MILLIMAN PAPER

Product pricing in transition across Asia

Considerations for pricing models under IFRS 17 and risk-based capital regimes, and the way ahead

Julian Man
Wen Yee Lee

Milliman

Introduction

The insurance industry across Asia is experiencing profound changes due to the adoption of IFRS 17 and risk-based capital (RBC) frameworks. In addition to the recent implementation efforts for in-force valuation, these regulations demand a reassessment of conventional pricing models and metrics. This paper examines how these shifts affect the development of product pricing models, highlighting the new requirements and key considerations under these regimes. Our goal is to provide insights into how insurers can successfully navigate and prosper in this changing environment, with a particular focus on enhancing pricing models by leveraging new technologies.

The changing landscape

PRICING PROCESS

The typical process for developing insurance products involves several critical stages:

- Product design, where insurance products are crafted to meet market demands
- Product classification and assumption setting, where products are categorized and essential assumptions are defined
- Pricing model development, which entails constructing models to forecast costs, set premiums, and ensure profitability under a particular reserving framework
- Profit testing, to evaluate financial viability under various scenarios to meet internal pricing metrics
- Product approval and launch, which involves securing necessary approvals and introducing the products to the market

Although the introduction of new regimes will influence all the aforementioned areas to some extent, the two most significantly impacted areas are pricing model development and profit testing.

CONTINUED EVOLUTION OF PRICING METRICS

A common question is whether pricing metrics should change when moving to a new regime. Generally, pricing metrics fall into three categories: value creation, such as new business value within a traditional or European embedded value framework; return to shareholders, often measured by internal rate of return; and profit emergence, which includes measures like break-even year or distributable earnings profile, concerning the timing of future profit under the statutory balance sheet. Observations from the Hong Kong market, which implemented IFRS 17 in 2023 and adopted Hong Kong RBC (HKRBC) in 2024, indicate that these pricing metrics have largely remained unchanged despite the change in regimes. The changes are limited to the underlying reserve calculation for IFRS 17 and HKRBC, as well as required capital considerations for HKRBC or contractual service margin (CSM) calculations for IFRS 17.

However, we believe companies could consider introducing new pricing metrics to align with the specific focus of each regime. For instance, under IFRS 17, CSM for new business is introduced to represent shareholder value creation on the accounting balance sheet, and the CSM amortization rate indicates future accounting profit release. Furthermore, as companies transition to RBC regimes, asset and liability management (ALM) becomes more important, making it crucial to identify products with significant ALM issues during the pricing stage. Despite this, few companies set ALM constraints during pricing, though they are considering them more actively at this stage, with ALM practices typically managed at the in-force aggregate level.

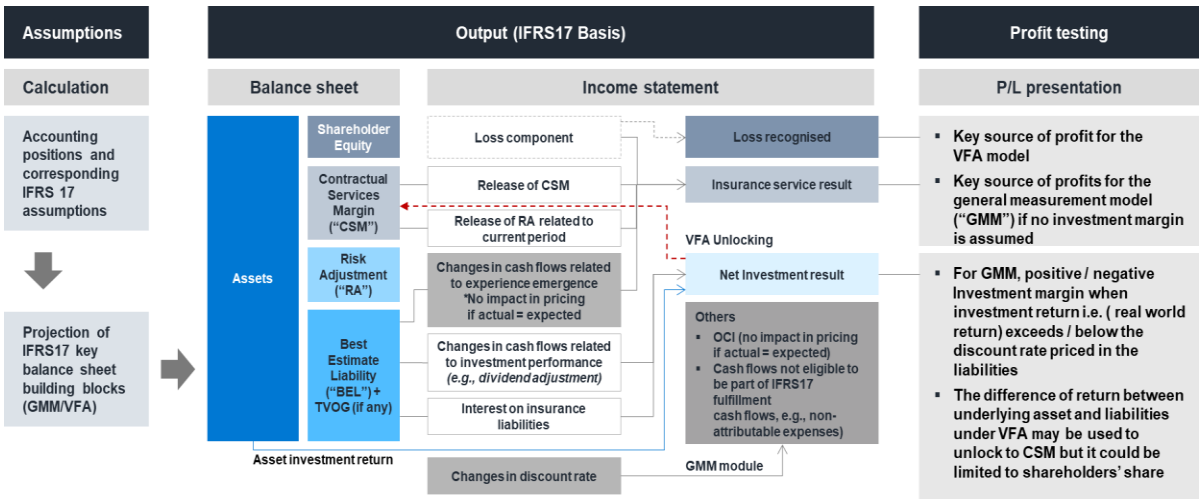
The new challenges for existing pricing models

THE PROJECTION OF ECONOMIC BALANCE SHEETS DURING PRICING STAGE

The most significant overhaul of the pricing model involves developing a functionality that can project an economic balance sheet (EBS) with sufficient accuracy to capture all essential characteristics while remaining practical enough to accommodate the dynamic nature of product pricing.

