Findur Advanced Curve Analytics Update

Safe Harbor

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Agenda

- Monotone Convex Interpolation
  - Introduction and Methodology
  - Implementing through the Curve API extension
  - Results and Examples
- Multi-Curve Valuations
  - OIS curve setup and Configuration
  - OIS related LIBOR (Benchmark) curve
  - OIS related LIBOR Basis Curves
  - Currency Basis Curve
  - Multi-Curve Valuation Models

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Multi-Curve Valuation

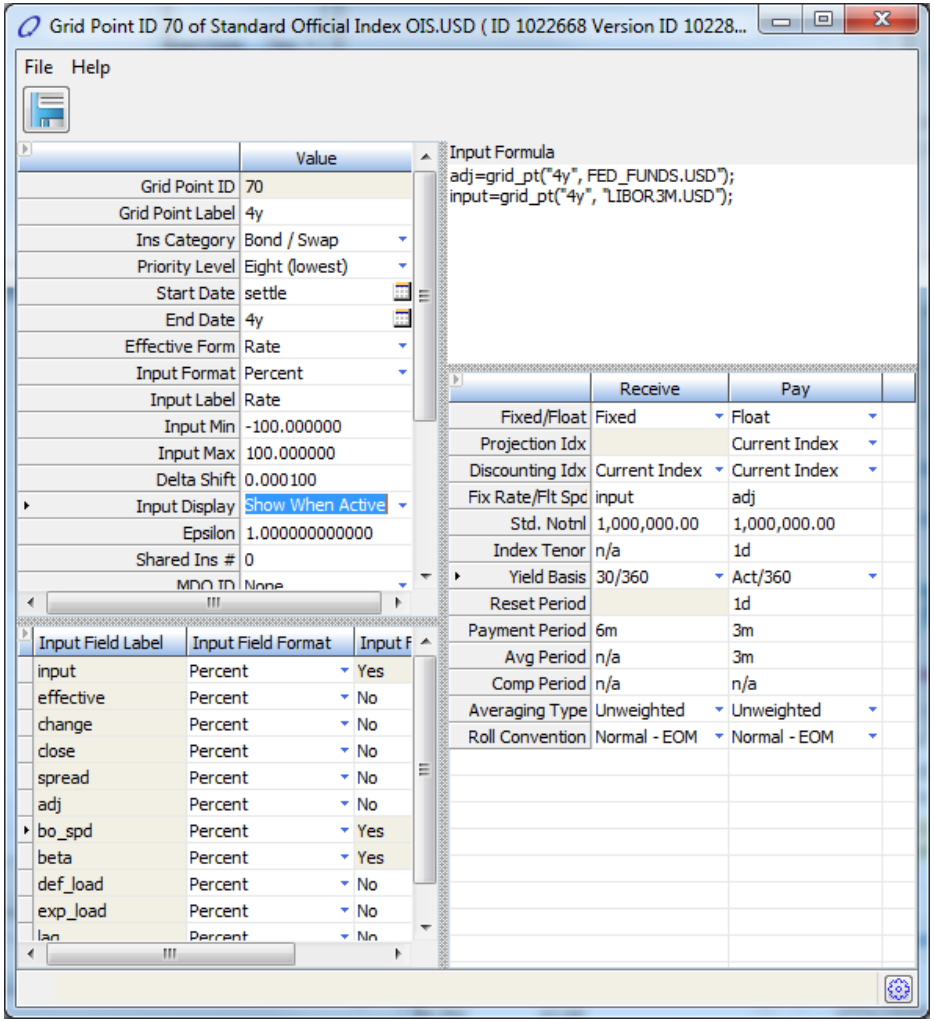
Background

- With emphasis on credit risk and push by regulations, OIS discounting has become the norm in the industry
- OIS methodologies and available market data have also become more standard
- OpenLink has a set of best practice recommendations and configurations that have been adopted by our clients
- Multi-Curve valuation models for available for a wide set of instruments

OIS Discounting Curve: Dual Curve Bootstrap (Our previous recommendation)

- Building Blocks (USD example)
  - OIS Cash and quoted Swaps: Overnight to 5y
  - FF/LIBOR Basis Swaps: 7y – 20y
  - Extrapolated LIBOR/FF basis: 25y -40y

