Risks & Rewards

SOCIETY OF ACTUARIES

INVESTMENT
SECTION

Investment Considerations under Principle-Based Approaches for ULSG Reserves

By Janelle D. Kern, Jeffrey S. Schlinsog and Sean T. Cahill

Principle-based approaches for reserves are fundamentally different from methods currently used to calculate most life insurance reserves. The reserve calculation relies chiefly on own company experience, and, notably, incorporates investment returns on existing and projected assets backing the policy liabilities. This entails:

1. Allocating existing assets in the amount of the reserve as of the valuation date.

2. Developing expected investment returns, net of defaults.

3. Modeling purchased and divested assets together with policy liabilities under many economic scenarios.

The investment strategy of the company is essential to modeling these asset and liability cash flows. The amount of reserve ultimately held will be sensitive to the chosen strategy. We will consider some of the modeling considerations for assets, as well as illustrate results for a typical ULSG product under various scenarios.

REGULATORY REQUIREMENTS

The regulatory requirements for reserves calculated under this new principle-based approach are found in the Valuation Manual referenced in the Revised Standard Valuation Law. The portion of the Valuation Manual dedicated to life insurance valuation is Chapter 20 (VM-20), Requirements for Principle-Based Reserves for Life Products (PBR). The reserve is the greatest of three calculations: (1) a net premium reserve, (2) a deterministic reserve, and (3) a stochastic reserve. The stochastic reserve requires explicit modeling of assets with the lia-

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Chairperson's Corner
We Are Lucky

By Jeff Passmore

As investment actuaries, we have the good fortune of working in one of the most dynamic and resilient areas of actuarial practice. It is dynamic in that change can come from the capital markets or by expanding and adapting an existing practice into a new geography or through new investment modeling techniques. Whatever the source, change presents us with professional challenges to keep our skills relevant. One important role of the Investment Section is to help us respond to these challenges.

As Investment Section members, we have the good fortune of having a large section with many talented professionals—almost 3,000 strong. We are also fortunate to have a financially strong section—this is a byproduct of both our large membership and the careful financial stewardship of prior section councils. We also have the benefit of having an energetic group of people on the council. Finally, we are fortunate to have wonderful support from the board and the Society of Actuaries (SOA) staff.

As a council, our challenge is to use these resources wisely to deliver value to you through your Investment Section membership. Some of this will be continuing to do those things our membership values. Some will be trying some new things—to deliver more value to existing members and to attract new or returning members. How? I am glad you asked.

PLANNED FOR 2016

Professional Development—Within the SOA, the sections provide the lion's share of the professional development content at SOA meetings and symposia. The Investment Section will continue to develop relevant professional content for investment actuaries and deliver this through our traditional venues:

- The Investment Symposium (NYC, March 14-15),

- The Life and Annuity Symposium (Nashville, May 16-17),

- The Valuation Actuary Symposium (Ft. Lauderdale, Aug. 29-30), and

- The Annual Meeting (Las Vegas, Oct. 23-26).

Networking Events—We will continue to reach out to other organizations to jointly sponsor social events and presentations for continuing education. When we are choosing where to hold these events, we look for other organizations with similar interests and venues where we have a significant presence with the potential to grow our membership. In 2016 these networking events will include:

- Networking Event and Presentation with the Society of Quantitative Analysts in New York City;

- Networking Event and Presentation with the CFA Society of Toronto; and

- Networking Event and Presentation with Premia in Washington, D.C.

Webcasts and podcasts—These are cost effective ways to deliver valuable professional development content to our membership in a format that is conveniently accessible. We are planning a number of these for 2016 beginning with the winner of the Redington Prize for an Outstanding Investment Actuarial paper. "Optimal Portfolios under Worst Case Scenarios" will be presented by its team of authors in late January, 2016.

Contests—We are working to keep our members engaged and have some fun with a number of contests including our annual Asset Allocation Contest, our Award for Outstanding Newsletter Article and through a membership drive to grow our ranks and make our section even stronger and more effective.

I hope that you share my enthusiasm for this exciting area of actuarial practice in which we work. I also hope that you feel fortunate for the many ways that the Investment Section helps you in your investment actuarial work. Please send me an email and let me know how we are doing and what we could do to be even more helpful to you.

Regards,

Jeff Passmore ■

Jeff Passmore, FSA, EA, a member of the Investment Section Council and current section chairperson, can be reached at jeffpassmore@hotmail.com.

Taking Stock: What Ever Happened to the "Invisible Hand"?

By Nino Boezio

The views expressed in this article are solely those of the author. The Society of Actuaries takes no position on the views of the author.

In high school I was taught about the principles of communism and capitalism. As I recall, communism was labelled a command economy where most decisions were centralized and planned by officials in government, whereas capitalism functioned freely with little to no government intervention. Capitalism was considered a more efficient system. I learned about the "invisible hand" of capitalism and how communism did not function effectively because its principles and policies would impede the invisible hand from operating.

One definition of the invisible hand is as follows: "The invisible hand refers to the self-regulating nature of the marketplace in determining how resources are allocated based on individuals acting in their own self-interest."[1] This online dictionary further explains how this works:

> "Coined by classical economist Adam Smith in *The Wealth of Nations*, the invisible hand refers to an unseen mechanism that maintains equilibrium between the supply and demand of resources. Smith states that the invisible hand functions by virtue of the innate inclination among free market participants to maximize their well-being. As market participants compete, driven by their own needs and wants, they involuntarily benefit society at large.

> "Smith envisioned the invisible hand as eliminating the need for market intervention on the part of government. Moreover, such regulatory action, Smith believed, would only be detrimental to market efficiency."[2]

> What we used to call capitalism is now only a sideshow, not the main event, in terms of what is happening in our economy and financial system.

In the past two decades, our western capitalism has changed significantly. The scale of government in our democratic societies was always much larger than what Mr. Smith envisioned (his book was first published in 1776), but our governments have become much more interventionist in recent years, either directly or through their various agencies. It sometimes seems to me that what we used to call capitalism is now only a sideshow, not the main event, in terms of what is happening in our economy and financial system.

Our level of regulation has mushroomed since the global financial crisis of 2008–09. Government bodies have added a considerable amount of complexity to the way we do business. And as some may argue, the do-gooders who behaved properly all along have likely suffered more than those who did not, because of the costs imposed upon them either through regulation or by having to absorb the costs either directly or indirectly, of the financial damages others had caused.

Central bank interest rate policy in the last decade also played a role in the financial crisis. The fluctuating interest rate policy of the prior decade (managed through such agencies as the U.S. Federal Reserve) did create financial imbalances and many institutions, investors and consumers found themselves caught. Low interest rates were brought about after the 2000–2002 recession (a recession spurred on by the collapse of the dot-com or Internet bubble). These low interest rates encouraged real estate investment to increase substantially (as equities were no longer considered as safe or attractive) and this investment rose to a point where suppliers were bringing all sorts of unsound and misrepresented real estate "junk" to market. The historically low rates, irrational exuberance from buyers, the lax standards and poor ethics of suppliers, and government policy and legislation (and, yes, admittedly, prior deregulation) encouraged high levels of home buying that ultimately proved to be unsound.[3] The Fed has also been accused of not paying sufficient attention to the emerging dilemma, despite claims from its leadership that the Fed was to a large extent ignorant of the problems.[4] We should not assume that the invisible hand acts right away to correct mispricings or to punish unsound consumer and corporate business practices, but was biding its time as to when to strike, and the longer it takes to do so (or is hindered from doing so), the more severe the consequences become.

As inflation began to appear, interest rates were then raised, that helped spur mortgage defaults during 2004–2006, particularly in the sub-prime space (and lo, the invisible hand came out with full force). Then as a response to the global financial crisis, rates were lowered to near zero to minimize the financial fallout.

Central banks for the most part have skirted much of the criticism for the issues plaguing their respective economies that they are supposed to be guarding, and oftentimes capitalism and

private enterprise is blamed. Yes, we can argue that our world today is very complex and it is hard to navigate and monitor a major company, especially when it trades in exotic products and derivatives (and so it may be claimed that the invisible hand does not work effectively anymore, since capitalism and the financial system is much more complicated)—but I would argue that the compensating actions of the invisible hand may sometimes just take longer to play out.

Today, we have monumental/gargantuan central bank activity and few want to question the omniscience or wisdom of central banks. Perhaps we also want to feel this way because we know that central banks are here to stay, and we have tremendous hope that they will do a better job the next time around, since we see no plausible solution otherwise. A person can be severely attacked if they even suggest that they have the ability to market time and predict the future occasionally. But we want to believe that central banks can do just that (or perhaps it is because they can sometimes create the environment they choose, through a force of will and their policy).

A great gift given to central bankers today has been the ability to increase liquidity in the financial system without causing inflation. It has helped governments continue without any serious fiscal challenges (or the need to implement reform) since their debt (if no one else wanted it) was ultimately bought by central banks, while offering yields that have remained historically low. But how long can this environment continue?

Most central bankers admit that they do not know what to do next. How do they reduce their balance sheets? How can they raise rates without creating fear and financial disruption? Could we conclude that what central banks have done so far has been truly beneficial? The evaluation of former Fed chairman Ben Bernanke's inspired policies and whether they were truly successful is still probably a decade away, since we still do not know what the ultimate consequences of his actions will be.

We have other troubles on the horizon if we have not experienced them significantly already. We have a very large welfare state in the western world that we can no longer afford. Demographics (low birth rates), longevity and mispricing (government politics) have all played a role, and reforms have been slow in coming.

CAN THE INVISIBLE HAND COME BACK TO PUNISH US?

We are still feeling the effects of the global financial crisis today, and we continue to see it discussed in many conferences and forums, as though it was just yesterday. Admittedly, it often becomes a complicated discussion and void of clear insights.

Our government agencies have attempted to tie up the invisible hand through intervention and it seems to have worked, but this can only be temporary. The invisible hand is waiting to strike, knowing that unnatural economic forces have been introduced into capitalism, and the financial system needs to come back to equilibrium. Here is where the invisible hand will someday appear:

a. **Overpriced assets –** Speaking to any professional money manager today will convey the same story— most if not all assets are expensive today. Yet there is still a compulsion to buy (even though under historical circumstances, investors would not) given the prevailing atmosphere of stability reinforced by central bank activity. In the past, the invisible hand would want to move to safety such as cash.

b. **The non-producing or welfare economy –** Can the working population and corporate community continue to be able to pay for benefits to the non-producing? Can our burgeoning welfare state still last into perpetuity and be supported by current levels of contributions/financing (which are now seen as too low and thus unsustainable) without introducing any new and meaningful reforms?

The pay-as-you-go framework was so compelling in past generations, but demographics has changed that (we cannot push the obligations to the next generation). We have not saved enough for the future. When reforms do take place today, they are often too little and too late. At least in the private sector companies do recognize the issues regarding their own benefit programs and therefore make modifications, but this is not always true at the national or federal level. The invisible hand will not let our broken social system and safety net continue forever.

c. **Sovereign debt, fiscal imbalances and a currency bust –** Could governments afford their current debts if interest rates had been higher? Can they afford these debts when interest rates begin to move higher? Why have there been no changes or reforms made to cut fiscal spending in the meantime? The tenuous balance between government revenues and outflows is not being seriously discussed (or perhaps because it is an unpleasant discussion with no easy solution in sight). The invisible hand will ultimately show governments no mercy here, but unfortunately this problem will be primarily passed onto taxpayers and others.

