



Article from
Financial Reporter
September 2017
Issue 110

PBR, How Shall I Examine Thee? Let Me Count the Ways

By Tricia Matson, Leslie Jones and Andy Rarus

Principle-based reserves (PBR) standards for individual life insurance business became effective in the vast majority of states on Jan. 1, 2017 (with a 3-year transition period that enables companies, at their option, to adopt anytime up to Dec. 31, 2019). As a result, life insurance companies (excluding those that qualify for and take certain exemptions or exclusions and/or those that exclusively offer pre-need, credit life and industrial life products, which are currently exempt) will be significantly changing the methods, assumptions, processes, and systems used to determine reserves for life insurance products. The available exemptions include the company-wide exemption (which may be renamed the “Life PBR exemption”) and stochastic and deterministic exclusion tests that, if both were passed, would allow companies to essentially continue to follow an approach similar to today’s. This article provides a brief overview of some of the changes that will be driven by the PBR requirements and a discussion of how reviewers of those reserves (auditors and examiners) may approach their review under the new methodology.

PBR REQUIREMENTS

Reserves under PBR still involve an evaluation of future benefits and future premiums; however, that may be where the similarities to the current formulaic reserving process ends. While there are some historical reserving processes that are more “principle based” in nature, such as asset adequacy analysis and reserving for variable annuities with guarantees, the reserving approach for the individual life formula reserves that currently must be held are static in nature. Under PBR, the projections of future benefits, expenses and revenue consider all cash flows material to the business, including premiums and other revenue collected from the insured, investment income, policyholder benefit payments (including surrender benefits net of surrender charges) and expenses. The calculation involves using some prescribed assumptions and some assumptions that are based on company experience and actuarial judgment. The calculation also provides for margins for uncertainty. In order to include investment income in the projections, both assets and liabilities are project-



ed. Rather than using a single economic scenario, a range of economic scenarios must be considered (if the stochastic calculation is required).

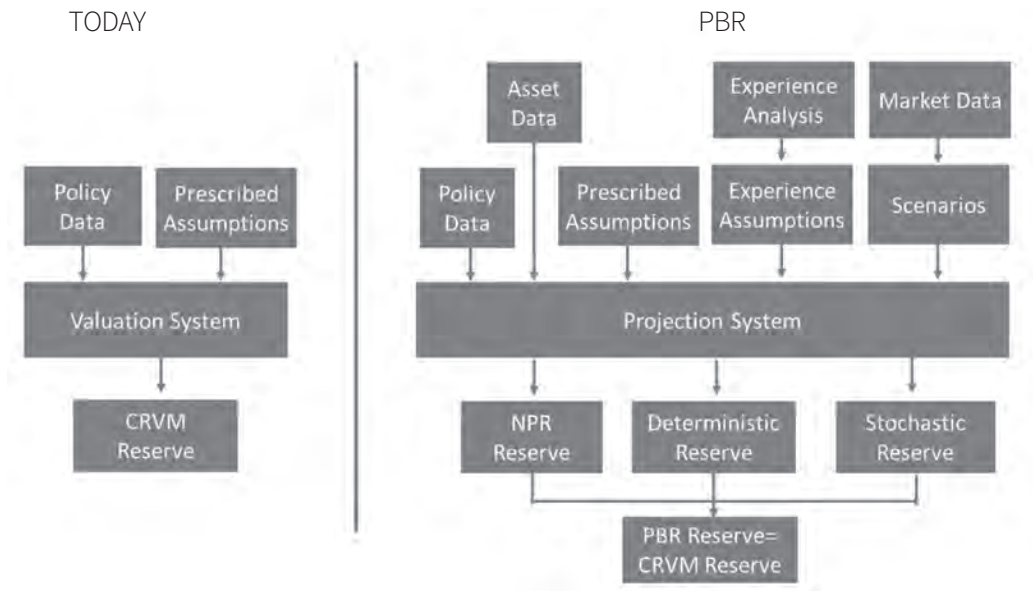
The requirements for the calculation are described in the NAIC’s Standard Valuation Manual (VM). Unlike the valuation law, this document will be updated regularly and does not require legislative approval in most jurisdictions. Chapter 20 (VM-20) describes requirements for life products. For in-scope life insurance products that have not met the exclusion tests, the reserve is the greatest of the following three calculated reserves:

1. The net premium reserve (NPR), which is a calculation similar to (and in some cases identical to) today’s reserve but with some potential differences in the underlying assumptions;
2. The deterministic reserve, which is a more risk-based, current-assumption reserve including all material cash flows, some prescribed assumptions and a single economic scenario; and
3. The stochastic reserve, which is similar in many ways to the deterministic reserve but is calculated using a set of stochastic interest rate and equity scenarios.

