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Discount Rates in US GAAP Targeted Improvements

By Bruce Rosner and Vincent Carrier-Cote

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Publication Schedule

Publication Month: December
Articles Due: Sept. 16

The digital edition of this newsletter can be found on the section landing page at *https://www.soa.org/sections/financial-reporting/*

Chairperson's Corner: Taking Stock

By Simpa Baiye

March 2019 Financial Reporting Section meeting in Chicago. From left to right: Lance Berthiaume, Mark Walker, Katie Cantor, Doug Van Dam, Steve Finn and Simpa Baiye. Not pictured: Dave Armstrong, Michael Fruchter, Enzinma Miller and Rob Winawer.

"Knowing yourself is the beginning of all wisdom." This great saying—attributed to Aristotle—applies not just to individuals but also to teams and organizations. I am proud to chair the Financial Reporting Section Council of dedicated volunteers who spend time and energy on advancing professional development and learning opportunities for financial reporting actuaries. The council is mindful of the value it brings to members and, therefore, makes time to examine its activities and impact. I will highlight this by summarizing our in-person meeting held in March 2019 and point to valuable resources online that will help you stay abreast of developments in financial reporting in the near future.

FINANCIAL REPORTING SECTION COUNCIL FACE-TO-FACE MEETING—MARCH 2019

The Financial Reporting Section Council met face to face at the SOA headquarters in Schaumburg for over half a day just before the spring of 2019 to take a good look at development and research activities for 2019. Discussion items included membership trends at the section relative to other sections, how the Financial Section could more effectively connect with the millennial cohort of SOA membership, and increasing the section's visibility to the SOA's non-U.S. membership segment. The section council left with specific takeaways on agenda topics. The impacts of these takeaways will become visible in the medium term. In addition, the council took stock of progress on the publication of both GAAP and IFRS textbooks and provided input on dealing with the latest amendments to IFRS 17.

KEY FINANCIAL REPORTING SECTION ONLINE RESOURCES

As life insurers prepare for the implementation of new accounting requirements across multiple frameworks, we would like to remind you of valuable section resources at your disposal to help you stay on top of these changes.

The regulatory resource site *(www.soa.org/resources/regulatory-resource/life-annuity)* is a one-stop shop for emerging and established regulations for the life and annuity insurance sector. We have a devoted set of volunteers, including Lance Berthiaume, Cindy Barnard and Mark Walker, who do a great job of curating content. More volunteer help on curating non-U.S. content is certainly welcome.

We have a slate of webinars already delivered or scheduled on topics such as IFRS 17, NAIC VA reserve and capital reforms, and FASB targeted improvements. Our volunteer section council members Katie Cantor, Lance Berthiaume and Doug Van Dam have been instrumental in getting these webinars set up. Section members have access to these webinars at discounted rates well into 2020.

I would also recommend that you bookmark the financial reporting section webpage at *www.soa.org/sections/financial-reporting/financial-reporting-landing*. Volunteer council members Steve Finn and Rob Winawer do a great job of helping maintain this venue for all section resources. You will find links to podcasts, links to hot topics, and other valuable information at that webpage.

The resources I have outlined represent but a small portion of the section's work. The section is highly instrumental in planning meeting sessions throughout the year and in sponsoring research that is pertinent to financial reporting. Should you have an interest in helping advance the work of the section as friend or as an elected member, do not hesitate to reach out to any of the section council members. Have a great summer! ■

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Discount Rates in US GAAP Targeted Improvements

By Bruce Rosner and Vincent Carrier-Cote

With the new U.S. generally accepted accounting principles (GAAP) targeted improvements, the Financial Accounting Standards Board (FASB) has significantly revised the treatment of discount rates for long-duration insurance contracts. In some ways, the new standard simplifies the process for insurance companies by defining a clear market reference point rather than a company's own portfolio of assets. In other ways, the calculations may be more complex, as companies need to interpret elements that are now principle based. This article will help us move beyond a basic understanding of the new Accounting Standards Update (ASU) 2018-12, *Targeted Improvements to the Accounting for Long-Duration Contracts*, and explore where there may be some room for interpretation in the requirements as well as some additional context from precedents around the world so that we are all making informed interpretations and choices.

One of the primary paragraphs in ASU 2018-12 addressing the topic of discount rates (under the *Initial Measurement* section) states:

944-40-30-9 The liability for future policy benefits shall be discounted using an upper-medium grade (low-credit-risk) fixed-income instrument yield. An insurance entity shall consider reliable information in estimating the upper-medium grade (low-credit-risk) fixed-income instrument yield that reflects the duration characteristics of the liability for future policy benefits (see paragraph 944-40-55-13E). An insurance entity shall maximize the use of relevant observable inputs and minimize the use of unobservable inputs in determining the discount rate assumption.

WHAT QUESTIONS ARE WE TRYING TO ANSWER?

1. What are appropriate rates during the period where the market is deep and liquid (the observable period)?
2. How should discount rates be extrapolated beyond the observable period?
3. What is the form of the locked-in interest rate curve?

Figure 1
Sample USD Spot Curve

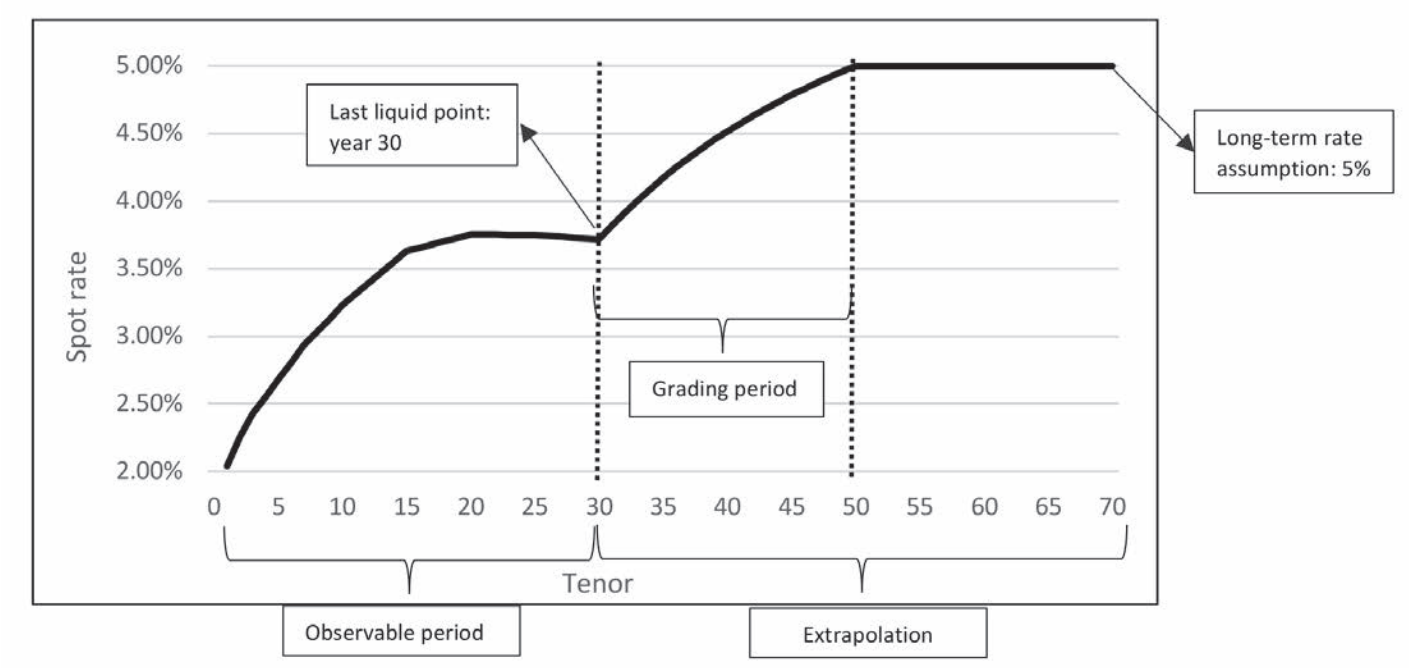


Figure 1 (Pg. 4) illustrates the first two questions and shows the basic segments of the curve that need to be addressed.

Additionally, the initial discount rate at the start of the contract should be locked in for income statement purposes. Each valuation period, the liability will be measured twice:

- Once using the locked-in interest rates for accreting interest on the liability in net income.
- A second time using current interest rates for the purpose of producing a liability on the balance sheet as well as an accumulated other comprehensive income (AOCI) balance.

This is similar to the way that available-for-sale assets are accounted for under Accounting Standards Codification (ASC) 320, *Investments—Debt and Equity Securities.*

THE OBSERVABLE PERIOD

The FASB intended for companies to have consistent treatment of the observable period. The ASU references an "upper-medium grade (low-credit-risk) fixed-income instrument yield," and the basis for conclusions notes that this is commonly interpreted as single A.[1] The ASU also states that one should maximize the use of observable data, which limits the ability to pick a subset of assets with market values that are not considered Level 1 and that produce a more favorable outcome. Despite this, there are still areas that companies are investigating:

- Observable single A rates should be used where liquid. Single A rates commonly exist at longer tenors (and occasionally at intermediate points) but trade at low volumes and are not considered reliable.

- Companies are exploring the use of indices that track specific ratings rather than the entire universe of traded instruments (e.g., the Bloomberg Barclays Index).

- The ASU was written with a common understanding of what single A rated means in the United States, but how this translates into local ratings in other currencies may not be readily apparent. For example, if a local Treasury bond is considered single A rated, can that be included in the mix of instruments used to set the discount rate? Or can you adjust upward or downward based on the rating of the local Treasury bond to translate from its rating to single A?

A company will have to perform its own analysis to determine the last liquid point (LLP). This analysis is similar to what is currently performed for derivative valuation under US GAAP and may involve considering trading volumes and other metrics to assess liquidity of the market at each tenor.

EXTRAPOLATION BEYOND THE OBSERVABLE PERIOD

A wider range of practice will likely emerge with respect to estimation of unobservable rates. The ASU points us to ASC 820, *Fair Value Measurement*, and, in particular, Level 3 guidance regarding unobservable inputs. The Level 3 guidance is generally principle based, as follows:

> *In developing unobservable inputs, a reporting entity may begin with its own data, but it shall adjust those data if reasonably available information indicates that other market participants would use different data or there is something particular to the reporting entity that is not available to other market participants…*
>
> *A reporting entity shall take into account all information about market participant assumptions that is reasonably available…*

This guidance is not prescriptive and permits companies to exercise their own judgment. However, some of the difficulty that companies will have to work through is that the guidance does tell them to look to their peers, which potentially creates an awkward situation if a company finds itself outside the range of practice. Fortunately, we do already have some indication of what companies have done in similar situations, in particular, under economic capital frameworks, Solvency II and in anticipation of International Financial Reporting Standard (IFRS) 17, *Insurance Contracts*. We will come back to specific practices under other standards in the next section.

