the polynomial. This can be overcome by generating more scenarios for the full stochastic runs and more calibration scenarios for the LSMC fitting.

Chart 1: Dollar Sensitivity of PVFB to Swap Rates



CONTINUED ON **PAGE 32**

Chart 2: Duration Sensitivity of PVFB to Swap Rates



As expected, the liability values move inversely to interest rates.

The graph above shows the duration of PVFB, measured as 100 times the percentage change in PVFB per 1 basis point (bp) parallel shock to the yield curve.

Table 2: Calculated DV01 Series

	DV01								
$thousand	1 yr	2 yr	3 yr	4 yr	5 yr	7 yr	10 yr	30 yr	Duration
5/31/2013	(24)	137	(0)	368	332	(806)	(332)	-	3.45
6/3/2013	(22)	139	1	376	404	(833)	(335)	-	2.86
6/4/2013	(24)	134	0	372	340	(814)	(331)	-	3.41
6/5/2013	(24)	139	1	377	363	(819)	(335)	-	3.16
6/6/2013	(26)	140	0	376	345	(810)	(338)	-	3.31
6/7/2013	(25)	137	(0)	371	331	(806)	(333)	-	3.45
6/10/2013	(26)	127	(6)	355	236	(772)	(322)	-	4.32
6/11/2013	(27)	124	(10)	359	200	(763)	(317)	-	4.59
6/12/2013	(27)	128	(6)	361	245	(777)	(326)	-	4.24
6/13/2013	(27)	130	(5)	364	256	(781)	(327)	-	4.13
6/14/2013	(23)	138	1	381	376	(824)	(333)	-	3.00
6/17/2013	(21)	136	1	380	382	(827)	(329)	-	2.93
6/18/2013	(23)	130	1	382	303	(806)	(319)	-	3.51
6/19/2013	(23)	131	2	385	312	(809)	(320)	-	3.41
6/20/2013	(21)	94	(23)	364	75	(704)	(268)	-	5.00
6/21/2013	(17)	78	(33)	368	28	(672)	(241)	-	4.99
6/24/2013	2	34	(47)	411	(12)	(587)	(155)	-	3.24
6/25/2013	(4)	54	(36)	387	16	(641)	(191)	-	4.07
6/26/2013	(10)	68	(32)	383	27	(669)	(214)	-	4.52
6/27/2013	(11)	72	(29)	366	48	(671)	(226)	-	4.58
6/28/2013	(13)	74	(29)	372	34	(669)	(229)	-	4.67
6/30/2013	(11)	76	(24)	379	70	(700)	(231)	-	4.51

As expected the duration of the liability moves over time, demonstrating the convexity of the block. The darker bar at the beginning shows a full stochastic calculation of the duration. Assuming monthly rebalancing of assets, the duration of assets would have been set to the duration of liabilities at the beginning of the month. The change in the duration of the liabilities over the month will lead to ALM breakage as the liabilities become more or less sensitive to interest rates versus the assets.

LSMC also allows us to break up the duration into key rate durations on a daily basis. Table 2 (left, bottom) shows the dollar value of one basis point (DV01) for the key rates in the polynomial. The overall duration is shown as well for comparison.

The DV01s change over the month since the key rates appear in the polynomial in terms of higher order than 1. The 30-year rate has no statistically significant bearing on the PVFB; or at least, it has no bearing that is not better explained by changes in the other rates. As the overall duration changes over the month, the key rate durations shift slightly between each key rate.

Assuming the assets are calibrated to the beginning-of-month key rate durations, we can track the ALM breakage as the daily difference between the change in assets based on constant key rate durations and the change in liabilities based on the proxy function. Table 3 (page 33) shows the daily tracking: the change in asset value, the change in liability value, and the difference between the two (i.e., the ALM breakage).

WITH LEAST SQUARES MONTE CARLO, DAILY LIABILITY MONITORING CAN BE A REALITY.

Table 3: Daily P&L Tracking

$million	Change in:		
Date	Assets	Liabilities	Difference
6/3/2013	1.98	1.70	(0.28)
6/4/2013	(2.77)	(2.50)	0.28
6/5/2013	2.36	2.26	(0.09)
6/6/2013	1.03	1.08	0.05
6/7/2013	(2.39)	(2.34)	0.04
6/10/2013	(3.86)	(4.01)	(0.16)
6/11/2013	(1.24)	(1.44)	(0.20)
6/12/2013	1.91	2.15	0.25
6/13/2013	0.33	0.38	0.05
6/14/2013	3.11	3.00	(0.11)
6/17/2013	(1.61)	(1.63)	(0.02)
6/18/2013	(3.62)	(3.37)	0.25
6/19/2013	0.31	0.29	(0.02)
6/20/2013	(11.87)	(13.19)	(1.32)
6/21/2013	(3.84)	(4.55)	(0.71)
6/24/2013	(10.37)	(10.35)	0.02
6/25/2013	2.16	2.76	0.60
6/26/2013	3.13	3.07	(0.06)
6/27/2013	1.50	1.67	0.17
6/28/2013	0.67	0.50	(0.17)
6/30/2013	(1.12)	(0.45)	0.67
Total	**(24.19)**	**(24.96)**	**(0.77)**

