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Generation of stochastic scenarios for Insurance companies



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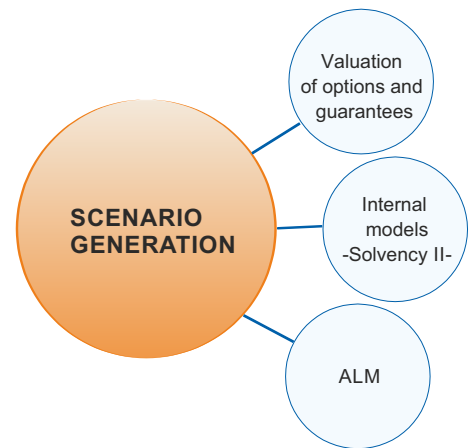
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Introduction

Stochastic scenario analysis for financial variables is used extensively by banks to value their financial instruments and manage their risk. They are used by front office to generate refined valuations of exotic instruments and instruments with early redemption optionality, while the middle office uses them in its VaR calculations, for regulatory and economic capital measurement purposes and for stress testing. They are also key to an entity's ALM.

For some time the use of stochastic models has been substantially more widespread among banks than insurers. However the introduction of **Solvency II** is driving a far-reaching transformation of the insurance sector, prompting the use of a much broader range of quantitative techniques, specifically **Monte Carlo simulations** (based on stochastic scenarios).

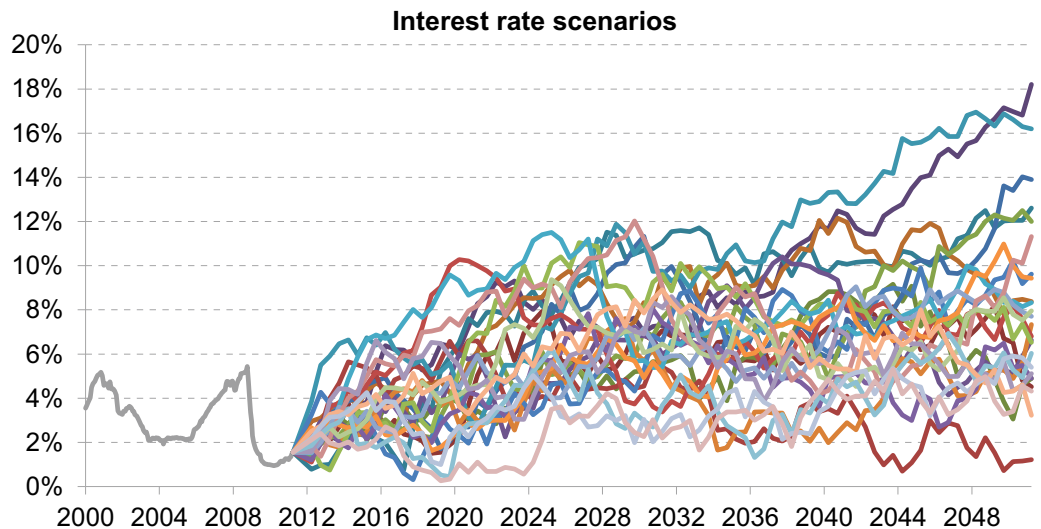
Their use by insurance companies is concentrated in three areas where Afi has proven solutions, expertise and experience.



Valuation of options and guarantees

Solvency II requires insurance entities to provide their 'best estimate' of the value of their liabilities. One of the biggest challenges intrinsic to this calculation is **valuing the options and guarantees forming part of insurance contracts such as surrender options, minimum guaranteed returns and profit-sharing arrangements, including participation in future discretionary benefits**. Valuation of all of these structures requires at the very least the generation of stochastic interest rate scenarios.

In this valuation environment, scenarios must be generated using risk-neutral models (i.e., absence of arbitrariness) fed by updated market information. Of the various models available, Afi has chosen the Black-Karasinski model for interest rate simulations. This





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model is robust, always provides positive interest rates and exhibits reversion to the mean in the long-term. This last point is crucial for insurance companies, particularly life insurers, given the extremely long-term horizon over which they have to manage their business.

Depending on your entity's characteristics and management needs, you may also need risk-neutral scenarios for inflation, credit spreads, defaults and other risk factors. Afi can provide you with expert advice on these matters or supply you directly with the corresponding simulations.