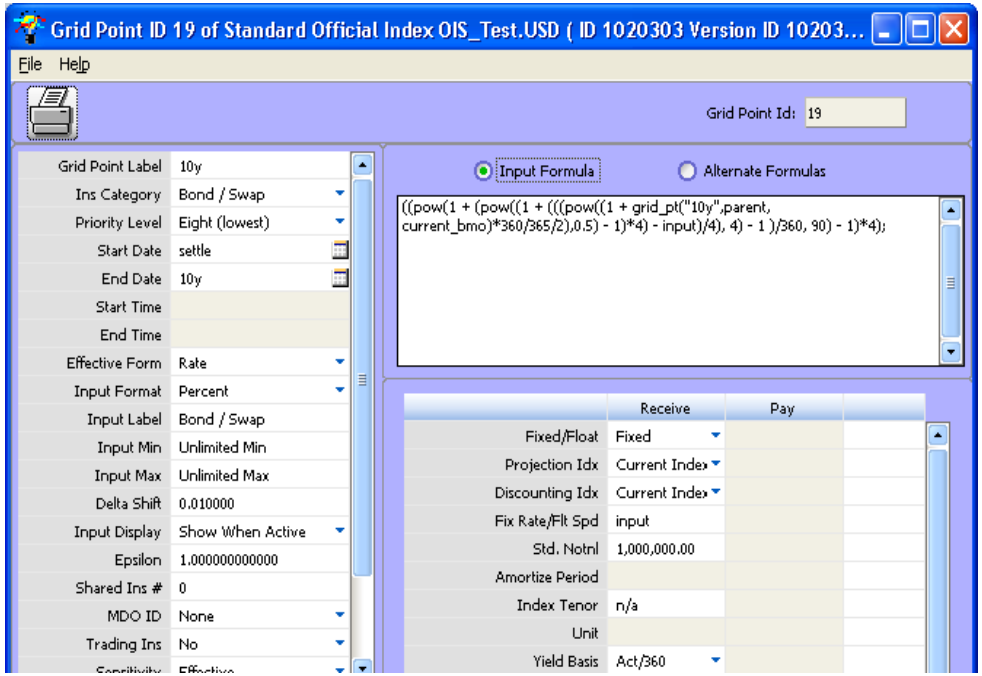
- Special Considerations
  - FedFund LIBOR Basis Swaps: Synthesize an (FF+Spd)/Fixed Swap from LIBOR Swap and LIBOR/FF basis.
  - Extrapolated LIBOR/FF: Assuming constant LIBOR/FF basis beyond last quoted (20y) basis swap



OIS Discounting Curve: Using Bloomberg Approximation (Updated alternative recommendation)

- Building Blocks (USD example)
  - OIS Cash and quoted swaps: overnight to 1y.
  - FF/LIBOR Basis Swaps: 7y – 30y
  - Extrapolated LIBOR/FF basis: 30y+ – 50y

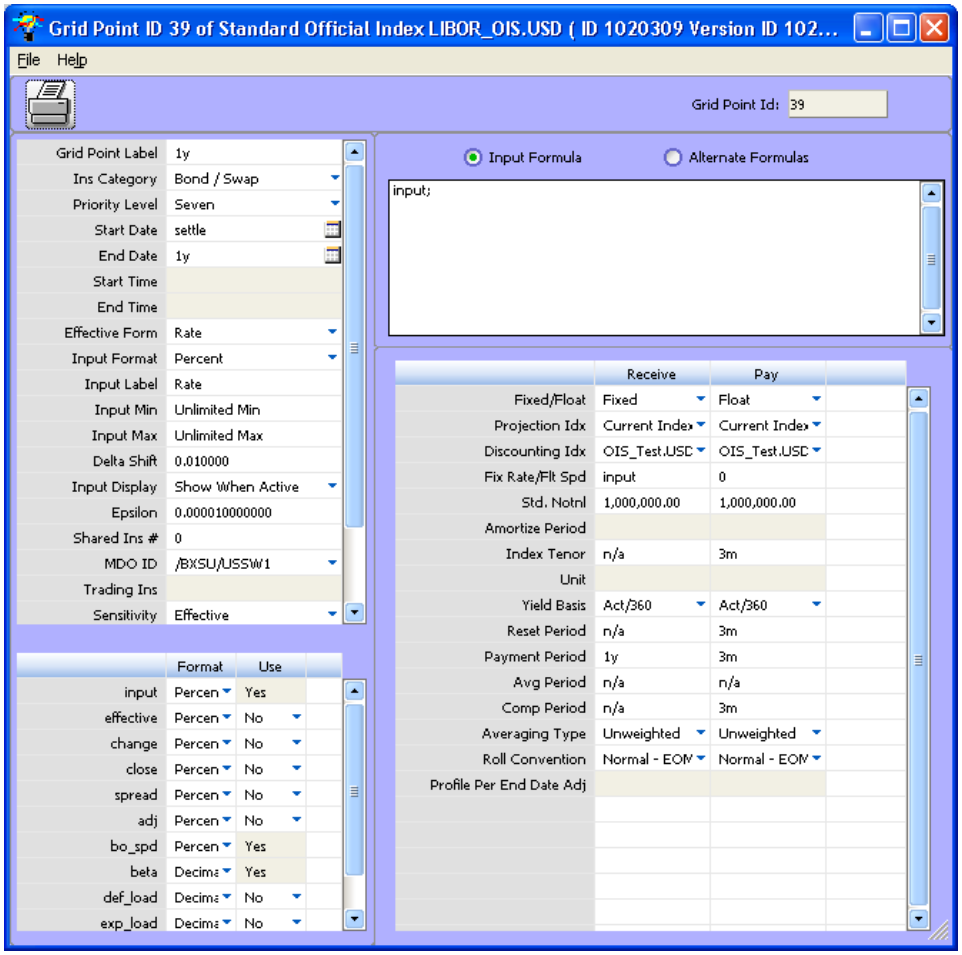
- Special Considerations
  - FF LIBOR Basis Swaps: use a BBG curve formula to approximate OIS swap rate from LIBOR swap rates and LIBOR/FF basis
  - Extrapolated LIBOR/FF: Assuming constant LIBOR/FF basis beyond last quoted (20y) basis swap