In total, this shows a $0.8 million (8 bps of account value) mismatch over the month. This mismatch can be reduced by convexity matching. In that case, this analysis can be extended into higher-order sensitivities and alert the asset managers when the convexity match breaks down and duration thresholds are breached. The thresholds can be set in terms of overall duration, key rate duration mix, convexity, or higher-order sensitivities.

This simple, hypothetical demonstration illustrates how LSMC proxy models might be used to improve and benchmark ALM and even enable companies to quantify ALM risk as a component of an economic capital framework. With LSMC, daily liability monitoring can be a reality, and with that knowledge, companies can manage risk exposures in real time.

LSMC can be used a proxy for any stochastic calculation. However, extreme care must be taken to ensure that all risk drivers in the model are captured and a thorough validation exercise is performed.

Casey Malone is a consulting actuary with Milliman Inc., Seattle, Wash. He can be contacted at casey.malone@milliman.com.

David Wang is a consulting actuary with Milliman Inc., Seattle, Wash. He can be contacted at david.wang@milliman.com.

WHAT MAKES AN ECONOMIC SCENARIO GENERATOR "REALISTIC"?

By Bahram Mirzai

Economic scenario generators (ESGs) are becoming vital tools of insurance and pension firms in managing their investment risks. This trend is in part due to the financial crisis of 2008 and in part due to stricter regulation that already started pre-crisis and became more pronounced during the crisis. What markets experienced in 2008—a Standard & Poor's (S&P) 500 drop by 50 percent in six months—is not a 1-in-200-year event, to speak Solvency II jargon. Less than a decade earlier, the S&P 500 also fell by 45 percent (in 2000 to 2001 over a period of 1.5 years). It can be difficult to assure that scenario risk calibration is as conservative as intended and no more.

This difficulty is compounded by the inappropriate use of traditional risk measures such as value at risk (VAR), which are deeply embedded in many applications. VAR techniques were developed for trading portfolios that are liquid or hedged with short risk assessment horizons, e.g., 10-day VAR, rather than for investment portfolios with mid- to long-term risk assessment horizons. The assumptions of normally distributed returns or covariance matrix-type dependencies belong to the annals of history—one would think. Not even the daily returns of a wide range of asset classes support such assumptions, let alone monthly or quarterly returns. Curiously enough, often a one-year moving window is used to calibrate the VAR model parameters, practically speaking a short memory in the context of investment portfolios.

ESGs provide projections of portfolio relevant risk factors into the future given the current state of the markets and in a wider sense that of the economy. The projections must provide realistic paths for the future development of the risk factors. Albeit ESGs provide information about the expected return, rate or growth of the respective risk factors, the main purpose of an ESG is not to outperform expectation forecasts. In a perfectly efficient market, available information (about the future) should already be encoded in observed market data. Therefore, as long as an ESG is calibrated with the latest market data, an unbiased expectation means the assumption of efficient markets. In case of information asymmetry or diverging assumptions, market participants will adjust the unbiased expectations according to their views. The main purpose of an ESG is rather to provide a realistic distribution of possible outcomes around the expectations. The notion of realistic requires ample consideration. This will be our focus in what follows.

To be more concrete on what constitutes a realistic distribution of projected scenarios, we consider two examples. Our first example considers equity returns. Equity log returns are typically modeled by specifying the expected return, the volatility of the return, and the distribution of the stochastic residual term for each projected time step ($R_t = \mu_t + \sigma_t \epsilon_t$). An unbiased estimate of the expected return is obtained from historical data. Biased estimates can be obtained by weighing the information content available in the market. By virtue of the argument that in the long run equity returns should exceed risk-free returns, the term structure of the interest rate may be used to define lower expected return bounds. Moreover, when analyzing historical time series of equity return volatilities, it is observed that volatility clusters in time. When equity volatility is low, it tends to stay low for a while until the returns move or jump to a higher volatility regime. Therefore, in projecting equity volatility returns it is important to start the model in the current volatility regime and move to other regimes based on all current information. In the case of a low volatility regime, the distribution of the projections should have a reduced probability mass for volatile scenarios and an enlarged one for scenarios with calmer volatility. In summary, the choice of the volatility model should take into account the observed clustering of returns in the data.

