FINASTRA

GreenPoint Financial

FORDHAM UNIVERSITY

FRTB CAPSTONE COURSE 2019

Collateralized pricing. Curve building and pricing for OIS, Libor, Xccy, …

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ADMIN/FEEDBACK

- Are groups correct?

Groups			
Group1	**Group2**	**Group3**	**Group4**
Yu Dai	Jiayue Xing	Kai Lyu	Jinzhou Yao
Tian Yang	Wenqi Hua	Yu Jin	Yating Wang
Yu Lin	Wenhao Zhao	Zheng Tang	Jialun Luo
Ci Song	Hanyun Zhang	Yuxiang Wang	Ziyuan Zhao
	Xiaoxiang Shan		Xiaojun Guo

- Next week's lecture will cover
  - UXP – Vincent Ferret
  - DRC Computation – John Beckwith
  - Prof Sharma and Prof Glauner will be in Europe
- Please post on Slack if you have issues and are stuck.
- Also, let us all know if you post on Stackoverflow.

PROJECT NOTES (CONT)

Market Data Setup and P&L Vector Generation

- TEAM0 is Finastra Curve Id
- Keep Curves simple with MM, Swaps for LIB3M/EUR3M and MM, OIS Swaps for OIS/EONIA
- Price USD LIB3M and take screenshots of all Curves (SWPM)
- Price USD LIB1M and do same
- Based on this information you define the points in the curve up to 10 years
  - USD LIB3M
  - USD LIB1M
  - USD OIS – we have it called FED
  - EUR EONIA
  - EUR XUSD – build with FX Forwards (this might be hard) and Xccy Swap Spreads
  - FX Spot
- Let’s look at system with curve id TEAM0

PROJECT NOTES

General

- We'll be upgrading the environment this and next week. There will be some downtime. After upgrade we will have more modern UXP with node-red.
- Node-red allows building low code REST orchestration. Next week's lecture will cover some of it.
- Let's look at some software tools that you should explore and use. You have discretion of what to use. Tech Tools

PROJECT NOTES (CONT)

Docker and Flask server

- Troubleshoot for a while but when stuck use Stackoverflow to post questions
- Test run by connecting to your flask server that runs in docker container
  - https://stackoverflow.com/questions/56727763/cannot-connect-from-chrome-to-flask-server-that-runs-in-docker-container-on-wind (Fixed in 45 min)

  - https://stackoverflow.com/questions/56759409/error-building-docker-from-onedrive-on-windows-10-unable-to-prepare-context

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BENEFITS OF FUSIONCAPITAL SUMMIT'S OIS MODULE

Developed on the basis of proven market experience – award-winning interest rate derivatives solution, 20 years of experience.

ISDA CSA compliant – enables cash-collateral trades to be discounted using the OIS rate for the trade currency and allows the discount index to be specified for each trade.

Real time processing – OIS curves are generated automatically following any movement in market data

Arbitrage-free valuation – includes integrated and arbitrage-free set-up with OIS discounting and all basis swaps.

Multi-curve management – Users have total flexibility in choosing a curve dependency level for hedging under the Misys Summit FT OIS framework

MARKET PRACTICE FOR COLLATERALIZED PRICING

Forward rates do not change

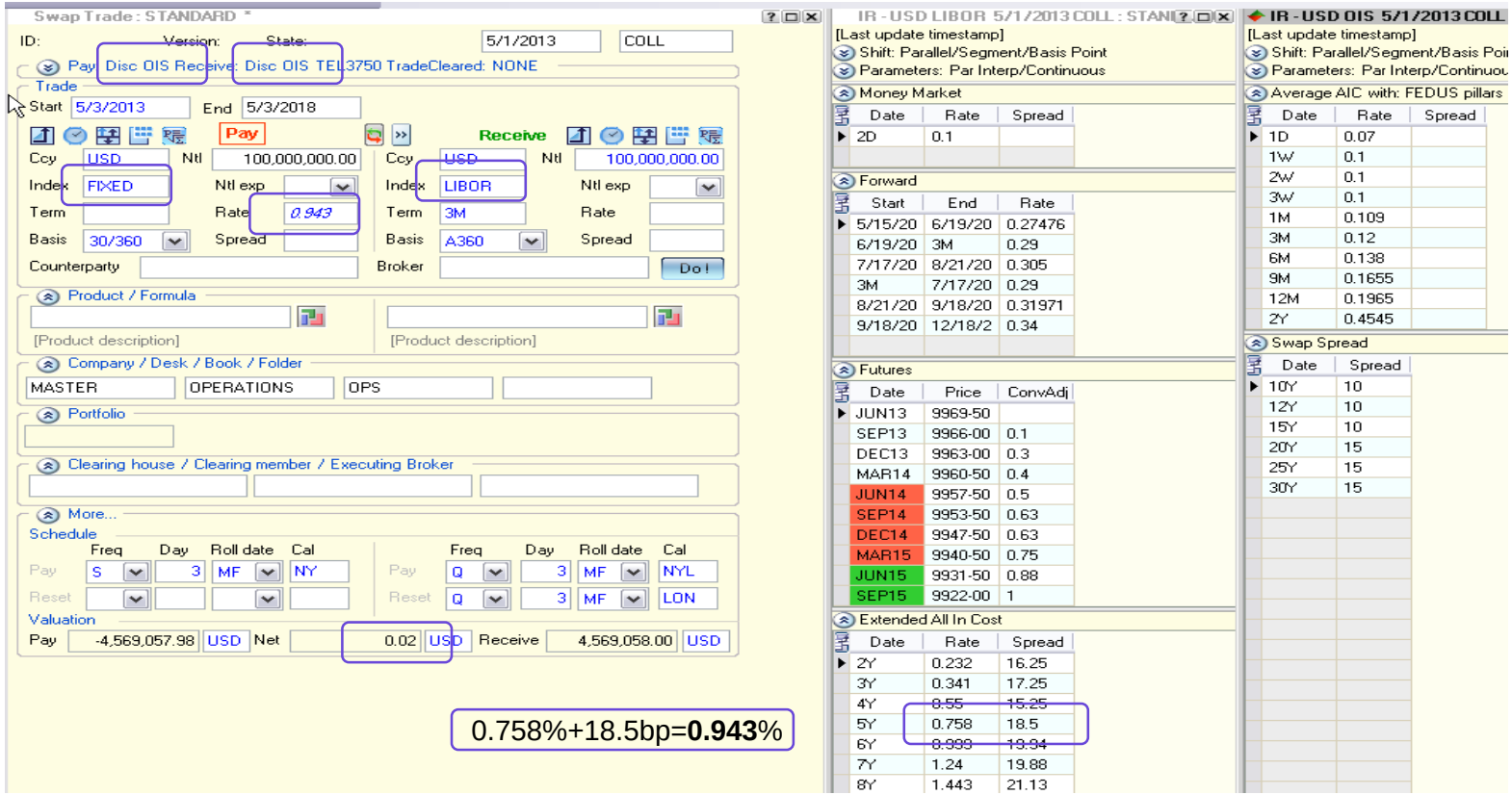
Discounting depends on collateral posted