Benchmark (LIBOR3M) Projection Curve with OIS Discounting

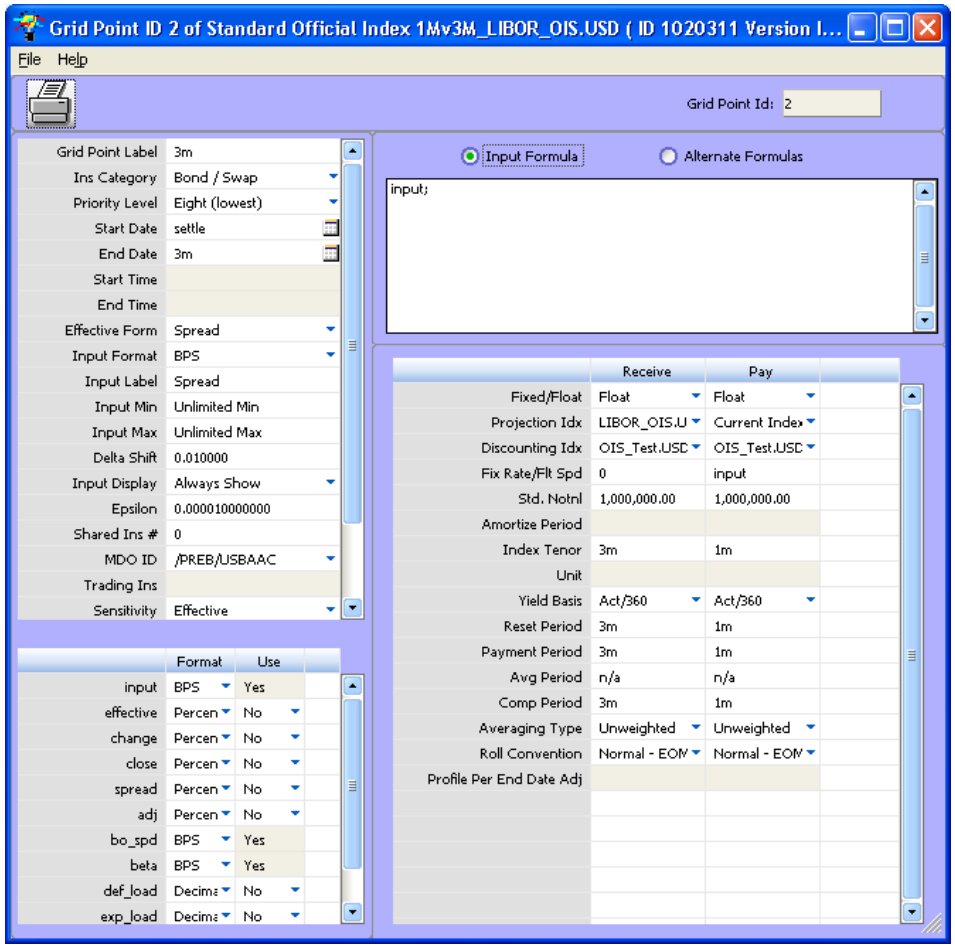
- Conventional LIBOR Index:
  - Used in both projection and Discounting together
  - For use in valuation of uncollateralized trades
- OIS based LIBOR Index
  - Used only for projection paired with OIS discounting
  - For use in valuation of collateralized trades

