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Publication Schedule

Chairperson's Corner: Thoughts on the Future of Reporting and Passing the Baton

By Simpa Baiye

We are in the midst of "once-in-a-career" changes to financial reporting standards both in the United States and globally. As insurers prepare to implement the new standards, they will need to evaluate the effects on both processes and people. The productivity (measured by timeliness and accuracy) and value (measured by relevance and insights generated) of the financial reporting function will be in the spotlight as organizations contemplate this new order.

Technology will be the proverbial oil that greases the wheels of the financial reporting process, and three enabling technologies that are high on insurers' lists are artificial intelligence, robotic process automation and data visualization.

Artificial intelligence will play a greater role in identifying and analyzing trends in key performance metrics. This should greatly enhance the value that even experienced financial reporting actuaries bring to their organizations. Imagine a system that embeds the knowledge and insights of actuaries, adapts as new insights emerge, and efficiently transmits all that learning for the benefit of future reporting and analysis.

Robotic processes can eliminate potential errors that result from manual intervention in data transformation, eliminate manual output manipulation, and efficiently run through reporting controls checklists.

Data visualization can make the display of quantitative information more compelling. This will help actuaries provide greater insights into trends in actuarial values that result from complex measurement procedures. With any of these tools, "human + machine" will remain the winning combination.

PASSING THE BATON

It has been an honor for me to lead the Financial Reporting Section Council over the past year. I have had the pleasure of working with a great group of council members who have made great strides in meeting the professional development needs of section members and, indeed, the broader SOA membership. I am confident that the good work of the council will continue under the able leadership of David Armstrong.

I have had the privilege of seeing our section proactively address the professional development needs of our members by providing more electronic resources, such as links to IFRS 17 publications, FASB LDTI articles and the regulatory resource page. (These are available to members at *https://www.soa.org/sections/financial-reporting/financial-reporting-resources/.*) We also have expanded the suite of webcast offerings on a variety of pertinent topics, including GAAP accounting, GAAP long-duration targeted initiatives and IFRS 17. For in-person development opportunities, I am pleased to note that the valuation actuary symposium remains a forum for receiving top-notch, in-person professional content. Our involvement in the upcoming publication of the IFRS 17 and GAAP textbooks is thanks to the efforts of current and prior council members.

Finally, I would like to point out that opportunities to volunteer remain available. The council will continue to deliver appropriate professional development opportunities and depends on your support to make it happen.

Thank you and have a great rest of the year! ■

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Projections of Investment-Related Discretionary Elements

By Allison Clark and Kevin Strobel

Many products sold by life insurers in the United States include benefits that can adapt, within limits, to changing conditions via elements that can be set using discretion. Examples with links to capital markets include crediting rates in universal life or fixed deferred annuities, and cap or participation rates in indexed products.

One practice for setting crediting rates, if guarantees allow, is to set them equal to the book yield on an underlying portfolio less provisions for credit losses, investment management fees and a targeted product spread. This article describes this practice in more detail and suggests one approach for modeling credited rates in a risk-neutral context. The approach can be generalized to allow projections of other variables such as cap rates or dynamic lapses driven by competitor credited rates.

This article lays conceptual foundations associated with projecting investment-related discretionary elements of various life insurance and annuity products. It outlines potential implementation approaches that may be appropriate when calculations are performed in a risk-neutral setting, such as in market-consistent valuation frameworks like IFRS 17. Specifically, the article concludes that crediting rates in risk-neutral models can be projected as in real-world models, except that the modeled provision for expected credit losses should be modified to equal real-world expected losses initially, but over the projection reflect management's evolving expectation, moving ultimately to risk neutral expected losses.

CREDITING RATE DETERMINATION IN PRACTICE

Discretionary crediting rates are usually set with the goal of achieving a targeted difference between the net investment income generated by the underlying assets and the liability growth. This can be expressed more formally as:

Crediting Rate = max (*Guaranteed Minimum Crediting Rate, Book Yield – Provision for Expected Credit Losses – Investment Management Fees – Product Spread*)

This formula is commonly not applied rigidly, but it is used as a general guide along with a number of other factors, such as providing customers with a stable rate, maintaining a competitive position relative to peer companies or avoiding large-scale disintermediation. In this article we will ignore the latter concerns and assume the crediting rates are set mechanically on the basis of the preceding calculation.

The Guaranteed Minimum Crediting Rate is contractually set at policy issue.

The Book Yield is usually a snapshot yield at the time of the rate reset and represents the gross book yield on a portfolio of assets on either an IFRS or a statutory basis. Because this metric is driven by historic cost accounting, it tends to evolve quite slowly and predictably.

The Provision for Expected Credit Losses is equivalent to the expected credit losses used in many actuarial projections. Expectations of default frequency and severity are often based on historical data, and observed variability in any one year's data is usually interpreted as being driven more by the credit cycle rather than signifying a fundamental change in long-run creditworthiness, especially as actuarial projections are typically over time spans that are long enough to encompass a fair number of credit cycles. The Provision for Expected Credit Losses does not aim to offset this year's credit losses within the credited rate; rather, its goal is to cover those losses on average over the life of the business.

The Investment Management Fees reflects investment management expenses.

The Product Spread is determined at the time the product is originally priced and usually remains unchanged in practice thereafter. Product parameters such as the product spread, cost of insurance charges and per-unit loads are chosen to deliver appropriate profitability after covering the product's benefits, commission payments and administrative expenses. One important factor in determining "appropriate profitability" is receiving a return on the capital that the company is required to hold to cover the risks associated with managing this product. If an especially credit-risky underlying portfolio is envisioned, then the product spread will be increased to help produce the necessary returns on the relatively large required capital, essentially pricing for the risk associated with "unexpected defaults."

CREDITING RATE DETERMINATION IN REAL-WORLD PROJECTIONS

In the current IFRS reporting environment, the calculations of deferred acquisition costs or loss recognition sufficiency involve projecting the profitability of a block of business in the future in

a best estimate scenario. Products with discretionary crediting rates require a projection of those rates, which is accomplished by projecting each of the terms in the crediting rate formula already given. The Guaranteed Minimum Crediting Rate is contractually defined, the Product Spread is typically projected to follow the targeted spread determined during product pricing, and the Investment Management Fees and Provision for Expected Credit Losses are often assumed to remain constant, matching the parameters used in real-life rate setting at the model start date.

The Book Yield is usually projected by explicitly modeling asset portfolio behavior, recognizing complicated dynamics such as asset maturities, purchases and sales. Newly purchased securities can be projected to have a yield consisting of a risk-free asset rate (e.g., a U.S. Treasury bond) plus a gross credit spread that is class-, quality- and tenor-specific. Note that the gross credit spreads used here are typically well in excess of expected credit losses. A large portion of the difference is made up of compensation for uncertainty in how actual credit losses will relate to expected credit losses (sometimes referred to as "unexpected credit losses"), while the remaining difference is taken to be an illiquidity premium.

IFRS 17 RISK NEUTRALITY

With the introduction of IFRS 17, the International Accounting Standards Board (IASB) attempts to more accurately reflect the underlying financial position of contracts with long-term and complex insurance risks.[1]

One of the key principles in IFRS 17 is that an entity "(d) recognises and measures groups of insurance contracts at: (i) a risk-adjusted present value of the future cash flows ... that incorporates all of the available information ... in a way that is consistent with observable market information."[2] The estimates of these cash flows may "reflect the perspective of the entity, provided that the estimates of any relevant market variables are consistent with observable market prices for those variables."[3]

Furthermore, paragraph B48 emphasizes that "the technique used must result in the measurement of any options and guarantees included in the insurance contracts being consistent with observable market prices (if any) for such options and guarantees."[4] This requirement is expected to be satisfied by adopting a risk-neutral economic scenario set.

CREDITING RATE DETERMINATION IN RISK-NEUTRAL PROJECTIONS

The question now arises on how to incorporate company and customer behavior in a risk-neutral context. In popular derivatives theories, the value of an option is equal to the present value of the expected payoff under a risk-neutral random walk.[5]

Complexities with real-world valuation, such as determining real-world probabilities and a utility function, are eliminated in risk-neutral valuation.[6]

Girsanov's theorem formally defines the concept of changing a probability measure from the real world to an equivalent risk-neutral measure. Here equivalency describes two measures that have the same sample space and the same set of possible outcomes. Probabilities for each outcome can differ, but the two measures must agree on what is possible.[7]

It follows that each outcome, or scenario, is not inherently real world or risk neutral; rather, it is the probability measure under which a model is operating that determines the framework. This insight suggests that risk-neutral models should project company and customer behavior in exactly the same way as real-world models.[8]

While actuarial models typically view a "scenario" as a specified path for interest rates, it should instead be viewed as a specified path for the full economy. That is, credit spreads and losses (as well as other relevant economic variables, such as inflation or equity returns) should be explicitly and stochastically modeled. Models are often simplified by assuming that using the average value for each of these non-risk-free-rate variables will give the same result as the average result across the stochastic random

variables. While the appropriateness of this simplification may at times be in doubt, for the purposes of this article we assume that this simplification will be employed. Note that when an average is taken across risk-neutral scenarios, the average credit loss equals expected credit losses (across a real-world probability measure) plus unexpected credit losses (the compensation for this variability).

Continuing to model Guaranteed Minimum Crediting Rate, Product Spread and Investment Management Fees as deterministic parameters seems reasonable and uncontroversial. Projecting the portfolio Book Yield and the Provision for Expected Credit Losses in a risk-neutral setting is more complicated.

The risk-neutral projection of Book Yield should conceptually follow the same outline as in real-world models. The modeled gross yield of any newly purchased asset is determined by the sum of a risk-free rate and a credit spread, with the latter matching the forward spread, determined by the model date's term structure of credit spreads. The difficult question is whether one should project portfolio management behavior to change, in particular buying less credit-risky assets over time in a scenario where credit risk is not well rewarded (because average credit losses are higher than originally anticipated). There are a number of reasons to continue projecting the same target for asset allocations in a risk-neutral model:

- A portfolio cannot move all the way to a credit risk-free investment strategy without also sacrificing the illiquidity premium.

- If a company moved to a lower risk (but still credit-risky) portfolio, that company would need to consider reducing the Product Spread as well, largely offsetting the effect on the crediting rate, which is the metric of concern here.

- It is the simplest approach and so is advisable unless there is another clearly superior alternative.

Real-world models often assume that the future Provision for Expected Credit Losses matches that used as of the model start date. This is consistent with the view that today's Provision for Expected Credit Losses is set based on an average of prior credit loss experience and that modeled credit losses match those expectations. In this case, there is no reason for the Provision for Expected Credit Losses to change. This contrasts with the situation in a risk-neutral model, where credit losses emerge higher than originally envisioned (on average, they match the sum of expected and unexpected credit losses). In a risk-neutral model, the Provision for Expected Credit Losses grades from time zero expectations to the sum of expected and

unexpected credit losses as, in this setting, experience consistently plays out following the larger amount. The projection of the Provision for Expected Credit Losses is of management's evolving expectation. A single year or two of new adverse data has little effect on a long historical data set and is likely to be interpreted as a difficult and temporary portion of the credit cycle, which is how many insurers viewed the 2008–09 period. However, as the model continues, it may be appropriate to begin applying disproportionate credibility to subsequent credit behavior.