Both IFRS 17 and RBC regimes, such as HKRBC, share similar fundamental elements, including a best estimate liability (BEL), which captures the time value of options and guarantees (TVOG), and a risk margin (RM) for RBC or risk adjustment (RA) for IFRS 17. The primary distinction between the two, however, is that IFRS 17 creates an additional CSM liability on the balance sheet to offset any day-one gains, whereas some RBC regimes permit the recognition of a day-one surplus. Under an RBC regime, it is necessary to project the required capital to evaluate both the solvency level and the costs associated with meeting the capital requirements. As assets and liabilities are projected forward, their corresponding movements will form the basis of the product's profits. The following illustration demonstrates how the profit and loss (P&L) interacts with the balance sheets under IFRS 17.

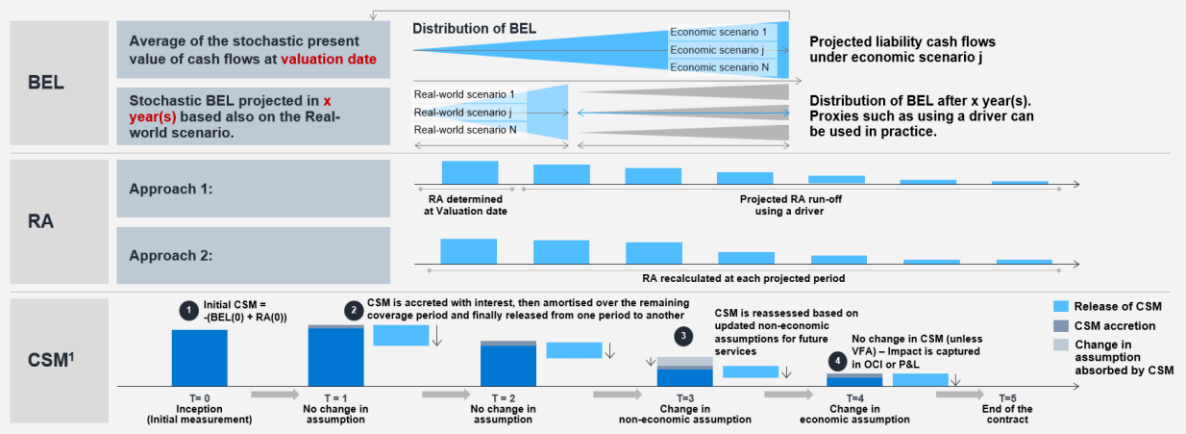
FIGURE 1: AN OVERVIEW OF PRODUCT PRICING BASED ON IFRS 17



THE PROJECTION OF STOCHASTIC BEL DURING PRICING STAGE

A significant challenge is forecasting the stochastic BEL for both IFRS 17 and RBC. Although a nested stochastic model can be created using actuarial software to assess TVOG at each projection year, this method may not be the most practical. Product pricing is usually an iterative process involving the testing of various assumptions and policyholder benefits, which makes a complex in-house actuarial model less appealing. An alternative common approach involves determining the TVOG at inception, deriving a factor based on certain drivers, and projecting the TVOG at future points in time. More advanced factor methods involve analyzing TVOG sensitivity to different interest rates and adjusting the TVOG factor projection according to assumed future interest conditions. Despite all these simplifications, a key consideration persists: whether a stochastic model can be effectively used during the pricing stage, which could be crucial for accurately pricing products under the new framework. The following illustration demonstrates the overview of projection of the balance sheet items under IFRS 17.