- Building Blocks for OIS based LIBOR:
  - same as conventional LIBOR, cash/future/swaps
- Special Considerations
  - Cash/futures: same as conventional
  - Swaps: OIS curve to be used as parent in discounting



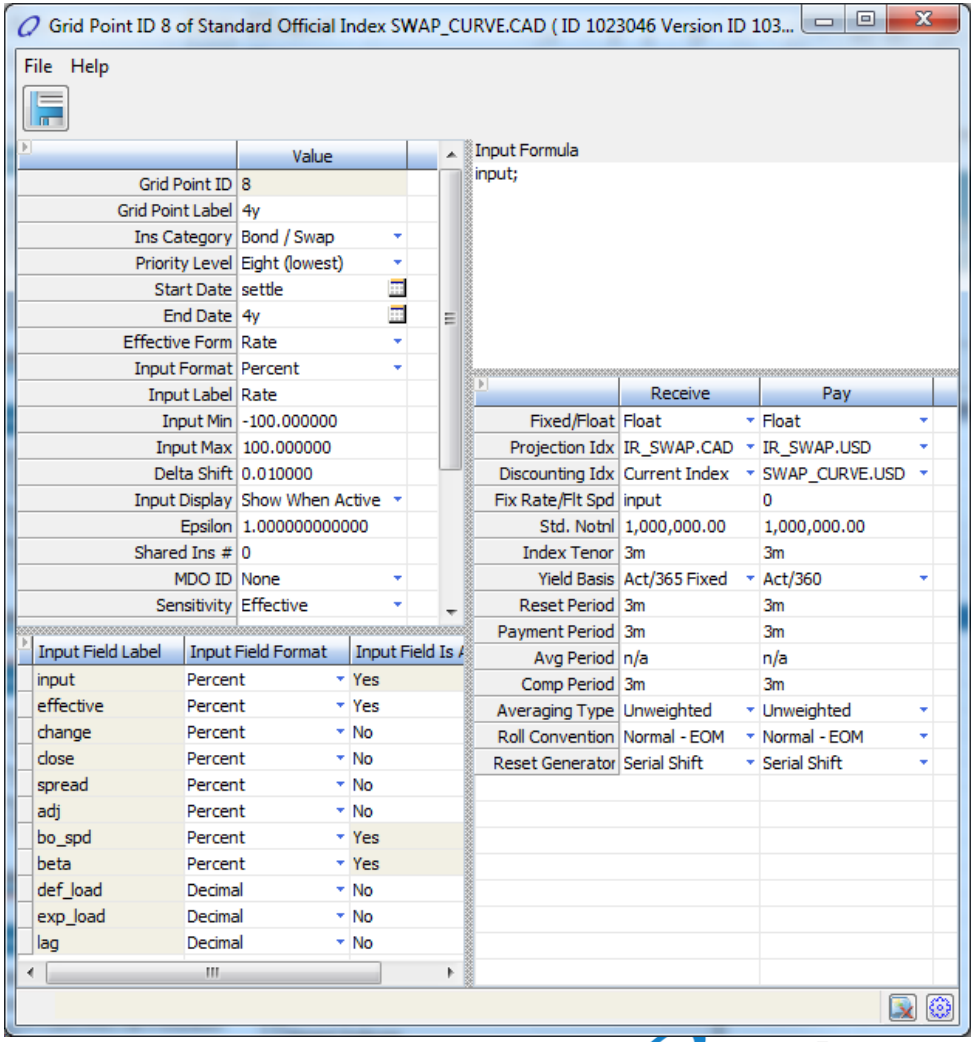
Basis Projection Curves with OIS Discounting

- Distinction from Conventional basis curves
  - Used only for projection paired with OIS discounting
  - For use in valuation of collateralized trades
- Building Blocks:
  - same as conventional basis curves: basis swaps
- Special Considerations
  - Basis Swaps: OIS Based LIBOR curve as projection
  - Basis Swaps: OIS curve to be used as parent in discounting