CONCLUSION

The conclusions above can be summarized simply for the sake of implementation: crediting rates in risk-neutral models can be projected as in real-world models, except that the Provision for Expected Credit Losses term should be modified over the course of the projection. The projected Provision for Expected Credit Losses should initially equal real-world expected losses. Then, over a period of time, it should incorporate unexpected losses such that it ultimately equals the sum of the two in agreement with full recognition of a new credit loss environment. ■

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ENDNOTES

1 IASB. 2017. *IFRS 17 Insurance Contracts,* section IN4.

2 Ibid, section IN6.

3 Ibid, paragraph 33(b).

4 Ibid, paragraph B48.

5 Wilmott, Paul. 2009. *Frequently Asked Questions in Quantitative Finance.* 2nd ed. Chichester, UK: Wiley and Sons, Ltd., 143.

6 Ibid, 160–61.

7 Ibid, 113–14.

8 Hatfield, Gary. 2009. "A Note Regarding 'Risk Neutral' and 'Real World' Scenarios— Dispelling a Common Misconception." *Product Matters!,* no. 73: 13–14.

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LDTI Implementations: Lessons Learned

By Nicole Kim, Gouri Kumaran and Daniel Sorensen

A recent survey[1] by PricewaterhouseCoopers (PwC) revealed that meeting the new long-duration targeted improvements (LDTI) requirements—issued by the Financial Accounting Standards Board (FASB) under its US Generally Accepted Accounting Principles (GAAP)—poses significant challenges for many companies. In fact, as shown in Figure 1, 87 percent of the survey respondents considered the LDTI timeline challenging, with 61 percent saying it has been extremely challenging. This is because companies have to make significant changes, in a relatively short period of time, to systems and related processes that accumulate and transform data that insurers have not previously captured and aggregated within their actuarial models.

In this article, we summarize five key lessons that we have learned in implementing LDTI and share our insights on practical ways to address them. This is not an exhaustive list of implementation challenges, but companies that can successfully tackle the issues we describe should have a smoother data and systems implementation transition.

TAKING A RIGHT-TO-LEFT APPROACH

After the initial release of the LDTI standard, many insurers unsurprisingly started asking questions about data storage, processing capabilities and new software implementation. While we recognize that there is a lot to do in a short period of time, we recommend that the first step for insurers is to detail the requirements they most want to address. We frame this in the context of a "right-to-left" approach.

Simply put, a right-to-left approach starts with defining the downstream business requirements (informally referred to as the "right"). The process of cataloging those business requirements should ideally include members from the IT, accounting and actuarial functions. After defining those downstream business requirements, the insurer then works to the "left," meaning that team members diagram the upstream data and system needs. Team members continue diagramming to the left, eventually stopping at the firm's source systems (i.e., the first point in the data continuum where data are ingested or entered).

Figure 1
Results from a Recent LDTI Survey
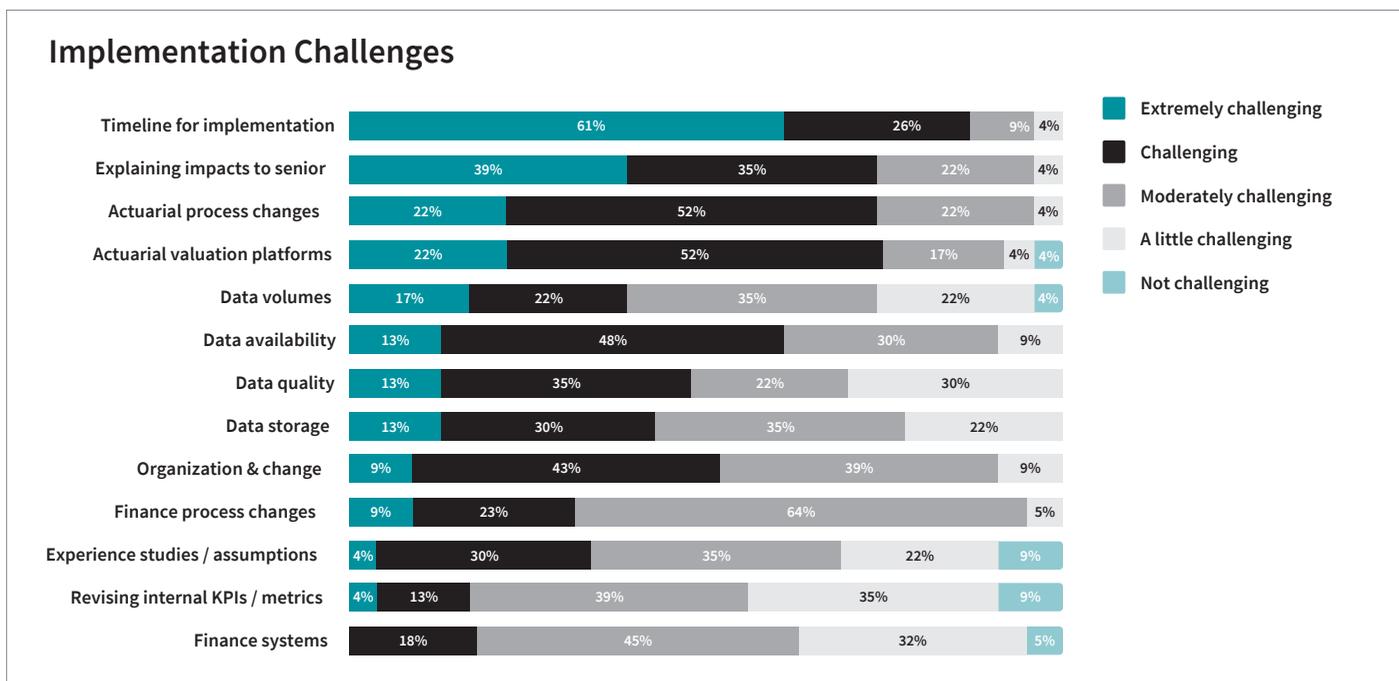
Source: PwC. 2019. Long-Duration Target Improvement Survey. https://www.pwc.com/us/en/cfodirect/issues/insurance-contracts/long-duration-improvement-survey-2019.html.

By using a right-to-left approach, the three functions will be able to map out the entire data journey while maintaining focus on the end requirements throughout the process. The time the functions spend on thinking through data requirements and system changes is thus anchored in LDTI requirements.

ADOPTING AN AGILE-BASED APPROACH DURING IMPLEMENTATION

One of the common themes to keep in mind with GAAP change pronouncements is that the timeline is set, and vendor software solutions and modifications are new. Therefore you will need to do more testing than in a typical upgrade or implementation.

Using an agile-based approach with short, two- to three-week sprints for identifying and handling basic requirements and implementation scenarios early on is essential for success. Do not try to design a solution for exception cases during requirements gathering. Break down more complex scenarios into smaller pieces of work. This will help you build momentum and obtain visible results early on, providing time to explore exception cases later in the project. This will also enable a continuous delivery model and help you manage changing requirements later in the process.

Prioritizing material design items, planning the sprints of work, and working in a collaborative way with different workstreams (actuarial, accounting, IT, data and so on) is extremely important both to gain agreement and clarity on policies and to determine the underlying assumptions, parameters and principles required for successful implementation. Finally, dedicating a team of skilled technical subject matter specialists (from both business and technology functions) is critical for obtaining suitable results within tight timelines.

BEING CLEAR ON VENDOR INTERACTIONS AND TOUCH POINTS

First, strong ties with vendor teams is crucial for success. Understand that vendors are ramping up for the higher level of client support that will be required of them for this GAAP change. They also will be engaging with a number of clients at roughly the same time. Developing strong relationships early on can help enable proper support for your organization. Scheduling vendor team resources to be on-site with your team during implementation is preferable.

Second, it's important to understand in detail the key hand-off points with your vendor to facilitate proper communication of requirements for configuration. For example, does the vendor have a specific business requirement template that addresses unique areas of the product and that it expects its clients to complete in advance? Does it have a defined data mapping template so that its clients can appropriately map data elements from various sources to the vendor's target solution or module?

Third, having an upfront discussion with vendors about their release timelines for LDTI features will help your organization better plan for implementation. With new GAAP change pronouncements, it's not uncommon to have a number of releases and patches during and after go-live. Knowing the

functionalities that will be provided and the timeline will help your organization plan an appropriate rollout strategy.

When vendors upgrade and tailor their products to LDTI, it could be helpful to assess the use costs and benefits as an opportunity for larger scale, enterprise-wide platform modernization efforts.

USING ESTIMATION TECHNIQUES WHERE APPROPRIATE

Working with external auditors early in the process to agree on how to use various estimation techniques can save companies months of implementation time. However, developing a framework to determine how and where to apply approximations can be challenging.

For those blocks that are deemed immaterial, one estimation worth considering is to leave current GAAP as it is. The rationale behind this is that the block is so immaterial that its impact on the overall balance is minuscule. This approximation is ideal for those companies that report under a consolidated balance sheet.

We also see companies assessing the appropriateness of approximation techniques based on potential impact (high, medium, low) and operational challenges (hard, moderate, easy). For example, updating discount rates may not be difficult, and because the potential impact is high, it probably makes sense to update them. On the other hand, combining material and nonmaterial cohorts could be operationally onerous and have a minimal impact. Companies can perform this analysis at the block level for each of the key changes that LDTI implementations require.

TAKING A PROACTIVE APPROACH TO MODEL TESTING

As described in PwC's recent paper on LDTI model validation[2], taking a proactive approach to testing is critical for success. Waiting to compile and document all existing test plans can potentially delay the project timeline and result in retesting if issues are not discovered early. Breaking down test plans into manageable pieces and testing more frequently (e.g., at the end of each sprint) will make the process more efficient. This method works as long as the larger testing project plan is periodically reviewed and the test case inventory is continuously updated for completeness. When building test plans, consider these three areas:

- **Data:** If test data are not available, use sample data (create your own) and start performing unit testing. This can help you catch errors in models early in the process. Using sample data is an established practice, as it helps test paths that may be encountered rarely or not at all with real-life data.

- **Models:** All the models need not be completely coded to start testing. Models can be tested piecemeal. For instance, if the premium piece of the model is coded first, it can be tested initially and then integrated with the benefits piece after that part is completed.

- **Reports:** Once again, if the data are not available for testing, run the reports anyway and use sample or test data to ensure reports are generated appropriately for the test case being considered.