FIGURE 2: A TYPICAL PROJECTION OF A IFRS 17 BALANCE SHEETS

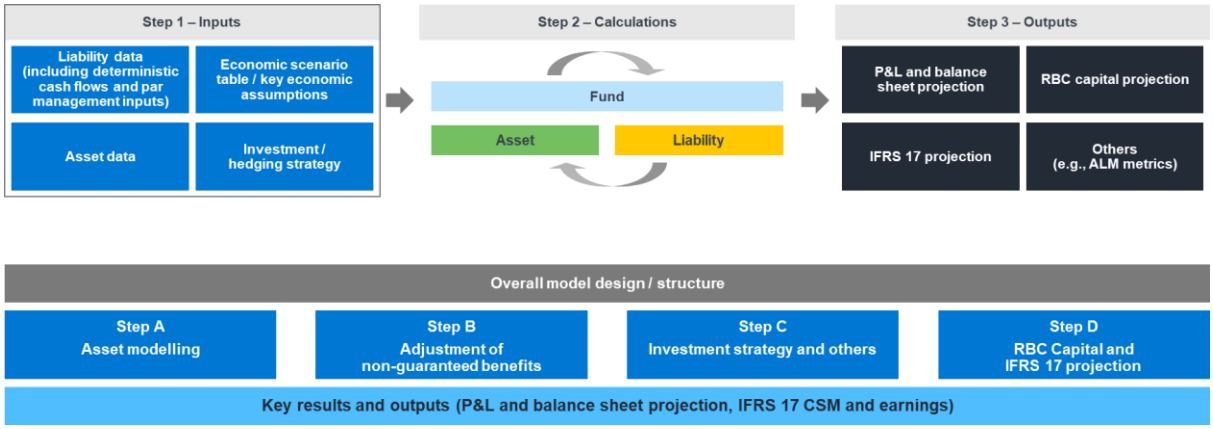


THE ALM MODEL FOR STOCHASTIC PRICING

Companies typically utilize an ALM model to assess the TVOG, primarily for valuation purposes. Whether implemented through in-house actuarial software, Excel, or other platforms like Python, an ALM model comprises three fundamental components: asset modeling, adjustments to non-guaranteed benefits, and investment strategy.

Asset modeling involves forecasting asset values, whether in market or book value, across different asset classes such as fixed-income securities or equity indices using standard approaches (i.e., discounting asset cash flow for fixed-income assets). Adjustments to non-guaranteed benefits are generally based on the company's internal dividend and bonus policies and their interaction with the asset side, including asset returns. The investment strategy necessitates continuous rebalancing of assets based on either a fixed or dynamic strategic asset allocation, incorporating cash flow interactions from both assets and liabilities. Typically, the ALM model processes detailed asset data, including coupon rates and maturity dates for each asset class, while grouping liabilities, often sourced from another pricing model for product liability cash flows. The calculation involves an interactive process between assets and liabilities. TVOG as at inception can be assessed during pricing by repeating the calculations under different economic scenarios. The following illustration demonstrates an overview of a typical structure of an ALM model.