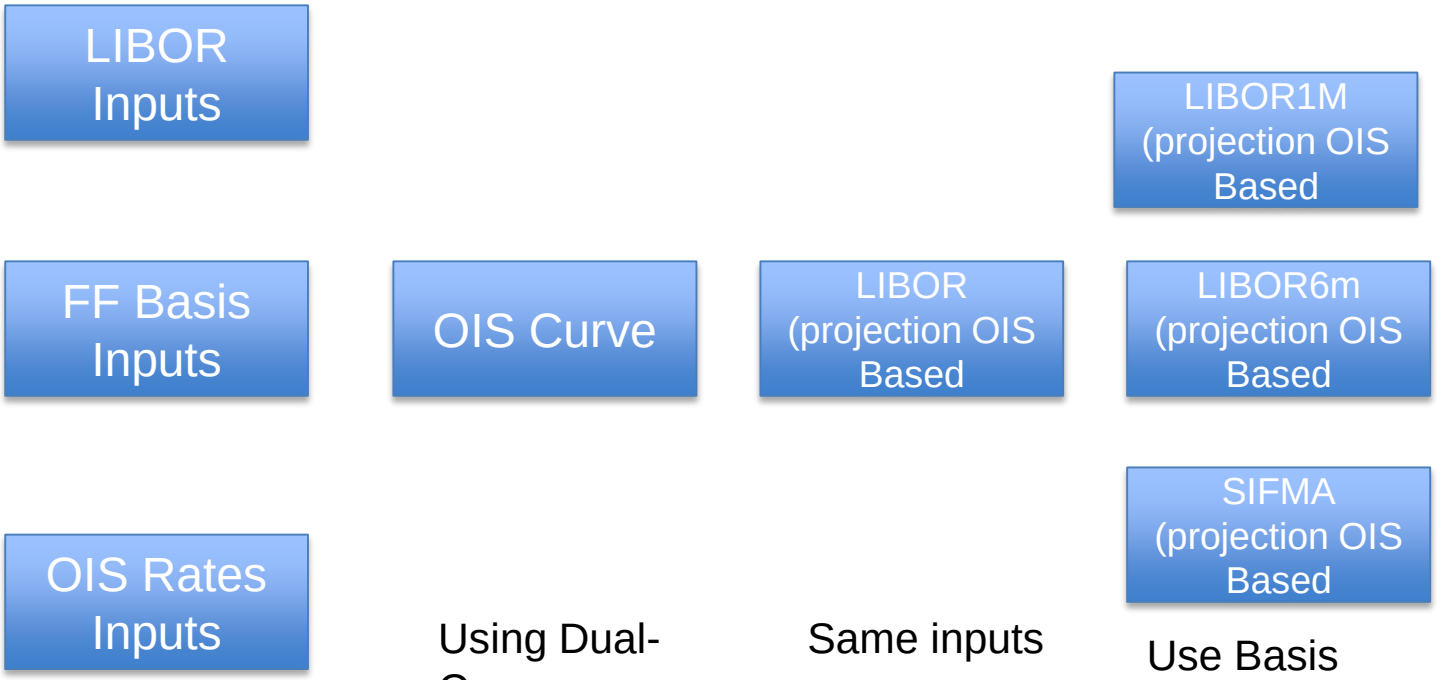


Cross-Currency Swap Curves

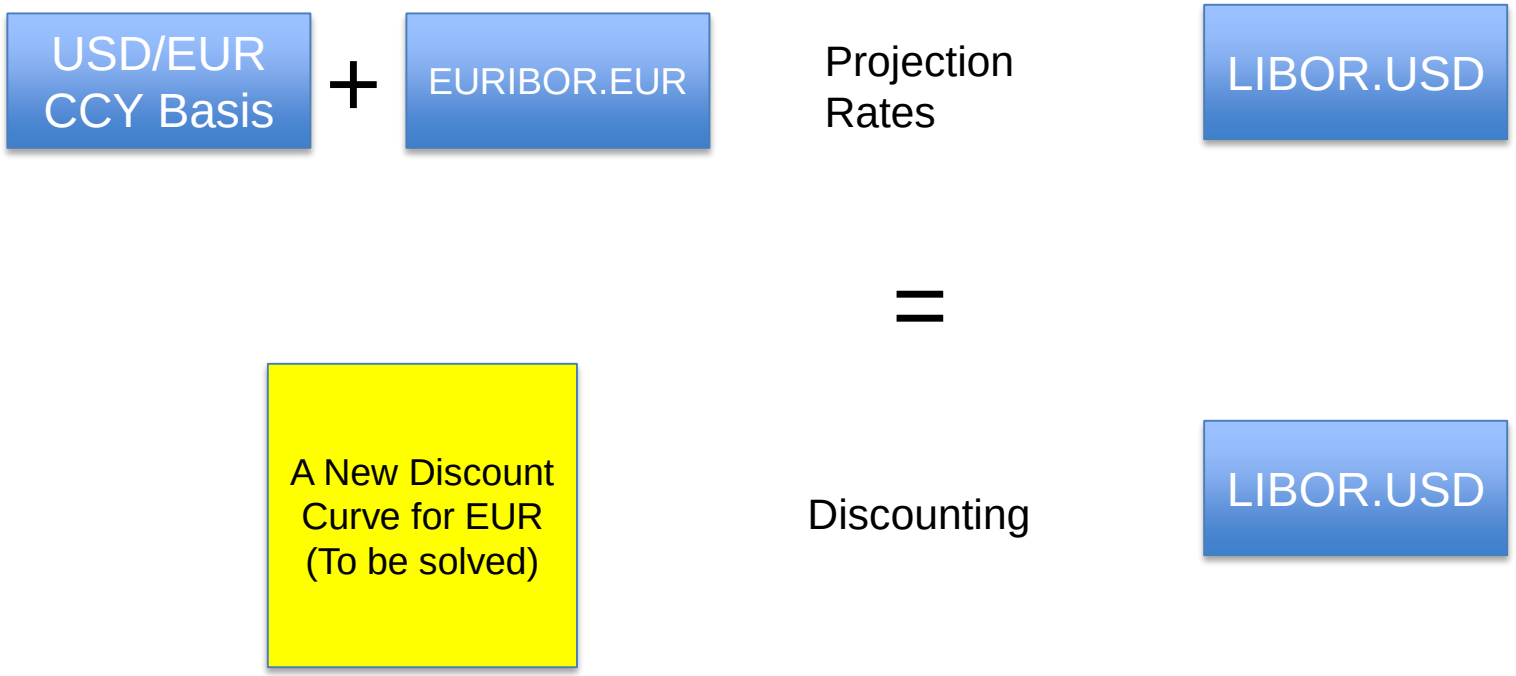
- Constructed using Currency Basis Swap (Float/Float)
- Full controls of projection and discounting curves on both sides
- Standard Setup:
  - Proj Curves: Benchmark IR curves for both currencies
  - Disc Curve on USD side: OIS or LIBOR USD Curve
  - Disc Curve on Currency side : To be solved in bootstrap
- Internal consistency with standard and quoted deals