We recognize that there are many challenges with LDTI implementation, but by taking these five key steps, you should be better positioned for a successful and sustainable transformation. ■

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ENDNOTES

1 PwC. 2019. Long-Duration Target Improvement Survey. *https://www.pwc.com/us/en/cfodirect/issues/insurance-contracts/long-duration-improvement-survey-2019.html.*

2 PwC. 2019. A Better Approach to LDTI Model Validation. *https://www.pwc.com/us/en/cfodirect/issues/insurance-contracts/ldti-model-validation.html.*
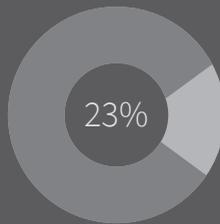
Implementation Considerations for VA Market Risk Benefits

By Dylan Strother, John Adduci and Janelle Kern

Editor's note: The views expressed in this article are those of the authors and do not necessarily reflect the views of the authors' firms.

In August 2018, the Financial Accounting Standards Board (FASB) introduced a new standard (ASU 2018-12) that made "targeted improvements" to the accounting for long-duration insurance contracts. The new standard changed the accounting for the future policyholder benefits liability and the amortization of deferred acquisition costs, established a new accounting classification and measurement for certain insurance benefits now referred to as market risk benefits (MRBs), and expanded the disclosure requirements associated with financial statements.

This article will focus on what companies need to know about MRBs and important implementation considerations when complying with the new standard.

WHAT IS AN MRB?

FASB defines an MRB as a benefit in addition to the account balance that protects a policyholder from "other than nominal capital market risk" and exposes the insurance company to "other than nominal capital market risk" (ASU 944-40-25-25C).

Generally, guaranteed minimum benefits (GMxBs) on variable, indexed and fixed annuities are considered MRBs under the new standards, if the capital market risk is "other than nominal." Annuitization guarantees on deferred annuities also may be considered MRBs.

Common features that are not in scope are the death benefits that exist on life insurance products, such as the death benefit on a variable universal life contract. Also out of MRB scope is any amount that "credits" the account value, such as a guaranteed minimum credited rate or the index credits on a fixed indexed annuity. While the index credits on a fixed indexed annuity would still be considered an embedded derivative, the feature would not be considered an MRB, since it is a crediting mechanism to the account value.

One challenge in identifying an MRB is the assessment of "other than nominal capital market risk," which includes a moderate amount of judgment. The ASU states that a risk could be nominal if it has a small chance or "remote probability of occurring." Additionally, the Update provides that the risk is other than nominal if "the benefit would vary by more than an insignificant amount in response to capital market volatility" (ASU 944-40-25-25D-c).

The assessment of "other than nominal capital market risk" occurs at contract inception based on the economic environment at that time. The same guarantee could be an MRB in certain economic environments but not in others. This is true for in-force at transition as well, since the assessment (and the calculation) is performed on a retrospective basis. In performing this assessment, the actuary would likely want to look at the risk over a range of probable capital market scenarios to determine whether the benefit amount in excess of account value would vary by more than an "insignificant amount." Note that the new standard focuses on the risk being other than nominal, not the expected value of the benefit that would incorporate the utilization of the benefit or the likelihood of exercise. Therefore, utilization assumptions should not be used in the assessment of other than nominal risk. It is possible for a benefit feature that has other than nominal capital market risk to be classified as an MRB but for the fair value of the benefit to be immaterial initially due to the lack of assumed utilization. The fair value of the MRB could become material at a later date based on updated assumptions.

METHODOLOGY CONSIDERATIONS

Once the scope has been decided, MRBs should follow fair value accounting. FASB requires that a contract with multiple

MRBs should be valued together as a compound MRB (ASU 944-40-30-19D). An example of a compound MRB would be a variable annuity with a guaranteed minimum living benefit and a guaranteed minimum death benefit.

Two methods of calculating the fair value are mentioned in the new standard: a non-option method and an option method. This article discusses the non-option method, which is commonly used by variable annuity carriers.

The non-option method generally calculates an "attributed fee" such that the MRB value is zero at inception using present value of benefits minus present value of ascribed fees. The attributed fee method is the most common for fair valuing certain GMxBs under current GAAP for many variable annuity carriers.

In addition to the in-force file with policy level information, the following other inputs are needed for valuation:

- Risk-neutral interest and equity scenarios
- Own credit risk
- Policyholder behavior assumptions
- Risk margins

Risk-neutral scenarios are commonly used by market participants to fair value capital market risk. Fair value calculations performed over stochastic economic scenarios may use scenario-specific, stochastic, risk-neutral interest rates for the discounting of benefits and fees. In such cases, equity and interest scenarios should be correlated to give meaningful results. Other dynamic assumptions connected to economic scenarios should be reviewed and validated if stochastic scenarios were not utilized under the prior reserve method.

For fair value calculations, a company's own credit spread is a component of instrument-specific credit risk. ASU 2018-12 requires that changes in the liability due to changes in instrument-specific credit risk be recognized below the line in other comprehensive income. Therefore, instrument-specific credit risk needs to be an explicit component of the discount rate so this measurement can be performed.

Policyholder behavior such as lapse, partial withdrawal and benefit utilization needs to be modeled across scenarios. These assumptions can be static, if not dependent on economic scenarios, or dynamic. The transition from best estimate to risk-neutral scenarios, when combined with dynamic policyholder behavior assumptions, can result in unintuitive results. It is good practice to establish a procedure to validate results and verify that there are no unintended consequences.

Risk margins are adjustments to account for uncertainty in cash flows and reflect assumptions that market participants would use to price the benefit. Many capital market assumptions are observable and do not require a risk margin. However, policyholder behavior assumptions are unobservable, so a risk margin is generally applied. A common way to reflect a risk margin is to explicitly adjust assumption parameters.

The non-option market risk benefit liability is calculated as follows:

- **Step 1:** Project all excess benefits and contract fees across each risk-neutral scenario.

- **Step 2:** Calculate the present value (PV) of excess benefits and contract fees in each scenario. The present value is determined by discounting back to the valuation date at the risk-neutral interest rate plus instrument-specific credit risk.

- **Step 3:** Average the present value of excess benefits and contract fees across all scenarios.

- **Step 4:** For newly issued policies, calculate the attributed fee percentage (AF%):

$$AF\% = min\left(100\%, \frac{Average\ PV\ of\ excess\ benefits}{Average\ PV\ of\ associated\ fees}\right).$$

This formula produces zero gain or loss at issue as long as the AF% is not capped at 100 percent. If contract fees are not enough to cover the MRB benefits, a loss could occur at issue. The AF% is locked in at issue and used at all future valuation dates.

- **Step 5:** Calculate the market risk benefit (MRB) balance using the AF% locked in at issue and the following formula:

$$MRB_t = (Average\ PV\ of\ excess\ benefits) - AF\% \times (Average\ PV\ of\ associated\ fees).$$

> Policyholder behavior such as lapse, partial withdrawal and benefit utilization needs to be modeled across scenarios.

OPERATIONAL CONSIDERATIONS

Once a methodology is determined, there are some operational implementation considerations, including building a process to support disclosure requirements and applying the guidance retroactively.

The disclosure requirements (ASU 944-40-50-7B), among other items, include aggregating the MRBs with similar characteristics into categories to present a disaggregated and detailed roll forward of each category's reserves from the beginning of the reporting period to the end. This type of analysis often requires many successive layered valuation runs to quantify the reserve movements due to changes in calculation inputs, such as changes in economic environment or actuarial assumptions. ASU 944-40-55-13K lists items that may be included in such an analysis. Additionally, ASU 944-40-50-7B lists certain items that are required in the disclosures, such as net amount at risk and weighted attained age. Actuaries should be working with their accounting counterparts to understand the level of disaggregation desired internally versus the level desired to be disclosed externally. Fair value disclosure requirements (ASU 820-10-50) should be considered as well in identifying the roll forward

components, so that both requirements will be satisfied in a single disclosure.

Companies currently reporting fair value reserves for these benefits can leverage their current fair value disclosure. Companies that accounted for only riders under SOP 03-1 will likely require significant changes to their existing attribution process. In both cases, valuation, modeling, accounting and IT will need to collaborate to set requirements for disclosures. Analysis should be performed to determine whether the current modeling platform and IT infrastructure can support the anticipated runs and level of detail required. Companies may need to increase computing power to meet financial reporting close timelines.

Much of the operational challenge in implementing the new calculation regime for MRBs will be related to meeting the retrospective transition adjustment. As of the transition date, the difference between the fair value and carrying value for an MRB is recognized as an adjustment to retained earnings. The cumulative effect of changes in instrument-specific credit risk between contract issuance and the transition date

is recognized as an adjustment to accumulated other comprehensive income (AOCI).

The attributable fee percentage and AOCI adjustment require assumptions and calculations as of contract issuance (or acquisition). This likely means a company will need to resurrect models from the past, retrofit current models to represent the past or use a practical expedient.

Resurrecting a model from the past may seem like the best path at first. However, for most companies, this option is unrealistic, unless they are going only a few years back. Many blocks of business containing MRBs have been acquired over the years. In addition, the increased complexity of benefits and guarantees on equity-based annuities and extra attention around model governance for these products has resulted in many companies converting to new software. Simply pulling the model off the shelf and rerunning it may not be a realistic option.

Retrofitting a current model to represent an older model is another option that has its own set of challenges. Policyholder data as of issuance are required to calculate the attributable fee percentage, but due to data retention policies and changes in modeling platforms, obtaining and using the data is challenging. A company may retrieve old data extracts and adjust the data to be compatible with current models, roll back elements of the current in-force data to mimic at-issue data, or create pricing cells that are representative of the company's assumed sales. Assumptions as of the policy issuance are also required. These assumptions may not be available for older vintages, which will require the company to use judgment and hindsight. When the assumption documentation does exist, the current model will have to be updated to use the retrieved assumptions, and the structure of legacy assumptions may no longer be supported.

Finally, a company may be able to use a practical expedient to comply with transition requirements (such as the ratio approach presented in "Transition Expedient for Market Risk Benefits Under GAAP Targeted Improvements" in the December 2018

> ## Simply pulling the model off the shelf and rerunning it may not be a realistic option.

issue of *The Financial Reporter*). If the company plans to use practical expedients, it is worthwhile to have discussions with auditors to ensure there is an understanding of the acceptable circumstances and documentation requirements of using a practical expedient.

CONCLUSION

There are a number of challenges associated with ASU 2018-12 related to the measurement of market risk benefits. Setting new accounting policies and changing infrastructure will take time and resources. Each company needs to review the facts and circumstances of its own situation to determine how difficult the implementation efforts will be. ■

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Volatility From FASB Changes to Traditional Liabilities (Part 3)

By Leonard Reback

In the first two parts of this series we looked at how the targeted improvements promulgated by the Financial Accounting Standards Board (FASB) in ASU 2018-12 will impact reserve volatility for traditional nonparticipating contracts resulting from changes in cash flow assumptions. Part 1 looked at the impact of changing cash flow assumptions when the reserve discount rate is unchanged since the contract was issued. Part 2 looked at the impact of changing cash flow assumptions when the reserve discount rate has changed since the contract was issued. Part 3 will look at the isolated impact of changing the discount rate.