And who may want to hold a particular currency when the underlying economy has too many issues to deal with? So far that question has remained moot, or perhaps it is because major currencies, whether it be the U.S. dollar, the Euro, the British Pound, or Japanese Yen (and alas, also the

> Can we really argue that we have efficient markets operating today? In many facets of the financial markets it seems that market forces are currently suspended.

Canadian and Australian dollar), all face the same issues, so it is a relative value game in the fiat currency space.

d. **Interest rates (negative interest rates) –** Interest rates globally are artificially low, and most would admit that central bankers (e.g., Fed, Bank of England) are behind the curve (i.e., short-term rates should already have been raised by now and should be at higher levels than is currently the case—similar economic statistics to what we are witnessing today have historically existed alongside higher rates).

If we are sceptical about the merits of the invisible hand taking vengeance in the other points discussed above, at least the matter of negative interest rates should get you thinking. Who would buy a bond that pays you back less than what you paid? Does this make any sense? The only argument to buy such securities is the belief that some other entity (the greater fool theory) will want your bond, making it even more valuable than before you bought it (some arguments to buy these fixed income securities could include the anticipated currency gains on the bond, continued more demand than supply for the bond making the interest rates even more negative, or perceived safety—but this charade eventually ends). In the case of negative interest rates, the invisible hand should come down like an invisible fist when the time comes.

e. **Inflation –** Can all of this liquidity eventually move inflation higher? In theory yes, but we have not truly seen inflation at all anywhere (in fact, we have often seen the spectre of deflation). There is still unused industrial capacity and a host of other factors that have accounted for lower inflation. But it is hard to see inflation continue to be muted if the monetary base continues to expand or if it reaches levels that are just mind boggling (and we could already be there—having $4.5 trillion in assets on deposit at the Fed is a huge number). Money velocity has been low (i.e., less money has been

changing hands than had been the case only a short time ago, perhaps in part because of uncertainty, but also lingering fear), but if people become scared of losing purchasing power and thereby start spending, then the invisible hand will not have to do anything, inflation will rise quickly and significantly as demand will outpace supply. And what could central banks do without killing the economy?

f. **An unrelenting recession –** If it is true that our (rather anaemic) global economy has been driven recently by monetary expansion, what happens when this stops? The U.S. economy was doing fine in 2015 even though the Fed stopped its quantitative easing (QE) program in 2014, so it can be argued that monetary expansion was not necessary or no longer needed. Then again, maybe other QE programs will pinch hit and take the Fed's place in 2015, such as the European Central Bank's QE version introduced in early 2015, helping to buoy not only Eurozone markets, but in the process, will help other international markets as well. How long can intervention continue?

g. **Liquidity and defaults –** All of the liquidity introduced into the financial system by central banks has helped to cover lower quality investment choices. Weak corporations and governments may have gotten a free ride by being able to rollover and issue new debt, due to a financial community eager and willing to gobble up any new investment opportunities. Sometimes lower quality investments can be masked in a portfolio through the argument of "diversification," the claim that not all bad investments will turn out bad, so the portfolio overall will do just fine (the same argument that was once used to package a large variety of sub-par subprime mortgages and CDOs together). But as we saw in the global financial crisis, quality was far worse than expected, and many bad assets were highly correlated with each other. The invisible hand can just sit back here and let natural market forces operate when liquidity begins to wane.

h. **Efficient markets –** Can we really argue based on the above, that we have efficient markets operating today? In many facets of the financial markets it seems that market forces are currently suspended—no one, for example, wants to fight a central bank or short equity/bond markets just yet. Many want to just ride the wave even if it otherwise does not make any financial sense right now. But the invisible hand married with efficient market principles will have to surface at some point.

CONCLUDING REMARKS

Our economic theory has been developed over hundreds of years. We have been taught what was considered to be well-established and sound financial and economic principles that have

been proven and have worked over and over again. This includes beliefs such as the following:

- That we cannot expand the monetary base (or its equivalent) too fast without creating inflation.

- Interest rates will never go negative.

- If debt cannot be repaid, then it has to be devalued or one has to default.

- An underlying currency is in jeopardy if the domestic economy or the financial health of its government is questionable.

So far all these beliefs among others have proven false (lately)—or have these "laws" of sound economics just been temporarily put on hold? Sometimes our economy does need to take a breather (which may include a mild recession) to alleviate some of the excesses created during the economic boom, in order to bring things back into a healthy balance. But now the principle of "no pain, no gain" has been replaced by the principle of "no pain, no pain" and various non-free-market entities are trying to achieve just that.

The new policy innovations have not solved problems, but just bought time (and that time will run out in the next few years), but most have not figured that out. The invisible hand does not have to act quickly or right away, but by not seeing it operate within a short span of time, some unfortunately assume it is not active anymore.

The former Soviet Union crumbled because its leaders and officials were not able to outsmart the invisible hand. A similar fate could await our western society, as we keep trying to suspend the natural forces in our economy and financial system from taking shape. ■

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ENDNOTES

[1] "Invisible Hand," Financial Dictionary, <http://www.investinganswers.com/> [path: http://www.investinganswers.com/financial-dictionary/economics/invisible-hand-771]

[2] Ibid.

[3] "Causes of the United States housing bubble" <https://en.wikipedia.org> [path: https://en.wikipedia.org/wiki/Causes_of_the_United_States_housing_bubble]

[4] Baker, Dean. "Alan Greenspan owes America an apology" <http://www.theguardian.com > [path: http://www.theguardian.com/commentisfree/2013/oct/28/alan-greenspan-housing-market-crisis]

bilities over a range of economic scenarios. The interdependency of asset cash-flows and liability cash-flows over the different market scenarios should be captured within the model as well as the optionality of both the liabilities and assets. For each scenario, the greatest present value of "accumulated deficiencies" is calculated and added to the starting asset amount at the valuation date which results in the scenario reserve. The reserve is then determined as the average of the worst 30 percent or CTE 70 of all the scenarios reserves. One can think of each scenario reserve as the amount of money needed today to pay the future obligations of the liability by taking into account all related liability and asset cash-flows for that particular scenario. We are interested in examining the role that investment strategy plays in this determination.

Certain aspects of invested asset returns are prescribed in VM-20. Section 9 of VM-20 addresses assumptions used for PBR. Part F of this section pertains specifically to asset assumptions. Default assumptions for both starting and purchased assets, and investment spread assumptions for purchased assets are specified here. Starting assets are those that exist and are allocated to current policies in force as of the valuation date. Per Section 7, Part F, "Cash Flows from Invested Assets," the gross investment income and principal repayments are to be modeled consistently with the contractual provisions of the assets. Purchased assets are those added during the projection period based on policy cash flows or asset maturities.

Spread assumptions
The NAIC monitors and publishes current and long-term spreads (over Treasuries) for non-callable public corporate bonds by weighted average life (WAL) and credit quality. Current spreads are updated on a quarterly basis. Long-term spreads are reviewed by the NAIC annually and updated as necessary.

Spreads for purchased assets in the first year of the valuation projection are equal to current spreads. Current spreads are assumed to revert to long-term spreads over a three year period with purchased assets in the fourth year of the valuation assumed to earn a long-term spread. Purchased asset spreads in years two and three should grade linearly between the current and long-term spreads.

Notably, no margins were incorporated in the spread data. This is because it was not clear whether increasing or decreasing the spread would produce a margin, as the direction of the margin would depend on whether the model was selling or purchasing assets.

Default assumptions
Assumed default cost varies by asset and is the sum of three components: (1) baseline factor, (2) spread related factor, and (3) maximum net spread adjustment factor. The baseline factor and spread related factor apply to all assets, both starting and pur-

> Given that modeled invested asset cash-flows are a central component of the stochastic reserve calculation, it is apparent that the investment strategies will impact the reserves and the reserve movements.

chased assets. The maximum net spread adjustment factor only applies to starting assets. These components are summarized below with more detail provided in the Appendix.

1. Baseline default cost assumptions are published and will be updated annually by the NAIC. Default costs vary by WAL and credit rating. The baseline default cost assumption applies to both starting and purchased assets.

2. A spread related factor dynamically adjusts default costs based on the difference between the current spread at the valuation date and the long-term spread. The spread related factor applies to both starting and purchased assets.

3. The maximum net spread adjustment factor adjusts the default cost for starting assets only. This adjustment does not apply to purchased assets.

Given that modeled invested asset cash-flows are a central component of the stochastic reserve calculation, it is apparent that the investment strategies will impact the reserves and the reserve movements. To assess this impact, we developed a model to illustrate these effects.

DESCRIPTION OF THE MODEL
To illustrate differences in stochastic reserve results under various investment strategies, we developed a model for a typical universal life policy with a lifetime secondary guarantee (ULSG) based on minimum premiums. We used a single model point for an issue age 65-year-old female, for one year of new business. The model calculates a stochastic reserve as of the valuation date, and further calculates future reserves annually for a "top level" planning economic scenario.

The reserve projection is depicted in Figure 1 below. A single year of new business policies are assumed to be issued on Jan. 1, 2014 (t=0, where t is in months) and projected forward along the top level planning scenario to the first valuation date (t=12

Figure 1
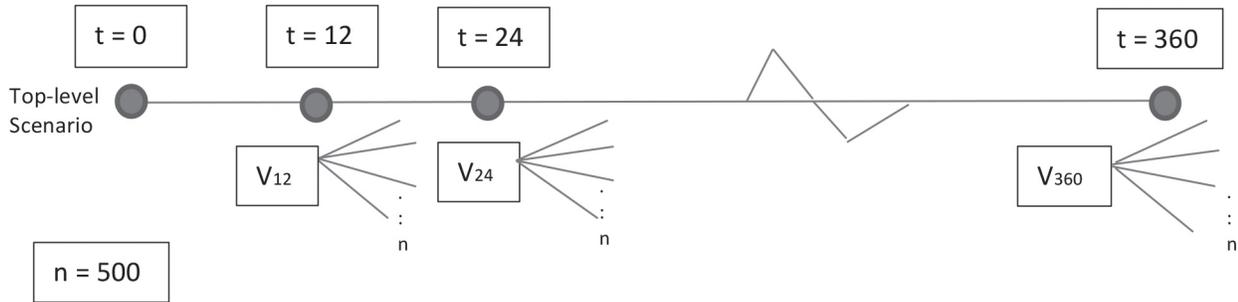
or Dec. 31, 2014), where a stochastic reserve is calculated based on 500 interest rate scenarios. The policy values and in force are again projected forward one year (t=24) based on the top level planning economic scenario, and a projected stochastic reserve is calculated as of one year hence. This process is repeated for a projection period of 30 years. In the end, we have a 30-year projection of stochastic PBR reserves, for a given planning scenario.

We chose three top-level planning scenarios for this exercise. In each case, the starting yield curve is the Treasury yield curve as of Dec. 31, 2014. That yield curve is shown in Figure 2 below. For reference purposes, the 10-year Treasury yield as of year-end 2014 was 2.17 percent.

Figure 2

UST	1yr	2yr	3yr	5yr	7yr	10yr	20yr	30yr
201412	0.25%	0.67%	1.10%	1.65%	1.97%	2.17%	2.47%	2.75%

Three representative "top-level" planning economic scenarios were chosen to illustrate projected stochastic reserves. They can simply be described as Level, Decreasing, and Increasing interest rate scenarios.

