



## Model Validation

### Transforming financial models into powerful decision-making tools

Mathematical models are frequently used by financial institutions to analyze potential business opportunities and risks. Once confined to a small corner of analysis, models are now increasingly used in:

- Estimating economic capital
- Quantifying exposures to assets/liabilities
- Analyzing potential business opportunities
- Setting risk tolerances based on VAR limits, concentration limits, ROI/ROE, etc.
- Developing risk-based pricing structures for premium rates, loan pricing, or loan scoring
- Many other applications

Yet it must be remembered that models are simplifications of reality. Models are designed to estimate the performance of a given asset or liability based on the underlying characteristics and other influential elements, such as economic forecasts. Management may heavily rely on the output from these models when making decisions and must be confident that the models are representative of the exposure.

So how much confidence should a company place in its models?

The answer depends on a variety of considerations, among them the quality and independence of its model validation. Once considered a prudent step, independent model validation is becoming a mandate not only with proposed regulations such as Basel III but also because of the stiff consequences of a failure to act.

#### A REASONABLE TRADEOFF

In many ways, the tradeoff between a model's usability and its complexity shapes the validation process, which varies depending on the model's use and modeled risks. No matter what form the model takes, an effective validation process should answer the following questions.

#### DOES THE CHOICE OF THE MODEL MATCH ITS INTENDED USE?

Models developed for one specific purpose may not be applicable to other areas of the business. However, limited resources, budget constraints, or other reasons may compel a company to modify existing models to serve alternative purposes. In certain cases, ad hoc adjustments are made to a model to account for extraordinary circumstances. Over time, add-ons or other periodic adjustments can significantly, yet unintentionally, alter the purpose for which the model was initially designed. An effective model validation would review the original purpose of the model and current uses to highlight any potential risks or limitations of using the model.

#### HOW INCLUSIVE DOES THE UNDERLYING DATA NEED TO BE?

Models are developed using a combination of historical data and economic forecasts as well as a modeler's judgment. As comprehensive as it is, the available data may not be inclusive of the possible range of results or economic scenarios applicable to the exposure. The data may also contain false signals that a "black box" model will pick up but may not be related to the exposure being modeled.

Starting with a review of the data used to develop the model, an effective model validation will review the range of model responses as well as the number and magnitude of stressful events in the data. The objective of such a review is to identify potential limitations of the model and to help managers develop an understanding of these or limitations on the model's estimates. Milliman has developed a team of professionals experienced with various types of credit risk who can provide unique insights into data requirements for model building.

### **DO THE MODEL RESULTS PROVIDE A REASONABLE APPROXIMATION OF REALITY?**

Model results can be skewed by assumptions that go beyond the data used to train the model, particularly in stress scenarios. In addition, a model may not capture all of the explanatory effects needed in the model. The validation process will highlight key assumptions in the model and the implications and limitations of these assumptions. The validation will also assess the variables used in the model for completeness in explaining the event being modeled. A complete validation will include a thorough review of the documentation developing and selecting such assumptions and variables.

### **WHAT ARE THE LIMITS OF THE MODEL?**

After extensive quantitative analysis of the model's selection, it is important to step back from the process and assess the reasonableness of the model theory and output. While sensitivity and stress testing, among other techniques, play a key role in this phase of review, the model validation will rely heavily on the model validator's professional expertise in uncovering the limits of the model and the circumstances that indicate when the model is appropriate and is not appropriate to use.

### **HOW DO THE MODEL'S RESULTS ALIGN WITH THE PAST?**

Outcome analysis answers this question by comparing the model's actual estimates with historical data using techniques such as back-testing and out-of-sample testing, among others. Discrepancies are certain to occur, but how do you know if they are reasonable or not? An independent review of the model expectations to actual outcomes will assist management in assessing the model. Such a review could also help with model governance. Management may set predetermined error limits on the model that would provide an objective guide to corrective action.

### **WHERE SHOULD YOU PUT YOUR TRUST?**

Objectivity matters and is essential in model validation. Model validation is a process that depends nearly as much on professional judgment and experience as it does on analytical expertise.

Our experience in quantitative analytics for the financial sectors, particularly banking and insurance, provides the basis for a unique skill set that allows us to perform high-quality model validation for our clients and to clearly and concisely communicate complex issues related to model design to our clients and their regulators.

Milliman has combined unparalleled expertise with an uncommon level of professional freedom to deliver objective, unbiased advice and analysis in the development of sophisticated statistical modeling.

### **ABOUT MILLIMAN**

Milliman is one of the largest independent consulting firms in the world with over 2,600 employees. For more than 60 years, Milliman has pioneered strategies, tools and solutions worldwide. We are recognized leaders in the markets we serve. Milliman insight reaches across global boundaries, offering specialized consulting services in mortgage banking, employee benefits, healthcare, life insurance and financial services, and property and casualty insurance. Within these, Milliman consultants serve a wide range of current and emerging markets. Clients know they can depend on us as industry experts, trusted advisors, and creative problem-solvers.

Milliman's consultants have achieved the highest credentials in their fields and are unmatched in the industry. We are dedicated to providing the best quality service to our clients. We pride ourselves in our responsiveness and customized solutions, tailoring each assignment to the specific needs and characteristics of clients. The results of our analyses are necessarily complex, and Milliman's ability to clearly communicate these results to clients makes our work respected by our many audiences.

Milliman's Mortgage Banking Practice in Milwaukee is dedicated to providing strategic, quantitative, and other consulting services to leading organizations in the mortgage banking industry. Past and current clients include many of the nation's largest banks, private mortgage guaranty insurers, financial guaranty insurers, institutional investors, and governmental organizations.

**Contact us to see how we can turn your  
models into strategic decision-making tools.**

**Jonathan Glowacki, FSA, CERA, MAAA**  
Consulting Actuary  
jonathan.glowacki@milliman.com  
+1 262 641 3560

**Ken Bjurstrom**  
Principal and Financial Consultant  
ken.bjurstrom@milliman.com  
+1 262 796 3325

**Michael Schmitz, FCAS, MAAA**  
Principal and Consulting Actuary  
mike.schmitz@milliman.com  
+1 262 796 3322