ASU 2018-12 changes the accounting for traditional nonparticipating contracts by requiring cash flow assumptions to be reviewed for possible revision at least annually and requiring true-ups of actual experience relative to the assumptions at least annually. The impact of these changes to cash flows on the reserve is partially reflected by retrospectively unlocking the net premium ratio (or deferred profit liability for limited payment contracts), and the net effect is reported in net income.

Discount rate updates are handled differently. The discount rate must be updated each reporting period. The discount rate is defined as a current "upper-medium grade (low-credit-risk) fixed-income instrument yield," which is generally interpreted as a single-A-rated instrument yield. Changes in discount rate do not impact the net premium ratio or deferred profit liability, which are always calculated based on the rate locked in at issue. The change in present value of future benefits net of present value of future net premiums resulting from a change in discount rates is reported in other comprehensive income (OCI), not net income.

UPDATING THE DISCOUNT RATE

Although updating the reserve discount rate will increase the volatility of the reserve, it may decrease volatility in the financial statements. Under targeted improvements, changes in discount rate will be reflected in the reserve every reporting period, with the reserve impact reported in OCI. Many invested assets backing traditional nonparticipating liabilities tend to be available-for-sale securities, whose change in fair value is also reported in OCI. So if the liability and asset durations are well matched, reporting the impact of discount rate changes in OCI may reduce noneconomic noise in OCI that occurs under current US GAAP, since only the asset side of the balance sheet is revalued through OCI when interest rates change. But the offset from liability OCI may not be complete.

We can see this by looking at the duration of the liability, taking into account all cash flows and comparing that to the duration of the liability using net premiums. The value of the liability on a pure cash flow basis, that is, a gross premium valuation, is:

$$GPV_t = \sum_{u=0}^{\infty}(B_{t+u} - GP_{t+u}) \times (1 + i_t)^{-u}, \text{ where}$$

GPV_t = The gross premium reserve at time t

B_{t+u} = The assumed benefit payment (including any expenses impacting the reserve) at time t+u, as measured at time t

GP_{t+u} = The assumed gross premium to be received at time t+u, as measured at time t

i_t = The liability discount rate as determined at time t

(I am assuming a single discount rate for simplicity, but the result should generalize to a yield curve.)

The change in gross premium liability for a change in discount rates is:

$$\frac{dGPV_t}{di_t} = \frac{-1}{(1+i_t)} \times \sum_{u=0}^{\infty} u \times (B_{t+u} - GP_{t+u}) \times (1+i_t)^{-u}$$

The modified duration is thus:

$$Modified\ duration\ (GPV_t) = \frac{1}{(1+i_t) \times GPV_t} \times \sum_{u=0}^{\infty} u \times$$
$$(B_{t+u} - GP_{t+u}) \times (1+i_t)^{-u}$$

This is the common "mean term" formula for calculating Macaulay duration multiplied by the $1/(1+i_t)$ factor.

But the net premium liability is used for financial reporting purposes, using net premiums instead of gross premiums. The net premium is, of course, the gross premium at each period multiplied by the net premium ratio. So we get:

$$V_t = \sum_{u=0}^{\infty}(B_{t+u} - NPR_t \times GP_{t+u}) \times (1 + i_t)^{-u}$$

The change in net premium liability for a change in discount rates is:

$$\frac{dV_t}{di_t} = \frac{-1}{(1+i_t)} \times \sum_{u=0}^{\infty} u \times (B_{t+u} - NPR_t \times GP_{t+u}) \times (1+i_t)^{-u}$$

The modified duration of the net premium reserve is:

$$-\frac{1}{(1+i_t) \times V_t} \times \sum_{u=0}^{\infty} u \times (B_{t+u} - NPR_t \times GP_{t+u}) \times (1+i_t)^{-u}$$

Looking at the duration as a mean term calculation, the duration of the gross premium reserve is the mean term of the benefits minus gross premiums, while the duration of the net premium reserve is the mean term of the benefits minus net premiums. Net premiums are less than gross premiums unless the net premium ratio is 100 percent, in which case they are equal. So as long as premiums are paid in advance of benefits, the early cash flows (which get a smaller "weight" u in this formula) are larger under the net premium reserve calculation than under the gross premium reserve calculation. As long as the gross premium reserve is positive, this will generally cause the duration of the net premium reserve to be smaller than the duration of the gross premium reserve.

So even if the asset and liability durations are matched on a pure cash flow basis, the change in asset fair values reported through OCI when interest rates change will tend to be greater than the change in liabilities reported through OCI. The effect will tend to increase for lower net premium ratios.

A similar effect will occur for limited payment contracts. This can be seen by recognizing that the deferred profit liability (DPL) will not be impacted by changes in interest rates, essentially having a modified duration of zero. But the fair value of invested assets backing the DPL will be impacted by changes in interest rates. So, again, the overall liability duration as reported in the financial statements will likely be less than the invested asset duration, even if both are perfectly matched on a cash flow basis.

Other elements can also impact the reported OCI matches between assets and liabilities. For example, some assets are reported at amortized cost rather than fair value, and for these assets, no OCI will be reported for interest rate changes. Also, the durations of the assets and liabilities on a pure cash basis may not be perfectly matched. Further, there may be

The overall liability duration as reported in the financial statements will likely be less than the invested asset duration.

some basis risk due to the fact that the reserve discount rate is based on single-A yields, while the invested assets may include assets of various types and credit grades. There will also be no OCI match for surplus assets or for assets backing products whose valuation was unaffected by ASU 2018-12, such as investment contracts, universal life-type contracts and participating contracts.

CONCLUSION

Under targeted improvements, the liability for traditional nonparticipating contracts will become more volatile. Some of this volatility will reduce volatility in the financial statements to the extent that the liability volatility is matched with the asset volatility that already exists under today's accounting. Since the impact of interest rate changes on liabilities will not perfectly match the impact on assets, it will be important to understand and explain these results. ∎

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Enhancing Controls in Conjunction With GAAP LDTI

By Mark Spong and Katie Kervick

A s a congressional page, one of the authors witnessed the passage of the Sarbanes-Oxley Act (SOX) of 2002. The legislation—officially called the Corporate and Auditing Accountability, Responsibility, and Transparency Act—was unexciting compared to higher profile legislation like the Patriot Act. This is a reminder of how easy it is for all of us to underappreciate financial controls; we hate to think controls will be an afterthought again as the industry implements the Financial Accounting Standards Board's (FASB's) long-duration targeted improvements (LDTI).

This article reviews why financial reporting controls are relevant to actuaries. It also discusses the impact of LDTI on controls and the strategic decisions that insurers need to make.

WHY ARE FINANCIAL REPORTING CONTROLS RELEVANT TO ACTUARIES?

SOX put a spotlight on financial reporting controls nearly two decades ago. However, control deficiencies and material weaknesses remain numerous and prominent. According to the Audit Analytics publication, 2018 is looking to be the worst year for the insurance industry in recent history. Figure 1 shows that control weaknesses through eight months of 2018 were high relative to prior years.

Financial consequences of control failures are significant: financial penalties, erosion of consumer trust, loss in shareholder confidence and meaningful costs related to remediation. Control failures can also shift focus away from the execution of strategic priorities, harm morale and trigger employee turnover. Although material weaknesses are often triggered by errors and restatements in financials, an error is not a necessary condition. Material weaknesses originate from deficiencies in the control environment, regardless of the presence of a control failure.

Further, we observed an increase in the scrutiny applied by accounting firms to life insurers in response to oversight from the Public Company Accounting Oversight Board (PCAOB).

This, as well as profound upcoming accounting changes, in particular FASB's LDTI, requires actuaries to be alert to and mindful of their contribution to financial reporting controls.

WHAT IS THE IMPACT OF LDTI ON CONTROLS?

LDTI greatly impacts all significant financial reporting control areas relevant for life actuaries, especially data, assumptions, models and post-modeling processes.

- **Data:** The data used will need to be more granular for cohorting, attribution analyses and disclosures. New controls may be needed on new or upgraded data feeds.

Figure 1
Control Weaknesses Among Registered Insurance Participants
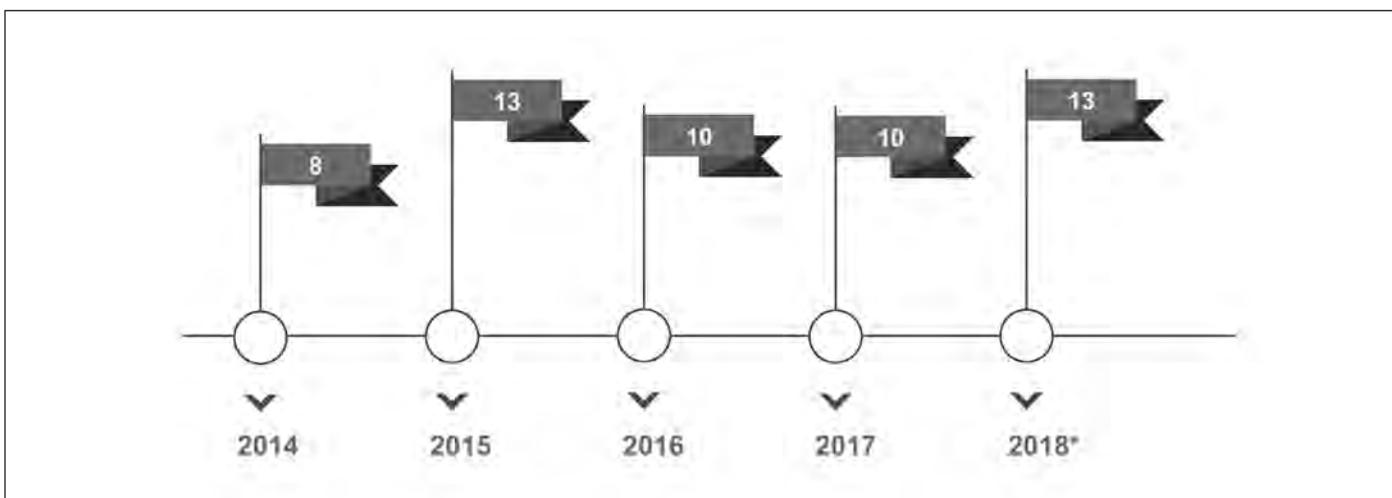
* 2018 results based on first eight months only.

- **Assumptions:** Traditional and limited-pay business will now use assumptions that are current best estimates as opposed to locked in at issue. Controls surrounding experience studies and assumption review processes for impacted product lines may need to be developed or enhanced.