Companies must choose whether to hold the LLP constant or grade to a long-term expected rate (which may be done using forward rates or spot rates). Additionally, when grading to a long-term expected rate, the following choices are available:

- Determine the ultimate rate as a single unit or separately determine a long-term view of real interest rates, inflation and spreads.[2]

- Determine the length of the grading period.

- Determine the path from the LLP to the ultimate rate, which may be linear, using polynomial regression, splines, Smith-Wilson,[3] bootstrapping[4] or another method.

The decisions made here can have a very significant impact on the measurement of long-dated liabilities and may also impact the volatility of the liabilities over time. Ultimately, a company should consider consistency with internal practices at the company for other purposes (e.g., variable annuities measured using fair value, which operate under the same guidance in ASC 820) or with economic capital or other internal metrics. It should also consider consistency with industry practice; complexity of the

method and the ongoing process that will be required; theoretical soundness, such as continuous, stable forward rates; and faster grading, which will result in a more stable liability from one valuation period to the next and typically results in a lower liability in today's low interest rate environment.

Figures 2 and 3 illustrate how companies might achieve very different outcomes based on their decisions. These two graphs illustrate spot rates and forward rates respectively for the following methods: bootstrapping of spot rates with a 20-year grading period (Method 1), linear grading of forward rates with a 20-year grading period (Method 2), and holding the last forward rate constant (Method 3).

One of the disadvantages of setting an ultimate spot rate is that the implied forward rates tend to be less appealing from a theoretical perspective, as they may exhibit unrealistic patterns. In

Figure 2
Sample Spot Curves Under Different Approaches

Figure 3
Sample Forward Curves Under Different Approaches

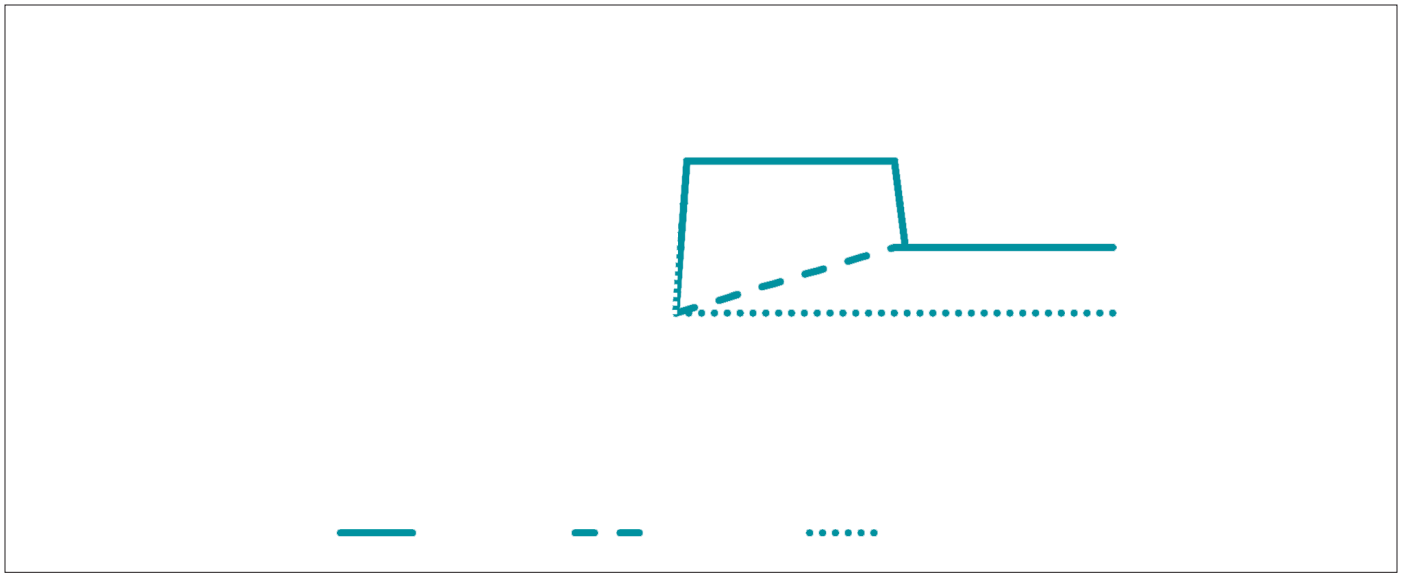


Figure 3 (Pg. 6), we do in fact see large discontinuities in the forward rates under Method 1.

Considerations Outside the US

As we noted earlier, the ASU was written primarily with the U.S. market in mind, leaving some room for interpretation where fixed income markets are fundamentally different from the U.S. market or where local accounting practices differ from U.S. practice.

A particular problem arises where single A rates are not liquid at all or liquid only for shorter tenors but local treasuries and other instruments are liquid at longer tenors. Strictly speaking, we are beyond the observable period of upper-medium grade fixed income instruments and operating under the guidance from ASC 820. However, even that guidance indicates that it is preferable to make use of as much market data as possible. We could consider extrapolating with reference to treasuries or another more liquid instrument, or extrapolating across currencies, which may be difficult to achieve in practice and is generally considered less preferable than sources from within the local currency.

Additional questions may arise regarding the appropriate discount rate for cross-currency products (for example, if you had a product where premiums are specified in local currency but account values are invested in U.S. assets).

WHAT IS THE FORM OF THE LOCKED-IN INTEREST RATE CURVE?

The ASU provides minimal guidance as to how the locked-in interest rate should be used to accrete interest on the insurance liability. The interest rate used for net income purposes is referred to in the ASU as "the original discount rate used at contract issue date," without specifying the form of those rates. Here are three basic options for the form of the locked-in rates that we see currently being discussed in the industry:

1. **Forward rates:** This is a relatively straightforward interpretation. Companies would derive the forward rates from the initial spot curve that was used at issue. Each year, the prior year's forward rate is discarded and the remaining forward rates are used to discount the remaining cash flows.

2. **Spot rates:** Each year's cash flows are tied to the associated spot rate. In each successive year, the cash flow at time N will continue to be discounted at the associated spot rate for time N but over a shrinking time horizon.

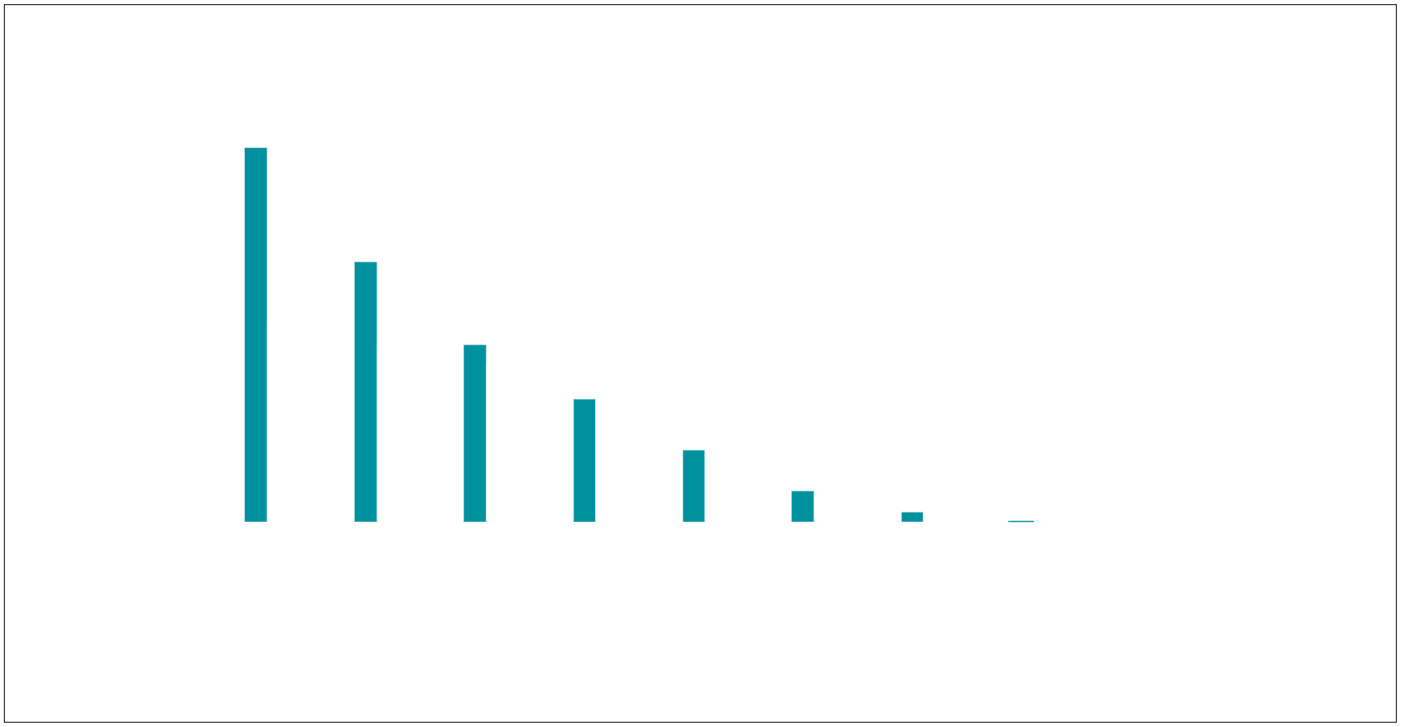
3. **Single flat rate:** A single rate is solved for, such that the discounted value of the liability cash flows at issue result in the same liability as using the current market rates (normally, a zero net premium liability). This single rate is preserved and used for the remainder of the lifetime of the policy or group of policies.

When selecting a technique, companies should consider the pattern of profit emergence, which will depend on the relationship between the yield on assets and the effective interest accretion rate on the liability in each year. Additionally, there may be systems limitations in applying certain techniques. Figure 4 describes some additional considerations specific to each of these methods, and Figure 5 (Pg. 8) illustrates the pattern of investment margin under each method for an illustrative

Figure 4
Considerations for Use of Different Interest Rates

Forward Rates	Spot Rates	Single Flat Rate
Aligned to market pricing principles Similar to treatment of traditional long-duration products under IFRS 17 Has the potential to lock in unusual patterns in forward rates resulting from the relationships between spot rates at successive tenors Unlikely to align well with asset valuation, typically resulting in higher profit in early years followed by lower profit in later years, when an upward sloping yield curve exists	Little precedent for this approach in accounting for insurance contracts Would align well with accounting for a set of zero-coupon bonds that collectively produce the same cash flows as the liability (assuming those assets also have changes in market value flowing through other comprehensive income)	Similar to treatment of interest-sensitive insurance products under IFRS 17 Requires an additional step in the valuation process where a flat rate is solved for using linear optimization or other techniques Would align well with accounting for a single theoretical asset that produces the same cash flows as the liability (assuming that asset also has changes in market value flowing through other comprehensive income), although that is unlikely to be the case in practice Unique to each cohort

Figure 5
Investment Margin Under Different Forms of the Locked-in Interest Rate Curve[5]



10-year single-premium immediate annuity that is backed by zero-coupon bonds.