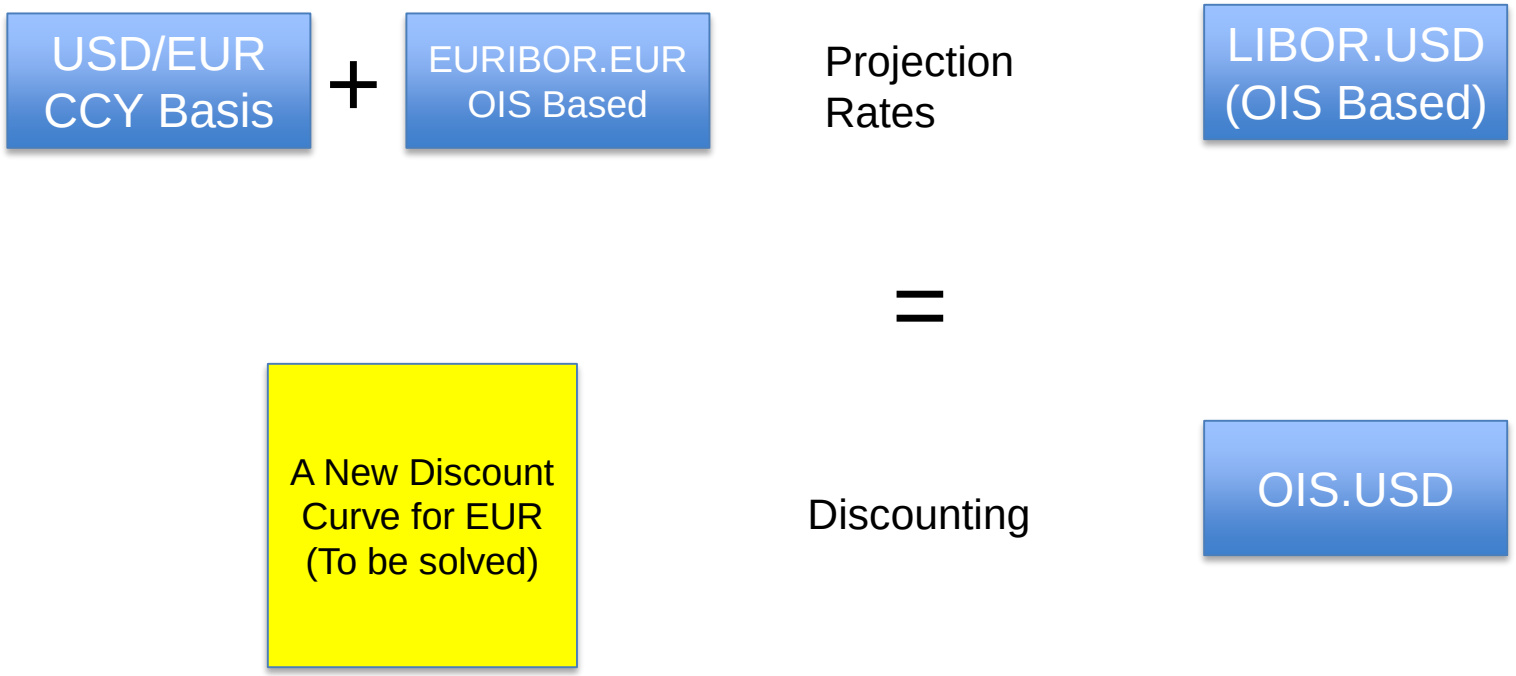
OIS Curve Structure for In-Currency Valuations