CHANGES IN THE RESERVING PROCESS

PBR will add significant complexity to the reserving process, requiring new data, systems, methods, assumptions and controls. Figure 1 is a representation of the data flow and elements involved in the current statutory reserving process as compared to what is required under PBR.

Figure 1



In order to focus our commentary on the most significant area of change, we have centered our discussion on the “formulaic” statutory reserves rather than the approach used to evaluate the adequacy of those reserves. Note that PBR will not impact asset adequacy testing requirements—a company will still be required to test their entire block of business. Figure 1 and our comments below regarding auditing reserves apply to the formulaic reserves and the PBR reserve that will replace the formulaic reserve, not the examination or audit process that is used for evaluating the reserve adequacy testing process performed by the appointed actuary.

Under the current reserving process shown on the left side of Figure 1, the input data needed to perform the calculation involves only policyholder data and specific, prescribed assumptions for mortality and interest based on the policy type and issue year. A valuation system is then typically used to perform the calculations using those two static assumptions, and the reserve for each policy is output from the system. The primary tasks involved in auditing or examining such a reserve are as follows:

- Verifying the accuracy of the policy data;
- Reconciling information flows (data and assumption feeds into the valuation system, and reserve feeds out of the system and into the ledger); and
- Verifying the accuracy of the valuation systems calculations (including whether the proper assumptions were used in the calculations).

Depending on the level of risk associated with the reserving process and the quality of the company’s internal controls to mit-

igate that risk, one or more of these tasks may occur as part of the audit or examination. Data verification and reconciliations are frequently handled by the financial/accounting auditors/examiners, and the verification of the reserve calculations is frequently handled by the actuarial auditors/examiners. Such verification may involve aggregate level review of reserve amounts (performing trend analysis on reserves or other analytical tests) as well as recalculations of reserves for a sample of policies.

Turning to the PBR reserve process, we have several similar tasks that would be performed in order to audit or examine the reserve, as well as some new tasks we must consider. Since the net premium reserve (NPR) calculation is quite similar to the CRVM reserve in the current framework, this article will not focus on that particular part of the calculation. Audit of the NPR calculation is expected to be very similar to what is performed under the current framework.

For the remainder, a key consideration in planning the audit or examination approach is consideration of risk. If, for example, the stochastic reserve drives the final booked reserve for the bulk of the business, it may make sense to focus audit efforts on that part of the calculation. If certain data inputs are brand new that were not previously used in reserving processes, they may be viewed as higher risk than inputs that are consistent with the prior reserving process. So this risk-based approach to identifying where to focus the audit or examination effort will be even more important in a PBR framework.

Based on what is typical for a life insurance company implementing PBR, we have identified the components of the calculation that we believe are likely to be relatively higher or lower risk

(after consideration of controls). Of course the actual assessment of the risk will depend on the specific facts and circumstances for each company.

Figure 2

Relatively lower risk	Policy data accuracy, asset data, market data, PBR reserve (booked amount)
Relatively higher risk	Policy data completeness, experience analysis, prescribed assumptions, experience assumptions, scenarios, projection system/model

In addition, the NAIC’s PBR Review (EX) Working Group is currently developing additional procedures for inclusion in the risk-focused financial examination process, and has identified the following risks¹ for inclusion in the Financial Examiners Handbook risk repository that are specific to PBR:

- **The insurer has not taken appropriate steps to prepare for the implementation of PBR.** We have not addressed this risk in our article, since it is focused on how to audit or examine PBR reserves subsequent to adoption.
- **In-force data is not complete or accurate nor consistent with accounting records.** Ensuring the completeness and accuracy of the in-force data has always been a focus of examinations. However, the importance of ensuring consistency with accounting records is heightened for PBR.
- **The data utilized in the company’s PBR model is not representative and consistent with the company’s in-force data.** This would be addressed in the evaluation of policy data accuracy that is included in Figure 2.
- **Policies subject to PBR are not properly identified or exclusion testing is not properly performed.** This would be primarily addressed in the evaluation of policy data completeness that is included in Figure 2. The projection system used as part of the exclusion testing (as applicable) would be covered in our projection system item.
- **The assumptions used by the insurer to calculate reserves for policies subject to PBR are not accurate or appropriate.** This would be addressed in the evaluation of experience analysis, prescribed assumptions, and experience assumptions that are included in Figure 2.
- **The methodologies utilized in PBR are not appropriate or the reserve computations are not performed correctly.** This risk would be primarily addressed in our projection system item. Certain methodologies may also be evaluated in conjunction with the review of assumptions (for example, application of credibility methods).

We expect that in both a financial examination and a financial statement audit, the review would first involve an evaluation of company controls related to each risk, and then substantive testing would follow only if the residual risk is still deemed to be high. The focus of this article is on these higher risk areas, and specifically the substantive testing that would help an auditor or examiner evaluate these risks further. While we understand that control testing is a critical component of the review, we have focused on substantive testing primarily for brevity, and also due to the likelihood that in the early years of PBR, residual risk assessments for many components of the process are likely to be moderate or high.

Policy data, asset data, and some portion of the market data required as inputs into the PBR process are likely to have already been used for other reserving processes, such as determining formula reserves or performing asset adequacy analysis. In the event that the company is leveraging existing processes and data that were already used as part of the cash flow testing process, and already have associated controls, the risk associated with errors in the data or inappropriate transfer of data may be relatively low. In addition, the process of using the results from the projection system calculation, determining the maximum reserve among the three components (NPR, deterministic and stochastic reserves), and booking the reserve amount to the ledger is a relatively low complexity component and is likely to involve specific controls. So, while there is certainly risk associated with these areas, the risk profile is lower than the remaining components of the PBR calculation.

The remainder of this article will focus on approaches to evaluate the higher risk areas. For each of these areas, there is a range of approaches to audit or examine the company’s analysis to assess accuracy and reasonableness.

Policy Data Completeness

The completeness of policy data is likely to be a relatively higher risk area due to the new and somewhat complicated process by which companies will be determining which policies are subject to which requirements within the valuation manual. There are several considerations in determining whether a given policy type uses a PBR approach, and then which components of the PBR calculation (NPR, deterministic reserve, stochastic reserve) apply, including:

1. The size of the company (some companies will be eligible for a company-wide exemption but only if they do not write certain types of universal life (UL) products and meet other criteria related to premium volume and risk-based capital levels);
2. The type of policy (certain life insurance business such as pre-need is excluded);

3. Treatment of policy riders, which must be valued in accordance with requirements set forth in the VM;
4. The issue year of the policy and the transition election made by the company (PBR application is prospective only, so only policies issued after the effective date are included, and the effective date is dependent on the transition election); and
5. Whether the business qualifies for the deterministic and stochastic exclusion tests.

In light of these considerations, there is risk that the company has misclassified its business, and potentially left out policies that should be included in the PBR calculation. There is also risk that the exclusion tests were not performed correctly.

The actuarial examiner or auditor could evaluate these risks through procedures such as the following:

- Advising the financial exam or audit team in their policy data completeness testing, to help in understanding which business should or should not be included in the PBR analysis;
- Selecting samples of policies from various lines of business to evaluate the company's decision tree in determining whether PBR applies;
- Evaluating the methods and assumptions used in performing the deterministic and stochastic exclusion tests for reasonableness and consistency with the guidance; and
- Evaluating the results of the deterministic and stochastic exclusion tests.

The last two procedures above are similar in nature to those that will be performed in evaluating the PBR reserve calculation itself, which is discussed further below.

Experience Analysis

This is likely to be a high-risk area because it has not historically been a direct component of financial reporting, at least for statutory analysis. Experience analysis does, of course, feed into the company's assumption setting process in general. However, the primary statutory financial reporting application that uses experience analysis has been cash flow testing. In the event that cash flow testing did not result in the booking of additional reserves, an insurer may not have placed a heavy focus on having appropriate controls and governance in their experience analysis process. This may be less true for companies that also report on a GAAP basis, since GAAP reserving does rely more heavily on experience-based assumptions.