In Figure 5, the investment margin under forward rates is front-loaded as a result of locking in the upward sloping yield curve. In the early years, assets will accrue investment income at the book yield (which is a flat rate for each zero-coupon bond), while the liability will accrete interest at the early forward rate tenors. The other two methods tend to produce more levelized income patterns, and in this illustration, the spot rates method produces investment margin that is a level percentage of the liability in each year.

OTHER PRACTICES FROM US GAAP AND AROUND THE WORLD

Here we provide some context from other practices. None of these should be considered a precise parallel, as they typically follow different guidance (with the possible exception of assets/liabilities that are accounted for at fair value under U.S. GAAP), are not always material and, in some cases, are bound by explicit methods in the applicable regulation rather than the company's own methods.

The guidance for pensions under U.S. GAAP refers to high-quality instruments, typically considered AA rated and above. It does not specify that one must maximize the use of observable data. Industry practice has evolved to include some flexibility in terms of selecting the reference assets, resulting in higher discount rates. Pensions have a "lock-in" concept in a limited fashion. Each year, the discount rates at the start of the year are locked in for one year for the purpose of interest accretion that goes to net income; industry practices include locking the spot rates or a single flat rate. Extrapolation methods have tended toward less sophisticated approaches (e.g., holding the last forward rate constant). However, extrapolation is not currently a material issue for most pension plans.

Meanwhile, fair value standards are currently applied in U.S. GAAP to a variety of assets as well as some insurance liabilities. Extrapolation methods have tended toward less sophisticated approaches (e.g., holding the last forward rate constant). Again, extrapolation is not a material issue for many common products in the United States.

IFRS 17 has a principle-based discount rate intended to capture a rate that is suitable for the liability that excludes credit risk. Most companies are adopting a bottom-up approach equal to risk-free rates plus an illiquidity premium. They estimate the illiquidity premium by adjusting from relevant assets. Some companies are adopting a top-down approach, beginning with their own asset portfolio and removing estimated credit elements. In principle, this can result in a similar overall result to single A rates, but the illiquidity premium

under IFRS 17 is often determined using historical analysis rather than current rates. With regard to extrapolation, companies are adopting a wide range of practice. Common methods include grading to an ultimate forward rate or ultimate spot rate. Grading periods may range from 10 to 60 years, and a variety of grading methods are used. Many European companies are expected to follow a practice similar to what they use for Solvency II.

Under Solvency II and the Insurance Capital Standard, discount rates are structurally similar to IFRS 17, but more prescriptive than principle based, and extrapolation is done using Smith-Wilson. The ultimate forward rate is prescribed and varies by groups of currencies.

CLOSING REMARKS

Despite the FASB's desire for consistency, there are areas where a broad range of practices will be acceptable, and companies will have to develop their own methods based on their unique circumstances. We do expect some convergence to happen over time, but the industry may never fully converge. Fortunately, we can look to IFRS 17 and other standards to learn from all the thinking that has been applied in similar situations, and we expect that companies will balance that against their own constraints and existing practices. ■

The view and opinions expressed in this article are those of the authors, Bruce Rosner and Vincent Carrier-Cote, and do not necessarily reflect the official views of Ernst & Young LLP. The material has been prepared for general information purposes only and is not intended to be relied upon as accounting, tax or other professional advice. Please refer to your advisors for specific advice.

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ENDNOTES

1 The FASB originally contemplated AA rates but moved to A in response to feedback from the industry. This is discussed in Basis for Conclusions 60 of the ASU.

2 The ultimate rate may be derived from historical data and forward-looking views of the economy. The expectation is that the current process to determine long-term rates for other purposes will be leveraged where available.

3 The Smith-Wilson method fits a set of functions to spot rates, as well as an ultimate forward rate and convergence speed, and applies linear algebra to solve for an interpolation or extrapolation.

4 Bootstrapping identifies a level forward rate over the grading period that results in the specified ultimate spot rate.

5 Investment margin is defined as investment income on assets less interest accretion on the reserve. The projection assumes that the liabilities are cash flow matched with a laddered portfolio of zero-coupon bonds purchased at issue, such that the overall asset yield increases over time as the short-maturity assets mature and the mix of assets shifts to longer-maturity, higher-yielding assets. The analysis is based on an upward sloping forward rate curve.

Volatility From FASB Changes to Traditional Liabilities (Part 2)

By Leonard Reback

Under targeted improvements to accounting for long-duration insurance contracts under U.S. GAAP that will generally become effective in 2021, reserves for traditional nonparticipating contracts will begin to use unlocked assumptions and discount rates. The impact of unlocking the discount rate will be reported in other comprehensive income (OCI). The impact of unlocking cash flow assumptions will result in retrospectively updating the net premium ratio (or net to gross ratio), with the net impact to the reserve reported in net income. For limited payment products, the deferred profit liability will also be retrospectively updated. The unlocking of assumptions will generate more volatility in the reserves than occurs under current U.S. GAAP.

The first article in this series (*Financial Reporter* March 2019) examined the impacts to these reserves from updating projected future cash flows or truing up assumptions to reflect actual experience, assuming no changes to the discount rate since the contracts were issued. This article will examine reserve impacts when discount rates have changed since the contracts were issued. Because net income is always determined based on a locked-in rate at contract inception, the results from the prior article will define the net income impacts from reserve changes. Any additional reserve changes resulting from changes in the discount rate since contract inception would be reported in OCI.

As in the first article, I will assume that the net premium ratio is not currently capped at 100 percent (i.e., the present value of gross premiums in the contract exceeds the present value of benefits) and that the reserve is not currently floored at zero. For contracts that apply modified retrospective transition, the transition date would replace the contract inception date.

UPDATING CASH FLOW ASSUMPTIONS FOR PERIODIC PREMIUM PRODUCTS (NO CHANGE IN DISCOUNT RATE)

As a review of the results from the first article, if I assume that the discount rate had not changed from inception and that historical cash flows have been trued up to reflect actual experience, the reserve at time t can be written as:

$$V_t = PVFB_t - PVFP_t \times NPR_t, \text{ where}$$

V_t = Reserve at time t

$PVFB_t$ = Present value of future benefits (plus any expenses included in the reserve) at time t

$PVFP_t$ = Present value of future gross premiums at time t

NPR_t = Net premium ratio as measured at time t

The net premium ratio can be written as:

$$NPR_t = PVFB_{0,t}/PVFP_{0,t}, \text{where}$$

$PVFB_{0,t}$ = Present value of all benefits from inception through the end of the contract, as measured at time t at the original contract discount rate

$PVFP_{0,t}$ = Present value of all gross premiums from inception through the end of the contract, as measured at time t at the original contract discount rate

I can drop the t subscript from the (0,t) and just use $PVFB_0$ and $PVFP_0$. I also introduced two additional terms:

$PVFB_s = PVFB_0 - PVFB_t$ = Present value of all benefits incurred through the valuation date, as measured at time t at the original contract discount rate

$PVFP_s = PVFP_0 - PVFP_t$ = Present value of all gross premiums incurred through the valuation date, as measured at time t at the original contract discount rate

The change in reserve for a change in projected future benefits was equal to:

$$\frac{dV_t}{dPVFB_t} = PVFP_s/PVFP_0$$

The change in reserve for an update or true-up from assumptions to actual historical incurred benefits was equal to:

$$\frac{dV_t}{dPVFB_s} = -PVFP_t/PVFP_0$$

The effects of changes to gross premiums were similar to changes in benefits, except for the sign and an effect of the net premium ratio on the change in reserve. The change in reserve for a change in projected future gross premiums was equal to:

$$\frac{dV_t}{dPVFP_t} = -NPR_t \times (PVFP_s/PVFP_0)$$

Finally, the change in reserve for an update or true-up from assumptions to actual historical incurred gross premiums was equal to:

$$\frac{dV_t}{dPVFP_s} = NPR_t \times (PVFP_t/PVFP_0)$$

I also looked at impacts for single premium with a deferred profit liability (DPL) that is amortized over an appropriate base. I assumed with no loss of generality that in force is the DPL amortization basis.

If there have been no discount rate changes since contract inception, Vt, can be written as:

$$V_t = PVFB_t$$

And the DPL at time t can be written as:

$$DPL_t = (P - PVFB_0) \times (PVFI_t/PVFI_0), \text{ where}$$

P = Single premium at contract inception
$PVFI_t$ = Present value of future in-force amounts at the locked-in discount rate at time t
$PVFI_0$ = Present value of future in-force amounts at the locked-in discount rate as of contract inception

For convenience, I defined $PVFI_s$ as $PVFI_0 - PVFI_t$ (i.e., the present value of the in-force amounts that have already been reflected in DPL amortization through the valuation date).

The impact to the liability for a change in the present value of future benefits was:

$$\frac{dL_t}{dPVFB_t} = PVFI_s/PVFI_0$$

The change in total liability for a true-up of actual benefits was:

$$\frac{dL_t}{dPVFB_s} = -PVFI_t/PVFI_0$$

So the change in total liability for changes in benefits for a single premium contract is similar to the change in reserve for regular premium contracts, except that the DPL amortization base replaces the gross premium.

UPDATING CASH FLOW ASSUMPTIONS FOR PERIODIC PREMIUM PRODUCTS (IF DISCOUNT RATES HAVE CHANGED)

The reserve impacts of changes in benefits and premiums are more complicated if discount rates have changed since contract inception. That is because the reserve calculation discounts premiums and benefits at a current discount rate, but the net premium ratio is always calculated using the discount rates locked in at contract inception. Although the reserve amount reported on the balance sheet reflects the changes in discount rate since contract inception, all reserve changes resulting from changes in discount rates are reported in OCI, not net income. So the impacts discussed in this section would not affect net income. The impact to the reserve of cash flow changes on net income would be based on the results of the prior section, in which discount rates remain unchanged.

To account for the change in discount rates, I need two additional factors:

a_t = Ratio of the present value of future benefits at the current discount rate to the present value of future benefits using the discount rate at contract inception

b_t = Ratio of the present value of future gross premiums at the current discount rate to the present value of future gross premiums using the discount rate at contract inception

Applying a_t and b_t, the reserve at time t becomes:

$$V_t = a_t \times PVFB_t - b_t \times PVFP_t \times PVFB_0/PVFP_0$$
$$= a_t \times PVFB_t - b_t \times PVFP_t \times (PVFB_s + PVFB_t)/(PVFP_S + PVFP_t)$$

All present values in the above equation (e.g., $PVFB_t$, $PVFP_0$, etc.) are taken at the discount rate from contract inception. I will assume that:

$$\frac{da_t}{dPVFB_t} \approx \frac{db_t}{dPVFP_t} \approx 1$$

In other words, I will assume that a change in cash flows does not significantly change the ratio of the present values of the cash flows whether using current or locked-in discount rates.