- **Models:** There will be significant changes to calculation logic and a shift to adopt model-based liabilities for traditional business. There will also be auditable disclosures that require additional setup, testing and infrastructure. Controls supporting the production of eight quarters of auditable financial statements will need both oversight changes and operational enhancements.

- **Post-modeling processes:** The derivation of actuarial balances will be significantly changed, and auditable disclosures will need to flow to financial statements. Control activities for initial setup and ongoing monitoring need to be developed and maintained.

WHAT STRATEGIC DECISIONS SHOULD INSURERS MAKE RELATED TO CONTROLS AND LDTI?

For each new requirement under LDTI, insurers will need to decide whether to opt for "smart compliance" or pursue process improvements such as consolidation and automation. Process

improvements are ideal because they will lower the number of resources needed to produce financials and execute controls after the transition. For example, due to the new and more granular data inputs required under LDTI, it may be a good time to create a "single source of truth" data lake or data warehouse. Otherwise, insurers may need to develop stopgap controls on the new input data sources and spend time reconciling multiple sources of data during the LDTI implementation.

However, even with an extended timeline for LDTI (the FASB is considering a one year extension to Jan. 1, 2022, for public companies), there will not be time to make all the desired process improvements, and insurers will need to prioritize. The goal will be to find a degree of process improvement that is attainable within the LDTI timeline and reduces resources needed for the new financial reporting process as much as possible. Decreasing the resources needed for financial reporting will allow the remaining resources to continue making process improvements and to execute stopgap controls until remaining process improvements are complete.

Examples of opportunities to minimize the resources required for financial reporting and controls are summarized in Figure 2. Insurers should review their existing processes to understand the

Figure 2
Process Improvement Opportunities

Category	Examples of Opportunities
Data	Create a "single source of truth" data lake or data warehouse
	Empower a data steward or chief data officer with the right mandate and responsibilities
Assumptions	Streamline experience studies
	Deploy oversight with transparent thresholds for risk and materiality
	Implement a scalable assumption repository for tracking approval status and application
Financial reporting models	Convert or retire legacy systems
	Leverage out-of-the-box vendor functionality where possible
	Maintain strict version and access controls
Upstream and downstream tools	Reduce the use of upstream and downstream tools and automate the remainder
Process and staff utilization	Streamline controls and review procedures by partnering with auditors
	Optimize use of actuaries across process design, production, analysis and controls

range of opportunities and prioritize what can be implemented prior to the LDTI transition.

CONCLUSION

Actuarial controls are increasingly relevant when accounting guidance changes. Thoughtful design of the new financial reporting processes and controls is needed to create sustainable financial reporting post-LDTI. Insurers that invest more resources in the design phase now will need fewer resources to execute the financial reporting and controls after transition. ■

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Improving Management Reporting in the Insurance Industry

By David Alison, Alex Zaidlin, Kaushal Balanadu and Natalie Huang

With countless innovations in the technology and analytics fields, more data are more accessible each day. The ability to process large masses of business data to make more accurate calculations has become one of the most sought-after goals for leaders across all industries, including insurance. In fact, insurance CEOs consider efforts to become more data driven a top-three and growing priority, according to a recent KPMG survey of more than 100 global insurance CEOs.[1]

Management reporting in particular leverages data analytics to allow business leaders to take a top-down look at their organization's financial results and key performance indicators (KPI) in order to make strategic decisions. Leaders look for management reports to be delivered in a meaningfully summarized form, with the functionality that allows them to drill down into the results and explore additional economic details and commentary behind the numbers on an ad hoc basis. The demand for this type of flexible reporting and analysis is only expected to increase as new accounting bases requiring additional disclosures are introduced, and the insurance industry meets capital markets' demands for greater transparency.

Management reporting stands in contrast to required regulatory reporting, which is typically a rigid, aggregated (based on fixed hierarchies), periodic, rules-based set of financial statements. Yet a number of insurance organizations are still using external regulatory reports for internal strategic business purposes.

Effective management reporting has defining characteristics and objectives that make it better for strategic decision-making than financial and other types of reports. Here we explore how to evaluate the effectiveness of management-reporting structures, explore drivers of change to improve them, and propose steps toward producing management reporting in which insurance leaders can have confidence.

MANAGEMENT REPORTING VERSUS TRADITIONAL FINANCE-ORIENTED REPORTS

In the insurance industry today, many companies repurpose their periodic regulatory reports to guide financial decisions. Since regulatory reports are already produced regularly for external reporting purposes, they are consistent from one period to the next and readily available for management to leverage.

However, it has become increasingly clear to many organizations that regulatory reports may not be sufficient for strategic decision-making, and they are looking for more dynamic, economic-focused, real-time solutions to provide insurance leaders with the information they need to make decisions. Sixty-nine percent of insurance CEOs say they plan to invest in the digital infrastructure necessary to support such solutions over the next three years, according to the survey.[2]

Management reporting is an internal reporting structure generated by management to support leaders in their business decision-making process. The internal nature of management reporting allows the generated reports to be flexible in overall structure, granularity and type of data sources, application and use.

Regulatory and financial reports are no substitute for management reporting when it comes to guiding business decisions. Key elements in the structure, assumptions and nature of management reports drive their use for decision-making. Figure 1 highlights the main differences between financial and management reports.

Figure 1
Differences Between Financial and Management Reporting

	Regulatory/Financial Reports	Management Reports
Structure	The regulatory reporting structure is rigid and subject to regulatory changes varying by jurisdiction.	Management reports tend to be dynamic and customizable. As management needs a value-based way of looking at its businesses, these reports are usually constructed to produce exactly what decision-makers in the company need in a unified, consistent way across jurisdictions.
Internal vs. External Nature	Regulatory reports are built to provide insight to regulators and investors whose focus is seeing the bottom line, prioritizing financial stability, meeting market standards and adhering to regulatory requirements.	The internal nature of management reporting is less rules-based and more economic-based. These reports are produced solely for internal use and can provide management with more actionable insight as to the economic status of the company, involving a more fit-for-purpose representation of results, as well as more focus on particular business KPIs.
Time Frame Relevance	Regulatory reporting uses monthly/quarterly/annually aggregated data to summarize a company's performance.	Management reporting can be generated as frequently as desired and include actual and projected results to provide the leadership team with a complete picture.
Level of Granularity of Results	Regulatory reports are often produced to provide financial results at an aggregated level based on fixed hierarchies.	Management reporting allows for dynamic segmentation of financial results on an ad hoc basis. Granularity of information will be aligned with the level required to steer the business and promote understanding. There is a consistent view of the business, unlike the potentially different segmentations that organizations experience when reporting under multiple accounting bases.
Assumptions Used	The results in regulatory reports are developed using mostly prescribed assumptions, with little room to reflect best estimate or company-specific experience.	Management reports are developed using a company's own view of its assumptions and reflects its current experience. For example, a decrease in expenses in future years can be appropriately reflected in the results of a management report.
Controls and Deadlines	Regulatory reporting is required to adhere to a high level of controls but must be completed within a relatively quick timeline to meet external submission deadlines.	As management reports are used solely for internal purposes, they are not necessarily constrained by strict timelines. However, as these results are used by management to make business decisions, a high level of accuracy in the numbers is desired.
Data Visualization	The format of regulatory statements, being predetermined by regulatory entities, is hardcoded, black-and-white numerical exhibits.	Advanced analytics and data visualization tools can be used to generate management reports. This allows data to be interpreted and manipulated better to depict trends and movements in data through graphs and charts.

WHAT DOES EFFECTIVE MANAGEMENT REPORTING LOOK LIKE?

Management reporting should do the following:

- Be dynamic and allow for real-time drill-down capabilities into aggregate results

- Allow for trend and volatility analysis on an ad hoc basis

- Offer data segmentation using a range of product, policyholder and market variables

- Have the flexibility to produce results at a desired frequency and for any time period

- Produce dynamic data visualization dashboards and allow for "what if" analysis

- Focus on the KPIs in which management is most interested

Figure 2
Key Characteristics of Quality Data
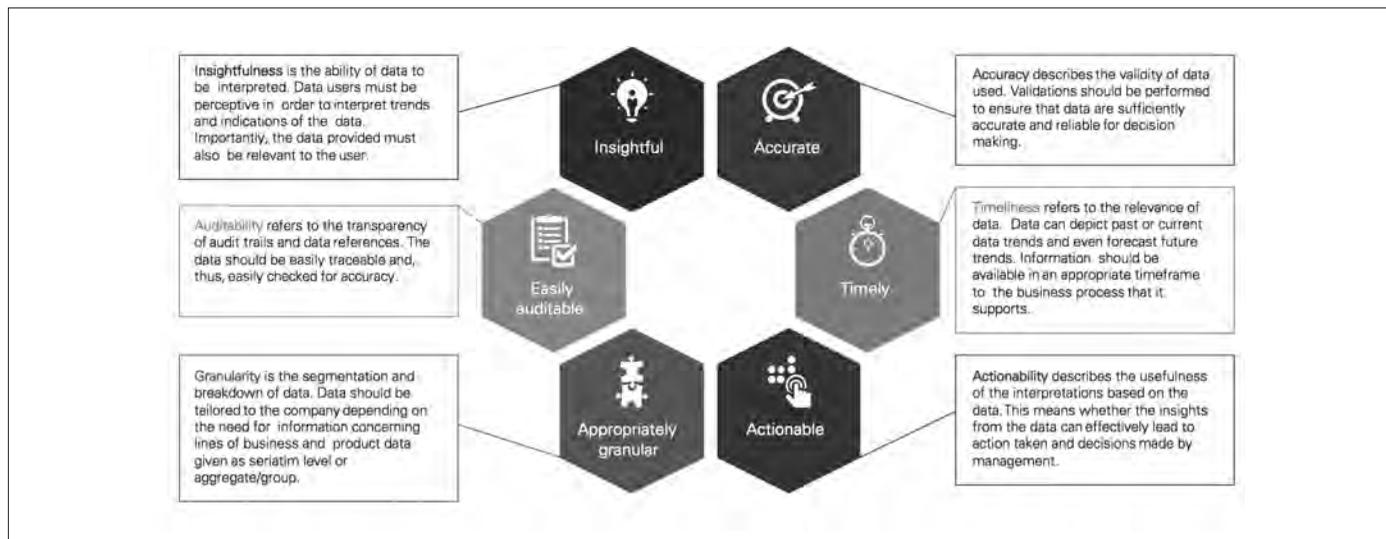
And it all starts with data. A strong characteristic of management reports is their ability to showcase relevant KPIs to business management. To do so, quality data and supplemental information is required to support the reporting process. Figure 2 shows six characteristics that summarize and define data reliability and relevance.

WHAT ARE THE ISSUES WITH MANAGEMENT REPORTING, AND WHERE DOES THE MARKET STAND TODAY?

Management reporting proves to be superior to regulatory reporting and other static types of reports, and it is flexible to management's needs. However, it is not immune to certain issues that insurance companies are facing.