The stochastic residual term captures the stochasticity of returns beyond expectation and volatility. The historical data suggests that the observed returns are heavier tailed than normal or even lognormal distributed returns. The choice of the stochastic residual distribution must account for the observed tails of returns for both market booms

THE CHOICE OF STOCHASTIC RESIDUAL DISTRIBUTION MUST ACCOUNT FOR THE OBSERVED TAILS OF RETURNS FOR BOTH MARKET BOOMS AND MARKET CRASHES.

and market crashes. Inappropriate choices will result in unrealistic projections of the tails. It is worth stressing that the selection criteria for an appropriate stochastic residual distribution is not to introduce heavy tails artificially but rather to fit observed return data as well as possible for a given application. However, there should be still some probability that projections exhibit not yet observed return and volatility levels.

Our second example considers modeling of risk-free interest rates. Projecting a term structure consistent with different regimes of low or high rate levels within a single modeling approach is a challenging but achievable task. Here we confine ourselves to four aspects that render the distribution of projected rates realistic. First the notion of term premium—i.e., higher rate levels for longer maturities—requires that scenarios with upward-slanted term structures should have higher probability than those with a downward-sloped term structure. Second, interest rates, both nominal and real, have a mean-reversion property. When starting a simulation at a low interest rate regime, the probability that the projected rates exhibit an increase in interest rate levels should be higher than the one associated with decrease in interest rate. Third, historical interest rate levels usually move in tandem with simultaneous inflation rate levels. The projected rates should therefore exhibit an interaction between nominal rates and inflation. Fourth, interest rate levels can temporarily fall below zero. The interest rate model should treat negative rates at short maturity and positive rates at long maturity in a consistent manner. The negative rates are typically bound by a floor in the range of tens of basis points. It is unrealistic to generate negative rates that would fall to -100 bps or more. Taking the Japanese yen as an example of a regime where the rates have been low for more than 20 years, excessive negative rates were never observed during this period. In fact, strongly negative rates are not sustainable for a longer period due to an implied arbitrage opportunity.

This article addresses some relevant aspects of realistic scenario generation in a qualitative manner. These aspects should be treated rigorously within a robust ESG framework. Clearly the scope of criteria that an ESG needs to meet is broader than what is outlined in this article. Nevertheless the author hopes to have increased the sensitivity to some relevant aspects in the selection of an ESG. An assessment of ESGs should consider these aspects and other relevant aspects for the risk factors of interest such as risk-free rates, spreads or FX rates.

Bahram Mirzai is managing partner at EVMTech responsible for advisory services and product strategy. Previously he was senior vice president and chief actuary for Global Banking Practice at Swiss Re. Mirzai has worked with numerous financial institutions in development of regulatory and economic capital frameworks, scenario generation, operational risk and model validation. He studied physics at ETH Zurich and obtained his Ph.D. from ETH Zurich. He can be reached at bmirzai@evmtech.com.

THE DISTINCTION BETWEEN "SPREAD" AND "FEES" IN STABLE VALUE INSURANCE CONTRACTS

By Paul Donahue

One of the most important—and most widely misunderstood—concepts in the stable value arena is the distinction between fees and spreads, and which applies to each type of contract. The heightened prominence fees receive as a result of participant and contract owner disclosures required by regulations under ERISA sections 408(b)(2) and 404(a)(5) makes it important to distinguish clearly between fees and spread.

SPREAD

The difference between what the issuer of a debt instrument earns on the funds it has borrowed and the yield the buyer of the debt instruments receives is "spread." The buyer of a bond or insurance company guaranteed interest contract has no reason to be concerned about spread. What concerns the buyer is the risk / return characteristics of the yield the debt issuer is offering.

FEES AND REQUIRED DISCLOSURES

"Fees" are deducted from the investment earnings of a designated portfolio and reduce the portion of the investment earnings that are credited to the plan and its participants. ERISA 408(b)(2) requires the disclosure of fees assessed against the investment earnings of plan assets to the plan. There are two reasons for this disclosure: (1) to enable the investor to reduce the yield it can anticipate from market returns by the fees charged; and (2) to enable the sponsor to determine if the fees assessed for the investment management style are reasonable. ERISA 404(a)(5) requires disclosure of fees to participants.

NO REQUIREMENT TO DISCLOSE ANTICIPATED SPREAD

There is no comparable requirement for the disclosure of spread for a contract offering a fixed return, because the assets supporting the debt instrument are not plan assets, and the investment performance of the supporting assets does not affect the yield the issuer has guaranteed to the purchaser. Moreover, the yield is known at the point of the investment or allocation decision, and can be easily compared by the sponsor to other similar arrangements in determining which is best for its plan.