To determine the impact to the reserve of a change to the present value of future benefits, I get:

$$\frac{dV_t}{dPVFB_t} = a_t \times \frac{da_t}{dPVFB_t} - b_t \times \frac{db_t}{dPVFP_t} \times \quad PVFP_t/PVFP_0$$
$$\approx a_t - b_t \times PVFP_t/PVFP_0$$
$$= (a_t \times PVFP_s + a_t \times PVFP_t - b_t \times PVFP_t)/PVFP_0$$
$$= [a_t \times PVFP_s + (a_t - b_t) \times PVFP_t]/PVFP_0$$

Taking account of changes in the discount rate since contract inception makes the impact of a change in future benefits more complex. Rather than just multiplying the change in the present value of future benefits by the ratio of the present value of all historic gross premiums collected through the valuation date to the present value of all gross premiums expected to be collected over the life of the contract, the impact is affected by the impacts of prior discount rate changes as well as by the ratio of the present value of future gross premiums to the present value of all gross premiums.

In many cases, $(a_t - b_t)$ may be small enough to ignore. This would be the case if discount rates have not changed much since contract inception. It may also be the case for shorter duration contracts or for other contracts, such as annual renewable term, where the difference in the timing of premiums and benefits is not great. In that case, any impact from future premiums is eliminated and the reserve impact reduces to:

$$\frac{dV_t}{dPVFB_t} \approx a_t \times PVFP_s/PVFP_0$$

If the simplification of ignoring $(a_t - b_t)$ is appropriate, the result of a change in the present value of future benefits is more intuitive. If interest rates have increased since the contract was issued, a_t is likely less than 100 percent, so the impact of a change in the present value of future benefits is somewhat muted relative to interest rates being unchanged since contract inception. If interest rates have decreased since the contract was issued, a_t is likely greater than 100 percent, so the impact of a change in the present value of future benefits is somewhat larger than if interest rates are unchanged since contract inception.

For other changes to premiums and benefits, the result of a change taking account of previous discount rate changes is simpler. That is because the a_t factor impacts only the present value of future benefits, so it drops out of the derivative of the reserve with respect to other cash flows.

For a true-up of actual benefits I get:

$$\frac{dV_t}{dPVFB_s} \approx -b_t \times PVFP_t/PVFP_0$$

In this case, the impact looks very much like the reserve impact from truing up benefits when discount rates have not changed since contract inception, except multiplied by the ratio of the present value of future premiums at the current discount rate to the present value of future premiums using the discount rate at contract inception. Since b_t is the ratio of the present value of future premiums using the current rate rather than the locked-in rate, this can also be stated as the reserve decreases by

- Amount by which actual benefits exceeded previously assumed benefits, multiplied by
- Ratio of the present value of future gross premiums at the current discount rate to the present value of all gross premiums at the locked-in discount rate.

For a change in future premiums, I get:

$$\frac{dV_t}{dPVFP_t} \approx -b_t \times NPR_t \times PVFP_s/PVFP_0$$

For a true-up of actual premiums, I get:

$$\frac{dV_t}{dPVFP_s} \approx b_t \times NPR_t \times (PVFP_t/PVFP_0)$$

The impact of a true-up of actual premiums is similar to the impact of a true-up of actual benefits, except for the sign and an effect from the net premium ratio.

UPDATING CASH FLOW ASSUMPTIONS FOR SINGLE PREMIUM CONTRACTS (IF DISCOUNT RATES HAVE CHANGED)

I can generalize the single premium results from the last article to a situation where the current discount rate has changed since contract inception. The change in current rate impacts only the base reserve, since the DPL is always calculated using discount rates locked in at contract inception. As before, I

define the factor a_t as the ratio of the present value of future benefits at the current discount rate to the present value of future benefits using the discount rate at contract inception. Now the reserve becomes:

$$V_t = a_t \times PVFB_t$$

Now the total liability, including DPL, becomes:

$$L_t = V_t + DPL_t = a_t \times PVFB_t + (P - PVFB_s - PVFB_t) \times (PVFI_t/PVFI_0)$$

I can see that the change in discount rate will not impact the effect of a true-up to the benefits. That makes sense since true-ups to the benefits impact only the DPL, not the base reserve.

When I look at the impact to the reserve from a change in future benefits, I get a more complex result:

$$\frac{dL_t}{dPVFB_t} = a_t - PVFI_t/PVFI_0 = (a-1) + PVFI_s/PVFI_0$$

Basically, the base reserve increases by the change in the present value of future benefits multiplied by the ratio a_t, while the DPL decreases by the change in benefit multiplied by the ratio of the present value of future in-force amounts to the present value of all in-force amounts from contract inception to termination (all discounted at the locked-in rate).

CONCLUSION

Under targeted improvements, it will be challenging to explain changes in traditional nonparticipating reserves. This article dealt primarily with the interaction between cash flow changes and discount rate changes. In the third article in this series, I will discuss the direct impact of discount rate changes on the reserves. ■

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Common Misunderstandings of Risk-neutral Valuation

By Stephen J. Strommen

One prominent idea in the recent development of accounting for insurance contracts is the immediate recognition of profit or loss due to changes in market values of assets and liabilities. Implementation of this idea requires determination of market value not just for invested assets but also for insurance liabilities. While most invested assets are traded in a market, most insurance contracts are not, so there is no easy way to obtain a "market value" for most insurance contracts. The idea of market-consistent valuation has gained traction to satisfy this need, and stochastic risk-neutral valuation has come to the fore as a widely recognized approach to market-consistent valuation.

As an actuary involved in discussions of new accounting standards, I have encountered several misconceptions about risk-neutral valuation, even among some experienced and prominent financial reporting actuaries and regulators. This article highlights several of these misunderstandings with an eye toward putting the debate in this area on a more scientific basis.

There is a common understanding of the following basics of stochastic risk-neutral valuation:

1. The time value of money is characterized by the short-term (single period) default-free interest rate (the "short-term risk-free rate").

2. The future path of the short-term rate is uncertain and can be characterized by a random walk or other stochastic process.

3. In risk-neutral stochastic valuation, the random walk or stochastic process governing the future path of the short-term rate is calibrated so that:

    a. the expected or central path of the short-term rate is the forward rate path of the observed risk-free yield curve; and

    b. the volatility is such that market prices of options and other derivatives are reproduced.

The mathematical justification of risk-neutral stochastic valuation is complex. While many actuaries understand the three points just mentioned, I have often encountered the following misunderstandings regarding their implications.

MISUNDERSTANDING 1: THE MARKET'S EXPECTATION OF FUTURE SHORT-TERM RATES IS EQUAL TO THE FORWARD RATE PATH OF THE OBSERVED RISK-FREE YIELD CURVE

Point 3.a. above says that risk-neutral scenarios are calibrated so that the expected path of the short-term rate equals the forward rate path of the risk-free yield curve. So it is true that the risk-neutral expectation of future short-term rates is equal to the forward rate path of the observed risk-free yield curve. But the market's expectation is not the same as the risk-neutral expectation. The probability distributions of future events and their expected values differ between the real world and the risk-neutral world. The real-world distributions are referred to as the P measure, and the risk-neutral distributions are referred to as the Q measure. The expected path under the P measure is different from that under the Q measure.

MISUNDERSTANDING 2: THE EXPECTED PATH OF THE SHORT-TERM RISK-FREE RATE IS HIGHER IN REAL-WORLD SCENARIOS THAN IN RISK-NEUTRAL SCENARIOS

Actually, the expected future path of the short-term risk-free rate is **lower** in properly calibrated real-world scenarios than in risk-neutral scenarios.

This misunderstanding probably arises because of the way equity investments are simulated when risk-neutral scenarios are used for simulation. In a risk-neutral simulation, the

distribution of equity returns is centered on the short-term risk-free rate—even though the expectation in the real world is that, on average, equities will earn a higher return that includes a risk premium. Basically, the projected cash flows from equity investments are lower in a risk-neutral simulation than in a real-world simulation.

Fixed-income securities are treated differently than equities. The cash flows are fixed, so it is the discounting of those cash flows that must be different.

To understand why the discounting is different, one must understand the nature of the "risk-free" yield curve. Only the short-term rate is risk-free. All longer-term rates involve lock-in of an interest rate in an environment where interest rates can change. Lock-in is a risk to the investor because interest rates could rise, resulting in a loss of market value. That risk has a price, and it is included in the risk-free yield curve in the form of term premiums. Long-term risk-free rates are normally higher than short-term rates because of the existence of term premiums, which are a form of risk premium.

Since the risk-free yield curve includes term premiums, the forward rates in that curve include term premiums. To get the market's expectation of the path of the short-term rate, those term premiums must be removed. The market's expectation of the future path of the short-term rate is lower than the path of forward rates in the risk-free yield curve because the term premiums are removed from the long-term forward rates to get the expectation for the short-term rate.

Term premiums are not insignificant. For example, the real-world stochastic interest rate generator mandated by the NAIC for use in VM-20 valuations has a parameter to set the average term premium in the 20-year rate 100 basis points higher than that in the one-year rate.

Term premiums increase by length of time from the valuation date. The longer the scenarios, the greater the difference between risk-neutral and real-world scenario paths. This should be an important consideration when using risk-neutral valuation for long-term insurance contracts. In the investment world, the risk-neutral approach is primarily used for valuation of comparatively short-term derivative securities where the difference between real-world and risk-neutral scenario paths is much smaller. Extension of the risk-neutral approach to much longer-term contracts is somewhat akin to extending the results of a linear regression to points far outside the sample used to calibrate the regression. This is especially true when extending risk-neutral valuation to contracts that last beyond the end of the observable yield curve.

MISUNDERSTANDING 3: ONLY A RISK-NEUTRAL VALUATION CAN BE MARKET-CONSISTENT, SO REAL-WORLD SCENARIOS SHOULD NOT BE USED FOR MARKET-CONSISTENT VALUATION

There is a common misunderstanding that the terms "market-consistent" and "risk-neutral" mean the same thing in the context of valuation. In fact, risk-neutral valuation is just one approach to performing a market-consistent valuation.

This misunderstanding may have arisen partly because many "real-world" scenario generators are not market-consistent. In order to be market-consistent, a generator must be calibrated to current market conditions on the scenario starting date. Many real-world generators are used to measure capital adequacy and are not frequently recalibrated because they are not used for valuation. The focus for their use is the outlier scenarios, not the central scenarios that get most weight in a valuation, so calibration of the central scenarios is not important.

Nevertheless, a real-world scenario generator can be market-consistent if it is calibrated on each valuation date. Three aspects of current market conditions must be included in the calibration:

a. The expected path of future short-term interest rates, based on the yield curve with term premiums removed

b. The volatility of interest rates, based on the market prices of derivatives

c. The market price of risk

The market price of risk is not directly observable, and neither are the term premiums. They can be inferred indirectly using a combination of historical data and current prices. Risk-neutral calibration gets around this problem by treating the market price of risk and term premiums as zero and adjusting the expected path and volatility to compensate. The theory that justifies that is complex, but the basic idea is that the market price of risk becomes implicit in the adjusted path and volatility of future interest rates in risk-neutral scenarios.

