



# ThetaSuite»

## Mark-to-Market using Libor Market Model

### Challenge

Analyze the risk return profile of a complex structured bond portfolio.

### Customer

An institutional investor

### Background

The financial crisis required a large institutional investor to reevaluate its investment strategy. Many complex instruments were present in the portfolio and lost most of their value.

### Open questions

Two main questions remain:

- What would be a fair price if liquidity comes back?
- Was the price at which the instruments were bought fair in first place?



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## Solution

The task discussed in this case study was brought up by an institutional investor holding a portfolio of about 20 different structured interest rate derivatives. The highly non-standard character of these derivatives made it impossible to obtain out-of-the-box pricing algorithms for the evaluation of prices and risk measures. The Theta Suite was the only tool that not only allowed the quick implementation of pricing algorithms, but also facilitated a modeling language that was easy to learn. Since the project had to be completed under tight time constraints ease of use and a steep learning curve was essential.

The Theta Suite provided all the functionality that was required to model the products in the portfolio. The final analysis consisted of a synthetic reconstruction of historic derivative prices. Only few of the products in the portfolio were exchange traded. Their prices could be used to verify corresponding model prices. It turned out that model prices matched market prices with low deviations. Further analysis involved the portfolio's sensitivity to key risk factors like interest rate curve shift, rotation and butterfly.

All price analysis was performed on the basis of the LIBOR Market Model, which was one of the models provided as part of the Theta Suite software. The input data required for the analysis was the prevailing interest rate curve, interest rate volatilities and the correlation matrix. The interest rates and the swaption volatilities could be directly extracted from Reuters data.

The numerics software Matlab provided the tools to convert swap rates and swaption volatilities into forward rates and forward volatilities. The correlation matrix was estimated from the historic interest rate curve dynamics.

With Theta Suite it was easy to compute the portfolio value of a few representative market scenarios which explained to the investor in which situations money would have been lost and in which situations it would have been earned. In summary, the result of the analyses showed that the portfolio had a high sensitivity to an interest rate curve rotation. Many of the products in the portfolio had payments depending on interest-rate spreads. The portfolio basically represented a major bet onto an increasing steepness of the interest rate curve.

If the investor had made use of the Theta Suite earlier he would have been aware of inherent risks and could have avoided a large financial loss.



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# Theta Suite. Tools financial engineers really need.

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