Spread is in any case an estimate. The issuer of a debt instrument has no doubt priced for some anticipated spread, but whether or not that spread will be achieved is dependent on the performance of the investment in which the issuer has invested the debt proceeds.

404(A)(5) EXAMPLE

For stable value investments, plans must report to participants: (1) the amount and a description of each fee charged directly against a participant's investment; and (2) the total annual operating expenses of the investment expressed as a percentage, among other things not figuring in our example (29 CFR 2550.404a-5(d)(iv)(A)&(B)).

Let's see how this works out for the following two stable value investment portfolios of the same size and with approximately equal yields. This example assumes direct management by the plan without sponsor asset-based charges. If there was a stable value manager with an asset-based charge, and/or plan sponsor charges assessed against participant account balances, the total fees illustrated would rise by the same amount for both portfolios.

THERE IS NO COMPARABLE REQUIREMENT FOR THE DISCLOSURE OF SPREAD FOR A CONTRACT OFFERING FIXED RETURN.

	SV Portfolio A	SV Portfolio B
Bonds Yielding 3.5%	$100,000,000	$80,000,000
Investment Management Fee at 25 Basis Points	$250,000	$200,000
Wrap Fee at 23 Basis Points	$230,000	$184,000
Custody Fee at 2 Basis Points	$20,000	$16,000
Book Value SA Contracts Yielding 3.1[1]	$0	$20,000,000
Average Net Yield	3.00%	3.02%
Total Fees	$500,000	$400,000
Fee Percentage	50 basis points	40 basis points

For the bonds, the investment management fee, the wrap fee and the custody fee are charged against the value of the assets, which must all be disclosed. The insurance company has no doubt made provision for its expenses in determining the guaranteed rate it would offer on its book value separate account stable value contract, but, depending on the performance of the assets in which the company invested the funds it received from the plan, the company may or may not actually recover its expenses. Further, under the definition of plan assets, assets supporting guaranteed benefit contracts are not plan assets—another good reason why the costs of managing the assets do not concern the plan sponsor or participants. The result is that a reallocation of a part of a managed stable value bond portfolio to insurance company fixed return stable value contracts will certainly reduce the option's expense ratio and would likely modestly increase rates credited to participants as well.

Paul Donahue, FSA, CFA, is a member of the New York bar. He works in the law department of MetLife, suporting Stable Value and other funding products. He can be reached at pdonahue@metlife.com.

ENDNOTES

1 Believers in active management demand a premium to invest in an instrument that cannot be traded.

U.S. TAX ASPECTS OF ASSET/ LIABILITY MATCHING FOR INSURANCE COMPANIES

By Aditi Banerjee, Brion D. Graber and Peter H. Winslow

At the March 2014 Investment Symposium, Dave Bell, Aditi Banerjee and Peter H. Winslow participated in a panel presentation (Session E2) titled "Tax Aspects of Asset/Liability Matching." The presentation discussed key tax issues that exist under current law with respect to asset rebalancing and hedging transactions that an insurance company might undertake. As a follow-up to that presentation, and in an effort to convey the information to a broader audience, this article summarizes the substance of that discussion for the readers of *Risks & Rewards*. Readers who would like to learn more about other tax issues of interest to individuals in the insurance industry can find informative articles in *Taxing Times*, the Taxation Section's newsletter.

SOURCES OF TAX CHARACTER AND TIMING MISMATCHES ON ASSET/LIABILITY BALANCING TRANSACTIONS

The fundamental tax quandary faced in insurance company asset/liability balancing transactions is a capital/ordinary mismatch in tax treatment. An insurance company's liabilities are reflected in tax reserves, which are ordinary in character for tax purposes (i.e., increases and decreases in tax reserves generate ordinary deductions and income, respectively). On the other hand, the assets used to satisfy these liabilities are capital in character for tax purposes. Moreover, income earned on capital assets is generally ordinary in nature while gain and loss on the underlying assets is capital in nature. This causes tax inefficiency, because capital losses on assets cannot generally be used to offset previous ordinary income earned on the assets.

This tax inefficiency is exacerbated in a credit loss environment. Credit losses are generally recognized for tax purposes only upon sale or maturity and are generally treated as capital losses. However, the income earned on the bond prior to sale or maturity would be ordinary in character. Moreover, a purchase of a distressed debt instrument at a discount often generates "market discount" income, which treats the discount in purchase price as ordinary interest income for tax purposes. In effect, a taxpayer is required to recognize ordinary interest income for tax purposes that it may never collect if the debt is of poor credit quality.