The Level interest rate planning scenario simply assumes that the starting yield curve is unchanged for the duration of the projection period. It is depicted in Figure 3.

Figure 3

Level Treasury Scenario at Various Points on Curve
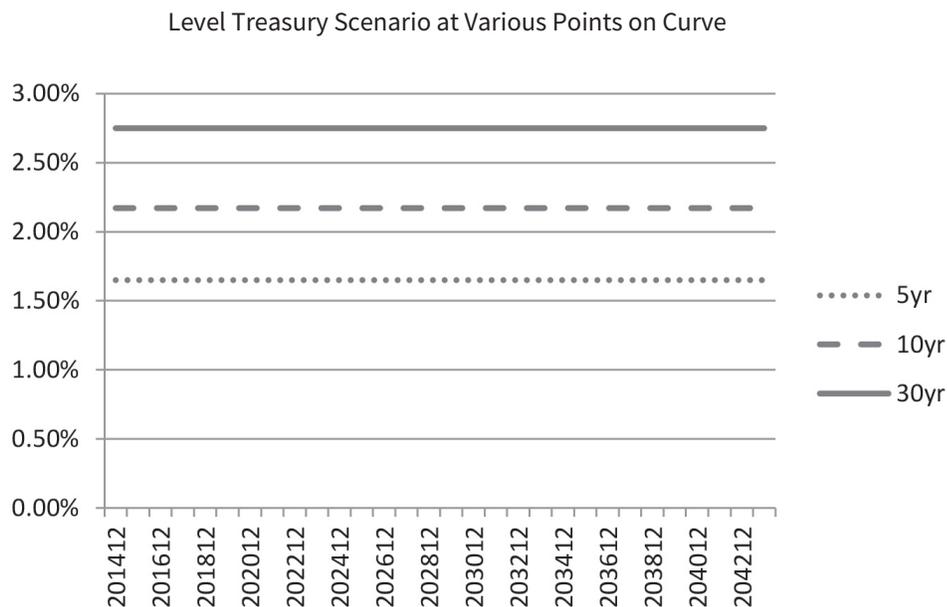
The Decreasing interest rate planning scenario assumes parallel 10 basis points decreases for as many as each of the first 10 projection years, subject to a floor of 50 percent of the starting yield rate. It stays level thereafter. It is shown in Figure 4 below.

Figure 4

Decreasing Treasury Scenario at Various Points on Curve
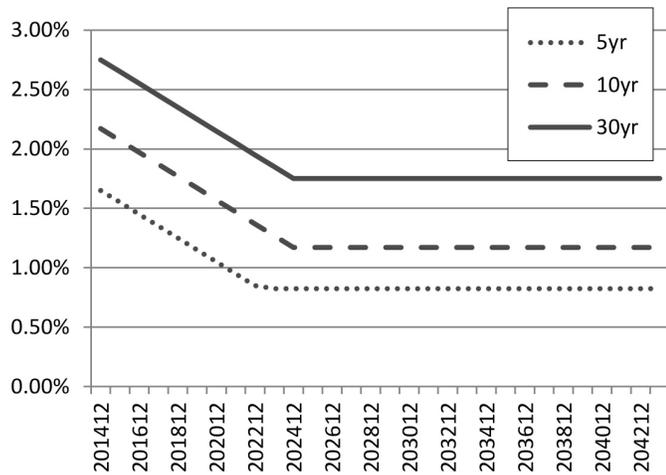
Finally, the Increasing interest rate planning scenario assumes parallel 25 basis points increases for each of the first 10 projection years. It stays level thereafter and is shown in Figure 5 below.

Figure 5

Increasing Treasury Scenario at Various Points on Curve
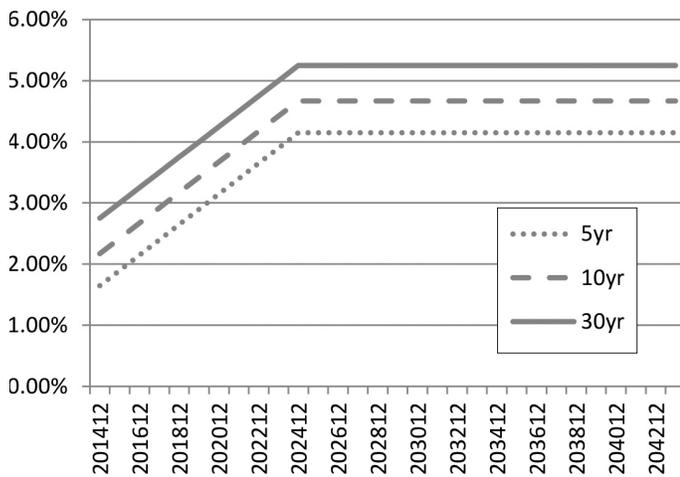
We have started with three different planning scenarios. They are typical of the range of scenarios that companies will review in the course of their annual planning and budgeting exercise. We next considered three alternative investment strategies.

They can simply be described as Short, Medium and Long duration investment strategies:

(1) Short duration strategy – invest 100 percent of free cash flows into five-year maturity investment grade non-callable corporate bonds;

(2) Medium duration strategy – invest 100 percent of free cash flows into 10-year maturity investment grade non-callable corporate bonds; and

(3) Long duration strategy – invest 100 percent of free cash flows into 30-year maturity investment grade non-callable corporate bonds.

For each of the above investment strategies, non-callable corporate bond spreads and defaults were set at the prescribed long-term VM-20 assumptions using a PBR rating of 2 which corresponds to a Moody's Aa1 credit rating. For simplicity, we did not grade from a current spread to long-term, we only used the long-term. Consequently, there was no spread-related adjustment for defaults since the current spread used was equal to the long-term spread. Also, since we are modeling new business, the starting assets were 100 percent in cash, so there was no maximum net spread adjustment factor.

We were interested in how the pattern of projected stochastic reserves would emerge for each of the planning scenarios under each of the investment strategies. Before we share results, now would be a good time to pause and form your own opinion on the likely relationship of reserves between planning scenarios and between investment strategies. It is only by forming a pre-conceived notion of the likely results, and then having it confirmed or refuted by the calculated results, that we begin to develop intuition on stochastic reserves. For instance, given the benefit of perfect foresight, in a level interest rate planning scenario, one would invest long, taking advantage of higher yields at the longer durations and knowing there was no risk of loss due to increases in interest rates. The same would hold true for a decreasing interest rate planning scenario. In the case of an increasing interest rate planning scenario, one may invest short while interest rates are increasing, to take advantage of the ultimate higher yields in the future. Having formed your opinion, let's see what happens.

DISCUSSION OF RESULTS

We first calculated stochastic reserves for the Level planning scenario for each of the alternative investment strategies. The projection period is 30 years. Not surprisingly, the long duration investment strategy resulted in the lowest level of reserves in every projection year. Likewise, the short duration investment strategy produces the highest level of reserves in every year. The results are pictured in Figure 6.

We next calculated stochastic reserves for the Decreasing planning scenario for each of the alternative investment strategies. Again, the long duration investment strategy resulted in the lowest level of reserves in every projection year. Likewise, the short duration investment strategy produces the highest level of reserves in every year. Also, the level of reserves for each of the Decreasing planning scenario investment strategies is higher than reserves for the corresponding strategy in the Level planning scenario. This makes sense, as a lower interest rate environment should generally result in higher reserves. The results are pictured in Figure 7.

Finally, we calculated stochastic reserves for the Increasing planning scenario for each of the alternative investment strategies. The same relationship holds. That is, the long duration investment strategy resulted in the lowest level of reserves in every projection year. Likewise, the short duration investment strategy produces the highest level of reserves in every year. There was no benefit to investing shorter, to take advantage of the increasing interest rate scenario. To understand why, we have to remember how the stochastic reserve is calculated. That is, the stochastic reserve is a 70 CTE calculation. The reserve will be determined by what happens in the 30 percent worst scenarios. If those worst scenarios are decreasing interest rate scenarios (which is the case here), then investing short will not be beneficial and will intuitively result in the highest reserves. The results are shown in Figure 8 (pg. 12).

Was your preconceived notion confirmed or contradicted by the calculated results? With more experience, actuaries will develop more intuition on how stochastic reserves will emerge under certain assumptions, strategies, and circumstances. In order to do so, actuaries will have to consider how cash flows will perform in the worst 30 percent of scenarios—not the average scenario.

FURTHER ANALYSIS

These results suggest many questions for further analysis. For instance, are these results merely a byproduct of the current low interest rate environment? To answer that question, we calculated stochastic reserves under each of the investment strategies for a more "normal" starting yield curve. In this case, we used a starting yield curve with a 10-year Treasury yield of 5.0 percent and a 30-year Treasury yield of 5.6 percent. We found the same relationship. That is, the lowest reserves occurred under the long duration investment strategy. The results are shown in the appendix.

We wondered if stochastic reserves would be more volatile for one investment strategy versus another. We produced results for the three investment strategies for a more volatile planning economic scenario. This scenario starts with the same "normal" yield curve (5 percent at 10-year Treasury and 5.6 percent at 30-year Treasury) with shocks of 100 bps alternating up and down at years that are multiples of five, holding level in between

Figure 6

ULSG VM20 Stochastic Reserves under Level Scenario and Varying Investment Strategies
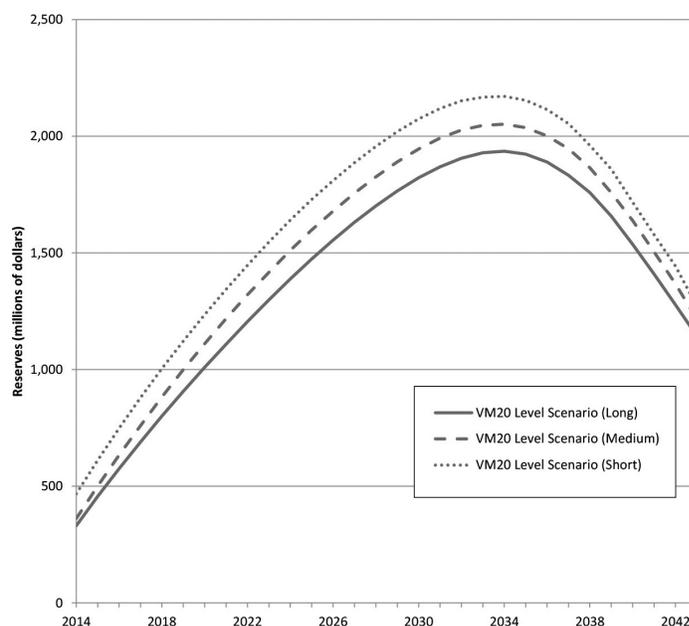
Figure 7

ULSG VM20 Stochastic Reserves under Decreasing Scenario and Varying Investment Strategies
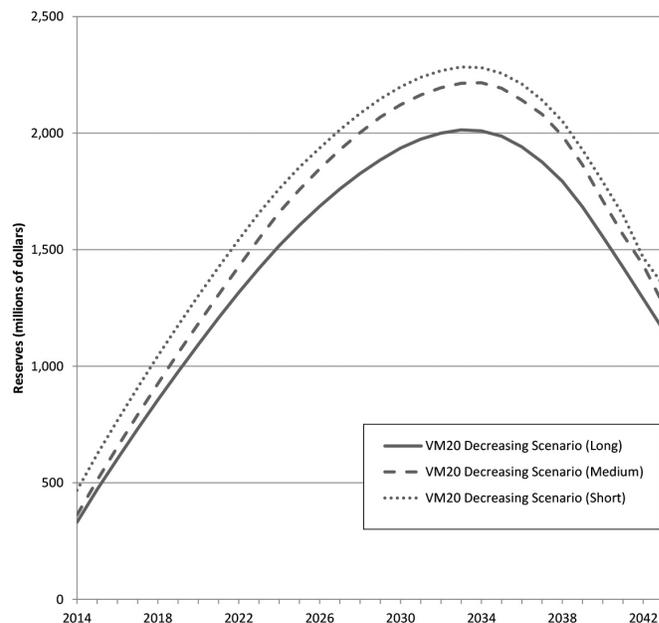
Figure 8