FIGURE 3: AN ALM MODEL (EXCEL-BASED OR OTHER) IS TYPICALLY COMPOSED OF THE FOLLOWING BLOCKS

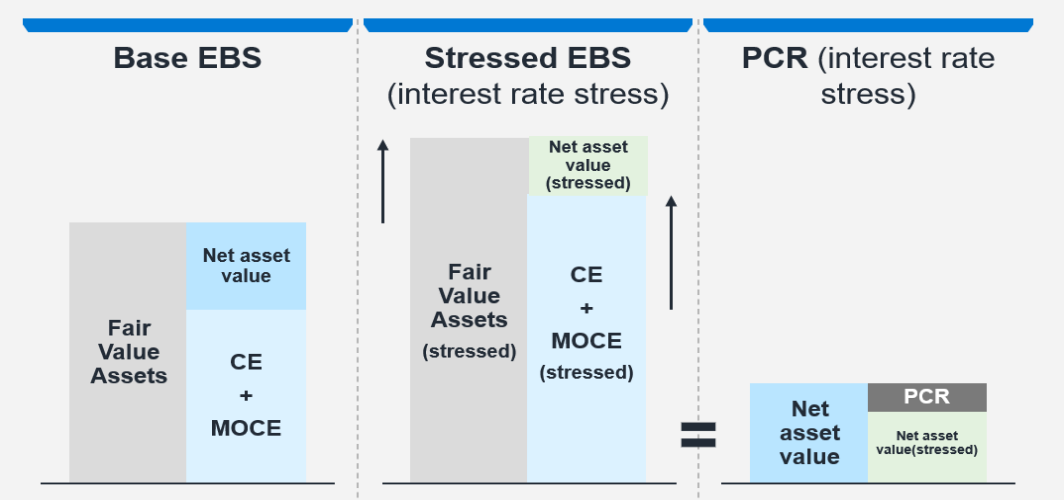


THE ALM MODEL FOR PROJECTING CAPITAL REQUIREMENTS UNDER AN RBC FRAMEWORK

Besides assessing TVOG, an ALM model can be readily adapted to project capital requirements for market risks under RBC frameworks, including interest rate changes, credit spread widening, and equity shocks from first principles. For instance, the main source of interest rate risk charges, or prescribed capital requirement (PCR), under RBC is the mismatch between asset and liability cash flows. The interest rate PCR corresponds to the drop in net asset value resulting from a specific interest rate shock (as illustrated below). The post-shock asset value can be calculated at each projection point by discounting asset cash flows using the stressed yield curve. Similarly, the impact of an interest rate shock on liabilities can be assessed by discounting the liability cash flows with the stressed yield curve. ALM models will also capture any loss absorption capability of non-guaranteed benefits through the interaction of assets and liabilities.

Another common approach involves using a factor, where the projected PCR is based on drivers derived from an existing block of products with similar features. However, caution is required when applying this method. For example, with a limited pay product that has a five-year premium payment term, the evolution of market risk charges may differ between the premium payment period and after it ends. A factor approach might not capture these impacts with sufficient granularity, potentially failing to identify major ALM issues (for example, the biting direction of interest rate stress may be different from an in-force product) during pricing, but realizing them only once the product is in force. Additionally, projecting market risk charges at different points in time enables a clear evaluation of the product's ALM risks throughout various phases and helps identify potential management actions, such as reinsurance or derivative hedging, to manage underlying ALM risks during product pricing.

FIGURE 4: SOURCE OF INTEREST RISK CHARGES



INTRODUCING ALM METRICS DURING PRICING UNDER RBC

In the context of ALM, achieving regulatory compliance is fundamental, but the optimization of capital efficiency and the management of surplus at risk are equally critical during the pricing stage. A common metric used in assessing ALM risk is DV01 (or DV100), which measures the change in value for a one-basis-point (or 100 basis points for DV100) parallel shift in the interest rate yield curve. This metric serves as a proxy for assessing interest rate risk charges. Metrics such as surplus DV01—calculated as the DV01 of assets minus the DV01 of liabilities—and matching ratios, like the DV01 of assets as a percentage of the DV01 of liabilities, are essential for evaluating ALM effectiveness. In addition to DV01, key-rate duration metrics such as KDV01 are considered to assess the impact of nonparallel yield curve movements. KDV01 measures the change in value for a one-basis-point shift at a specific term on the yield curve. Although convexity metrics are less frequently utilized, defining metrics and setting risk tolerance targets in line with ALM risk management policies is crucial.

For example, a goal might be to keep the surplus shortfall within 1% of the baseline surplus for each one-basis-point shift in interest rates. Identifying key projection years for analysis is crucial; these could include the starting point (time 0), the moment when all premiums are paid for limited-pay products, and regular intervals such as every five or 10 years. Recognizing that the process could be time-consuming, it may not be necessary to calculate metrics from first principles for all projection years.

To enhance the analysis, simplifications or proxies can be applied. For example, when managing new products within a wider product category composed of existing in-force products, consider a business plan approach where cash flows from the new product are integrated into the existing portfolio using a projected sales mix. The main goal is to determine if the inclusion of new sales adversely affects the ALM metrics in the early years—something not evident in a standalone assessment of a new product, as the diversification effect between in-force products are not captured.

Additionally, for products without a comparable existing portfolio, rather than assessing ALM metrics for a single year, it is advisable to analyze future sales and estimate aggregated ALM metrics, weighted by specific drivers, to understand the overall impact at specific time intervals.

Hence, in light of the shift toward EBS frameworks and the uncertain interest rate environment, the demand for more sophisticated pricing tools has markedly increased.

KEY FEATURES FOR NEXT-GENERATION PRICING TOOLS FOR IFRS 17 AND RBC

The next generation of pricing tools will feature three key elements that are essential for effectively assessing different pricing metrics.

The first feature involves projecting assets and analyzing their interactions with liabilities. This is crucial for evaluating the TVOG, as well as understanding policyholder behaviors, such as dynamic lapses. These insights are vital for accurately assessing risk and ensuring the financial soundness of products under these new regimes.

