Kalotay Analytics

FIXED INCOME INNOVATION, PRECISION & PERFORMANCE

CurviLinear™ Yield Curve Analytics

CurviLinear is a versatile tool for building yield curves using a non-linear least square fit to a set of bond prices or yields. The bonds used for building the curve can be both non-call life and callable. This is essential for building US municipal yield curves, since almost any municipal bond whose maturity is longer than 10 years is callable.

A yield curve is constructed by searching through a universe of possible yield curves for the one that leads to the smallest pricing errors. Each possible yield curve is converted into a discount factor curve, which is used to obtain model prices for the bonds. If a bond is callable, then the bond price is adjusted downward by the call option value using an OAS valuation model calibrated to the discount factor curve.

AP National Tax–Exempt Municipal Bond Yields

Yields
30yr: 3.43

Benchmark Curve is a 5% Non-Call 10yr Curve

There is always tension between minimizing the pricing error and maintaining the proper shape of the yield curve. If the bonds used for building the curve are concentrated within a narrow range of maturities, then standard methods for building a yield curve can be unstable, leading to unrealistic yield curves.

CurviLinear's unique approach remains stable and produces properly shaped curves under these circumstances. It does this by controlling the degrees of freedom for the family of eligible curves. If prices are noisy and/or available for only a narrow maturity spectrum, then fewer degrees of freedom ensure a properly shaped yield curve that best fits the prices. If there is less noise in the prices and a broad maturity spectrum, then more degrees of freedom allows a tighter fit to the prices.
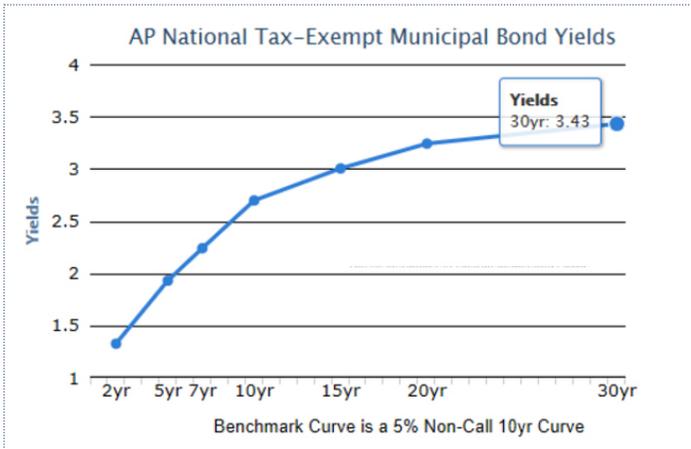
Functionality

Inputs

+ Bond terms and conditions
+ Bond prices (or yields)
+ Solver parameters (partial list)
  - Degrees of freedom in family of eligible curves
  - Maximum error tolerance
  - Maximum number of iterations
  - Maximum computation time

Outputs

+ Par yield curve
+ Bond prices
+ Bond yields
+ Effective risk measures relative to par yield curve
+ Yield-to-worst curve for specified coupon and lockout period (optional)

(Primarily for US municipal bond curves)

continued

Technical Specifications

• Shared Library

Supported Platforms

+ 32-bit and 64-bit Windows
+ 32-bit and 64-bit Linux
+ 64-bit Mac OSX

API's

+ C++
+ Java
+ C#

• Console Application

Inputs

+ Configuration parameter file
+ Command-line option
+ CSV file
  - Bond terms and conditions
  - Bond prices or yields

Output CSV File

+ Par yield curve
+ Yield-to-worst curve (optional)
+ Input and computed bond prices
+ Price and yield errors
+ Price and yield error histograms

• HTML and Text Documentation

• Sample C++, C# and Java Code

About Kalotay Analytics

For more than twenty-five years, Kalotay Analytics has been at the core of the world's most sophisticated fixed income valuation systems. From real-time pricing of bond ETF's to instantaneous MBS portfolio analysis for risk managers, Kalotay's patented technology performs computationally intensive calculations with the precision and speed demanded by today's markets.