ULSG VM20 Stochastic Reserves under Increasing Scenario and Varying Investment Strategies
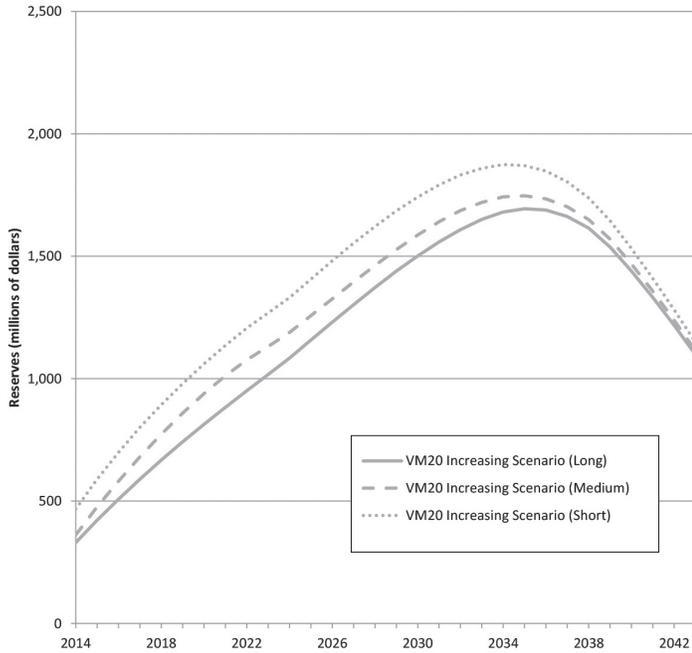

Figure 9

ULSG VM20 Stochastic Reserves - Level vs. Up & Down Scenario with Varying investment Strategies ("Normal" Initial Curve)
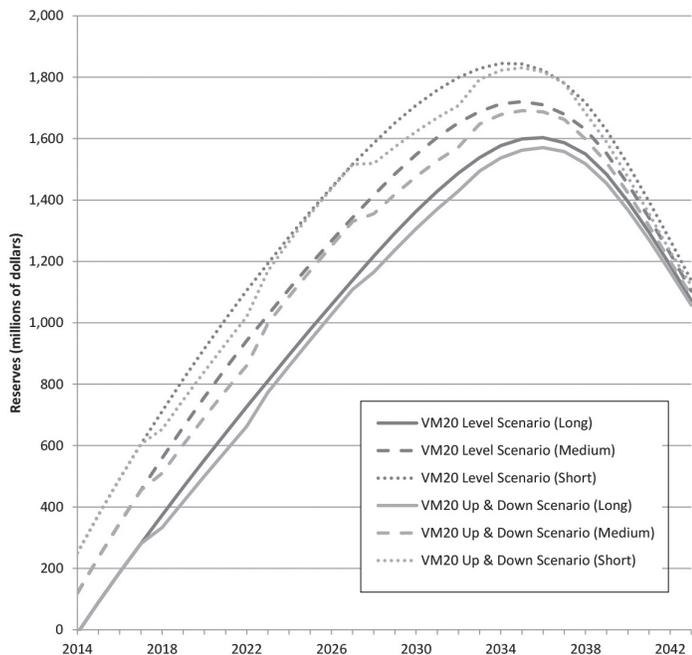
shocks. Figure 9 compares this Up & Down Scenario with that of the Level scenario for the three investment strategies. Figure 9 shows that the long duration investment strategy not only produces lower levels of reserves, but also reduces the volatility associated with the large interest rate movements.

There is no end to the possibilities for further analysis. Some candidates for additional analysis include:

(1) Is it always better to invest long? Or are we merely approaching an optimal duration for this modeled ULSG product? Is there a duration which would be too long for this product? Under what scenario would investing shorter be more advantageous, if any?

(2) Would we observe the same results for a shorter term product? Would investing long still be preferable? Or is there a shorter duration that is optimal?

(3) How would the reserves emerge for more robust investment strategies such as laddered investment portfolios? Should the investment strategy itself be more sophisticated—adjusting for different interest rate environments? Of course, the programming needed to implement such a strategy would be complex, and a skeptical reviewer may rightly question the ability to execute on such a strategy.

(4) How will the results change if we add more issue years to the projection? How about more products to a projection group? Will the combination of shorter-term and longer-term products have a different pattern of reserves? Will volatility increase or decrease?

Putting a model in place is only step one of being able to answer questions such as these. It is equally important to put the diagnostics and analytics in place in order to understand results. These diagnostics include:

(1) Buy and sell reports for the assets, to understand if cash flow is positive or negative, and how it is being applied or funded.

(2) Portfolio yield rates, to understand how closely the book yields are tracking or lagging the then current market rates.

(3) The 30 percent worst scenarios to understand what is driving the reserve calculation. Are they declining interest rate scenarios or increasing interest rate scenarios? Or are they a combination of extreme low and high interest rate scenarios?

These capabilities are a prerequisite to not only understand the reserve calculations, but to also form strategies that influence the level and volatility of reserves.

CONCLUSION

A principle-based approach to reserves incorporates investment returns on allocated portfolio assets. As we have observed here, the chosen investment strategy will absolutely have an effect on

the level and volatility of the calculated stochastic reserve. Companies will be well-served to reevaluate the investment strategy for their life insurance portfolio, including projections of how PBR reserves will emerge over alternative planning scenarios. This will require a capacity to calculate reserves over many scenarios, strategies, and circumstances specific to each company. In the absence of this capability, companies many hold higher reserves than necessary—and not even know it! ■

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APPENDIX:

Figures A1-A3 are synonymous with Figures 6–8 within the report except the figures in the Appendix have a starting yield curve meant to represent more "normal" interest rate levels with 5 percent at the 10-year point and 5.6 percent at the 30-year point:

Figure A2
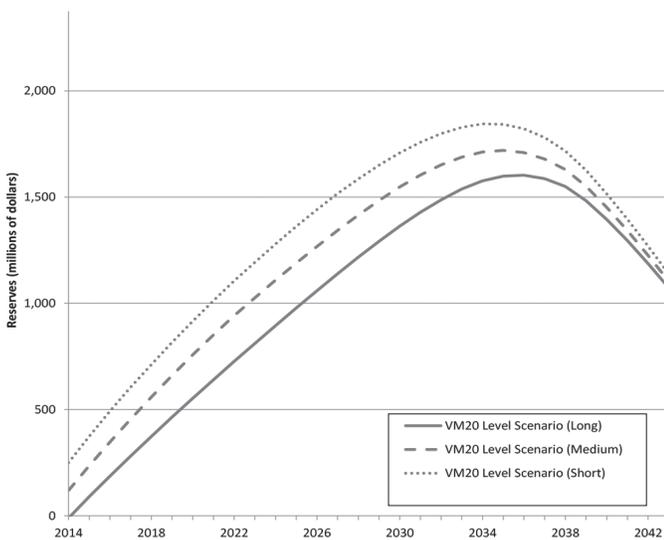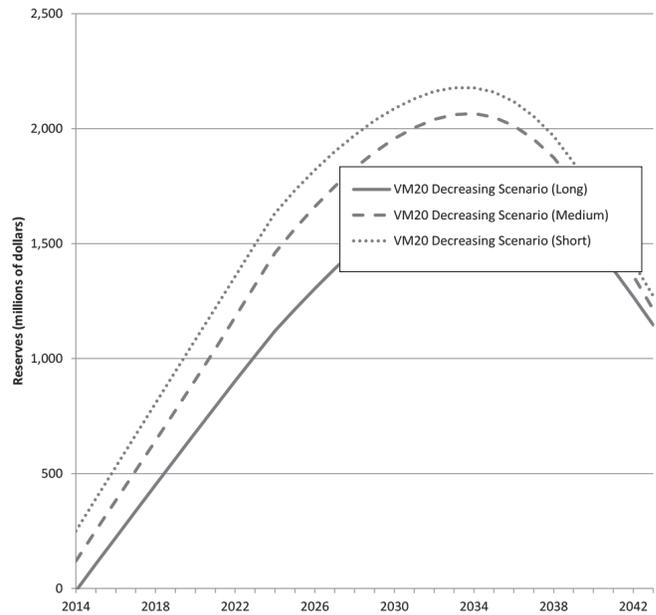
Figure A1

Figure A3
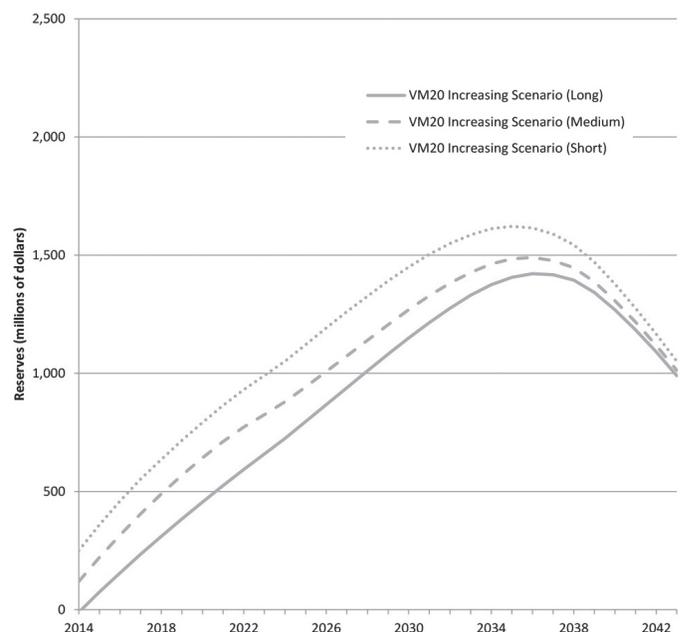
Default cost components:

(1) The default costs were calculated using cumulative default rate and recovery rate data published by Moody's in February 2008. Default rates and recovery rates underlying the default costs were generally estimated at a CTE 70 level. Therefore, the prescribed default costs incorporate margins at around the CTE 70 level.

(2) To calculate the spread related factor in the first projection year, subtract the long-term spread from the current and multiply by 25 percent. This amount can be positive or negative and grades linearly in annual increments to zero by projection year four. The amount is also floored at the negative of the projection year one baseline default cost and can be no larger than twice the same baseline default cost in the first projection year.