The second feature is the development of a pricing model that integrates both IFRS 17 and RBC calculations. This integration is expected to result in a sophisticated model, but it may lead to longer execution times, which can be challenging given the rapid pace of pricing activities. Therefore, maintaining speed and efficiency will be critical to meet business demands, considering the dynamic nature of product pricing.

The final feature is that both IFRS 17 and RBC require complex calculations and projections, which necessitate careful scrutiny and awareness of potential model risks. Ensuring the accuracy and reliability of these calculations is paramount, making verifiability and clarity in the modeling process essential to mitigate risks and enhance decision making.

The revamp of existing pricing tools and the case study of Milliman Mind

The first of the previously described key features can be met through the use of an ALM model, which can be Excel-based or use other platforms, while the second and third features can be addressed by utilizing the latest technologies. For example, cloud-based software can significantly reduce processing time by utilizing GPUs instead of conventional CPU calculations. Milliman Mind is one such example.

Milliman Mind uses Excel-like formulas for users and incorporates high-performance computing technology to provide superior calculation capabilities, allowing large-scale complex models to be processed quickly and efficiently. Conversion to Milliman Mind can be based on an original Excel model, with limited modifications that will maximize the effectiveness of Milliman Mind functions.

As an example, Milliman's Hong Kong office has developed an Excel-based ALM model to estimate the TVOG for a participating product offering reversionary and terminal bonuses. This model incorporates asset share based on projected asset values with annual time-step calculation and bonus adjustment mechanisms, while the input consists of liability cash flows from a separate liability model. Running this model on a system with 12 cores takes roughly one hour for 1,000 scenarios. After migrating to the Mind platform, the model reduced core usage to eight and completed the runs in just three minutes.

Cloud-based solutions also offer process automation to streamline workflows that may take longer due to manual operations. In our previous scenario, the ALM model relies on cash flows from an Excel-based liability model. The process to update the liability cash flows in the ALM model from the underlying liability model can become cumbersome when pricing assumptions change, as the liability cash flows must be manually recalculated from the liability model before being input into the ALM model. By converting both the ALM model and the liability model to the Mind platform, the interlinks function in the platform can connect the output of the liability model directly to the ALM model as its input, allowing ALM results to be generated automatically after the liability

calculations are completed. Since Mind utilizes GPU technology, it allows for the simultaneous execution of multiple Excel calculations, greatly enhancing process efficiency.

A practical example of the interlinks function during the pricing stage is its ability to configure multiple runs with different assumptions or premium rates in the liabilities model. This setup provides various liability cash flows to the ALM model, allowing it to be rerun and generate varied results based on different liability profiles, all within a single execution. In the past, this would have required multiple executions in Excel to achieve the same outcome.

At the same time, software such as Milliman Mind is designed to maintain audit trails, enhancing governance and transparency while preventing any black-box calculations.

Conclusion and the way ahead

The insurance industry in Asia is undergoing a significant transformation due to the implementation of IFRS 17 and RBC frameworks. These changes necessitate a reconsideration of traditional pricing models to ensure compliance with new standards while maintaining competitive advantage. This paper has explored the impact of these regulatory shifts on product pricing models, highlighting the need for insurers to adapt and innovate.

The introduction of economic balance sheets and the focus on ALM have brought new challenges to pricing processes, demanding more sophisticated tools and methodologies. The projection of stochastic BELs and the integration of ALM models for assessing TVOG and capital requirements are crucial steps in this adaptation.

As insurers transition to these new regimes, leveraging advanced technologies like cloud-based solutions can significantly enhance efficiency and accuracy. Milliman Mind, for instance, exemplifies how modern platforms can streamline complex calculations and automate processes, reducing execution times and facilitating dynamic pricing strategies. By integrating IFRS 17 and RBC calculations within pricing models, insurers can better manage risks and optimize capital efficiency, ensuring financial soundness while meeting regulatory demands.

In conclusion, the shift toward EBS frameworks and the evolving interest rate environment underscore the necessity for next-generation pricing tools. Insurers must embrace innovation and technology to navigate the complexities of IFRS 17 and RBC regimes successfully. By doing so, they can not only achieve regulatory compliance but also enhance their competitive position and drive value creation for shareholders. As the industry continues to evolve, the insights and strategies discussed in this paper will serve as a foundation for future advancements in product pricing across Asia.

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milliman.com

CONTACT
Julian Man
julian.man@milliman.com
Wen Yee Lee
wenyee.lee@milliman.com

Milliman