Real-world calibration is sometimes criticized because it requires explicit treatment of the market price of risk and is, therefore,

There is a common misunderstanding that the terms "market-consistent" and "risk-neutral" mean the same thing.

more subject to judgment. This is based on the misconception that risk-neutral valuation does not involve judgment, which will be addressed next.

MISUNDERSTANDING 4: CALIBRATION OF RISK-NEUTRAL SCENARIOS IS OBSERVATION-DRIVEN AND INVOLVES LITTLE JUDGMENT

Risk-neutral scenario calibration is rooted firmly in observed data. But significant judgments are still involved.

The first judgment is the choice of underlying stochastic process to be calibrated. For interest rates, there are one-factor models, two-factor models, stochastic volatility models, regime-switching models, zero lower bound models, and so on. The stochastic shocks in these models can be normal or lognormal or can use other distributions. The choice of stochastic process will affect characteristics of the generated scenario set, such as the frequency and length of periods of persistent low interest rates. These characteristics can certainly affect the valuation of insurance contracts, especially those with minimum interest crediting guarantees.

The second judgment is the choice of volatility to use when generating stochastic scenarios. Calibration will provide a volatility surface—that is, a range of implied volatilities that vary by strike price and tenor. This range of implied volatilities is an indication that the model does not fit perfectly, but that point is often passed over. When generating stochastic scenarios, volatility can have only one value in each time step, not a different value for each strike price and tenor, so judgment is necessary in selecting the volatility to use.

The third judgment is the measurement of the risk-free rate. For valuation of insurance contracts that are illiquid, it is generally accepted that the observed yield curve for U.S. Treasurys is inappropriate because Treasurys are very liquid. Illiquid securities have higher yields than liquid securities, so an "illiquid default-free" yield curve is suggested for use. Such a yield curve can be U.S. Treasurys plus an illiquidity adjustment. Sometimes the illiquidity adjustment is given other names, such as a matching adjustment. Whatever the name, setting the size of the adjustment requires judgment, and there is significant debate over the appropriate size of adjustment to be made when valuing different kinds of insurance contracts.

The three judgments listed here can significantly affect the results of risk-neutral valuation for long-term insurance contracts. In my view, these judgments within the risk-neutral approach are just as significant as the judgments required in the real-world approach to market-consistent valuation.

MISUNDERSTANDING 5: THE MARKET PRICE OF RISK IS THE SAME FOR EVERYONE

One important aspect of the theory behind risk-neutral valuation is that the market price of risk is a single figure and is the same for everyone. Calibration of risk-neutral scenarios does not quantify the market price of risk but builds it in implicitly through the expected path and volatility of future interest rates.

Real-world market-consistent valuation requires one to specify the market price of risk. Often that is done by equating the market price of risk to the cost of capital. In the real world, we know that the cost of capital is not the same for everyone.

The fact that the market price of risk is not the same for everyone is fundamental to the very existence of the insurance business. Understanding this provides some insight into the debate over determination of the appropriate discount rate for market-consistent valuation of insurance contracts.

The difference between parties for the price of risk can be considerable. Let's define the price of risk as the cost of keeping available the amount of money needed to be made whole after a risk event occurs—that is, keeping money available to pay for the potential loss. Consider a family that owns its home. It must bear the risk of destruction of the home through fire or other disaster. In the absence of risk sharing, the amount they must keep available to restore their home in the event of loss is the full value of the home plus the cost of potential temporary housing. In the absence of risk sharing, that is the price of bearing the risk.

With insurance, the cost of bearing that risk can be vastly reduced to the size of a small annual homeowners insurance premium because that is all that's required to make available the money required to replace the family home if it is destroyed. The cost of the risk to the insurer is much lower than to the family because the insurer makes use of risk sharing.

Basically, the financial purpose of insurance companies is to reduce the market price of insurance risk through risk pooling and diversification. To accomplish this, insurers are motivated to increase in size (to increase risk pooling) and to diversify (to reduce correlation of risks). As a result of these activities, the price of risk for insurers is reduced. Insurers can provide risk protection with what amounts to a lower cost of production and can, therefore, sell it at a low price.

The fact that the market price of risk is not the same for everyone is fundamental to the very existence of the insurance business.

This applies not only to insurance risks but also to investment risks, such as bond defaults. The price of this risk is reduced for insurers precisely because of pooling and diversification with other risks. This means that the expected net investment return for the insurer, after subtracting the insurer's price of risk, is higher than the so-called risk-free rate.

I understand that the prior paragraph is heresy to some economists and actuaries. But when you think about it, the concept at work here is the same as that which suggests that introduction of technology that lowers the cost of production for a manufactured good will lead to lower market prices.

To continue with this heresy, consider the idea that insurers pass their investment returns on to customers through the pricing of insurance products. A simple example is the pricing of lifetime income annuities. Insurers typically back annuities by investments in a portfolio of defaultable bonds. Their low cost for bearing the default risk is passed on in the competitive marketplace by pricing with net investment returns higher than the risk-free rate. That's because their expected investment return—net of defaults, expenses, and net of the cost of capital—is significantly greater than the risk-free rate. (Challenge to the reader: Do the math. See sidebar, pg. 18.) Call the excess over the risk-free rate a liquidity adjustment or a matching adjustment or something else, but I believe it comes partly from pooling and diversification, not just liquidity.

I believe the liquidity adjustment or matching adjustment is required for a risk-neutral valuation to be market-consistent. This is based on observation of real market prices. Those who push back on this sometimes argue that life income annuities are often mispriced by insurance companies; the market prices are too low because the investment return assumptions exceed the risk-free rate. I find that argument to violate the scientific method. In science, observations take precedence over predictions based on theory. Those who say annuities are mispriced because of such investment return assumptions give predictions of their theory precedence over observations of actual market prices.

CONCLUSION

The risk-neutral approach to valuation has come to the fore in recent years as accounting standards have moved toward use of market-consistent valuation. Actuarial standards are now being drafted regarding compliance with the new accounting standards. In drafting these standards, some have suggested that the risk-neutral approach should be required for market-consistent valuation. This article has highlighted some misunderstandings about the risk-neutral approach that have come up in such discussions, with the hope that better understanding will lead to standards that reflect the complexity of the issue and allow alternate methods and professional judgment where appropriate. ■

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DO THE MATH

What is the market-consistent discount rate for valuation of a lifetime payout annuity by an insurance company? How does it compare with the risk-free rate?

Assume that the insurer invests in A-grade corporate bonds. For simplicity, we look at the net spread on a 10-year A-grade corporate bond.

Gross credit spread:	133 bps (source: NAIC tables for VM-20 valuation)
Less:	
Expected defaults	18 bps (source: NAIC tables for VM-20 valuation)
Investment expenses	10 bps
Cost of capital	48 bps (8% capital requirement x 6% cost of capital rate)
Net spread:	57 bps

Based on these assumptions, the market-consistent valuation uses a discount rate that includes a 57 basis point spread over the risk-free rate. This is a bit oversimplified because the calculation should reflect a weighting of net spreads at different points on the yield curve, assuming the insurer would purchase an array of bonds to match the expected cash flows of the annuity. And the cost of capital is an estimate that involves judgment. Nevertheless, the market-consistent spread over the risk-free rate is significant, because a reasonable estimate of the insurer's cost of capital is much less than the market credit spread.

Insurance Capital Standards: Changes on the Horizon

By J. Peter Duran and Grant K. Knapman

In the wake of the global financial crisis of 2008, the G-20 group of countries established the Financial Stability Board (FSB) at its meeting in April 2009. The FSB is charged with, among other things, assessing the vulnerabilities of the global financial system and identifying the supervisory actions needed to address them. The members of the FSB include regulatory and standard-setting bodies globally. The International Association of Insurance Supervisors (IAIS) is a member.

At the direction of the FSB, the IAIS announced in October 2012 that it would undertake development of a global insurance capital standard (ICS). The ICS is intended to be a group solvency standard rather than one that applies to legal entities. This is different from the system in several major jurisdictions, including notably the United States and Hong Kong, where the supervisor's powers apply only to the insurance legal entities. Because the focus of the ICS is on the global financial system, it applies only to so-called internationally active insurance groups (IAIGs). IAIGs are essentially large, multinational insurance groups.[1]

In this and subsequent articles, we will explore the current state of the ICS and the various issues that the IAIS and IAIGs are working through. At present, there is a wide range of opinions of what form the ICS should take and even what its purpose should be.

The ICS has been undergoing field testing and evolving since 2014. In addition, two major consultations and numerous stakeholder meetings have been held. A reference ICS is scheduled for adoption by the IAIS at its annual meeting in November 2019. Under the terms of the "Kuala Lumpur Agreement" reached at the 2017 IAIS annual meeting, there will be a five-year monitoring period (MP), during which IAIGs will report the ICS to the IAIS and their group supervisors on a confidential basis. During the MP, the ICS will be discussed in the supervisory colleges, but it will not be used as a basis for any regulatory intervention. After the MP, it will be used as a prescribed capital standard (PCR) (i.e., a level below which the group supervisor could intervene on solvency grounds). It is expected that the ICS will continue to evolve during the MP.

HIGH-LEVEL DESCRIPTION OF THE ICS

The scope of the ICS is the consolidated group, and the starting point is the consolidated balance sheet on the group's accounting basis (e.g., IFRS, US GAAP, etc.). Invested assets are revalued to fair value if not already held at fair value. Intangible assets (e.g., DAC, goodwill, software, etc.) are eliminated. Policy liabilities consist of a best estimate liability (BEL) and a margin. The BEL is the discounted value of best estimate future cash flows at rates that are referenced to current market conditions. The time value of options and guarantees is included in the BEL. The margin, referred to as the margin over current estimates (MOCE), is an additional amount held to reflect the uncertainty inherent in the BEL.

Beyond the valuation basis, capital requirements are derived based on a combination of stresses and factors applied to the balance sheet for a range of different risks, including market risk, credit risk, insurance risk and operational risk. These stresses are calibrated to a one-in-200-year shock scenario, as with many other solvency regimes. For example, the charge for interest rate risk is based on shocks to the risk-free curve applied simultaneously to revalue assets and liabilities under the shocked conditions, while the charge for operational risk is based on factors applied to premiums and policy liabilities. The separate risk charges are combined via a correlation matrix.

TOPICS OF DEBATE

There are various highly controversial areas with the ICS. Following is a brief description of what we believe to be the three most consequential ones.

Liability Valuation

In the 2018 field testing, the default method for discounting policy liabilities is the so-called three-bucket approach. This approach seeks to recognize an "illiquidity premium" on the risk-free rate for those portfolios whose assets and liabilities are considered sufficiently well matched. To qualify for the additional spread, the asset-liability portfolio must meet certain criteria intended to ensure that asset-liability risk is mitigated.