(3) The maximum net spread adjustment would be necessary in instances where, and in the amount of, the net spread for starting assets is in excess of the current net spread for purchased assets of Moody's credit rating of Baa2. This amount grades to zero linearly over four years, similar to the spread related factor. ∎

Residual Risk When Hedging Delta and Rho of Equity Options

By Mark Evans

This article explores the effectiveness of hedging delta and rho of equity options. This provides insight into the frequency and severity of losses due to not hedging volatility risk (vega) or other higher order risks, often known as "greeks." Ten-year equity put option strategies were chosen to represent the risk of hedging guaranteed benefits attached to variable annuities, while one-year put and call strategies were modeled to investigate the risk of hedging equity index interest credited to fixed indexed annuities. In both cases, the value of the option was compared to the value of delta/rho hedges in the tail of both actual historical and simulated scenarios for equity returns and volatilities. The historical path of interest rates and equities was generally used to highlight the hedge impact for different implied volatility assumptions in each example.

FRAMEWORK: DATA AND MODELS FOR INTEREST RATES AND EQUITIES

To simulate the investment environment for hedging, a model was built in Visual Basic for Applications in Excel. Input data included the daily closing value of the S&P 500 index price from Jan. 2, 1962 through Sept. 23, 2014 and daily treasury yields for one, two, three, five, seven, and 10 year bonds. Any missing Treasury yields were estimated using interpolation. A cubic spline was used to interpolate Treasury yields at six-month intervals, and corresponding present value factors for each six month period were boot-strapped. Then for intervening discount factors, the model assumed a constant interest rate during each six-month segment of the curve. Thus an entire yield curve was built for each business day. The model captures the short rate each day for a given put issue date as the one-year Treasury yield. Thus each day's short rate came from a new yield curve as the model moved from one business day to the next. Lastly, the short rates from any given put issue date to the exercise date were accumulated to build a discounting curve for the put. That will be referred to as the Actual Interest Curve. It is used to accumulate and discount actual payoffs for evaluating effectiveness.

Besides the bulk of the simulations that used historical equity returns, two tests were done using a stochastic volatility model to change volatility quarterly and generate equity returns. This provided two paths of stochastically generated equity index scenarios.

In these two runs, equity returns were generated with the following algorithm:

Let σ(t) be the volatility for quarter t. Let ε be a random normal variable. Then the stochastic volatility for the quarter is calculated by two steps. First, the intermediate variable v is calculated. Based on a random number, one of three formulas is used to calculate v. The formulas and probability attached to each are as follows:

99%: $v = .1*\exp\{.07\epsilon - .07^2/2\}$

.5%: v = .4

.5%: v = .65

Then once this calculation is done, we set $\sigma(t) = \max\{v, .65\ \sigma(t-1)\}$. We use this volatility, historical treasury rates, dividends, and a risk premium of about 2 percent to generate the stochastic scenarios.

This procedure is roughly calibrated to historical S&P 500 returns.

10-YEAR PUT OPTION HEDGING

For the long-dated case, the model sold a 10-year ATM put for each trading day from 1962 to 2004 with a notional amount of 100 and implied volatility of 27 percent. The last put was sold on 9/27/2004 for a total of 10,758 puts. The model hedged delta with S&P futures. For simplicity, it assumed futures expire on each trading day. The model hedged rho with a zero-coupon treasury note that had a maturity date equal to the put expiry date.

Simplifying assumptions were made about futures and treasuries mechanics. Transaction costs such as ticket fees, roll costs and initial margin were not reflected. Futures and treasuries were rebalanced daily at the close.

Tests Performed
The model tested conventional delta/rho hedging of an at-the-money 10-year option with various volatility assumptions and daily rebalancing based on the indicated risk statistics of the option.

The model varied the equity index volatility used to calculate delta and rho from 16 percent to 35 percent, resulting in 20 separate test runs. For any given test run, implied volatility was held constant for all puts at all tenors.

The model also looked at a reduced trading algorithm whereby delta and rho were calculated at two different equity volatilities

and no trade was made if the two volatilities suggested trades of opposite sign. If the suggested trades had the same sign, then the smaller of the two trades was made. This was tested as a range around 17 percent volatility and also tested as a range around volatility in the high 20s.

A special run was done with randomly shuffled daily equity returns to investigate how autocorrelation of equity volatility affects the result.

A second test was run using historical returns on a put struck at 50 percent. This was done with volatilities ranging from 20 percent to 33 percent.

Statistics Calculated

All values were discounted using the Actual Interest Curve.

For each 10-year hedging simulation, the hedging cost was expressed as a percentage of the initial notional amount. "Hedge slippage" was measured as the incremental cost of the dynamic hedge program vs. the initial cost of the option (which assumed implied volatility of 27 percent). If real-world experience evolved exactly as the Black-Scholes formula indicates, then the average hedging cost in the output tables below would be the same as the price of the option. Since the real-world historical scenario excludes a market risk premium, the average hedging cost should be expected to be less than the price of the option. However, the tail of the hedging cost distribution indicates the amount of unexpected losses the hedger would have experienced by limiting the program to a first-order delta-rho strategy.

For each hedging volatility, the average hedging cash flows were calculated and the percentile results assuming an initial cash position equal to the price of a 27 percent volatility put were tabulated. The model evaluated hedge slippage at the 90 percent, 95 percent, 97.5 percent, 99 percent and 99.9 percent point in the distribution as well as the maximum observed difference. The put issue date for each of the above percentiles was also captured.

For each hedging volatility, the hedge efficiency was calculated as the square root of the quantity of one minus the ratio of the variance of accumulated hedged results to the variance of unhedged put payoffs.[3]

Numerical Results

The average historical realized equity volatility across all the 10-year puts is almost exactly 16 percent.

For the basic historical test, the average cost of hedging is fairly insensitive to the hedging volatility, but the dispersion of results by the various measures above were all minimized around 28 percent to 30 percent volatility. The volatility assumption also impacted which dates corresponded to the highest hedging cost. Results were similar for a 50 percent strike except that lower-

ing the volatility assumption reduced the average hedging cash values at the cost of increasing the dispersion of results. Hedge efficiency could not be calculated for the 50 percent strike as there was never actually a payoff.

The results are summarized in the following tables which show the tail of the distribution of realized hedging cost (assuming an initial cash position corresponding to an option premium calculated at a 27 percent volatility for the percentile calculations) as a percent of the initial notional amount, at various assumed implied volatility assumptions.

TABLE 1: 10-Year Put, 100% Strike					
Pct'ile\Volatility	16%	20%	25%	30%	35%
90	0.96	2.42	2.85	2.62	2.33
95	-0.50	1.68	2.47	2.28	1.57
97.5	-2.18	-0.21	2.19	2.15	1.38
99	-4.72	-1.08	1.95	1.85	1.25
99.9	-6.46	-2.39	1.29	1.49	0.91
100	-7.17	-3.39	0.67	1.36	0.74
Avg Hedge CF PV	-5.20	-5.21	-5.13	-4.96	-5.12
Std Dev(Hedge)	3.68	2.96	2.52	2.46	2.62
Hedge Efficiency	56%	75%	82%	83%	81%

TABLE 2: 10-Year Put, 50% Strike			
Pct'ile\Volatility	20%	25%	30%
90	0.11	-0.12	0.05
95	-1.26	-0.88	-0.15
97.5	-2.52	-1.30	-0.34
99	-3.20	-1.58	-0.44
99.9	-3.59	-1.82	-0.61
100	-3.70	-1.88	-0.65
Avg Hedge CF PV	-0.72	-0.91	-1.06
Std Dev(Hedge)	1.14	0.82	0.64
Hedge Efficiency	n/a	n/a	n/a

At a 100 percent strike, realized actual interest convexity is worth about 1 percent of equity volatility. That is to say, with historical interest rates, the average cost of hedging corresponds to 17 percent volatility. If interest rates are levelized and frozen, then the average cost of hedging corresponds to 16 percent volatility.

At a 50 percent strike, hedging costs correspond to 21 percent to 23 percent volatility depending on the hedging volatility assumption. This sounds like volatility skew, but when constant

> Results for the two stochastically generated paths were very much different from both each other and the historical path based results.

dividends and interest are used instead of actual, the hedging costs correspond to a 17 percent volatility implying that most of the added cost is due to interest convexity, not volatility skew. This makes sense, since it is hard to imagine that volatility skew matters as much on long-dated options as on short-dated options.

The reduced trading algorithm worked slightly better when the band was around 17 percent as compared to a constant 17 percent hedging volatility, but at the higher volatility test mentioned above, it performed noticeably worse. Given the complexity and unimpressive results of the reduced trading algorithm, this does not seem like something worth further consideration.

When the daily returns were randomly shuffled, assuming a level 16 percent volatility resulted in 99 percent hedge efficiency, implying that the shuffling obscured legitimate volatility trends. Hedging costs are primarily a function of volatility, not market direction.

Results for the two stochastically generated paths were very much different from both each other and the historical path based results. For the first path, the percentiles and equivalent volatility looked best for a 23 percent volatility, the average cost dropped as volatility went up, but the standard deviation of the hedge cost was lower for lower volatilities. For the second path, while the average hedge cost was similar to historical, there were a lot of puts with a very high hedge cost, in other words, results were much more dispersed, particularly at the higher hedging volatilities. The divergent results from the stochastically generated paths strongly suggests that the results suggesting using a high volatility to get less divergent results are an overfit to the historical data. Note that there is a lot of overlapping in our 50 years of data, since if we prohibited overlapping data we would have modeled only five puts.

ONE-YEAR PUTS AND CALLS

The study was repeated for one-year puts and one-year calls. The last option was sold on 9/23/2013 for a total of 13,021 options. The average realized volatility across all the one-year options was almost exactly 14.8 percent.

As the hedging volatility increases, the average hedge cash flow worsens, but the dispersion of results in the tail improves while hedge efficiency is nearly constant. The results are similar for both puts and calls which is to be expected due to put/call parity or equivalent gamma (one implies the other). Interest rate volatility impact is different between the two, however.

The results are summarized in the following tables which show the tail of the distribution of realized hedging cost (assuming an initial cash position corresponding to an option premium calculated at a 27 percent volatility for the percentile calculations) as a percent of the initial notional amount, at various assumed implied volatility assumptions.

TABLE 3: 1-Year Put, 100% Strike					
Pct'ile\Volatility	16%	20%	25%	30%	35%
90	-6.42	-6.56	-6.81	-6.80	-6.60
95	-8.63	-8.51	-8.35	-8.17	-8.15
97.5	-10.12	-10.30	-10.75	-10.38	-10.78
99	-12.27	-11.92	-12.10	-13.18	-14.29
99.9	-16.89	-15.76	-15.06	-15.45	-16.54
100	-23.10	-20.66	-18.48	-16.90	-16.73
Average Hedge CF PV	-4.70	-4.83	-4.95	-5.04	-5.09
Std Dev(Hedge)	4.65	4.64	4.67	4.72	4.78
Hedge Efficiency	78%	78%	77%	77%	76%

TABLE 4: 1-Year Call, 100% Strike					
Pct'ile\Volatility	16%	20%	25%	30%	35%
90	-7.21	-7.22	-7.31	-7.30	-7.14
95	-8.72	-8.85	-8.99	-8.91	-8.97
97.5	-9.39	-9.74	-10.15	-10.44	-10.92
99	-11.70	-11.15	-11.81	-12.33	-13.21
99.9	-15.92	-15.02	-14.32	-14.98	-16.11
100	-22.01	-19.58	-17.39	-15.81	-16.26
Average Hedge CF PV	-7.02	-7.16	-7.28	-7.36	-7.42
Std Dev(Hedge)	5.74	5.80	5.90	5.99	6.07
Hedge Efficiency	84%	84%	83%	83%	82%

CONCLUSIONS

As we have seen, the best volatility to use for delta hedging is revealed only in retrospect which is of little practical use. Using something drastically different than a reasonable expectation of future volatility, however, is not practical. On the other hand, a precise prediction of volatility has a smaller impact on hedge

efficiency than one might intuitively expect. Second, we see that hedging only first order risk results in hedge efficiency significantly lower than 100 percent. Hedging only the first order risks may be a problem where the unhedged risk is large compared to the overall size of the insurer and/or earnings volatility is a concern.