The speed of production for management reports is a challenge mainly due to the use of inefficient and/or outdated software, leading to slow and limited production times. These generally slow data processes lead to rushed analysis and ineffective review.

Data quality is also a challenge for a number of insurers. This includes the inability to get granular data due to some companies still reserving large blocks of business on an aggregate level, as well as poor data quality, such as missing data and inconsistent or inaccurate values. Fifty-one percent of insurance CEOs surveyed by KPMG say they are concerned about the integrity of their management data.[3]

The process supporting the production of management reporting is often inefficient. A lack of materiality thresholds and a tendency to go into unwarranted levels of detail/accuracy results in production delays. Furthermore, actuarial analysis is typically left until the end of periodic production runs, minimizing the time for advanced analysis of actuarial results; this lack of time to critically review results and explore additional dimensions or perspectives leads companies to prioritize meeting minimum requirements to appease auditors.

Conservative approaches to innovation and force of habit prevent many organizations from taking full advantage of their available data and tools to produce meaningful management reports. Fostering innovation is a top and growing priority for global insurance CEOs, according to the survey, and 48 percent plan to increase investment in this area over the next three years.[4]

HOW DO INSURERS CLOSE THE EFFECTIVENESS GAP FOR IMPROVED MANAGEMENT REPORTING?

To develop a robust management reporting structure, organizations need to come up with a comprehensive action plan to address the gaps in their current structures. Here we outline some of the action items to consider as part of that plan.

• **Decide on the design of the reports.** Data visualization functionality needs to be consistent to present results in a format that is familiar to management but also flexible to allow leaders to explore additional details on an ad hoc basis. Some organizations have adopted a structure that includes a set of agreed-upon graphs and charts while allowing for a "sandbox area" for further investigation. In addition, a collective agreement on the frequency, speed and accuracy of the reports is essential. Finally, granularity and richness of data is key to creating meaningful visualization results.

- **Define the process and controls around management reporting.** Defining an end-to-end process and overall architecture is the first step in designing the management reporting structure. This needs to be detailed enough for the different stakeholders to understand their roles in the process. It is also important to define the controls and governance framework at an early stage and to treat management reporting as a separate process from other reporting bases.

- **Fix the data.** As discussed previously, comprehensive reporting functionality requires high-integrity, granular data. Setting up data warehouses to contain the "single source of truth" data, with extended data marts for each functional area feeding granular data into the reporting system, can help streamline and automate the reporting structure.

- **Decide on a suite of software to support processes.** A thorough system selection process can help stakeholders agree on the suite of platforms that satisfy most of the requirements from various functional areas. Business intelligence systems allow for easy consolidation of results, which many organizations take advantage of to report their actuarial, finance, sales, underwriting, claims and other results in a single set of comprehensive dashboards.

- **Get stakeholder buy-in.** Just like with any operational transformation program, stakeholder buy-in is part of a successful implementation of a sophisticated management reporting structure. In addition to upper management buy-in, functional leads should understand the importance of the task at hand and support the effort by allocating time and resources to it.

- **Improve the culture.** An organization's overarching approach to management reporting will play a key role establishing how successful the program is. Organizations need to think creatively and innovate in order to be successful at this task.

Once the gaps have been identified and a plan has been put in place to ensure the development of an effective structure, the journey to management reporting transformation can begin. While transformation programs typically take years to complete, it is important to continue challenging the relevance and appropriateness of the management reporting process and making revisions as needed.

CONCLUSION

While financial reports provide regulators with a single lens through which to analyze results across different insurance companies, management reports provide the flexibility that can fully reflect an organization's unique characteristics.

An effective management report is dynamic and allows for drill-down capabilities and unconstrained segmentation, helping business leaders fully understand the details behind the results. But this is only possible with access to accurate, auditable and timely data to back these reports. In addition, a well-defined process, people with the right skill sets and the appropriate systems are critical for making the effort even more effective.

Organizations currently face issues due to poor data quality, the use of outdated technology and conservative approaches to innovation. But with recent trends driving a need for advanced analytics and explanations, increased frequency and tighter controls around reporting, an organization needs to produce robust management reports that can be used to analyze results. When paired with insightful and actionable results backed by accurate data, management reporting can be the driving force that leads a business toward sound strategic decisions. ■

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ENDNOTES

1 KPMG International Cooperative. 2017. "Preparing to Disrupt and Grow: Insurance CEOs Pick Up the Pace." KPMG, https://assets.kpmg/content/dam/kpmg/ch/pdf/preparing-to-disrupt.pdf.

2 Ibid.

3 Ibid.

4 Ibid.

Discounting Stochastic Scenarios Under IFRS 17's OCI Election Provision

By Darin Zimmerman

Author's note: The pronoun "we" appears throughout this article because I owe a debt of gratitude to many of my colleagues who contributed to the article but chose not to attach their names for publication.

It is widely understood that path-dependent discounting is critical in calculating the correct price of options and guarantees when using stochastic scenarios to perform a valuation. International Financial Reporting Standard 17 (IFRS 17) requires the use of two sets of discount rates for a single set of cash flows when one elects a systematic disaggregation of income through other comprehensive income (OCI). IFRS 17 describes three potential discount rates: (1) the current rates; (2) the locked-in rates at time of initial recognition to measure the change in nonfinancial assumptions for contractual service

margin (CSM); and (3) the adjusted locked-in rates from IFRS 17 paragraph B132(a), using either the effective yield method or the projected crediting rate method for products with indirect participation features.

The standard is not explicit about how someone is supposed to discount one set of cash flows using different rates when one of those is potentially hundreds of scenarios of stochastically generated rates. We are proposing one method we believe provides reasonable results while capturing the spirit of what the standard is trying to achieve. This method applies an adjustment to the individual scenario cash flows in order to calibrate them back to the original discount rates. The average of the cash flows will then be a single scenario of cash flows that reproduces the correct price for options and guarantees. We believe this single set of cash flows will then be suitable for application to the other discount rates.

ILLUSTRATION OF THE PROBLEM

To reiterate, path-dependent discounting is critical in deriving the appropriate value of options and guarantees. Consider the following numerical example with a hypothetical product. It is a fixed deferred annuity where the crediting strategy declares a rate equal to the 1-year risk-free rate. It has a product guarantee of 1.5 percent annual growth in all years. (This results in a minimum surrender value at year 10 of $116.05 for a $100 premium.) At the time of initial recognition, the risk-free rate is 4.5 percent in all years, and the illiquidity premium appropriate for the product is 20 basis points in all years. To price the value of the guarantee correctly, we use the 10 scenarios shown in

Figure 1
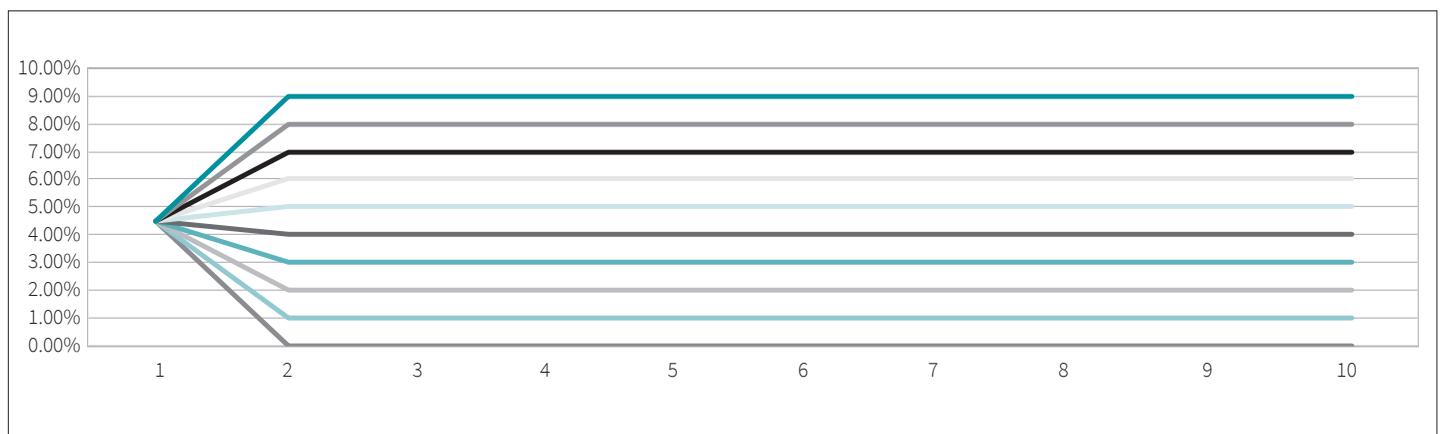Illustrative Risk-Free Rate Scenarios

Figure 1 (not technically "stochastic" as they were designed for illustrative purposes).

The graph of path-dependent discount rates would be 20 basis points higher to reflect the appropriate illiquidity premium. The surrender assumption for this first example is zero in the first nine years and 100 percent in the 10th year. (Technically, if there is not at least a "risk" of the annuitization feature being utilized, the product likely would not qualify as insurance under IFRS 17. This example ignores the potential profit or loss of the annuitization feature for simplicity. This could be interpreted as meaning the actuary believes the annuitization feature "lacks commercial substance," which would mean the product does not qualify as insurance. Expenses are also ignored for simplicity.)

We will illustrate the importance of path-dependent discounting by showing two methods of discounting that provide an incorrect value of the liability. The first method we might use to value the product (Method 1 shown in Figure 2) simply employs

a single best estimate scenario. We accumulate the account value for 10 years, compare it to the guarantee and then discount it back for 10 years.

Method 1, by using a single deterministic scenario, effectively ignores the value of options and guarantees and is not an appropriate valuation technique for products that have options and guarantees.

Next, we examine what happens when a stochastic valuation does not use path-dependent discounting. Figure 3 uses the interest rate scenarios presented in Figure 2 for fund growth but discounts the results at the average of the scenarios.