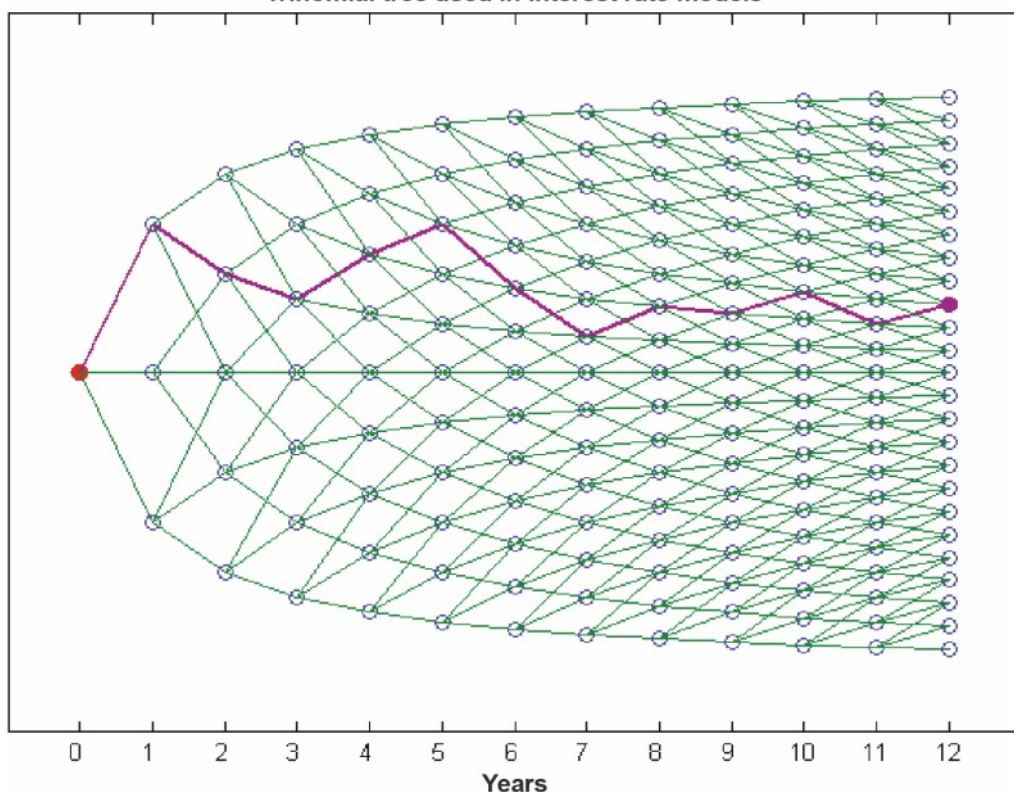
Internal models

Solvency II allows the use of internal models to calculate the capital required to cover any and all risk factors. These calculations entail estimating the corresponding probability of loss at a 99.5% confidence interval.

The probability of loss distribution can be estimated using Monte Carlo methodology based on stochastic scenarios for the risk factor in question for a one-year forward. Unlike the case described above, **these scenarios are not generated using risk-neutral models but are instead based on statistical analysis of the pertinent historical series in order to yield a realistic distribution of the possible risk factor parameters over a one-year horizon**. This framework, known as 'real world', is related to predictive techniques and requires models capable of capturing the key drivers of observed trends and distributions for a given risk factor such as mean reversion, fat tails, stochastic volatility, etc.

The Afi team has extensive experience using all kinds of advanced market and credit risk measurement models and is in a position to advise its clients on how to develop them. Alternatively, Afi can provide clients with 'real world' interest rate, credit spread, rating mitigation or default simulations, or indeed scenarios for any other risk factor for which the client calculates the corresponding losses at an interval of 99.5%.

Trinomial tree used in interest rate models



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ALM

Development of an ALM platform is an insurance company's biggest challenge. The cornerstone of such a platform is the generation of very long-term scenarios which effectively capture the actual performance of multiple risk factors. The ability to generate these simulations over the various time horizons takes time and poses very significant technical challenges in terms of projecting realistic scenarios which fit with historic performance.

In addition, to be able to determine the value of options and guarantees or of more exotic instruments or positions, an entity may have to generate **families of risk-neutral scenarios for each 'real-world' scenario**, i.e., create **nested simulations**. This **'Monte Carlo of Monte Carlo'** process, coupled with all calculations needed to value the company's assets, liabilities and other balance sheet items, makes ALM development a very demanding process from both the quantitative and IT standpoints, and it is therefore desirable to have the support of a multi-disciplinary team of experts. The Afi team is in a position to provide you with highly-qualified support on both the quantitative and technological aspects of developing an ALM platform.

What Afi offers

Afi's core service consists of the regular provision of simulations for the risk factors and time intervals of interest to its clients. The standard file delivery formats are Excel, plain text or XML. However, the exact format can be tailored to suit client requirements. Files can be downloaded via FTP or web-based services (SOAP or JSON), facilitating seamless integration with the entity's systems.

In addition, Afi can help its clients to apply the scenarios provided in any of the three areas described by selecting and developing the most appropriate techniques and procedures in each case.

Contact

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