For questions and comments on this study, as well as much more detailed statistics and associated graphs, please send an email to mark@appliedstochastic.com. ∎

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ENDNOTES

[1] http://data.treasury.gov:8001/Feed.svc

[2] In certain cases the result was also expressed as an equivalent number of percentage points of equity volatility, by comparing hedging cost to the put prices calculated at various volatilities and the forward curve on the put issue date.

[3] The standard deviation of the unhedged results was 4.45, 7.36, and 10.62 for the 10-year put, one-year put, and one-year call respectively.

[4] Average put costs are .73, .88, 1.05 at 21 percent, 22 percent, and 23 percent volatility respectively.

Investment Section Breakfast in Austin

By Frank Grossman and Jeff Passmore

I t was a pretty warm week in Austin, Texas, during the 2015 Annual Meeting & Exhibit from Oct. 12-14, 2015, with record-breaking temperatures recorded in the upper 90s. Investment section members were confronted by a 98.7 degree scorcher on the first day of the meeting. Under these conditions, the cool pre-dawn walk to the Hilton for the early 7:15 a.m. start of our Investment Section breakfast a couple of days later was a definite relief.

The Investment Section routinely sponsors a breakfast session at SOA meetings, providing a chance to network with colleagues. The Austin breakfast was also an opportunity for incoming section chair Jeff Passmore and outgoing chair Frank Grossman to share news about recent and upcoming section happenings, including:

- key sessions at the 2015 Investment Symposium Philadelphia and the 2015 Life & Annuity Symposium New York earlier in the year;

- our semi-annual Risk and Rewards newsletter, including tips on how to make our newsletter editors happy; and

- the continuing importance of section volunteerism, recognition of the contributions of outgoing council members, and introduction of the 2015-16 section leaders.

Council member Jon Mossman also came to the lectern, and took a moment to briefly present the results of the recently concluded annual asset allocation contest.

Jeff, as vice-chair of the 2015 Redington Prize organizing committee, then said a few words about this year's prize. Every other year, the Investment Section Council awards the Redington Prize recognizing the best paper written by an actuary on an investment-related topic during the preceding two years. The prize is sponsored by the Investment Section and is named after Frank M. Redington, the eminent British actuary who coined the term "immunization" in his seminal 1952 paper "Review of the Principles of Life Office Valuation" published in the Journal of the Institute of Actuaries.

Phil Gold (right) accepted the ceremonial $10,000 check on behalf of the Redington Prize winning paper's authors from incoming Investment Section Council chair Jeff Passmore (left). (Photo: David Schraub)

The 2015 Redington Prize winning paper is "Optimal Portfolios under Worst-Case Scenarios" by Carole Bernard, Jet Seng Chen and Steven Vanduffel. Unfortunately, the authors were not in attendance at the breakfast session, but Phil Gold joined Jeff on the podium to accept the $10,000 award, and an oversized ceremonial check, on behalf of the author group. Investment Section members can access the winning paper through
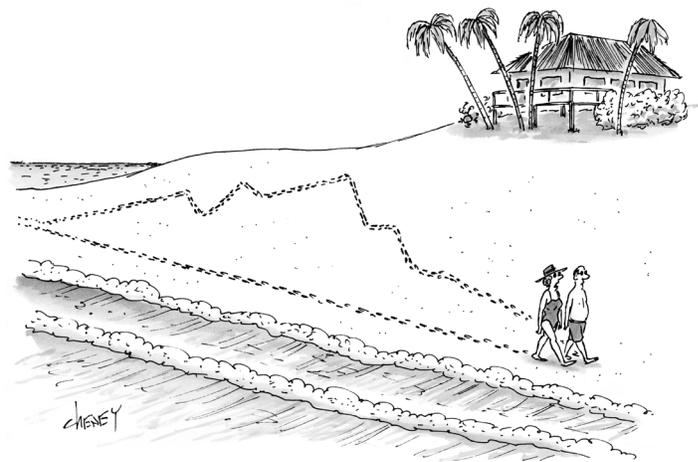
"Will you please try to get your mind off of the S.&P. Index?"

the EBSCO facility via the section's webpage (i.e., https://www.soa.org/Professional-Interests/Investment/Access-Ebsco.aspx). Nominations for the upcoming 2017 Redington cycle will be received in spring 2017.

Section breakfast sessions usually enlist the support of a local guest speaker to deliver thoughtful investment content. And Sandy Leeds, distinguished senior lecturer of the McCombs School of Business at the University of Texas (Austin), certainly fit the bill; delivering a whirlwind in-depth assessment of the recent run-up in the external value of the U.S. dollar—touching on both contributing factors and the outlook for the dollar going forward—all in just under 30 minutes.

The Thomas C. Barham III Speed Chess Networking Event was held on Tuesday evening, and the tournament's eventual winner, Charlie Larimer, was up early the next day to attend the breakfast. Charlie was the most senior player at the chess event and earned a perfect 5:0 result, demonstrating that old(er) wine is often the best wine!

The investment cartoon caption contest returned after its debut at the 2015 Life & Annuity Symposium section breakfast in New York City. Once again, attendees were challenged to come up with an alternate caption for a vintage cartoon from the pages of *The New Yorker*, this time by Tom Cheney. The original caption was "Will you please try to get your mind off of the S.&P. Index?" spoken by a lady to her husband while walking together along a tropical beach, as his footprints traced out a path that deviated from her baseline track. Phil Gold put on his thinking cap and delivered a clever caption: "This doesn't look normal to me." On reflection, there's much about current market conditions that seems positively abnormal. And in that vein, Phil won a copy of Reinhart and Rogoff's *This Time It's Different* for his creative effort at such an early hour.

The luck of the Canadian contingent held through to the conclusion of the breakfast session as Shuyin Mai won the door-prize book draw—a copy of Kindelberger's *Manias, Panics, and Crashes*—to read on the return flight home. ■

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The fifth Thomas C. Barham III Speed Chess Networking Event was held at the JW Marriott Austin on the concluding evening of the 2015 Annual Meeting. Once again, this networking event was co-sponsored by the Technology and Investment Sections, and attracted more than 35 chess players, assorted kibitzers and friends. Twenty-seven actuaries participated in a five-round speed chess tournament: Carlos Arocha, all the way from Zürich, battled jet-lag and took second place (left); Charles Larimer finished in top spot with an undefeated score (center); and Sven Sinclair took third place. (Photo: Frank Grossman)

The organizing team for the TCB3 event were chess arbiter Julia Hall (left), event co-ordinator Albert Moore (centre), and international chess master and tournament director Carolina Blanco (right). In addition to networking over light refreshments, the speed chess tournament, and numerous pick-up blitz games, Ms. Blanco conducted a short teaching session titled, "Zwischenzug and Zugzwang: Two Game-Changing Tactics to Improve Your Results." Check out 2015 AM Session 135 on soa.org for a copy of her interesting slide presentation. (Photo: Frank Grossman)

2015 Investment Section Asset Allocation Contest Results—So Much for Tame Markets!

By George Eknaian

The 2015 version of the Asset Allocation Contest for section members is now complete. We would like to thank all of the participants in the contest for their willingness to participate and their feedback. This is the third year that we have run this contest, and we expect to do so in future years as well.

In presenting the results for this year, I think the best way to begin is by quoting Benjamin Franklin: "An investment in knowledge pays the best interest." It was a challenging six-month period for investors, with a time period of fairly positive returns (some significant) in April and May, followed by very volatile and negative returns for the last four months. It is probably hard to remember, but returns for the first two months of the contest were positive in seven out of the 10 asset classes that were ETF choices for the contest, with the EAFE ETF (symbol EFA) showing the highest price return during that time (just under 4 percent). Unfortunately, by the end of the contest, the only ETF showing positive return was the short duration bond ETF (symbol GSY). All other asset classes were negative, with emerging markets showing the worst return at almost an 18 percent loss for the six-month period. The Commodities ETF (symbol DBC) is emblematic of the volatility and direction of returns; for the first month, the ETF had a positive 7 percent return, followed by a month of negative and positive returns for May and June, and then a 17+ percent swoon for the last three months.

Not many folks took advantage of the ability to manually rebalance, which given the general direction of returns, resulted in only one participant (who unfortunately was not eligible to win the prize) having positive returns for the six-month period. There were three prizes awarded—highest return, lowest risk measured by annualized standard deviation, and best return-to-

risk ratio. Given the returns on the ETF, folks that chose the 20 percent short duration bond ETF, 80 percent total bond ETF asset allocation dominated the winning results. The winners were as follows:

Highest Return—Alan Wong with a -.2927 percent return and won via tiebreaker,

Lowest Risk—Tom Anichini with a 1.81 percent annualized standard deviation, and

Best Return/Risk Ratio—Vladimir Martinak with a -.136 ratio and won via tiebreaker.

The choice of predicted returns was very important in this contest, as two out of the three winners had to be determined via the tiebreaker of predicting what returns, risk, and return/risk ratio would be for the chosen asset allocation. Congratulations to the winners! For those of you that are interested in seeing the results, they are posted on the Investment Section page on the SOA website.

Thank you once again for participating and we look forward to your participation in the 2016 contest. There will be some changes made due to feedback we received as well as the natural evolution of the contest. Please feel free to contact any Section Council members with suggestions you may have for changes to make the contest even better! ■

George Eknaian, FSA, CERA, MAAA, the section vice chairperson, is a consulting actuary with experience in all sectors of the life insurance business. He may be reached at george.eknaian@comcast.net.

An investment in knowledge pays the best interest — Benjamin Franklin

Correspondent's Report from the SOA 2015 Annual Meeting and Exhibit

By Warren Manners, Martin Bélanger, Jeff Passmore, Jon Mossman, Peter Sun

The 2015 SOA Annual Meeting was held at the Austin Convention Center in the heart of the Austin, Texas business district. The ACC is nestled between the shores of Lady Bird Lake and the historic 6th street district, offering visitors a diverse cultural flavor of what the capital of Texas has to offer. This year's annual meeting provided members with an eclectic menu of topics to choose from including product and regulatory updates, new in-force management strategies, application of behavioral economics to the insurance world, and a session on how actuaries can better project confidence and courage. There was even a *Shark Tank* themed session where real business ideas in search of investment dollars were pitched to sharks and audience members alike.

A great many sessions had to do with predictions: interest rates, reserve regulations, reinsurance trends, etc. One of the most provocative was the opening presentation by the keynote speaker, Salim Ismail. The predictions he highlighted were fantastic, extreme and mind blowing … and more than likely to come true. It brought to mind a quote from the legendary Yogi Berra, "It's tough to make predictions, especially about the future."