The method separates liability portfolios into three "buckets" of decreasing degrees of asset liability matching and consequent recognition of spread. The top bucket uses a spread based on the insurer's own assets, the middle bucket uses IAIS's prescribed spreads applied to the insurer's own assets, and the general bucket uses prescribed spreads based on a reference portfolio. The top bucket uses an application ratio of 100 percent, the

middle bucket 90 percent, and the general bucket 80 percent. The application ratio is applied to the net spread after deduction for credit risk.

The primary points of discussion relate to:

1. The criteria to qualify for the various buckets: The criteria used for the 2018 field testing were highly restrictive. The overwhelming majority of business fell into the general bucket. As of the writing of this article, we understand that the IAIS intends to take a more expansive approach to the 2019 field testing. This will be welcomed by the industry.

2. The definition of "eligible assets": Currently no spread is recognized on equity assets. Some, including us, believe that provided certain guardrails are present, a spread should be recognized on equities that are used to back long-term liabilities. This will be the subject of a subsequent article in this series.

MOCE

The IAIS has not decided how MOCE are to be calculated or what they actually represent. The cost-of-capital MOCE (COC-MOCE) are calculated similar to the risk margin in Solvency 2 (i.e., as the present value using risk-free rates of a cost of capital times future required capital for non-diversifiable risk). The cost of capital rate used in the 2018 field testing was 5 percent. COC-MOCE are based on a transfer value concept. After a shock, the insurer should have enough assets to be able to transfer the business to a third party. Many in the industry object to COC-MOCE on the grounds that insurers do not actually transfer their liabilities but rather fulfil them.

Prudence MOCE (P-MOCE) are based on the difference between a liability calculated using prudent assumptions and the BEL, a concept similar to existing U.S. GAAP for long-duration traditional contracts. Many in the industry believe that P-MOCE represent a double counting and should be deducted from required capital.

Note that the industry views mentioned above are premised on the assumption that after a shock, the insurer should be required to hold only the BEL, as this would be expected to be sufficient to fulfill the liabilities as they fall due.

Capital Resources

The last major area of controversy is capital resources. This centers around what types of financial instruments should be counted as available capital. For example, a debt instrument issued by the non-insurance holding company, the terms of which require that policyholders be paid before the debt holders, is "contractually subordinated" to policyholders. Such debt instruments may be considered a capital resource, provided other criteria are met.

Many in the industry have argued that debt that is "structurally subordinated" to policyholders should also qualify. For example, if the proceeds have been injected into an operating insurance company and money is needed to pay policyholders, they will be paid before the holding company debtholders.

The area is highly complex and technical and beyond the scope of what can be described in this article.

LOOKING TO 2025

The IAIS is a standard-setting body only. For the ICS to become effective in any jurisdiction, it must be adopted locally. Inevitably there will be variations among jurisdictions. The question of what an acceptable implementation of the ICS would be is a critical one that must be answered before the end of the MP. The standard will be that it is "outcome equivalent" to the reference ICS.

Among the options being considered is the aggregation method (AM). The AM is based on two core concepts: the aggregation of local solvency requirements to the group level and the calibration of these requirements via scalars. For example, a scalar of 150 percent might be applied to the local basis PCR of a particular jurisdiction if the jurisdiction's local basis is deemed not strong enough. The AM is still in the initial stages of development. In 2018, an initial data-collection

exercise was undertaken. Development is being led by the NAIC, which is the most vocal advocate among regulators of the AM. Other jurisdictions, including Hong Kong, have expressed interest.

The main advantage cited for the AM is the potential to maintain a level, competitive playing field in local markets. The reference ICS, on the other hand, has the potential to distort the level playing field by applying a different, potentially more onerous, standard that non-IAIGs would not be subject to. Under the Kuala Lumpur Agreement, the AM will be evaluated for outcome equivalence by the end of the MP. How exactly this will be done is not yet clear. The IAIS is in the initial stages of developing criteria.

CONCLUSION

While the IAIS has come far in the development of the ICS, it is clear that more work is needed. What is most important in the next few years is to maintain open communication among the industry, supervisors and the IAIS so that an informed and collaborative approach to group-wide supervision can be developed.

Subsequent articles in this series will explore issues around liability valuation in more detail. Aside from the issue of outcome equivalence, this is the single biggest issue that needs to be dealt with before agreement can be reached on the final ICS. ■

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ENDNOTE

1 The exact criteria are that the group must (1) operate in at least three jurisdictions, (2) have assets of not less than $50 billion or premiums of not less than $10 billion, and (3) receive at least 10 percent of its premiums from outside the home jurisdiction.

Transition From IFRS 4 to IFRS 17: Impact on Shareholders' Equity

By Muhammad Usama Dangra

The new accounting standard for insurance contracts, IFRS 17, brings about an unprecedented change in the way an insurer's financial performance will be measured and reported. Adopting this change will require significant changes to an insurer's information technology infrastructure, actuarial, finance and accounting processes.

The new standard is based on different fundamentals from current accounting standards, which could lead to a difference in shareholders' equity as measured under IFRS 17. The provisions of IFRS 17 regarding transition require that any difference in the shareholders' equity due to transition should be accounted for as a one-time impact at the time of transition. This impact is dependent on a multitude of factors, and whether it would increase or decrease shareholders' equity would be specific to each insurer. The factors that could impact shareholders' equity upon transition can be grouped into factors related to the insurer's business and accounting practices up to the transition date and factors related to implementation of IFRS 17. This article explores both categories of factors.

IFRS 17 WILL IMPROVE COMPARABILITY OF FINANCIAL STATEMENTS

The ultimate result of the change in reporting standard to IFRS 17 is a financial performance measurement and reporting framework that:

- **Is market consistent.** Reflects the most recent information by requiring valuation of insurance contracts using current and market consistent assumptions;
- **Has fewer accounting choices.** Significantly restricts accounting policy choices available to insurers;
- **Reflects the level of services rendered.** Recognizes profit from a group of insurance contracts over the term of the contracts in proportion to the level of services rendered during each reporting period and recognizes the entire loss from a group of insurance contracts at the time it becomes reasonably certain that the contracts would lead to a loss; and
- **Provides more information and disclosures.** Provides sufficient information and disclosures to the users of the financial statements to enable them to identify and evaluate the sources of profits or losses.

The above improvements in the accounting framework address one of the greatest criticisms of the previous standard, IFRS 4, by improving comparability of financial statements between insurers writing similar types of products, between insurers writing different types of products, and between insurers and entities in other industries.

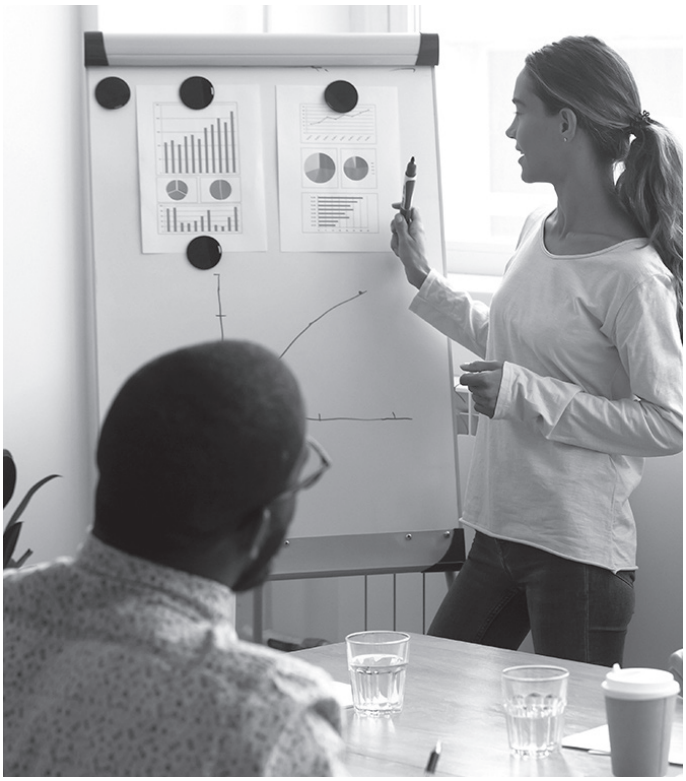
The new standard requires that the financial performance of an insurance contract be split into "insurance service" and "insurance finance" components. This segregation essentially implies that the embedded investment aspect of an insurance contract (such as in a typical unit-linked or universal life plan) should be reported separately. This segregation improves the comparability of the financial statements of insurers writing different types of products. The segregation also improves the quality of the consolidated financial statements of insurance groups composed of entities writing different types of insurance products.

FACTORS RELATED TO INSURER'S BUSINESS AND ACCOUNTING PRACTICES UP TO THE TRANSITION DATE

Recognizing profits in proportion to services rendered is the cornerstone of the new accounting framework. The impact on equity upon transition to the new framework, therefore, depends on how closely the profits recognized under the current framework resemble the service-related pattern. The pattern of recognizing profits under the current accounting standards varies with the type of insurance products and with the accounting policy choices made by the insurer, particularly those related to the valuation of insurance contract liabilities.

Profit and Revenue Recognition Principles

Both the current and new accounting standards have different measurement models for different types of products. A rudimentary classification of the measurement methods can be based on the insurance contract duration. Most long-term contracts (such as term life, unit-linked and universal life, and endowment plans) are measured differently from short-term contracts (such as motor insurance and medical expense insurance). However, there are certain long-duration casualty lines (such as some classes of engineering business and liability coverages) that are measured in a manner similar to short-term products.



Given the accounting policy choices available under current accounting standards, various measurement and reporting practices are being used by insurers globally. The differences in measurement and reporting practices between different regions are more profound for long-term products than for short-term products.

Measurement and reporting practices for long-term products can be broadly classified into two categories. The first category consists of practices that measure profits in a way that more closely resembles the pattern of net cash flows than the pattern of services rendered. The second category consists of practices that measure and recognize the entire expected profit from the contract at initial recognition regardless of the pattern of services rendered. The impact on equity would be different for the two categories of accounting practice.

Insurers that follow the first category of accounting practice for their long-term products can expect a significant impact upon transition, but the direction of the impact cannot be generalized and would depend on the exact product structure. The impact essentially depends on how different the net cash flow pattern is from the pattern of services rendered. For instance, a back-end-loaded unit-linked product generally has large net cash inflows in later policy years, but services are provided throughout the term (and are not proportionally higher in later policy years). The current accounting practice for such products is likely to have postponed the recognition of profits; therefore, transition to the new standard is likely to have a positive impact on the equity.

Insurers that recognize the entire profit from long-term contracts upon policy inception will perhaps be most significantly and adversely impacted by the introduction of the new accounting standard. The new accounting framework eliminates the possibility of Day 1 profits (i.e., profits at policy inception) and requires that profits be recognized in relation to the level of services delivered. Therefore, insurers following such practices are likely to experience significant adverse impact on their shareholders' equity upon transition.