In addition, PBR has specific requirements regarding the setting of "anticipated experience" and "prudent estimate" assumptions.

An anticipated experience assumption is an expectation of future experience for a risk factor given available, relevant information pertaining to the assumption being estimated and a prudent estimate assumption is a risk factor assumption developed by applying a margin to the anticipated experience assumption for that risk factor.

Key areas of focus for purposes of auditing or examining the experience analysis process would include:

- Testing of the data underlying the experience studies,
- Evaluation of the appropriateness of the data based on its intended use and
- Sample recalculations of specific experience study results.

Note that we will discuss the application of the experience data to the actual assumption setting process below. The first bullet above would typically be handled by the accounting specialists. However, actuaries would assist in identifying the data to be tested based on its significance to the ultimate reserves booked.

The most important actuarial review item is the second bullet above. It will be very important for the auditing or examining actuary to evaluate whether the experience data being used is suitable for the ultimate use of the experience study. For example, if the experience study is used to set assumptions on business written in 2017 on a six-class underwriting structure, but the data underlying the study is based on only three underwriting classes, how is that being addressed in the process? If the experience data is analyzed at a very granular level, are the results at that level credible, or do they need to be blended with industry data or grouped differently to achieve appropriate credibility? For experience that is dependent on the external environment (for example, lapses that tend to vary based on interest rates), how is that accounted for? As part of the audit or examination, these are areas that the reviewing actuary should understand, and raise as issues or concerns if the process does not appropriately take them into account.

It may also be worthwhile to do some testing of the experience study calculations on a sample basis. While the calculations of metrics such as actual to expected ratios is typically not very complex, the process may be prone to error if it has not historically been well controlled.

Assumptions

Due to the increased number and complexity of both prescribed assumptions and experience-based assumptions in PBR as compared to current formulaic reserve approaches, auditing or examining the proper application of these assumptions will be more challenging. However, the general approach to doing this review

will be similar to what is done today for the prescribed assumptions used in the formulaic reserves and the experience-based assumptions used in asset adequacy analysis. Currently, as part of examinations or audits, where reserving assumptions are deemed areas of high risk (which is typical), the auditing or examining actuary will evaluate (sometimes on a sample basis) whether the company has applied the correct mortality table(s) and interest rates as part of the reserving process for formulaic reserves, and whether the company has appropriately considered experience data, credibility, and other sources of information in setting assumptions for asset adequacy analysis. Similarly, audits or examinations of PBR reserves will involve evaluating whether the PBR reserves follow the prescribed approaches and assumptions as documented in VM-20, as well as whether the assumptions can be supported by credible company data or industry studies. However, the items to be evaluated are much more extensive and include items such as:

- Default costs
- Interest rates, spreads and equity levels
- Mortality
- Premium persistency
- Lapses
- Expenses
- Other policyholder behavior
- Application of credibility
- Treatment of reinsurance
- Treatment of hedging programs

Not all of these are explicitly prescribed, but even where company experience is used in the assumption setting process, there are prescribed approaches that must be used, limits that must be considered and margins that must be established.

One suggested approach to audit this long list in an efficient manner is to apply risk-based sampling techniques, similar to what is already done on audits and examinations. For example, the reviewing actuary could review the company's sensitivity testing to understand which assumptions are most impactful, and focus the review on only those assumptions. Another approach would be to select a representative sample of policies (considering the relative risk profile of policy types), and test the assumptions used for the sample for compliance with the regulation. This could be done in conjunction with the testing of the PBR projection system, which will typically be done on a sample basis (this is covered in more detail below).

One component of PBR will be experience data reporting. This data provides a comparison basis that allows the regulator to perform reasonableness checks on the appropriateness of assumptions as documented in actuarial reports and may serve as a source of information for regulators to potentially use to iden-

tify assumptions that appear inconsistent with typical industry practice and therefore warrant additional review.