What follows is a brief report from Investment Council members on some of the more investment-focused sessions as well as a wine tasting network event co-sponsored by the Investment Section and the Entrepreneurial Actuary Section. [WM]

EQUITY INVESTING FOR LIFE INSURERS (SESSION 90)

As the title suggests, this session focused on the use of equity type investment vehicles in life insurer general account (GA) portfolios. Mary Pat Campbell from Conning Research and Consulting kicked things off by providing a historical perspective. She began with a theme that was likely the preface of half the presentations at the annual meeting: the persisting low interest rate environment has driven insurers to look outside of their traditional comfort zone in search of extra yield. An optimistic projection of rates still shows net book yields are not expected to get back to 2008 levels for another six years. A less optimistic (Japan) scenario could extend it much further and recent U.S. history looks eerily like the early days of the Japan deflationary period.

Conning research showed a clear trend in the growth of Schedule BA assets for life insurers, primarily in joint ventures and hedge funds. In 2013 Conning polled life insurance CEO's asking what their investment plans were for the near term. While a majority indicated a desire to increase GA allocations to preferred and common equity, the data shows they have tended to hold steady at around 1 percent of total GA assets. There have been some exceptions though, specifically for new Private Equity and Asset Management firms that have acquired fixed and equity indexed annuity blocks.

Peter Sun from Milliman took the podium next, offering a forward looking perspective that outlined the cost/benefit tradeoff of increasing exposure to equities. Peter began by highlighting the benefits of investing in equity, namely, higher returns over long periods, high liquidity, and a hedge against inflation. The latter is particularly important as retirement income protection products take off, which are more exposed to inflation than pure insurance.

Sun outlined three primary challenges to investing in equity: 1) uncertainty of returns, 2) lack of equity selection expertise in house, and 3) a high 30 percent RBC charge.

Regarding uncertainty of returns, gross fixed income yields over the past five years are down nearly 100 bps whereas the average equity return is greater than 10 percent. So even with a 30 percent RBC charge you can still achieve risk adjusted returns comparable to decent fixed income returns. Additionally, the GFC has demonstrated that fixed income values can be just as volatile as equity returns.

Regarding in-house expertise, the enhanced investment techniques VA writers have developed over the past two decades are now being considered for GA portfolios. Strategies like volatility control funds, risk control funds and CPPI can be customized to target a certain desirable level of volatility and a way to manage overall exposure.

Lastly, regarding the high RBC charge, two strategies were posited as ways to help mitigate this cost. One takes advantage of the short futures positions utilized by these aforementioned allocation strategies. These short positions can offset long cash positions, reducing the dollar RBC charge. The other approach is to use ICOLI—insurance company owned life insurance—as a wrapper around Risk Managed Funds. RBC uses a look-through principle that looks to the underlying investment to determine the appropriate risk charge, but this principle does not apply to ICOLI policies. The RBC charge is tied to the ICOLI policy rather than the underlying investments which could potentially

lower the RBC percent charge substantially (full disclosure, Sun emphasized the importance of discussing this strategy with a tax expert). [WM]

DC PLANS—THE END OF CHOICE (SESSION 94)

Session 94 was one of the many sessions that focused on defined contribution pension plans, an area that was underserved by the SOA Annual Meeting in the past. This is a welcome development as DC plans have become a permanent fixture.

Three industry experts provided their point of view on the DC market. The first speaker, Marcia Dush of Buck Consultants, provided an overview of the evolution of the DC market, since the enactment of ERISA in 1974. DC plans went from being supplemental savings plans to being the primary retirement vehicle for many workers. Although a return to DB plans is unlikely, she highlighted the two main benefits they provided to members: 1) employees did not have to make choices, and 2) the plan delivered a predictable retirement income. Her suggestion was to make DC plans more like DB plans by introducing auto-features and focusing on retirement income and not accumulated assets.

The second speaker, Gene Paranczak of Vanguard, presented the plan sponsor view. He provided an overview of the trends in plan design for DC plans. These include streamlined lineups, automated features, professionally managed accounts, a focus on fees and better engaged and educated participants. He described the concept of tiering, which involves having different groups of funds, each targeted to a different group of members. Tier 1 funds are all-in-one investments, such as target-date funds and target passive members. Tier 2 funds are broadly diversified investment options, covering equity, fixed income and capital preservation. Tier 3 funds include specialty investment options and are intended for do-it-yourself investors.

The last speaker, Lori Block of Buck Consultants, presented the participant view. She made the point that most plan members are smart and well intentioned, but that sometimes reality gets in the way of doing the right thing. She argued that we should focus on financial wellbeing and not so much on retirement readiness. Financial wellbeing focuses on the total individual, not just on their financial assets. Her approach involves under-

> This year's meeting agenda included a *Shark Tank* themed session where real business ideas ... were pitched to sharks and audience members alike.

standing who your audience is and that the messaging must be different depending on the generation you're addressing. Some of the tips she suggested to reach your audience include being entertaining in your delivery of education, targeting your messaging, providing accessible self-diagnostic tools, tracking members' progress and personalizing features.

Overall, this was a very strong session that covered a lot of ground and was very applicable even to a non-U.S. DC plan sponsor. [MB]

NEW DEVELOPMENTS IN PENSION FUND INVESTMENTS (SESSION 180)

This presentation was a panel-style presentation representing four different perspectives on recent developments in pension investing.

There was an audience of about 30 investment actuaries with a variety of backgrounds. Some were pension actuaries working mainly on the liability side of the pension balance sheet. Others were investment consultants. Most worked with corporate pension plans in the U.S. However, there were a number of Canadian actuaries and some public pension actuaries as well.

The presenters were pleased with the audience participation—there was a lively question and answer session at the end. They were also pleased with the size of the audience given this session was in the final time slot of the final day of the Annual Meeting.

Simplify, Grow and Protect

Tamara Burden, FSA, CFA, is a principal and managing director of Milliman Financial Risk Management. She presented a retirement investment risk management approach that is an alternative to traditional asset allocation and diversification. This approach, titled the Managed Risk Strategy uses a futures overlay to capture a majority of the upside of equity performance and protect against the majority of the downside of equities.

Tamara advocated for the approach by first illustrating the historic failure of diversification through static asset allocation. She pointed out the increasing correlation of different asset classes, especially during times of trouble. She also pointed out the consistent relationship of equity underperformance during periods of high volatility.

Furthermore, she illustrated how periods of low volatility and high volatility tend to persist and showed that this suggested a dynamic approach to volatility management. Using market returns from 2000 through 2014 and simulated portfolios, she illustrated the outperformance of this approach to a static allocation of 60 percent stocks and 40 percent bonds. She concluded by illustrating how this approach can be even more powerful during the pay-out phase of retirement investing.

Pension Risk Transfer

Scott Gaul, FSA, MSAA, is SVP and head of Distribution, Pension Risk Transfer for Prudential. He presented on the pension risk transfer (buyout annuity) market in the U.S. He first discussed tools along the risk management spectrum for U.S. corporate pension plans—including taking advantage of funding relief, risk reduction strategies with plan design, liability driven investing asset strategies and risk transfer strategies. He then described three risk transfer alternatives, comparing the advantages of lump sums to buy-in annuities and buy-out annuities.

Scott spent some time clarifying the differences between buy-in annuities where the annuity is an asset of the plan, and a buy-out annuity where the annuity becomes an asset of the participant and the plan liability is settled. Scott showed how the new corporate pension mortality basis of RP 2014 and MP 2014 made buy-out annuities cheaper than the all-in, economic cost of managing a pension plan. He concluded by discussing in-kind asset transfers as part of a buy-out annuity purchase.

Recent Developments in Corporate Pension LDI

Jeff Passmore, FSA, CFA, is an LDI strategist with Barrow, Hanley Mewhinney and Strauss. He discussed two trends in corporate pension liability driven investing: building customized liability benchmarks and pension funded status and risk reporting. With each he provided some observations and things to watch out for.

In discussing custom liability benchmarks, he described a framework for analyzing the three hedgeable sources of pension volatility and provided some quantification of each of these sources relative to the total pension volatility. He suggested that volatility from credit spread changes can be much greater than is commonly believed and described how this can undermine some approaches to pension hedging. Jeff also discussed how the duration of pension liabilities can be different than the duration of the benefit cash flows and how this issue could be addressed from a practical standpoint.

Second, Jeff spent some time discussing pension asset-liability reporting and suggested some best practices. These included providing information in a tiered format with a summary for those readers only needing the high level information. This summary can be followed by detailed information for those readers requiring more detailed information. He concluded by describing pension risk measures that could be used in an asset-liability report to help plan sponsors monitor progress in de-risking the plan.

Liability Driven Investing for Small DB Plans

Alexander Pekker, ASA, CFA, Ph.D., is the director of Quantitative Strategies at Sage Advisory Services. Alex explained an economical approach that small companies can take to implementing LDI. He began by showing the size of the small plan market—81 percent of pension plans with at least $1million in assets have $25 million or less in assets. He suggested that these plans are underserved, despite being subject to the same regulatory requirements as larger plans.

He then illustrated many of the challenges that small plan sponsors face and discussed which of these can be addressed. In particular, he discussed how exchange traded funds (ETFs) can be used to create customized solutions in an economical way for small plan sponsors. He contrasted ETF-based solutions with mutual fund-based solutions, highlighting the shortfalls of mutual fund approaches and the benefits of ETF-based approaches.

Alex also pointed out the importance of appropriate LDI expertise in creating these solutions including investment actuarial expertise. He concluded by showing an example that illustrated the hedging success of an ETF-based solution for a small pension plan. This example used five years of historical market returns to illustrate the hedging capabilities of this approach. [JP]

The presentation is available on the SOA website at: *https://www.soa.org/files/pd/2015/annual-meeting/pd-2015-10-annual-session-180.pdf*

RISK MANAGED FUNDS: PRINCIPLES AND APPLICATIONS (SESSION 123)

Insurance companies have widely adopted Managed Risk Funds within their variable annuity offerings over the last several years. Currently, there are approximately 200 Managed Risk funds in the VA space with over $270 billion in assets; five years ago, only a handful of these funds were live in the market. This widespread adoption of Managed Risk Funds sprang from the financial crisis, as insurance companies looked to design more sustainable variable annuity offerings.

Managed Risk Funds have advantages and disadvantages for investors. Although Managed Risk Funds will potentially reduce returns during rising markets, they can also provide substantial benefits during severe, sustained market declines. This is particularly important for retirement-oriented investors, who face the sequence of returns dilemma.

Going forward, the insurance industry faces certain challenges regarding Managed Risk Funds. One major challenge concerns benchmarking, and how to evaluate the performance of these funds. Risk Controlled indices and peer group comparisons can be helpful benchmarking tools.

Zack Brown from Milliman and Samir Mathur from the Capital Group presented on the history and rationale for the development of Managed Risk Funds. This session gave a fairly comprehensive overview of the Managed Risk Fund landscape with

Zack focusing on VA writer's perspective and Samir focusing on the fund company's perspective. [PS]

JOINTLY SPONSORED WINE TASTING NETWORK EVENT

The Entrepreneurial Actuary Section and the Investment Section jointly sponsored a wine tasting at MAX's Wine Dive on Tuesday night. Co-hosting the tasting were Stephen Camilli, vice chair of the Entrepreneurial Actuary Section Council and Jon Mossman, vice chair of the Investment Section Council. The sommelier who led the session was very enthusiastic and very knowledgeable and encouraged the group to speak up about their thoughts on the wines we were tasting. Four wines were tasted in order from the lightest to the heaviest.