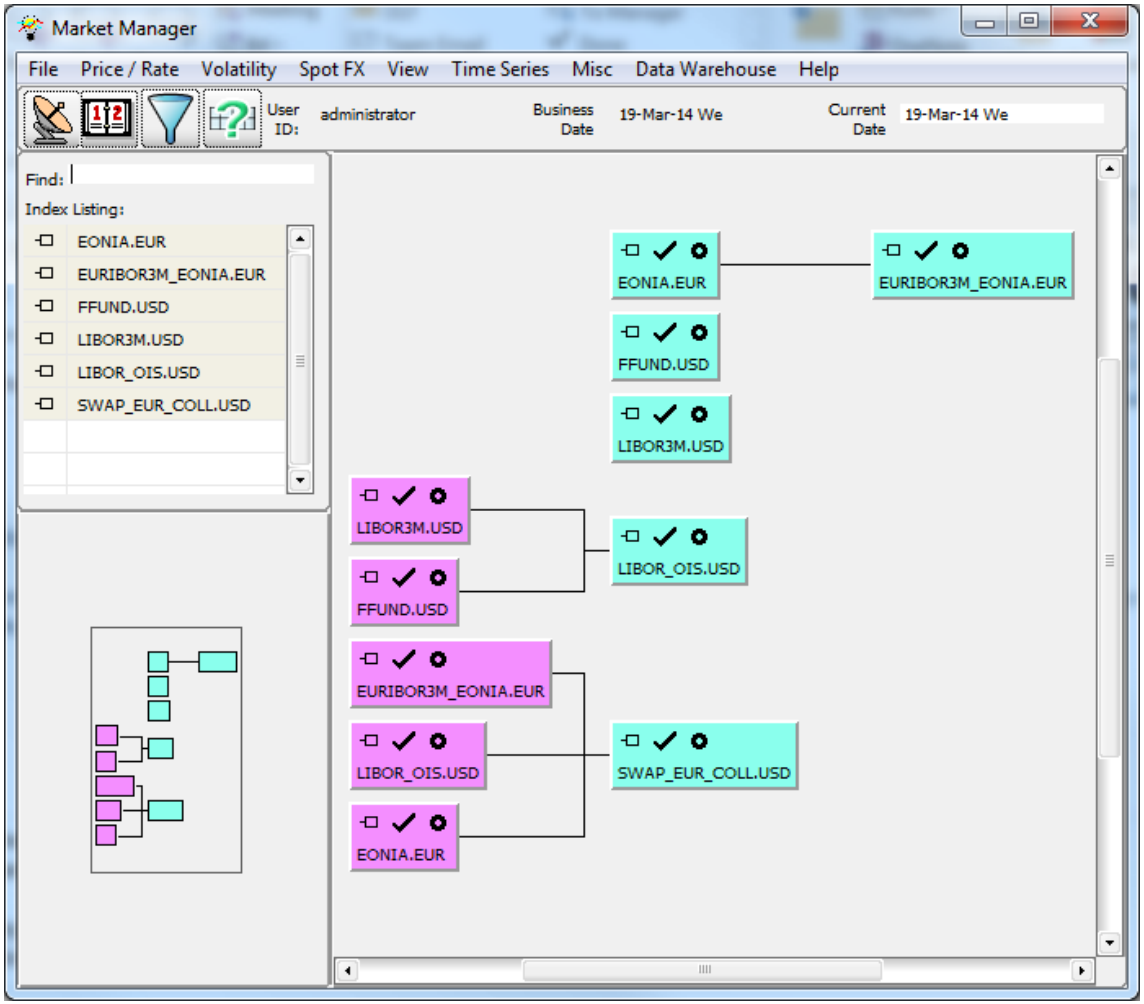
Cross Currency Curve Structure (Conventional)



Cross Currency Curve Structure (OIS Based)



Examples of Multi-Currency OIS setup



Idea here is that we want to set up a USD discount curve to value USD in-currency swaps but collateralized in EUR.