Limitations on Use of Capital Losses

Capital losses can only offset capital gains.[1] Any unused capital losses can only be carried back three years and carried forward for five years.[2] In a rising interest rate environment, a large amount of capital losses may be generated without offsetting capital gains within the relevant carryback/carryforward period. For statutory accounting purposes, loss carryforwards are reflected as deferred tax assets (DTAs) on the balance sheet. However, there are limitations on the ability to admit DTAs as capital. DTA admittance is limited by the amount of taxes paid by the company in the current year and the prior two years. Thus, at a time when substantial capital losses are generated, the company may be able to admit only a minimal amount of DTAs if it has been in a loss position in the past few years.

MANAGING TAX CAPACITY FOR CAPITAL LOSSES

This asymmetry between capital loss and ordinary income may be managed through two principal means, subject to accounting, business and regulatory constraints: (1) triggering embedded capital gains through sale/repurchase transactions or through special tax structuring transactions; and (2) obtaining an ordinary deduction through a partial worthlessness deduction.[3]

Options for Triggering Capital Gains on Appreciated Bonds

In order to utilize capital losses before they expire, a taxpayer may trigger embedded capital gains through a variety of mechanisms. This can be achieved through a sale and repurchase of a bond, through a sale and a purchase of another bond, or through certain tax technology, including the use of identified mixed straddle transactions or through constructive sales, discussed in more detail below.

IF THE REGULATIONS ARE FINALIZED IN THEIR CURRENT FORM, INSURERS WILL NO LONGER BE ABLE TO USE IDENTIFIED MIXED STRADDLES TO TRIGGER CAPITAL GAIN RECOGNITION WITHOUT DISPOSING OF ASSETS.

Sale and repurchase transactions are constrained by regulatory considerations. Regulatory requirements for asset and liability matching narrow the universe of investments that may be included in a portfolio. In addition, if appropriate substitute bonds are not found, cash flow testing reserves may be increased by regulators. The accounting treatment may also be unfavorable. Generally, if a bond is sold at a gain because yields have declined, repurchase of a lower-yield bond would trade future yield for a one-time gain. For Generally Accepted Accounting Principle (GAAP) purposes, the one-time gain reduces future investment income throughout the duration of the investment.

As an alternative to actual sales to recognize capital gains, life insurance companies have entered into identified mixed straddles that result in deemed asset sales for tax purposes. An identified mixed straddle is the holding of offsetting positions with respect to actively traded property that includes an I.R.C. § 1256 contract (which is any regulated futures contract, foreign currency contract, nonequity option, dealer equity option, or securities future contract) and a non- I.R.C. § 1256 contract (i.e., anything other than an I.R.C. § 1256 contract) that is specifically identified.[4] Historically, the unrealized gain or loss on a position in an identified mixed straddle is required to be recognized on the day prior to establishing the identified mixed straddle. As a result, by selecting bonds with unrealized gain to be part of an identified mixed straddle, capital gains can be realized without disposing of the bonds.

On July 18, 2014, however, final regulations were published that fundamentally changed this beneficial result.[5] Under those regulations, unrealized gain or loss on a position held prior to establishing an identified mixed straddle with respect to that position is taken into account at the time, and has the character, provided by the provisions of the Code that would apply if the identified mixed straddle were not established. The regulations apply to identified mixed straddles established after Aug. 18, 2014, with the result that insurers cannot use identified mixed straddles after that date to trigger capital gain recognition without disposing of assets.[6]

Taxpayers can use also "constructive sales" to trigger an embedded capital gain without actually having to sell an asset. Under I.R.C. § 1259, constructive sale treatment applies when taxpayers enter into short sales against the box[7] or other hedges that transfer substantially all of an appreciated asset's risk and return. In such a transaction, for tax purposes, capital gain will be recognized but not loss. Specifically, the asset will be treated as being sold at fair market value and then immediately repurchased, which results in a basis step-up and a restart of the holding period. These rules apply to stock, debt, partnership interests and actively traded trust interests.

Opportunity for Ordinary Deduction—Partial Worthlessness Deduction

Under the tax rules, a "partially worthless business debt" is deductible as an ordinary expense to the extent that the taxpayer can establish that the part claimed to be worthless cannot be recovered.[8] Corporations subject to supervision by federal or state authorities may rely on the conclusive presumption of partial worthlessness that they charge off as required by the regulatory authority's specific orders.[9] In 2012, the IRS issued a directive instructing its examiners not to challenge certain partial worthlessness deductions claimed by insurance companies for credit-related charge-offs reported on their Annual Statements.[10]

The IRS noted that when certain securities held by an insurance company are impaired and subject to a charge-off, the company must observe certain accounting principles under NAIC SSAP 43R. Under these rules, pursuant to a charge-off, there is a reduction in the carrying value of a debt, resulting in a realized loss that is recorded on the company's Annual Statement. The asset's cost basis is required to be written down if the loss of principal is "other than temporary."