We see that Method 2 overstates the value of options and guarantees, because by discounting using only the current discount rates, it does not discount at the path-specific rates, which gives the wrong price. This is the crux of the problem when it comes to applying a different set of discount rates that is required to

Figure 2
Discounting Using a Single Best Estimate Scenario

Method 1 (Which is Wrong)	
4.5% accumulated for 10 years	$155.30
Minimum surrender value	$116.05
4.7% discount for 10 years	1.5829
Value	$98.11

Figure 3
Discounting Using the Average of the Scenarios

Method 2 (Also Wrong)					
Scenario	Cash Flow Years 1-9	Year 10 Accum'ed Value	Year 10 Surrender Value	Discount Rate	PV Current Rates
1	$-	$104.50	$116.05	1.5829	$73.32
2	$-	$114.29	$116.05	1.5829	$73.32
3	$-	$124.89	$124.89	1.5829	$78.90
4	$-	$136.35	$136.35	1.5829	$86.14
5	$-	$148.74	$148.74	1.5829	$93.96
6	$-	$162.11	$162.11	1.5829	$102.41
7	$-	$176.55	$176.55	1.5829	$111.53
8	$-	$192.12	$192.12	1.5829	$121.37
9	$-	$208.90	$208.90	1.5829	$131.97
10	$-	$226.96	$226.96	1.5829	$143.38
Average					$101.63

Figure 4
Discounting Using Path-Dependent Rates

Method 3 (Correct)					
Scenario	Cash Flow Years 1-9	Year 10 Accum'ed Value	Year 10 Surrender Value	Path-Specific Discount	PV Path-Specific Rates
1	$-	$104.50	$116.05	1.0660	$108.87
2	$-	$114.29	$116.05	1.1657	$99.56
3	$-	$124.89	$124.89	1.2735	$98.06
4	$-	$136.35	$136.35	1.3902	$98.08
5	$-	$148.74	$148.74	1.5162	$98.10
6	$-	$162.11	$162.11	1.6523	$98.11
7	$-	$176.55	$176.55	1.7991	$98.13
8	$-	$192.12	$192.12	1.9575	$98.15
9	$-	$208.90	$208.90	2.1281	$98.16
10	$-	$226.96	$226.96	2.3118	$98.18
Average					$99.34

disaggregate insurance finance income or expense. If we applied the single set of locked-in discount rates to the 10 scenarios of stochastic cash flows generated using current rates, the value of options and guarantees would be misstated.

Finally, we perform the valuation correctly using the path-dependent discount rates, as shown in Figure 4.

In this example, the expected profit from the product is only 66 cents. If the risk adjustment is more than 66 cents, we will have an onerous contract with a starting loss component. We also see an elevated cost associated with the two scenarios where the rates are below the guarantee, as well as a very similar cost for all scenarios where the guarantee does not impact policy cash flows.

SOLVING THE PROBLEM

The following technique attempts to recalibrate each scenario's cash flows to the current rates so that we can calculate an average cash flow across all scenarios and then revalue the average adjusted cash flows using the locked-in rates. When this is done, the result will be internally consistent and will properly value options and guarantees. This numerical example differs from the preceding one in only one way: We have altered the surrender assumption to be 5 percent in years 1 through 9 and 100 percent in year 10 to make it slightly more realistic. We will also refer to the current discount rates as Scenario 0. (Note: The model does not process Scenario 0! That is, the model does not generate cash flows for Scenario 0.

Instead, Scenario 0 cash flows will be the average of the cash flows in scenarios 1 through 10.) The transform that is applied to produce adjusted cash flows is to multiply each cash flow by a factor that is a ratio of the accumulation factors for Scenario 0 and the scenario being processed:

$$CF_{ij}^{adj} = CF_{ij} \times \prod_{k=1}^{j}(1 + r_{0k}) \div \prod_{k=1}^{j}(1 + r_{ik}),$$

where i is the scenario, j is a time period, and r_{0k} is the current discount rate (Scenario 0) for time step k. More simply, the adjusted cash flow for Scenario i at time step j is the actual cash flow for Scenario i at time step j multiplied by the accumulation factor for time step j using Scenario 0 divided by Scenario i's path-dependent accumulation factor for time step j.

Using the new surrender assumption, we get the account values, policy cash flows, discount rates and accumulation factors shown in Figure 5.

In this formula, the rates come from the discount rates table, where Scenario i is a row and time step j is a column. The products in the formula result in the accumulation factors. So the adjusted cash flow for Scenario 7, time step 2, would take the original cash flow for Scenario 7 at time step 2; multiply it by the accumulation factor for Scenario 7, time step 2; and then divide by the accumulation factor for Scenario 0, time step 2. That is: $5.26 \times 89.94\% \div 91.22\% = 5.19$. Figure 6 contains all of the adjusted cash flows in rows 1 through 10 and the simple average of them in Scenario 0.

Figure 5
Account Values, Cash Flows, Discount Rates and Accumulation Factors

AV (B4 Surr)	1	2	3	4	5	6	7	8	9	10
1	$104.50	$100.76	$97.16	$93.69	$90.34	$87.11	$84.00	$80.99	$78.10	$75.30
2	$104.50	$100.76	$97.16	$93.69	$90.34	$87.11	$84.00	$80.99	$78.10	$75.30
3	$104.50	$101.26	$98.12	$95.08	$92.13	$89.28	$86.51	$83.83	$81.23	$78.71
4	$104.50	$102.25	$100.05	$97.90	$95.80	$93.74	$91.72	$89.75	$87.82	$85.93
5	$104.50	$103.25	$102.01	$100.78	$99.57	$98.38	$97.20	$96.03	$94.88	$93.74
6	$104.50	$104.24	$103.98	$103.72	$103.46	$103.20	$102.94	$102.68	$102.43	$102.17
7	$104.50	$105.23	$105.97	$106.71	$107.46	$108.21	$108.97	$109.73	$110.50	$111.27
8	$104.50	$106.22	$107.98	$109.76	$111.57	$113.41	$115.28	$117.18	$119.12	$121.08
9	$104.50	$107.22	$110.00	$112.86	$115.80	$118.81	$121.90	$125.07	$128.32	$131.66
10	$104.50	$108.21	$112.05	$116.03	$120.15	$124.41	$128.83	$133.40	$138.14	$143.04

Cash Flow	1	2	3	4	5	6	7	8	9	10
1	$5.23	$5.04	$4.86	$4.68	$4.52	$4.36	$4.20	$4.05	$3.90	$75.30
2	$5.23	$5.04	$4.86	$4.68	$4.52	$4.36	$4.20	$4.05	$3.90	$75.30
3	$5.23	$5.06	$4.91	$4.75	$4.61	$4.46	$4.33	$4.19	$4.06	$78.71
4	$5.23	$5.11	$5.00	$4.90	$4.79	$4.69	$4.59	$4.49	$4.39	$85.93
5	$5.23	$5.16	$5.10	$5.04	$4.98	$4.92	$4.86	$4.80	$4.74	$93.74
6	$5.23	$5.21	$5.20	$5.19	$5.17	$5.16	$5.15	$5.13	$5.12	$102.17
7	$5.23	$5.26	$5.30	$5.34	$5.37	$5.41	$5.45	$5.49	$5.52	$111.27
8	$5.23	$5.31	$5.40	$5.49	$5.58	$5.67	$5.76	$5.86	$5.96	$121.08
9	$5.23	$5.36	$5.50	$5.64	$5.79	$5.94	$6.09	$6.25	$6.42	$131.66
10	$5.23	$5.41	$5.60	$5.80	$6.01	$6.22	$6.44	$6.67	$6.91	$143.04

Figure 5, Cont.
Account Values, Cash Flows, Discount Rates and Accumulation Factors

Discount Rates	1	2	3	4	5	6	7	8	9	10
0	4.70%	4.70%	4.70%	4.70%	4.70%	4.70%	4.70%	4.70%	4.70%	4.70%
1	4.70%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%
2	4.70%	1.20%	1.20%	1.20%	1.20%	1.20%	1.20%	1.20%	1.20%	1.20%
3	4.70%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%	2.20%
4	4.70%	3.20%	3.20%	3.20%	3.20%	3.20%	3.20%	3.20%	3.20%	3.20%
5	4.70%	4.20%	4.20%	4.20%	4.20%	4.20%	4.20%	4.20%	4.20%	4.20%
6	4.70%	5.20%	5.20%	5.20%	5.20%	5.20%	5.20%	5.20%	5.20%	5.20%
7	4.70%	6.20%	6.20%	6.20%	6.20%	6.20%	6.20%	6.20%	6.20%	6.20%
8	4.70%	7.20%	7.20%	7.20%	7.20%	7.20%	7.20%	7.20%	7.20%	7.20%
9	4.70%	8.20%	8.20%	8.20%	8.20%	8.20%	8.20%	8.20%	8.20%	8.20%
10	4.70%	9.20%	9.20%	9.20%	9.20%	9.20%	9.20%	9.20%	9.20%	9.20%

Accum Factors	0	1	2	3	4	5	6	7	8	9	10
0	100.00%	95.51%	91.22%	87.13%	83.22%	79.48%	75.91%	72.51%	69.25%	66.14%	63.17%
1	100.00%	95.51%	95.32%	95.13%	94.94%	94.75%	94.56%	94.37%	94.18%	94.00%	93.81%
2	100.00%	95.51%	94.38%	93.26%	92.15%	91.06%	89.98%	88.91%	87.86%	86.82%	85.79%
3	100.00%	95.51%	93.45%	91.44%	89.47%	87.55%	85.66%	83.82%	82.02%	80.25%	78.52%
4	100.00%	95.51%	92.55%	89.68%	86.90%	84.20%	81.59%	79.06%	76.61%	74.24%	71.93%
5	100.00%	95.51%	91.66%	87.97%	84.42%	81.02%	77.75%	74.62%	71.61%	68.72%	65.95%
6	100.00%	95.51%	90.79%	86.30%	82.04%	77.98%	74.13%	70.46%	66.98%	63.67%	60.52%
7	100.00%	95.51%	89.94%	84.68%	79.74%	75.09%	70.70%	66.57%	62.69%	59.03%	55.58%
8	100.00%	95.51%	89.10%	83.11%	77.53%	72.32%	67.47%	62.93%	58.71%	54.76%	51.09%
9	100.00%	95.51%	88.27%	81.58%	75.40%	69.69%	64.40%	59.52%	55.01%	50.84%	46.99%
10	100.00%	95.51%	87.46%	80.10%	73.35%	67.17%	61.51%	56.33%	51.58%	47.24%	43.26%

Figure 6
Adjusted Cash Flows

Adj CF	1	2	3	4	5	6	7	8	9	10
Avg/Scn 0	$5.23	$5.20	$5.17	$5.14	$5.12	$5.09	$5.06	$5.04	$5.01	$99.72
1	$5.23	$5.26	$5.30	$5.34	$5.38	$5.43	$5.47	$5.51	$5.55	$111.82
2	$5.23	$5.21	$5.20	$5.19	$5.17	$5.16	$5.15	$5.14	$5.13	$102.26
3	$5.23	$5.19	$5.15	$5.11	$5.07	$5.04	$5.00	$4.96	$4.93	$97.83
4	$5.23	$5.19	$5.15	$5.11	$5.07	$5.04	$5.00	$4.96	$4.93	$97.85
5	$5.23	$5.19	$5.15	$5.11	$5.07	$5.04	$5.00	$4.97	$4.93	$97.87
6	$5.23	$5.19	$5.15	$5.11	$5.08	$5.04	$5.00	$4.97	$4.93	$97.88
7	$5.23	$5.19	$5.15	$5.11	$5.08	$5.04	$5.00	$4.97	$4.93	$97.90
8	$5.23	$5.19	$5.15	$5.11	$5.08	$5.04	$5.00	$4.97	$4.93	$97.92
9	$5.23	$5.19	$5.15	$5.11	$5.08	$5.04	$5.00	$4.97	$4.93	$97.93
10	$5.23	$5.19	$5.15	$5.11	$5.08	$5.04	$5.00	$4.97	$4.93	$97.95

Figure 7
Traditional Market-Consistent Valuation

Sum Product of Figure 5 Cash Flows and Accumulation Factors	
1	$109.35
2	$101.91
3	$98.45
4	$98.46
5	$98.47
6	$98.49
7	$98.50
8	$98.51
9	$98.52
10	$98.53
Average	$99.92

Figure 8
Adjusted Cash Flows

Valuation with Adj CFs	1	2	3	4	5	6	7	8	9	10
Avg Adj CF	$5.23	$5.20	$5.17	$5.14	$5.12	$5.09	$5.06	$5.04	$5.01	$99.72
Cur Accm Fx	95.51%	91.22%	87.13%	83.22%	79.48%	75.91%	72.51%	69.25%	66.14%	63.17%
PV of CV	$4.99	$4.74	$4.50	$4.28	$4.07	$3.86	$3.67	$3.49	$3.31	$63.00
Sum of PV	$99.92									

We now have two ways in which to calculate the market-consistent price of the liability. The traditional method is to use the (unadjusted) cash flows and path-dependent accumulation factors from Figure 5. This results in a market-consistent liability price of $99.92, as shown in Figure 7.

