PROPHET PROXY MODELING
Generating rapid results

Overview

Insurers are under increasing pressure to produce a greater range of results from increasingly complex models, more frequently and more quickly.

- More results to study the impact of a wider range of risk factors, and how these risk factors interact
- More simulations to achieve greater confidence in the results, especially when looking at several risk factors in one run of the model
- More complex models, such as nested stochastic and models with multiple risk factors
- Running the models more frequently, with some insurers aiming for daily solvency monitoring
- More quickly – the time horizon for a risk-based decision is getting ever-shorter, and management expects rapid answers to questions related to multiple risk factors

One way to increase the speed of the modeling process is to use faster hardware, and many insurers have adopted this approach. However, with the advent of proxy methods, modeling techniques have advanced to allow the same hardware to provide a cost-effective solution to the increasing demand for high-speed, reliable actuarial calculations.

Proxy modeling offers useful results in much less time than by running full models, and offers a deeper understanding of the business. For example, looking at the form of the proxy can provide insight into which risk drivers or combinations of risk drivers are significant, and the sensitivity of the business to those drivers.

There are a number of proxy techniques that can be used to find a surrogate model or a 'model of models' to provide rapid result estimation.

The Proxy Fitting Library supports:

Replicating portfolios
This technique uses a set of assets to mimic the behaviour of the liabilities. The techniques used to model asset shocks (for example, interest rate shifts or changes in equity prices) are simple and quick to calculate, and so replacing the liabilities with representative assets is a simple way to get a rapid valuation of liabilities, assets and/or free capital.

Curve fitting
Uses a polynomial to quantify the movement of a key metric of a block of business in response to a change in one or more risk factors. The risk factors are the variable inputs to the polynomial. While evaluating a polynomial takes only a fraction of the time of running a full actuarial model, the challenge is finding a set of risk factors and a polynomial that produce a good fit for the full model.

Least Squares Monte-Carlo
A variant of the Curve Fitting approach, Least Squares Monte-Carlo is ideal for situations where many external fitting scenarios exist, reducing the need for expert judgement on scenario selection.

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Prophet Proxy Fitting Library generates proxies for rapid and accurate results

Using the Proxy Fitting Library is remarkably simple: Select the appropriate proxy technique for your business objective, identify the relevant part of the full model, for example the solvency ratio or market value of liabilities, and run the full model results through a Proxy Library product to find the best fitting proxy model.

The Proxy Fitting Libraries provides an extensible set of statistics to help declare the proxy fit for purpose. Once a suitable proxy has been chosen, it can be used in place of the full model.

Fitting approaches

The library supports all three of the above approaches to fitting proxies. The first, 'Replicating Portfolios', requires the user to specify the set of candidate assets that should be considered. The system finds the optimal amounts of each candidate asset using a linear or quadratic programming algorithm.

The second, 'Curve Fitting', requires the user to specify the polynomial's form in all respects apart from the coefficients.The system finds the optimal coefficient values using a linear programming algorithm.

This approach requires results with a relatively small number of real-world scenarios and a relatively high number of market consistent simulations. For example, the market values of the assets and the liabilities should be known with a high degree of confidence, on each real-world scenario.

The third, commonly referred to as 'Least Squares Monte Carlo' or 'LSMC', is a variant of Curve Fitting, but lets the algorithm identify more of the polynomial's form. Curve fitting only calculates the polynomial's coefficients, for a given set of terms, but LSMC identifies which terms and cross-terms are required as well as calculating their coefficients. The range of polynomial solutions is configured by specifying the maximum order of the polynomial and of the cross-factor terms, and the type of polynomial: Power, Legendre or Chebyshev.

This approach requires results with a relatively high number of real-world scenarios and a relatively small number of market-consistent simulations. For example, the market values of the assets and the liabilities do not need to be estimated with a high degree of confidence, on each real-world scenario, but the method assumes that, overall, the values from the proxy will be accurate.

The user can specify that any or all approaches are used to fit a set of full model results.

Fast

Proxy Fitting run very quickly. During testing of the Least Squares Monte Carlo method, finding the optimal terms of the proxy model based on seven risk factors using the Proxy Fitting Library, took under a minute on a standard desktop machine.

Stand-alone

The full model results do not have to come from a Prophet model – the library can be used to fit a replicating portfolio or a polynomial to any input data. The proxy model can be used outside Prophet in other modeling and reporting tools, if required. For example, curve fitting produces a polynomial that can be built into any system.

Modeling purposes

There are a wide range of applications for proxy models in insurance. Replicating portfolios are, by their very nature, suited to market risks. For example, replicating portfolios can be used to speed up risk-based or economic capital calculations, to approximate daily balance sheet movements, to identify matching assets, or to express investment management requirements, such as a hedge or a benchmark, in a form that asset managers can easily understand.

Curve fitting is a more general approach as it takes into account a wider range of risk factors, for example equity volatility or lapse sensitivity. This is reflected in the areas of application: modeling and monitoring of market risk and of non-market risk such as counterparty, underwriting and operational risk.

Regularly updated

FIS has a large team of actuarial library developers, responsible for the on-going development and maintenance of all Prophet libraries, and the Proxy Fitting Library is included in this process.

Transparent, user-friendly and very flexible

As with all the Prophet actuarial libraries, everything is configurable and transparent. The logic for the proxy fitting products is stored as Prophet code in the Proxy Fitting library. We provide 'quick start' example models, tutorials and documentation. As standard with all Prophet libraries, customers can customize them if required, using the powerful actuarial development environment provided by Prophet Professional.

Benefits of the Prophet Proxy Fitting Library

- The Proxy Fitting Library provides a quick and easy way to build a simple representation of a more complex model
- Rapid implementation of proxy fitting solutions – much of the process can be run out of the box
- Each proxy model can use Prophet's parallel processing to fit different proxies simultaneously
- Use a variety of fitting approaches and then pick the approach that generates the best-fitting model
- Provide additional insight into the key risk drivers of an insurer
- Transparent code allows deep understanding of the methods used in a format familiar to existing Prophet users
- Flexible modeling environment allows user customization of a fitting product
- Share in FIS' enhancements to the underlying libraries which reflect and support key changes in modeling approaches worldwide

The library can be used in both **Prophet Professional** and **Prophet Enterprise.**

About FIS' Prophet

FIS' Prophet is a leading enterprise-wide actuarial modeling system that helps insurance and financial services companies meet reporting responsibilities, improve risk management, and develop more profitable products faster. Prophet uses customizable actuarial libraries for all major product types, including regional variations. It provides the transparency, performance and control required by today's actuaries and risk managers through integrated financial modeling and data management capabilities. Prophet is used by more than 10,000 users at nearly 1000 customer sites in over 70 countries.

About FIS

FIS is a global leader in financial services technology, with a focus on retail and institutional banking, payments, asset and wealth management, risk and compliance, consulting and outsourcing solutions. Through the depth and breadth of our solutions portfolio, global capabilities and domain expertise, FIS serves more than 20,000 clients in over 130 countries. Headquartered in Jacksonville, Florida, FIS employs more than 53,000 people worldwide and holds leadership positions in payment processing, financial software and banking solutions. Providing software, services and outsourcing of the technology that empowers the financial world, FIS is a Fortune 500 company and is a member of Standard & Poor's 500® Index. For more information about FIS, visit www.fisglobal.com