CONTINUED ON **PAGE 40**

In order to avail of the IRS' safe harbor, the company's deduction must be the same amount as the company's SSAP 43R credit-related impairment charge-off for the same securities as reported on its Annual Statement, with a positive or negative adjustment in the first year to account for differences between the security's tax basis and its statutory carrying value. Eligible securities for the purpose of this safe harbor are investments in loan-backed and structured securities that are within SSAP 43R's scope and that are not "securities" as defined for tax purposes. Notably, REMIC[11] regular interests constitute eligible securities for this purpose.

ADDITIONAL SOURCES OF CHARACTER AND TIMING MISMATCHES

Hedging Transactions:
Hedging transactions also have significant tax consequences for insurance companies. Tax hedge accounting must clearly reflect income through matching of the timing of income, deductions, gains and losses, in the hedging transaction and the item(s) hedged.[12] In general, for hedges of ordinary liabilities, any hedge gain/loss is matched to tax reserves. Gains/losses have ordinary character.[13] Tax hedge qualification also can be important because, as discussed below, tax hedges are excepted from the straddle and mark-to-market (MTM) rules.[14]

To qualify for tax hedge treatment, a hedging transaction must be clearly identified as such on the taxpayer's books and records on the day it is acquired, originated, or entered into (identification for financial accounting or regulatory purposes is insufficient).[15] In addition, the hedging transaction must (1) manage risk of price changes or currency fluctuations with respect to ordinary property or (2) manage risk of interest rate, price changes or currency fluctuations with respect to ordinary obligations (policy liabilities).[16] Significantly, a transaction that hedges a risk relating only to a capital asset (such as an insurance company's investment assets) does not qualify for tax hedge treatment.

GAAP and statutory accounting have different standards for hedging transactions than tax. For example, GAAP and statutory accounting require that the hedging relationship be highly effective at the inception of the hedge and on an ongoing basis. Tax accounting does not specify a degree of hedge effectiveness, but requires that the hedge manage specified risks. Due to these differences, situations may arise where a company can use hedge accounting for tax, but not for GAAP or statutory accounting, and vice versa.

Duration gap hedges by insurers that relate to both capital assets and ordinary liabilities are particularly problematic under current law because of uncertainty as to whether they qualify as tax hedges. It is the IRS' position that tax hedge qualification applies to a gap hedge only if the hedge is more closely related to ordinary liabilities than to capital assets.[17] Applying this standard is difficult because, by definition, a gap hedge relates to both assets and liabilities and closes the duration gap between the two. As a result, there is widespread inconsistency between insurers' and IRS auditors' application of current law.

House Ways and Means Committee Chairman Dave Camp (R-MI) released a comprehensive tax reform discussion draft on Feb. 26, 2014, that includes a proposal that would modify the definition of a qualified tax hedge to allow a hedge of a bond or other evidence of indebtedness held by an insurance company to qualify (despite the fact that such assets are otherwise treated as capital assets).[18] Adoption of this proposal would allow tax hedge accounting for virtually all insurance company hedges, including gap hedges. Although this hedging proposal would be beneficial, the discussion draft stops short of solving all the problems with insurer hedges because it would preserve the character mismatch between the ordinary derivatives and the hedged capital assets. In addition, tax reform does not appear imminent and it is unclear what changes might ultimately be included in tax reform.

IT IS THE IRS' POSITION THAT TAX HEDGE QUALIFICATION APPLIES TO A GAP HEDGE ONLY IF THE HEDGE IS MORE CLOSELY RELATED TO ORDINARY LIABILITIES THAN TO CAPITAL ASSETS.

Straddle Rules:
Straddles are offsetting positions that substantially reduce the risk of loss on interests in personal property of a type that are generally actively traded.[19] The straddle rules do not apply to tax hedges or straddles consisting solely of qualified covered call options and the optioned stock.[20] The rules constitute an anti-abuse regime intended to prevent deferral of income and conversion of ordinary income and short-term capital gain into long-term capital gain. Although the rules were not intended to apply to insurance company business hedges, they can nevertheless apply to those transactions.