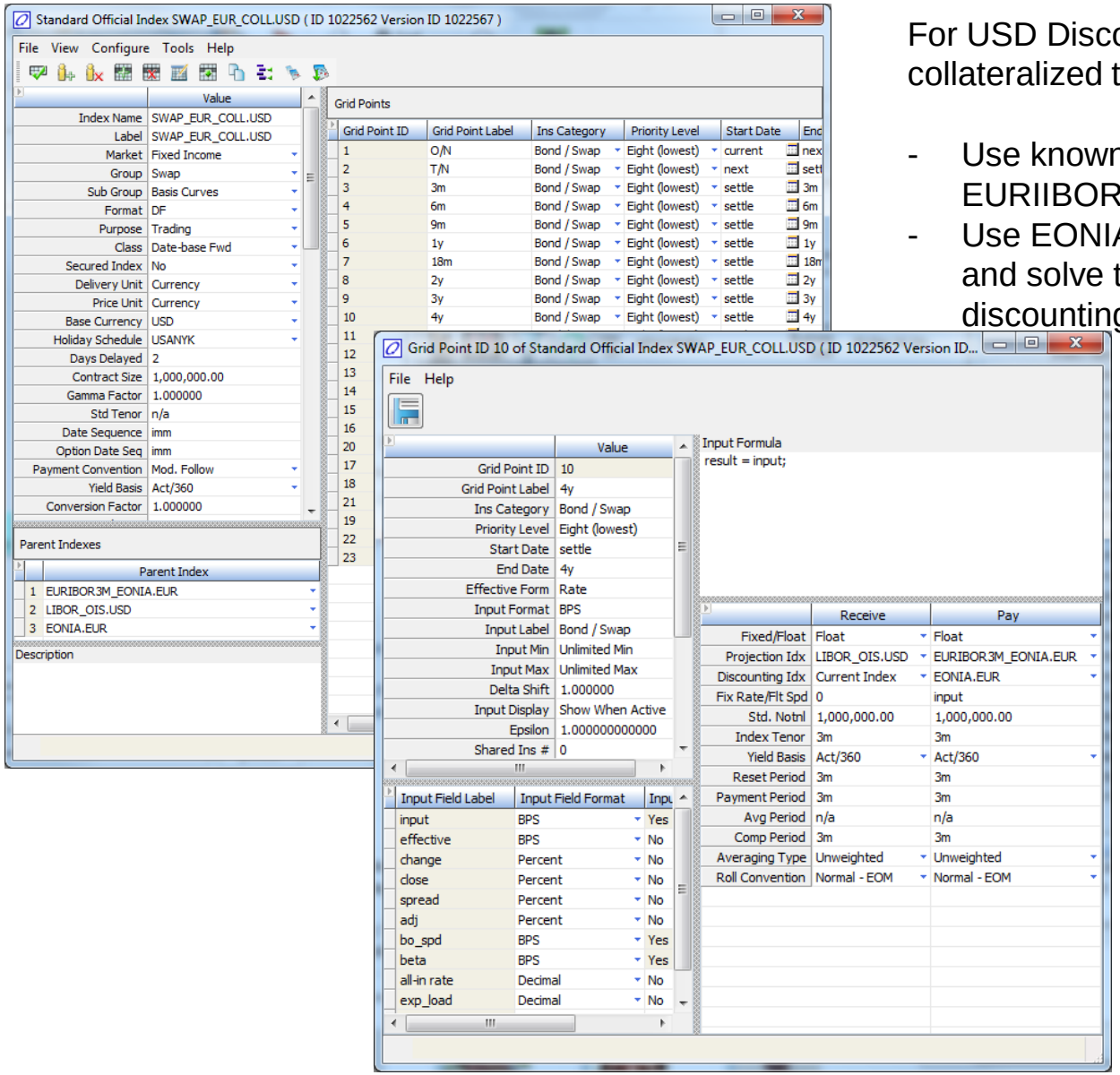
Market Quotes used are:

- USD Fed Fund / OIS Rates
- USD and Futures Rates
- EONIA Rates
- EONIA – EURIBOR Basis
- EURIBOR Swap Rates

Construction sequence:

1. USD FedFund and EONIA curves (they can be achieved independently and/or through dual-curve
2. LIBOR and EURIBOR Curves (achieved based on given OIS curves)
3. USD Discounting for EUR collateralization (based on LIBOR/EURIBOR and EONIA)

Examples of Multi-Currency OIS setup



For USD Discounting Curve for EUR collateralized trades

- Use known and already solved curves of EURIIBOR, LIBOR, and EONIA
- Use EONIA for discounting on the EUR side and solve the target curve which is the discounting on the USD side

Questions/Discussions

Thank you