Most short-term products can be expected to be eligible for the simplified model of the new framework. Such products are not likely to experience a significant impact on the shareholders' equity, barring a possible impact from the treatment of acquisition costs discussed below.

There may be products that are currently measured in a similar way to short-term products but do not qualify for the new framework's simplified model. The magnitude and direction of the impact on equity cannot be generalized for such products.

Basis of Insurance Contract Valuation Assumptions

Under current accounting standards, insurers value insurance contract liabilities using either current assumptions or locked-in historical assumptions. However, the new standards make it mandatory to use current and market-consistent assumptions to the maximum extent possible. This could have a significant impact on shareholders' equity for those insurers currently using locked-in assumptions.

Another important aspect associated with valuation assumptions is the requirement of IFRS 17 to value liabilities for incurred claims on a discounted cash flow basis. Insurers do not generally discount claims-related cash flows when determining claim liabilities. This new requirement would—all things being equal—reduce the claim liabilities, and the impact could be significant for insurance products with long tail claims.

Other Accounting Policy Choices

The current framework provides many accounting policy choices. Two of the choices that are particularly important with respect to the impact on shareholders' equity upon transition to the new framework are the choices related to the treatment of acquisition costs and those related to the treatment of contracts that are likely to produce a deficit or loss.

Under the current accounting standard, there is a wide variety of practices used to recognize acquisition costs. The new standard

unifies the treatment of these costs. The impact of this change upon an insurer's equity would depend on the insurer's current practice for recognizing acquisition cash flows and how closely it conforms with the principles set out in the new standard. Since a wide variety of practices are currently used, no generalized comment can be made on the magnitude and direction of the impact.

Both the current standard and the new standard require that the expected loss from contracts that are likely to produce a loss should be recognized at the time it becomes reasonably certain that the contract would lead to a loss. The tool used to achieve this principle under the current framework is the premium deficiency reserve. Although the principles under both standards are similar for loss-making contracts, the classification of a contract as loss making could be different based on different aggregation requirements. The new framework sets out a much more specific method for aggregation, whereas the current framework largely leaves it up to the insurer to decide the level of aggregation, particularly for the purpose of determining premium deficiency reserves.

FACTORS RELATED TO IMPLEMENTATION OF IFRS 17

The most critical financial aspect of transition from IFRS 4 to IFRS 17 is the determination of the contractual service margin (CSM), or the unearned profit as of the transition date. IFRS 17 sets out three approaches for determining the CSM at the transition date: the full retrospective approach, the modified retrospective approach and the fair value approach.

The full retrospective approach, as its name suggests, requires that the CSM at the transition date be determined as if IFRS 17 had always been applicable. This essentially requires that each group of insurance contracts should be identified, recognized and measured from its inception to the transition date using IFRS 17 principles.

If it is not practical to apply the full retrospective approach, the modified retrospective approach allows the insurer to modify the full retrospective approach to achieve the closest outcome to the full retrospective approach using all possible reasonable and supportable information available without undue cost or effort.

If it is not possible to apply either the full or the modified retrospective approach, the fair value approach can be adopted. Under the fair value approach, the CSM at the transition date is determined as the difference between the fair value of the group of insurance contracts and the fulfillment cash flows for the group of contracts.

The three different transition options are likely to lead to a different estimate of CSM at the transition date; therefore, the impact on shareholders' equity upon transition also depends upon the transition approach adopted by the insurer. An insurer's choice of transition approach depends on the data available or obtainable, the complexity of the products, and the time and other resources available.

CONCLUSION

IFRS 17 is a long-awaited remedy to the shortcomings of IFRS 4; however, transitioning to the new standard could have an impact on an insurer's reported shareholders' equity. The impact is dependent on a multitude of factors and cannot be generalized. Insurers should undertake early efforts to identify the impact under each possible transition option to avoid last-minute surprises. Although transition from the current to the new accounting standard will have an impact on equity, it should be noted that any accounting standard is just a measurement and reporting framework and it has no impact on the aggregate profitability over the term of the group of insurance contracts. That is to say, when an insurer has fulfilled all its obligations to a group of insurance contracts, the total shareholders' equity will be the same regardless of whether the group of insurance contracts was measured under IFRS 4 or IFRS 17 while it was active.

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Withdrawal Delay Cohort Method Under VM-21

By Benjamin Buttin, Matthias Kullowatz, Zi Xiang Low and Zohair Motiwalla

In early December 2017, the National Association of Insurance Commissioners (NAIC) released proposed revisions to the existing U.S. variable annuity statutory framework. These revisions were promulgated as redline updates to the existing Actuarial Guideline 43 (AG 43) and Risk Based Capital C-3 Phase II instructions, paving the way for VM-21 of the *Statutory Valuation Manual* (VM), "Requirements for Principle-Based Reserves for Variable Annuities." After an exposure period in early 2018 to allow for comments from industry participants, regulators and interested parties, the Variable Annuity Issues (E) Working Group of the NAIC adopted almost all of the recommended changes outlined in the redline instructions.

While these revisions have been broadly agreed upon by the NAIC, a final set of regulatory instructions for VM-21 is still pending, with the responsibility assigned to the VM-21 Report Drafting Group. New updated redline instructions are exposed publicly on a piecemeal basis, inviting comments and feedback from practitioners and interested parties.[1] The working expectation is that the final version of VM-21 will be formally adopted at the NAIC Summer Meeting in August 2019 for a Jan. 1, 2020, effective date. Under the new VM-21 framework, the Aggregate Reserve is now the sum of the conditional tail expectation 70 amount (CTE Amount) and the Additional Standard Projection Amount, where the latter term is determined using the Standard Projection.

The VM-21 Standard Projection is essentially a complete overhaul of the existing AG 43 Standard Scenario framework. It can be calculated using either the company-specific market path (CSMP) method or the conditional tail expectation with prescribed assumptions (CTEPA) method. The CSMP method uses at least 40 prescribed economic scenarios, while the CTEPA method uses the same economic scenarios as the CTE Amount calculation.

One of the more challenging and important components of the Standard Projection is the withdrawal delay cohort method (WDCM), which is a prescribed approach for determining the timing of policyholder election for policies with either hybrid guaranteed minimum income benefits (GMIB)[2] or guaranteed minimum withdrawal benefits (GMWB). This article discusses practical considerations when implementing the WDCM.

WDCM PROCESS

The WDCM applies in both the CSMP method and the CTEPA method. To be in scope for the WDCM, policies must be either nonconforming (meaning they have taken a withdrawal in the policy year occurring coincident with the valuation date, and this withdrawal was in excess of the GMWB's guaranteed annual withdrawal amount or the GMIB's dollar-for-dollar maximum withdrawal amount) or nonwithdrawers (meaning that they have not started taking withdrawals).

Under the existing AG 43 framework, the Standard Scenario assumes that the exercise of any living benefits such as GMIBs or GMWBs occurs at the earliest available opportunity that is consistent with contractual provisions.

In contrast, the WDCM under VM-21 defines a prescriptive process for determining a distribution of possible election cohorts for each policy in scope, each with its own weight. The cohorts simulate each potential age of starting systematic withdrawals. In order to determine the election distribution, the guaranteed actuarial present value (GAPV) concept, as prescribed under VM-21, is used to calculate the prospective

withdrawal value of the rider to the policyholder at each potential individual withdrawal age.

The main steps in the WDCM are outlined below:

- For each potential initial withdrawal age (starting from issue), compute the GAPV assuming the policyholder elects to take withdrawals at that age. This will produce a set of GAPVs.

- Apply certain prescribed transformations and normalizations to this set of GAPVs to develop a from-issue cumulative distribution function (CDF), reflecting shocks as necessary. [3] This CDF defines a specific weight for the withdrawal cohort corresponding to each initial withdrawal age from issue.

- A "never withdraw" cohort is also defined, whose weight varies by rider type and tax status.

- Given a valuation date, any withdrawal cohorts corresponding to initial withdrawal ages occurring prior to that date are discarded and the remaining weights are rescaled to produce a rescaled CDF.

The key drivers in this process are those that underlie the GAPV calculation, namely the rider benefit base mechanics, the payout rate for the GMWBs and/or hybrid GMIBs under consideration, the prescribed Standard Projection mortality and the discount rate (3 percent). The most recent redline instructions stipulate that the CDF is calculated once for a set of policies with the same combination of issue age, rider type and tax status. For the purposes of this article, we refer to this combination as the WDCM cell key. In practice, there may be legitimate reasons to expand the WDCM cell key definition. For example, gender is a key item that should also be considered (because mortality rates will vary by gender). Moreover, the payout rate may vary by joint life status or rider generation.

Theoretically, policies with the same WDCM cell key should produce the same from-issue CDF even if their benefit bases on the valuation date are different, because the associated GAPVs should simply scale and the weights would renormalize to the same values. One could even calculate the CDF using an arbitrary (but nonzero) benefit base amount. Accordingly, for existing policies, the calculation of the from-issue CDF is intended to be a one-time process. Once calculated for a given WDCM cell key, the weights are fixed and do not need to be recomputed in the future.[4] The practitioner need only compute new weights for new business issued that have different WDCM cell key combinations.

USING RANDOM SAMPLING TO MITIGATE COMPUTATIONAL BURDEN

While the WDCM process is theoretically very appealing, in practice the run-time associated with splitting the in-force file into many cohorts (some of which may be assigned very small weights) can be very challenging, particularly under the CTEPA method. The full WDCM cohort file record count is likely to be many times greater than that of the original in-force file.

The redline instructions provide some allowance for discarding additional cohorts to mitigate the computational burden, so long as this decision has been disclosed. The specific language indicates that individual withdrawal age cohorts may be discarded or a small number of withdrawal cohorts may be assigned to each contract via random sampling.

Discarding cohorts to relieve the computation burden without loss of accuracy (relative to results produced using the full WDCM cohort approach) requires practitioners to engage in some analysis and testing, ideally before VM-21 becomes effective.

As noted in the redline instructions, one possible route practitioners can take is to use a random draw to collapse all cohorts to a single cohort for each in-force policy. The process would involve using a robust random number generator to produce a random draw on the interval zero to one for each in-force policy. This value would be compared with the rescaled CDF produced by the WDCM process, thereby randomly selecting a future election time and modeling each in-force policy using a single cohort with that particular election time. The advantage to this approach is that the in-force file record count for the randomized run is the same as the pre-WDCM version (i.e., the original in-force file). For proof of principle, the practitioner should verify that the results produced using both the random sampling approach and the full WDCM cohort approach are not only similar, but that repeated random trials produce stable results. This test should be performed at the onset of adopting the random sampling approach and may also need to be carried out at future intervals (such as to support disclosure of the approach in the year-end actuarial memorandum). It should be noted that a number of companies already employ random sampling methods in their CTE Amount calculations.

