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ORTEC FINANCE

Insurance Risk Management:

Duration Policy

ORTEC FINANCE

Duration Policy

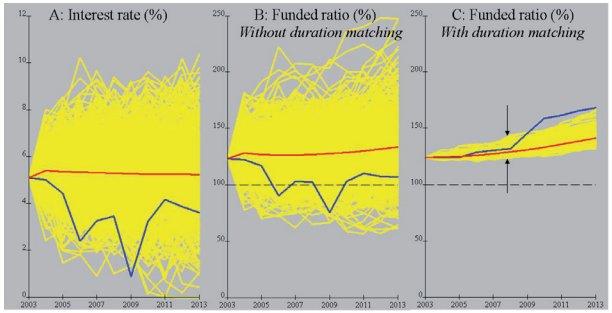
Risk Management Solutions for Insurers

An insurance company is almost always exposed to interest rate risk, especially if the liabilities contain contracts with embedded options. For example, the value of profit sharing or unit linked options depends strongly on the level of the interest rate. When the interest rate changes, the value of these options may therefore also change significantly. This has a strong impact on the overall market value of the liabilities. It is therefore crucial to determine the appropriate duration policy which will bring the exposure to interest rate risk in accordance with the desired risk level.

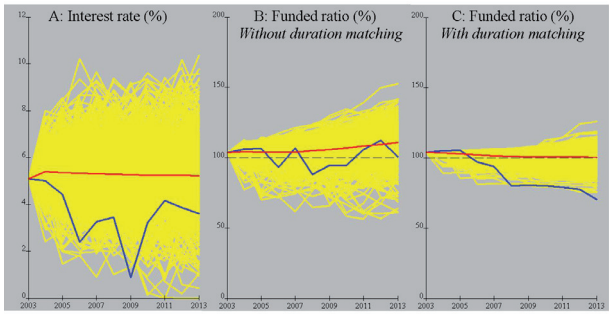
Example

Let us first, as an example, consider a liability portfolio that does not contain products with embedded options. This analysis makes it possible to gain insight into the implications of matching the duration of the investments with the duration of the liabilities. In this example, we annually match the duration using linear interest-rate derivatives (swaps).

This figure clearly shows that if embedded options are not present in the liability portfolio, duration matching will significantly reduce the exposure to interest rate risk (especially for low interest rate levels). However, the upside potential for high interest rate levels diminishes as well.



Effect of duration matching when there are no options embedded in the liabilities. We here consider 500 stochastic interest rate scenarios. The blue line is one selected scenario; the red line is the average value over all scenarios. A clear correlation exists between the development of the interest rate, which can be found in Panel A, and the development of the (market value) funded ratio, see Panel B. By matching the duration of the assets to the duration of the liabilities this correlation can be reduced significantly, see Panel C. The volatility of the funded ratio is in fact strongly reduced.

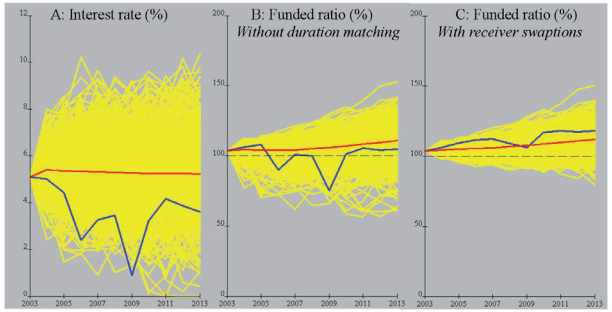


Duration matching when there are profit sharing options embedded in the liabilities. Notice that the funding ratio now deteriorates over time for the selected interest rate scenario. Duration matching with linear interest rate derivatives (swaps) thus becomes less effective when the liabilities contain embedded options.

Impact of embedded options

Let us now consider a liability portfolio with embedded profit sharing options. In this case, duration matching does not necessarily lead to a decreasing exposure to interest rate risk.

In fact, for the selected interest rate scenario, which is very volatile, the funding ratio significantly deteriorates over time. This effect is due to the mismatch in convexity between the assets and liabilities when options are embedded in the liabilities.



Using receiver swaptions to reduce the exposure to interest rate risk. Panel B displays the development of the (market value) funded ratio. When (receiver) swaptions are added, see Panel C, the downside risk diminishes since the receiver swaptions become valuable for low interest rates.

One way in which one can still diminish the exposure to interest rate risk is through the use of interest rate derivatives, like for example swaptions. Through the use of swaptions one can match the convexity of the profit sharing option completely, or just reduce the downside interest rate risk. An example of the last approach can be found in the above figure.

Advanced topics

The above case study has been performed with Ortec Finance's Asset Liability Management (ALM) model for insurers. This model is an excellent tool to study the effect of different interest rate hedge strategies, giving the possibility to extensively study the impact of various alternatives on risk and return. Advanced topics can also be addressed, such as hedging liabilities with credits or the implications of investments in different currencies.