The first was a sparkling wine from the Loire Valley in France. Many tasters agreed it had a dusty undertone which apparently comes from the yeast that has died in the bottle after the second fermentation has taken place (space does not allow me to go into a detailed description of the method used to produce quality sparkling wines). The second wine was a Riesling from Mosel, Germany which people were surprised to note had a faint taste of gasoline which is a classic feature of a good Riesling. The third wine was a Cotes du Rhone red from France which was spicy and had a hint of leather on the nose. The last wine tasted was a Merlot from Tuscany, Italy and was excellent despite what the movie Sideways had to say about Merlot.

After the official tasting, attendees stuck around for a glass or two of their favorites, some delicious tapas and some networking with fellow wine-loving actuaries. [JM] ■

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Jon Mossman, FSA, is a consultant with Towers Watson. He can be contacted at Jonathan.Mossman@towerswatson.com.

Peter Sun, FSA, MAAA, is a consulting actuary with Milliman. He can be contacted at peter.sun@milliman.com.

Investment Section Council Call For Volunteers

The SOA Investment Section Council is seeking talented individuals living in geographic locations outside of the US/Canada to help shape the Investment Section newsletter, *Risks & Rewards*. R&R recently started a new section titled "International Focus" designed to provide international actuaries with a platform to share interesting investment related topics from their region.

The council is looking for volunteers to be Investment Council Regional Representatives from Latin America, Central Europe and Asia/Pacific—responsibilities include authoring articles, being a conduit for other regional actuaries looking to publish articles, and helping to connect events in your region with the worldwide investment actuarial community.

Ideal candidates will have strong English writing skills and be able to ensure accuracy of content in articles before submission. Interested candidates please send an email to warren_manners@swissre.com and nboezio@sympatico.ca explaining why they are interested in the job and why they believe they would be a good fit.

International Focus
The Far East: Stepping Up

By Fred Ngan, Michael Chan and Eric Forgy

The insurance story in Asia has been so dominated by "growth"—for example, China's doubling of insurance industry assets over the last five years—that is it easy to lose sight of the many other interesting tides through which Asian insurers are navigating. The product demands in Asia are ultra-localized yet rapidly evolving, as are the regulations and capital markets. Coupled with the continued strong growth, these demands may pose many pronounced business management challenges for life insurers that can no longer simply focus on growth.

With the exit of several multinational insurers such as AIG and ING from the region to shore up capital back home, local offices often are left without the support of sophisticated group actuarial, risk and investment functions. While this may have relieved local offices from foreign requirements that were at times burdensome and incompatible with the domestic market, relatively new capital management functions need to setup their own frameworks while keeping pace with the rapid business developments. This article aims to share some experiences in insurance investment management from the Far East.

Asia is a complex arena that challenges insurance companies at all stages of their Asset Liability Management (ALM) processes. This article illustrates some of the interesting stories faced by investment actuaries at every step of the path, starting with finding suitable asset classes in which to invest, to the competition in sourcing the assets, to managing conflicting views across risk and constantly-changing regulatory frameworks at all stages of development and balancing all of these demands with relatively young risk and capital functions.

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At the 2015 SOA Annual meeting in Austin, president-elect Craig Reynolds highlighted as one of his five essential areas of focus, supporting our members in international markets and enhancing the global reputation of our organization. With that as backdrop, Risks &Rewards is proud to introduce a new section of our newsletter titled International Focus.

This new section will provide a platform for authors from around the globe to share topical, investment related ideas, initiatives, regulatory developments, etc., related to their specific region. We encourage volunteers to raise their hands if they are interested in supporting this exciting endeavor. Support would entail identifying potential topics of interest and seeking out authors with professional experience in their regions to write an article—roughly 900-1000 words in length—for publication. Interested parties should contact both the SOA Investment Section Council chairman, Jeff Passmore, at jeffpassmore@hotmail.com, and the vice chariman, Jon Mossman, at mossman@towerswatson.com.

If international investment and/or actuarial professionals are interested in regularly receiving the Risks & Rewards newsletter, please visit the SOA website at https://www.soa.org/professional-interests/professional-interests/prof-join-section.aspx and sign up to become an official member of the Society of Actuaries' Investment Section.

Our first International Focus installment comes from Fred Ngan, Michael Chan and Eric Forgy, co-founders of Coherent Capital Advisors, Ltd., based out of Hong Kong. This is a brief preview of an article they have written for the 2016 February/March issue of *The Actuary* magazine.

The article discusses some of the ALM challenges faced by life insurers in the Asia Pacific region due to a confluence of recent events including double-digit growth, the exit of several multinational insurers, and ultra-localized product demands, regulations and capital markets. We have provided the introduction and conclusion of the article here.

CONCLUSION

Asia has the appetite for more investment-savvy actuaries who not only have a solid technical foundation and a creative mind-set, but also an unparalleled commitment to learning how to deal with business uncertainties in Asia. Rather than importing experts from the West, domestic firms are looking for local asset managers, consulting firms and software vendors to demonstrate local insights and develop solutions that meet their specific needs.

Asia is ripe with opportunities that reward those with creative solutions in these highly inefficient markets. Simpler products and fewer legacy systems give Asian insurers the potential to leapfrog their Western counterparts by adopting new technology much faster. A great example being China's digital insurance revolution that capitalized on its gigantic e-commerce industry. ALM practices may seem behind the Western counterparts for the moment, but with the exponential growth of insurance business and an ever growing SOA membership base combined with the rate the regulation and infrastructure transformations, Asia's life insurance market may well come out ahead of the game in the not-so-distant future. ◼

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RISKS & REWARDS CROSSWORD PUZZLE

Soon …

By Warren Manners

The theme to this issue's crossword puzzle has some urgency to it. The solution will be provided in the next issue of *Risks & Rewards* along with the names of those who were able to successfully complete it. Submissions should be made to warren_manners@swissre.com and nboezio@sympatico.ca by July 31, 2016. For submissions received before the posted deadline and 100 percent correct, a winner will be selected at random and awarded a $25 Amazon gift card. Note, previous winners will not be eligible to win the very next issue's prize. The solution to last issue's puzzle can be found below along with the names of those who were able to successfully complete it.

Warren Manners

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Across

1. … to no longer be (with 10 across)
5. Freshwater snail
10. See 1 across
14. Wild African sheep
15. Geneology
16. Nobel chemist
17. Writer Thomas
18. Plato's theory
19. Roller on a Rolls
20. … to be overwhelmed
23. NASA garb
24. Part of GTO
25. Nav. rank
27. Religious deg.
28. LAX guess
29. … to be poorer
32. Pride components
34. Stock holders
36. Wild ox
37. … to be launched
38. Indian city
39. Alberta resort
41. Chief god of the Assyrians
42. M.I.T. degree
43. Homer's burial spot
46. Letters of credit?
48. Carrier to Oslo
49. Assisted liv. fac.
50. Henri's kindness
52. … to be richer
55. Famous twin
57. Russian town on river with same name
58. Thunderbirds org.
60. Parcel
61. Tropical tree
62. Hue
63. Hard to catch
64. Egg containers
65. "As chaste as unsunn'd _____": Shakespeare

Down

1. Power source
2. Syria, once
3. Hit the bar
4. _____ English
5. Compendium
6. Elevators
7. Hebrew letter
8. Foil
9. Aver
10. Hoax
11. Eland's cousin
12. Donne's done
13. What Tyler burns himself with
21. They come with strings attached
22. Goods opposite
25. Black suit?
26. Pioneer in quantum mechanics
29. Priciest time of year
30. Carnival to Andres
31. 1917 marked their end
33. Bouncing letters
35. Univ. figures
40. Paystub abbr.
41. River in Italy
44. Put a collar on?
45. Few and far between
46. Take away
47. Shots of Jameson?
49. Oil vessel
51. Bolt fasteners
52. … to be a competitor
53. BeIN Sports CEO initials, et al.
54. One billionth
55. "Unbelievable" band
56. Change or chest prefix
59. Minority

SOLUTION TO THE AUGUST CROSSWORD PUZZLE

Congratulation to all those able to complete the puzzle. 100% perfect: Paul Haley, Bryan Jenchowski, Paolo Zadra

Further congratulations to Paolo Zadra who was randomly selected to receive a $25 Amazon gift card.

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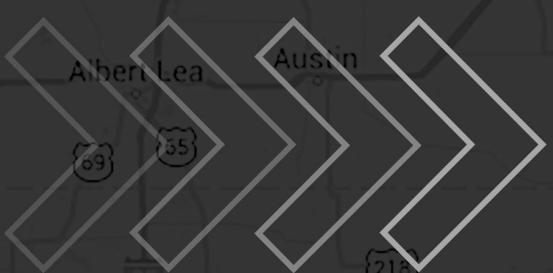
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Explorer.SOA.org

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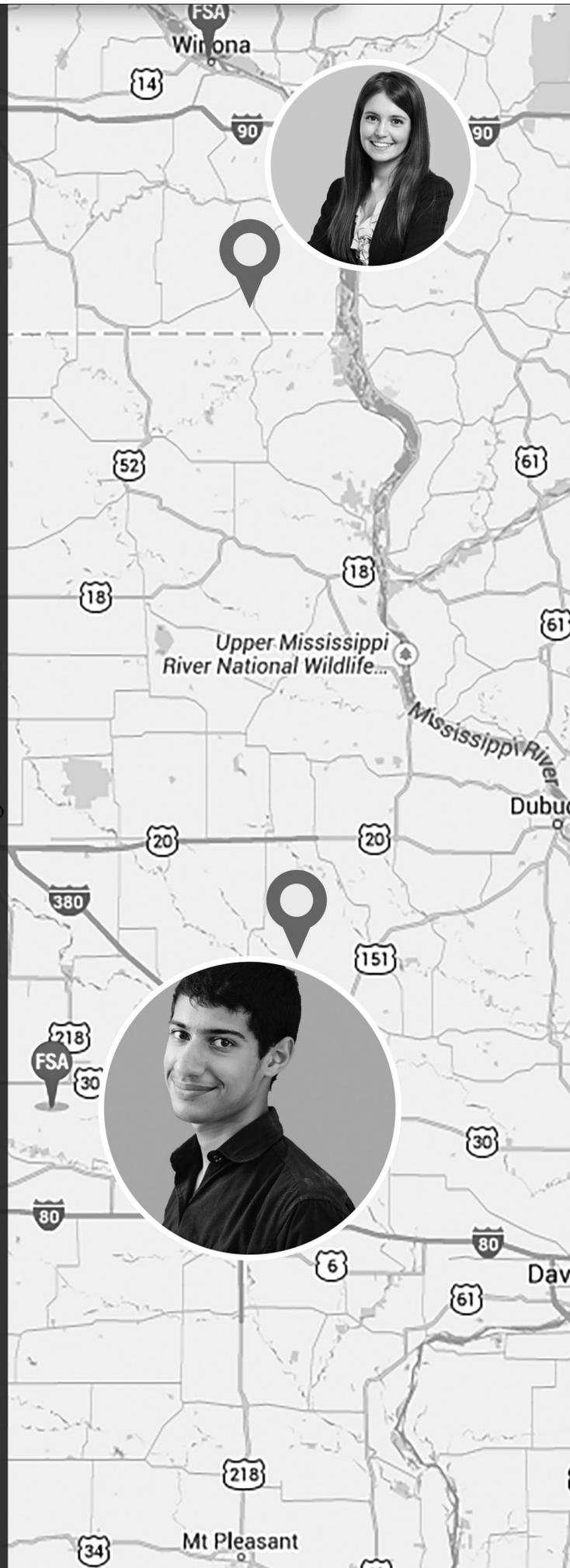
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