STATISTICAL THEORY BEHIND RANDOM SAMPLING

In defense of the random sampling approach outlined above (in which a single delay cohort is randomly selected for each policy) we argue that the greatest present value of accumulated deficiencies (GPVAD) calculated by randomly sampling the election time for each in-force policy will converge to the true GPVAD within an economic scenario for large in-force sizes, where the true GPVAD is that which would be calculated by using the full WDCM cohort in-force file. We start by showing

convergence of the policy-level accumulated product cash flows, and we expand that to the convergence of the GPVAD.

Probability theory suggests that when you sample values from a population, the ratio between the sample standard deviation and the sample sum shrinks as the sample size increases. The sample standard deviation here can be thought of as an error, the discrepancy between our GPVAD estimate and the true GPVAD. As such, even though larger in-force sizes will generally lead to larger errors, the errors will become smaller as a proportion of total GPVAD.

This theory extends naturally to WDCM cohort sampling—which is effectively a form of stratified sampling—where exactly one outcome is randomly selected for each policy. We first conceptualize the effect using the policy-level accumulated product cash flows. Each policy has a theoretical variance of possible accumulated product cash flow values based on the randomness of which WDCM cohort is sampled. Because WDCM cohorts are sampled independently for each policy, the variance of the sum is equal to the sum of the variances, shown mathematically here:

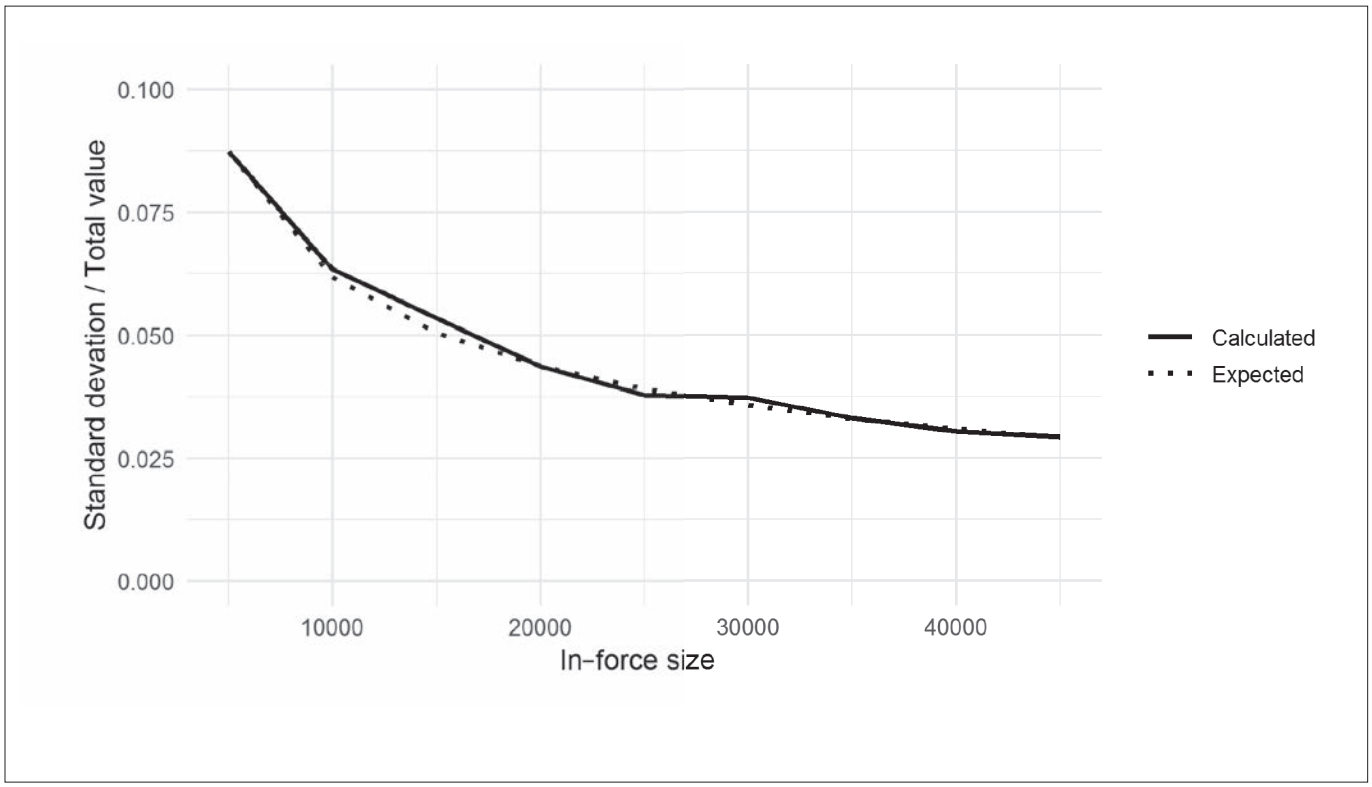
$$Var\left(\sum_{1}^{n} X_i\right) = \sum_{1}^{n} Var(X_i)$$

$$where\ X_i = sampled\ cash\ flow\ value\ for\ i^{th}\ policy\ and\ n = in\text{-}force\ size$$

As such, the variance of the sum increases linearly with the in-force size, implying that the standard deviation of the sum increases at a rate *proportional to the square root* of the in-force size. In other words, the sum is growing at a linear rate, but the standard deviation, or error, is growing at the rate of the square root, which is much slower.

In order to illustrate this relationship, we started with nine sets of in-force files that contained samples of between 5,000 and 45,000 policies. Each of these in-force files contained policies that were cohorted under the prescribed full WDCM approach with accumulated product cash flow results pre-calculated

Figure 1
Ratio of Standard Deviation to Total Accumulated Product Cash Flows by In-Force Size



for each cohort. For each of these in-force files, we randomly sampled distinct sets of cohorts 1,000 times to generate a distribution of potential total accumulated product cash flows.

In Figure 1 (pg. 28), the solid line represents the ratio of the standard deviation of the random samples to the total accumulated product cash flows for each in-force file size, while the dotted line represents the ratio that we would expect to see if the square root principle held. The graph shown in Figure 1 explains the phenomenon near perfectly. In other words, the sample error—as measured by the sample standard deviation—will shrink at a rate proportional to the square root of the in-force size.

While the probability theory discussed in this article explains the variation for sums of policy-level cash flows quite well, it does not cover how convergence of a policy-level cash flow implies convergence of the GPVAD. Intuitively, the calculation of GPVAD implies additional aggregation, both within and across time steps, and aggregation generally leads to lower variances. For example, this concept of aggregation is used to diversify portfolios and reduce risk. We found that the relative error of GPVAD values across random samples was, in fact, lower than the relative error of policy-level cash flows for equally sized in-force blocks.[5]

FINAL THOUGHTS

In recognition of the potential run-time challenges posed by the WDCM for variable annuity statutory valuation requirements under the VM-21 Standard Projection, we expect that companies will be looking to incorporate innovative solutions to manage the computational burden. Random sampling offers one such solution—one that is allowed within the proposed framework.

A complete version of this article that also presents a WDCM case study comparing the random sampling approach with the prescribed full WDCM approach for a guaranteed living withdrawal benefit (GLWB) block of business can be found at the following website address: *http://www.milliman.com/insight/2019/The-Withdrawal-Delay-Cohort-under-VM-21/AG-43-The-case-for-random-sampling/*. Certain technical considerations for companies thinking of adopting the random sampling approach are also discussed. ■

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ENDNOTES

1 This article has been developed using the updated VM-21 redline that was exposed in early March 2019. The reader is cautioned that to the extent that the final version of the instructions is different from this redline, certain outcomes from this article may need to be revised.

2 A hybrid GMIB policy is a policy with both guaranteed growth (such as with a rollup or doubler) and dollar-for-dollar partial withdrawal reductions in the GMIB benefit base.

3 For applicable policies, these prescribed shocks correspond to the end of the rollup period and/or required minimum distributions after age 70 for qualified plans.

4 Other than for the rescaling as the valuation date changes. Also, if there is a model correction/refinement that impacts the key drivers outlined above, then the CDFs need to be recalculated.

5 One can find our case study on GPVAD stabilization in the complete version of this article, linked in the Final Thoughts section.

Financial Reporting Research Update

By David Armstrong and Ronora Stryker

Research is a primary mission of the Financial Reporting Section and a significant use of our section dues revenue. Here is an update, as of March 2019, on projects in process and those recently completed.

CURRENTLY IN PROCESS

"Simplified Methods for Principle-Based Reserve Calculations." This project is in the late stages, and the project is being prepared for publication.

"The Application of Credibility Theory in the Canadian Life Insurance Industry." This survey of credibility practices of Canadian life insurers will compare and contrast credibility methods used by the companies. The Financial Reporting Section contributed to the funding for this project. Work is in the late project stage.

"Delphi Study of Economic Variables." This study uses a Delphi Study framework to gather insights on the thought processes experts employ to estimate future values of economic variables. Work is in the early project stage.

"Macroeconomics-Based Economic Scenario Generation." This project intends to find a practical way to improve economic scenario generators by studying the causes of economic development, economic volatility and capital market volatility. Work is in the early project stage.

"Modeling and Forecasting Cause-of-Death Mortality." This study will develop mortality projection models and produce cause-of-death mortality forecasts. Work is in the mid-project stage.

"A Machine Learning Approach to Incorporating Industry Mortality Table Features in Mortality Analysis." This research applies a machine learning approach that would enable a practicing actuary to incorporate key industry mortality table features into insured mortality analysis. Work is in the early project stage.

RECENTLY COMPLETED

"The Use of Predictive Analytics in the Canadian Life Insurance Industry." This project surveyed Canadian life insurers on the use of predictive analytics in practice. The Financial Reporting Section contributed to the funding for this project. The project report was published in May.

https://www.soa.org/resources/research-reports/2019/predictive-analytics-canadian-life-insurance/

COMPLETED IN 2018

"Earnings Emergence Insurance Accounting Under Multiple Financial Reporting Bases." This expands a 2015 research report on earnings emergence under multiple financial reporting bases. The original report looked at deferred annuities and term life insurance under U.S. SAP, U.S. GAAP, IFRS, CALM and market-consistent balance sheet approaches. This expanded report adds universal life and makes updates for principle-based U.S. statutory reserves, targeted changes to U.S. GAAP, and the new IFRS for insurance products. *https://www.soa.org/resources/research-reports/2018/earnings-emergence/*

"Survey of Waiver of Premium/Monthly Deduction Rider Assumptions and Experience." This report summarizes the practices and assumptions that different companies use for waiver of premium and waiver of monthly deduction benefits. Survey topics included mortality, valuation and pricing, and may be valuable to companies as they prepare for a principle-based framework. The results were published in March. *https://www.soa.org/research-reports/2018/survey-waiver-premium-monthly-deduction-rider/*

REQUEST FOR RESEARCH PROPOSALS

Do you have an idea for a research topic you would like to see the Financial Reporting Section consider for funding? If so, we want to hear from you! For more information, please contact Dave Armstrong or Ronora Stryker. ■

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