Analysis of application-specific requirements for estimation of risk-free interest rate term structure

Kurbangaleev M.

Lapshin V., PhD

Higher School of Economics

Risk-Free Interest Rate

- Is used for discounting in various areas.

- Possesses a term structure.

- Is not directly observable on the market.

- Varies for different applications.

Actuarial Reserves

- CEIOPS (EIOPA): Recommendations for implementation of Solvency II:
  - No significant credit risk premium.
  - Replicability.
  - Data credibility.
  - Liquidity for all tenors (terms to maturity).
  - No technical bias.

Market Instruments

- Sovereign bonds
  - Recommended by CEIOPS (2009)
  - Is the main component of insurers' portfolios.

- Interest rate swaps.
  - Recommended by EIOPA (2014)
  - Also used by insurers.
  - Higher liquidity.
  - Uniform credit quality due to CSA and/or central counterparty.

Extrapolation

- Insurance obligations can exceed traded instruments in maturity.

- Various methods of extrapolation are in use:
  - Flat term structure after the maximal maturity.
  - Macroeconomic approach.
  - Parametric approach.
  - Constant/variable spread to a base curve.

- EIOPA proposes a parametric method based on the notion of the "ultimate forward rate".

Liquidity premium

- Liquid and illiquid liabilities require different kinds of reserves.
  - One can use an illiquid asset as a reserve for an illiquid liability and receive additional return.
- Should the risk-free rate include the liquidity premium?
  - No, because we have no single reliable way of estimating it.
  - Yes, if necessary, because we have many different ways of doing it.
- EIOPA allows to account for the liquidity via a special procedure.

Update Frequency

- For actuarial reserves, frequent recalibration is not required.

- Special procedures are in place to reduce the volatility of the risk-free curve.

- Monthly recalibration.

Pricing Derivatives

- The nature of discounting is different: cost of funding.
- Before the 2007 – 2009 crisis everybody used LIBOR, EURIBOR and the interest rate derivatives based on them.
- The crisis has changed many things:
  - Credit risks and funding liquidity risks have become significant.
  - Interest rate derivatives with different tenors imply different risk-free curves (multiple curve effect).
  - LIBOR rates are indicative and vulnerable to manipulations.

Alternatives to LIBOR

- Overnight Indexed Swaps are more suitable for discounting:
  - One can really afford funding at these rates.
  - Low counterparty risk exposure.
- Derivative instruments are now usually collateralized.
  - The risk-free rate must be consistent with the interest rate on the collateral (money or assets).
  - CVA vs. LIBOR?
- The future is in joint use of several interest rates.

- For risk-management, portfolio sensitivity to interest rate shocks is more valuable than prices of individual instruments.

- Basel II proposes a quick and dirty approach to interest rate risk: gap-analysis.
  - OIS+swaps are used for discounting.

- Estimating interest rate risk via IMA requires modeling interest rate dynamics.

- Risk-management: reflect possible future interest rate scenarios.

- Pricing: fit currently observed prices.

- Multiple curve modeling, correlations.

- Liquidity premium is out of scope.

The Comparison Chart - I

Factor	Actuarial Reserves	Pricing	Risk-management
Basic Principle	Asset-Liability Management	Funding cost, Market consistency	Portfolio sensitivity
Instrument set	LIBOR-swaps with credit adjustments	OIS	According to the model (OIS for basic approach)
Required price fitting precision	Low	High	Medium

The Comparison Chart - II

Factor	Actuarial Reserves	Pricing	Risk-management
Required real dynamics fitting precision	No	No	High
No Arbitrage	No	Yes	Only for hedging
Liquidity Premium	Yes	No	No

The Comparison Chart - III

Factor	Actuarial Reserves	Pricing	Risk-management
Technical Requirements	Volatility Adjustments	Market Data Fitting	Correlations
Extrapolation	Yes	Probably	No
Update Frequency	Monthly	Up to real-time	Daily / As needed.

Thank You for Your Attention

mkurbangaleev@hse.ru

vlapshin@hse.ru