The NAIC performed a pilot project to assess company readiness and approach for PBR. One of the findings was that the approach companies used for setting the mortality assumption varied significantly, in particular as it related to credibility of experience data. So this, for example, may be an assumption that is viewed as a relatively higher risk item.

Although this article is focused on substantive testing, and less so on controls, an important consideration in designing the nature and depth of testing is the extent to which the company has formal, documented processes for assumptions setting and governance. We expect that companies will have in place formal processes and procedures for setting assumptions, including information to be evaluated, frequency and thresholds for determining whether updates are needed. We also expect a formal and centralized assumption review process. To the extent the assumption governance process is weak, more substantive testing may be warranted.

Scenarios

Unlike today's reserving for life insurance products, the PBR calculations will often include a stochastic component, in which future cash flows are projected over a range of stochastic interest rate (and depending on the product, equity) scenarios. In fact, PBR also contemplates stochastic scenarios for other risk factors (such as mortality and policyholder behavior), but it is not anticipated that many companies will use such scenarios at implementation. Since the stochastic reserve component of the PBR reserve is based on the results from the "tail" of these scenarios, it is important that the scenarios used are generated and applied properly. There is a prescribed scenario generator that companies must use, and while some companies will already be familiar with the generator, many may be using it for the first time. Areas for review related to the scenarios include:

- Evaluation of the generation of the stochastic scenarios using the prescribed generator and
- Evaluation of use of the scenarios in the cash flow projection model.

Since the scenario generator is available to the public, testing the scenarios used is relatively straightforward. Techniques to do so could involve an independent run of the economic scenario generator and comparison of the results or performing analytical tests on the scenarios such as deriving the means, volatilities and specific calibration points at future projection years to confirm accuracy.

Evaluating the use of the scenarios in the cash flow projection model could be accomplished through independent recalculations of results for sample policies and sample scenarios, which is discussed further below. Another potential approach is to perform analytical tests on cash flow output, such as calculating the projected investment return in several of the tail scenarios to confirm that the relative returns move in tandem with the input scenarios.

Projection System

Potentially the area of greatest risk in the near term is the accuracy of the projection system used to determine the PBR reserves. Many companies will be implementing, or significantly enhancing, their actuarial projection systems to handle PBR. The vendors offering these systems have been working on expanding the functionality to accommodate PBR for some time. However, there has been limited industry testing of the functionality to date, and some of the guidance was continuing to evolve right up until mid-2016 for a 2017 adoption date. The guidance will continue to change. All of this presents risk in the projection system, including:

- Vendor coding is not fully reflective of the PBR requirements, or does not appropriately handle the specifics of an individual company's products.
- Company-implemented modifications were not done correctly.
- The approach used by the company to group individual policies into "model cells" for projection purposes materially misstates the reserve.
- Use of modeling simplifications or scenario reduction techniques that materially misstate the reserve.
- The detailed specifications of the products are not properly reflected in the projection system.
- There are insufficient controls on the projection system, resulting in errors with data feeds or manual entries, or a poor change control process.
- Users of the system are not fully trained or proficient and use the models or model output incorrectly.
- The company does not have a robust (or even reasonable) model validation policy or process, or appropriate model governance in place.

Therefore, it will be important for auditors and examiners to perform testing to assess the accuracy of the PBR calculations. This is not a new concept, since we have existing examples in

which auditors and examiners are testing complex (including stochastic) actuarial projection models, such as:

- Testing of variable annuity reserves, which already follow a principle-based approach for reserving.
- Testing of asset-liability management, cash flow testing, and hedging models as part of a risk-focused examination where these areas present high residual risk.
- Testing of actuarial projection models used for certain GAAP applications such as DAC amortization and products for which there are profits followed by losses and a projection-based reserve must be established.