Under the general straddle rules, loss deductions are deferred to the extent of unrecognized gains in any offsetting position.[21] Particularly for macro hedges, these rules could result in a loss being postponed for years. Recognized gains are not deferred. If the loss relates to a position in an identified straddle (i.e., any straddle that is clearly identified as such on the taxpayer's books and records before the close of the day on which the straddle is acquired), special rules apply. Under those rules, the loss is permanently disallowed and the basis of each of the identified positions offsetting the loss position in the identified straddle is increased by a specified percentage of the loss.[22]

Mark-to-Market Requirements:
In certain circumstances, the Code requires that an asset be MTM and deems a sale of the asset to occur. For example, the Code provides that each I.R.C. § 1256 contract held by a taxpayer at the end of the tax year be treated as though it were sold for its fair market value on the last business day of the year, with any resulting gain or loss taken into account.[23] Sixty percent of any gain or loss is treated as long term, and the remaining 40 percent is treated as short term.[24] When the taxpayer ultimately disposes of the I.R.C. § 1256 contract, any gain or loss previously included in income as the result of marking to market must be taken into account in determining the gain or loss of the actual disposition of the asset.[25] The MTM rules do not apply to transactions that qualify as tax hedges.[26] Interest rate swaps are not subject to the MTM rules.[27]

CONCLUSION

Navigating the tax pitfalls in asset/liability balancing is not an easy task. Asset character and timing mismatches can, and frequently do, occur. Without coordination between the investment, hedging, and tax personnel, capital losses can expire unused, potential DTAs can be lost, recognition of hedge losses can be postponed indefinitely, and expensive conflicts with IRS auditors could result.

ENDNOTES

1 I.R.C. § 1211(a). Unless otherwise indicated, all I.R.C. § references are to the Internal Revenue Code of 1986, as amended (the "Code").

2 I.R.C. § 1212(a)(1).

3 For many insurance companies, this issue has recently been of particular importance. As a result of the upheaval in the financial markets in 2008, many companies incurred significant capital losses in that year that could be carried forward only as far as 2013.

4 Temp. Treas. Reg. §§ 1.1092(b)-3T(a), -5T(e).

5 T.D. 9678. With the exception of the effective date, the final regulations adopt the position of temporary and proposed regulations that were published on Aug. 2, 2013. T.D. 9627; REG-112815-12.

6 The temporary and proposed regulations were initially released with an immediate effective date so that they would have applied to all identified mixed straddles established after Aug. 1, 2013. In response to concerns raised by the insurance industry, the government subsequently provided that the regulations would be effective no earlier than when finalized. Announcement 2013-44, 2013-47 I.R.B. 545. The final regulations indlude an effective date that is 31 days after the regulations were finalized.

7 A short sale against the box occurs when the taxpayer shorts a stock that it owns.

8 I.R.C. § 166(a)(2).

9 Treas. Reg. § 1.166-1(d)(1).

10 I.R.C. § 166: LB&I Directive Related to Partial Worthlessness Deduction for Eligible Securities Reported by Insurance Companies, LB&I-4-0712-009 (July 30, 2012).

CONTINUED ON **PAGE 42**

[11] A REMIC, or real estate mortgage investment conduit, is an entity that files an election, owns primarily qualified mortgages and other permitted investments, issues multiple classes of investor interests that meet certain requirements, and satisfies certain other requirements. I.R.C. § 860D. A regular interest is an interest in a REMIC with fixed terms that is issued on the day the REMIC issues all of its interests and that is designated as such. In addition, a regular interest generally must unconditionally entitle the holder to receive a specified principal amount and provide that any interest payments made at or before maturity will be based on a fixed rate of interest or a variable rate (to the extent provided in regulations) or consist of a specified portion of the interest payments on qualified mortgages that does not vary. I.R.C. § 860G(a)(1).12. Treas. Reg. § 1.446-4.

[13] I.R.C. § 1221(a)(7); Treas. Reg. § 1.1221-2(a)(1).

[14] I.R.C. §§ 1092(e), 1256(e).

[15] I.R.C. § 1221(a)(7); Treas. Reg. § 1.1221-2(f).

[16] I.R.C. § 1221(b)(2)(A)(i); Treas. Reg. § 1.446-4.

[17] T.D. 8555 (preamble), 1994-2 C.B. 180.

[18] Tax Reform Act of 2014, § 3402(a)(1). This hedging proposal was included in the discussion draft in response to concerns raised by the insurance industry with an earlier Camp proposal generally requiring derivatives to be marked-to-market, with the only exception being for qualified tax hedges. That mark-to-market proposal is included in the comprehensive tax reform discussion draft, although insurers would now qualify for the exception.

[19] I.R.C. § 1092(c)(1), (2).

[20] I.R.C. § 1092(c)(4), (e).

[21] I.R.C. § 1092(a)(1).

[22] Id.

[23] I.R.C. § 1256(a)(1).

[24] I.R.C. § 1256(a)(3).