Alternatively, we can simply discount the average of the adjusted cash flows using the current discount rates to obtain a market-consistent liability price of $99.92, as shown in Figure 8.

This demonstrates that the adjusted cash flows, when discounted at the original discount rates, reproduce the price we get when we discount the unadjusted cash flows using the path-dependent discount rates. This makes the adjusted cash flows suitable for discounting at single curves, including the locked-in rates used to disaggregate insurance finance income or expense. This also potentially reduces the amount of data that must be stored during the valuation process, leading to a more cost-efficient solution for companies. ◼

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Highlights and Implications of the PBR Assumptions Resource Manual

By Ying Zhao

Principle-based reserving (PBR) will be required in most states on Jan. 1, 2020. Prior to PBR, static formulas and assumptions were used to determine statutory reserves as prescribed by state laws and regulations. Under PBR, companies may use assumptions based on their own experience. Therefore, assumption development, management and governance will be an integral part of the statutory valuation process. In January 2019, the Life Practice Council of the American Academy of Actuaries released the much anticipated *Life PBR Assumptions Resource Manual*,[1] an 83-page document providing a step-by-step sample framework for setting, updating and governing life insurance assumptions for PBR. The manual is not a piece of regulation, nor is it an actuarial practice note. It is a toolkit "to assist actuaries in implementing or maintaining a process for updating, reviewing, and uploading assumption for valuation modeling purposes."[2]

This article will highlight the key components of the resource manual and analyze its implications for companies' assumption management practice.

PURPOSE OF THE RESOURCE MANUAL

The resource manual describes the assumption management process as a cyclical process with eight distinct elements: Identify assumptions, select timing, analyze experience, determine margins, review reasonableness, document results, implement decisions, and monitor experience. It provides details of approaches, techniques, steps and examples. The manual illustrates four case studies highlighting considerations in some common situations encountered by practicing actuaries. It also devotes several pages to references listing laws and regulations, practice notes, Actuarial Standards of Practice (ASOPs), research papers and experience study resources. While the valuation manuals (VMs) outline the "what" required of actuaries,

the resource manual provides information for how to develop and maintain an effective assumption management process.

CONSIDERATION OF ALL RELEVANT ASSUMPTIONS

Section I of the resource manual identifies assumptions used for life insurance valuation purposes. Besides the usual assumptions such as mortality, lapses and expenses, a few items are worth highlighting.

Reinsurance risk refers to the uncertainty of future cash flows for reinsurance arrangements: "Reinsurance assumptions must reflect non-guaranteed elements in the reinsurance contract, such as the ability for either party to modify contract features."[4]

Traditionally, companies modeled reinsurance cash flows according to the contract terms. Yearly renewable term reinsurance (YRT) tended to be treated as guaranteed and remained unchanged through the lifetime of the contracts. However, YRT rate increases are no longer uncommon. Life insurance companies may consider reflecting anticipated reinsurance rate increases—and possible management actions—in the valuation model and developing supporting assumptions.

Other nonguaranteed elements to consider include dividends, crediting rates and modifications to other premiums and charges. While dividend and crediting rate changes may have been reflected in the model as a common practice, changes to premiums or charges may have not been reflected. Premium and charge changes typically require a lengthy filing and implementation process and are difficult to predict. But if the practicing actuary anticipates that such changes will occur, it may be prudent to reflect them in the model.

A third consideration is to develop a good understanding of dynamic assumptions across scenarios. This is especially important for companies with final reserves based on the stochastic reserves. Assumptions developed under normal economic conditions may produce exotic results under extreme scenarios.

Reasonableness checks over time and across scenarios should be considered, especially for new assumptions.

QUANTITATIVE APPROACHES TO (ALMOST) EVERYTHING

The resource manual describes assumption setting as being "a complex process involving a significant amount of data, review, and judgment."[5] PBR requires "prudent estimate assumptions," which consist of anticipated experience assumptions plus a margin.

Historically, "actuarial judgment" was sometimes quoted, without much substance, as the method of determining the anticipated experience or margins or both. This may no longer be a satisfactory rationale for PBR assumptions. The resource manual describes quantitative approaches to analyze experience, determine margins and review reasonableness in Sections III, IV and V.

Credibility is a primary consideration when analyzing experience data. VM-20 describes the credibility method for mortality assumptions. For nonmortality assumptions, ASOP 25 *(Credibility Procedures)*, along with other research papers and practice notes, provides guidance in determining credibility.

The quantitative approach for credibility not only helps practicing actuaries set anticipated experience assumptions, but it also informs application of margins. Margin setting may be a new exercise for many practicing actuaries. The primary methods used to set margins are sensitivity testing and statistical-based methods, such as confidence intervals or percentiles. The use of quantitative approaches is also suggested for determining the materiality of risks, which is a required disclosure. Statistical analysis and model cash flow analysis, along with some

> The quantitative methods suggested by the resource manual should enable practicing actuaries to make informed decisions on assumptions and document their decisions precisely.

qualitative analysis methods, may be used to check the reasonableness of assumptions. The quantitative methods suggested by the resource manual should enable practicing actuaries to make informed decisions on assumptions and document their decisions precisely.

SIGNIFICANT REQUIREMENTS FOR DOCUMENTATION AND GOVERNANCE

Many valuation actuaries may find the task of completing the PBR Actuarial Report daunting. The resource manual suggests that "it might be prudent to document the full assumption cycle, from beginning to end."[6] Section VI of the manual describes practical steps to establish an assumption repository to house process maps, development files, decision documentation and meeting minutes related to assumptions. The manual also outlines the required disclosure of assumptions under VM-31.

As for governance, assumption management may operate under multiple risk control requirements, such as model audit rule (MAR), VM-G, and the company's own enterprise risk management (ERM) framework. From a statutory reporting perspective, a MAR control should be established to cover the development and review of assumptions. VM-G specifies related corporate governance responsibilities involving boards of directors, senior management and qualified actuaries. Section VII of the manual explores the roles and responsibilities of each party and the communication, approval and implementation of assumptions for valuation purposes.

CONTINUOUS MONITORING TO BRING THE ASSUMPTION PROCESS FULL CIRCLE

The last section of the resource manual, Section VIII, concerns elements to be considered for the ongoing monitoring of anticipated experience. This involves determining which assumptions to monitor closely, reviewing internal and external factors that could impact risk factors or affect emerging experience, and reviewing trends and fluctuations. Practicing actuaries should also monitor margins because they may become insufficient as underlying experience or the level of fluctuation changes. The margin method may need to be revisited periodically to make sure the method produces appropriate and consistent margins.

IMPLICATIONS FOR ASSUMPTION MANAGEMENT PRACTITIONERS

Rethink (and redesign) the assumption process. It is not uncommon to find companies with two connected but separated processes—experience studies and assumption setting. The experience study process tends to include a combination of IT data processing and actuarial experience analysis, and its controls often focus on data flows. The assumption setting process

refers to the steps by which actuaries utilize the experience study results to propose, approve and implement assumptions. This process is typically covered by an actuarial governance framework.

The resource manual suggests that every step leading to the final implementation of assumptions should be included in an integrated assumption management process, putting the "data work" and the "actuarial judgment" under one roof. Companies may need to map their existing process into the eight-step framework and integrate IT, data and actuarial processes into one process with common objectives and approaches. Significant resources and effort may be needed to establish the initial framework. It may be appropriate to consider process improvement and automation at the same time.

Effective collaboration is key. The assumption management process outlined in the resource manual identifies many roles and function areas. Parties involved in the process should have a clear understanding of their roles and responsibilities. It is critical to develop a clear and open communication channel between IT, assumption management, modeling and other associated function areas. Documents such as flowcharts, procedure maps, process narratives and glossaries may be developed to aid communication.

Under the framework outlined in the resource manual, a company's modeling function would take an early and active role in the assumption management process. While quantifying impacts and implementing assumptions are still the primary involvement of the modeling team, models may also be needed for establishing materiality and determining margins, as well as reasonableness checks. Early and frequent communication between assumption and modeling functions will result in better work products and enhance collaboration among team members.

> Early and frequent communication between assumption and modeling functions will result in better work products and enhance collaboration among team members.

The new operating process calls for a new paradigm for assumption governance and control. Up to this point, statutory valuation for life insurance has used prescribed assumptions. The existing controls for statutory financials may not sufficiently cover the assumption process. This will certainly change. The new controls may need to follow multiple sets of requirements such as MAR, VM-G, the Sarbanes-Oxley Act (SOX) and ERM. A combination of tools will have to be used to cover a variety of processes such as data processing, actuarial calculation, decision-making and information handoff. The complexity of the control structure and variety of methods it requires will undoubtedly pose new challenges.

FINAL THOUGHTS

Establishing and maintaining a consistent assumption management framework across business lines, reporting bases, entities and even geographic locations is considered industry leading practice. Although the *Life PBR Assumption Manual* was introduced as a framework to serve valuation purposes, the road map it presents for developing an end-to-end assumption management process may be leveraged to serve wider purposes and broader goals. ∎

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ENDNOTES

1 *American Academy of Actuaries. 2019. Life Principle-Based Reserves (PBR) Assumption Resource Manual,* https://www.actuary.org/sites/default/files/files/publications/PBR_Assumptions_Resource_Manual_012919.pdf.

2 *Ibid, p. 1.*

3 *Ibid, p. 3.*

4 *Ibid, p. 9.*

5 *Ibid, p. 33.*

6 *Ibid, p. 40.*

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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 June 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.

"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 mid-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 mid-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 late 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 late project stage, and the project is being prepared for publication.

RECENTLY COMPLETED

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