The steps involved in substantively testing a projection model for PBR are:

1. Performing static and/or dynamic validations of the model: A static validation confirms that the modeled policies are consistent with the in-force business subject to PBR, through comparisons of items such as actual and modeled policy counts, reserves, face amounts and account values. A dynamic validation is a comparison of recent actual cash flows to those projected in the early years of the model.
2. Testing, or reviewing the company's testing, of whether the approach to grouping policies into model cells results in a significant understatement of reserves: This may involve running the calculations before and after grouping on a sample basis, or asking the company to do so and reviewing the results.
3. Selecting a sample of policies for testing: This involves obtaining a listing of the policies and/or model "cells" (policy groupings used for modeling) and selecting a subset of the policies or cells based on risk characteristics. For example, the examiner or auditor may wish to cover the top products being sold, males and females, the most prominent underwriting classes, and a range of issue ages in the selection process.
4. Coordinating with the financial examination team: It is the financial team that is likely to be testing policy data (if

It will be important for auditors and examiners to perform testing to assess the accuracy of the PBR calculations.

appropriate) and they will need guidance from the actuary as to which policy characteristics are important ones to the calculation.

5. Selecting a sample of scenarios for testing: This would typically focus on the deterministic scenario since it supports the deterministic reserve and then one or more “tail” scenarios that drive the stochastic reserve. Since the stochastic scenarios themselves are evaluated as described above and the process by which the projection model develops projected cash flows is the same regardless of scenario, it is generally not necessary to test a large number of scenarios to gain comfort with the model.
6. Obtaining from the company the detailed model input (data and assumptions) and output (projected cash flows and associated in-force statistics), and performing analytical tests on that model output to assess reasonableness.
7. Performing independent projections of cash flows for the sample in a different system than the one the company uses: Using a different projection system eliminates the potential for a vendor error to be present in both calculations and therefore missed.
8. Comparing the projection amounts for consistency, and working through differences with the company.

Another approach that is referenced in the draft financial examination guidance and has been suggested by the NAIC, is the use of a “model portfolio approach.” This approach involves the use of a defined, standard set of policies and specifications and the calculation of the PBR reserve for that policy set using both the company’s projection system and the reviewing actuary’s projection system. The NAIC has a team of actuarial resources in place to assist state regulators in this process and most large audit firms have an actuarial projection model that could be used for such an approach. Two potential drawbacks of this approach are that it may not address the risk if the reviewing actuary has the same projection system as the company (since certain errors could be vendor-built), and that it will not necessarily identify risks associated with unique product features offered by the company. However, in many instances it would capture the bulk of the potential drivers of error.

In performing independent recalculations, it is very common to have small projection differences due to differences in treatment of cash flow timing (e.g., order of decrements), different time steps, etc. However, these should not have a material impact on the final reserve amount for the sample. Significant differences from the company’s calculations would be evaluated and resolved.

As a final point on modeling, the PBR Model Governance Practice Note Work Group of the American Academy of Actuaries (Academy) released a new practice note² to provide additional

information for practicing life actuaries seeking to better understand models, model risks, model governance, and related issues, as these actuaries implement PBR. There is also a model governance checklist on the Academy website that touches on many of the items discussed above.³

CONCLUSION

Due to the magnitude of the change in data, assumptions, application of judgment, processes and technology, significant effort is required to examine or audit PBR reserves. However, it is not an insurmountable task. Using many of the tools already in existence for similar processes and applying a risk-focused approach to the testing, the examination or audit can be broken down into key areas of risk to be focused on. In addition, because the business subject to PBR will be relatively small to start and grow over time, the examination or audit of the reserves can follow suit. It will be beneficial for auditors and examiners to review and plan their procedures in advance of having to actually perform substantive testing. Because of the complexity of PBR and the need therefore to focus on areas of highest risk in performing substantive testing, it is even more important to plan carefully in advance of diving in!

The authors would like to thank Mike Boerner and Pete Weber for their valuable review of and contributions to this article. ■



Tricia Matson, FSA, MAAA, is a partner at Risk & Regulatory Consulting. She can be reached at tricia.matson@riskreg.com.



Leslie Jones, ASA, MAAA, is a consulting actuary at Risk & Regulatory Consulting. She can be reached at leslie.jones@riskreg.com.



Andy Rarus, ASA, MAAA, is a consulting actuary at Risk & Regulatory Consulting. He can be reached at andy.rarus@riskreg.com.

ENDNOTES

- 1 PBR Review (EX) Working Group June 13, 2017 meeting materials; see http://www.naic.org/documents/cmte_e_fehtg_170629_materials.pdf
- 2 http://www.actuary.org/files/publications/Model_Governance_PN_042017.pdf
- 3 http://actuary.org/files/publications/PBRChecklist_Final.pdf