[25] I.R.C. § 1256(a)(2).

[26] I.R.C. § 1256(e)(1).

[27] I.R.C. § 1256(b)(2)(B).

Aditi Banerjee is a lawyer in the Tax Department at Prudential, specializing in US tax matters and M&A. Prior to joining Prudential, she was a tax attorney for seven years at Sullivan & Cromwell, advising on cross-border transactions, international tax issues, tax controversy matters, financial restructuring, structured finance transactions, private equity transactions, partnership tax issues and M&A transactions. She is a graduate of Yale Law School (J.D.) and Tufts University (B.A., International Relations)..

Brion D. Graber is a partner with the Washington, D.C. law firm of Scribner, Hall & Thompson, LLP and may be reached at bgraber@scribnerhall.com.

Peter Winslow's practice includes audit, administrative appeals and litigation on tax issues that affect insurance companies. His tax planning work broadly covers most federal tax issues involving insurance companies, including insurance reserves, investments, reinsurance, valuation, accounting and insolvency. He is engaged as an expert witness on insurance tax matters in litigation and in proceedings involving insurance company tax issues, and is a frequent speaker and writer on insurance tax issues. Peter represented the insurance industry on the IRS Information Reporting Program Advisory Committee and is a former member of the editorial board of the Society of Actuaries Taxing Times publication. He can be reached at pwinslow@scribnerhall.com.

THE 2014 INVESTMENT SECTION ASSET ALLOCATION CONTEST

By Joe Koltisko

One thing that makes investments the best actuarial practice area is that the market tells us who was right. We argue impressions and opinions as in all actuarial work, but the facts rudely step in to settle those arguments every day.

In the 2014 Investment Section Asset Allocation Contest, we asked section members to lay it on the line by selecting a hypothetical long-position-only portfolio from among 10 exchange-traded fund (ETF) assets for a six-month holding period ending in September 2014. We will award one prize each for the best outcome in three different investment objectives: maximum return, minimum volatility, and the maximum ratio of return to volatility. You can follow your favorite celebrity investment actuary as results are updated each month at the Investment Section's webpage:

http://www.soa.org/Professional-Interests/Investment/2014-investment-contest.aspx.

Each ETF in the universe is broadly representative of an asset class, such as bonds, emerging market stocks, TIPs, cash and more. The leaders to date all had high real estate allocations. My rationalization for coming in #56 as of April is that I am shooting for the ratio of return to volatility category. We'll see how that one goes! I did have a little model but it may not be worth crowing about.

Often crowds are smarter than individuals. Here[1] is the initial allocation of the universe of all 134 participants in the contest. I wonder if this allocation will outperform.

We struggle with how to make sure contestants have some skin in the game. Please send the section council your suggestions on that. As a positive incentive, you can talk about your winning approach here on the pages of *Risks & Rewards*. Should we ask the contestants who come in below the median in their designated category to pledge a small contribution to the Investment Section? Just a thought.

Our correspondent asked one of last year's winners, Melissa Knopp, to comment on her trade secrets. Melissa writes:

"Last year I won the award for the highest ratio of return to volatility in the Asset Allocation Contest. I didn't have a particular prize category in mind when making my selections; I picked a portfolio that I might have picked in real life. My goal, of course, was to maximum returns, without taking on excessive risk. That being said, in early 2013 I did feel optimistic about the market in the short term, so I picked mostly stocks. I added a few more assets so I could feel good about being diversified.

"My 2013 portfolio consisted of: 60 percent Total Stock Market (VTI), 20 percent International (ACWI), 10 percent Bonds (BND), 5 percent Real Estate (RWO) and 5 percent Commodities (DBC). As it turns out I would have been better off picking 100 percent VTI, like Marguerite Boslaugh.

"I chalk my win mostly up to luck. So good luck to you all in the 2014 contest!"

That's right, good luck all! Watch next month for the big finale.

Joe Koltisko, FSA, MAAA, is an investment actuary with New York Life and the editor of this issue of Risks & Rewards. He can be reached at jkoltisko@nyl.com.

[1]

GSY	BND	TIP	VTI	GLD	ACWI	DBC	EFA	RWO	EEM
4.9%	13.5%	3.2%	21.9%	14.4%	6.1%	7.6%	8.7%	7.8%	11.9%

SOCIETY OF ACTUARIES Investment Section

NONPROFIT
ORGANIZATION
U.S. POSTAGE
PAID
SAINT JOSEPH, MI
PERMIT NO. 263

475 N. Martingale Road, Suite 600
Schaumburg, Illinois 60173
p: 847.706.3500 f: 847.706.3599
w: www.soa.org

Risks & Rewards

FSC MIX FSC® C004755