No collateral implies Libor or Funding rate discounting

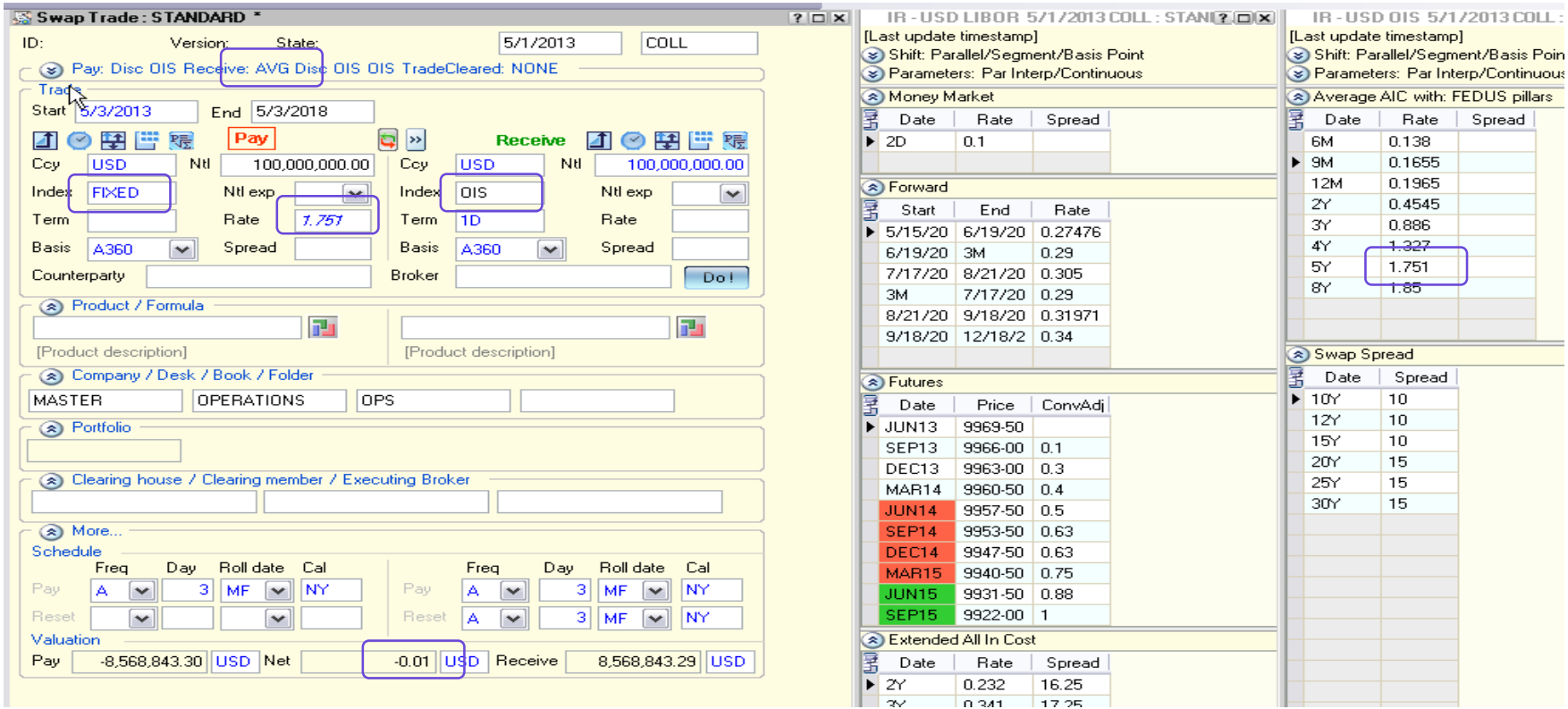
If the trade is collateralized

- Risk free curve if flow ccy same as collateral ccy
- More complex curve with xccy basis if ccys differ
- Multi collateral ccys have CTD option

USD/LIBOR VS FIXED 5Y



USD OIS VS FIXED 5Y

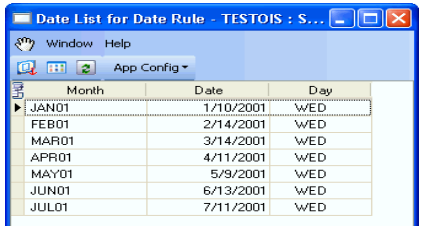


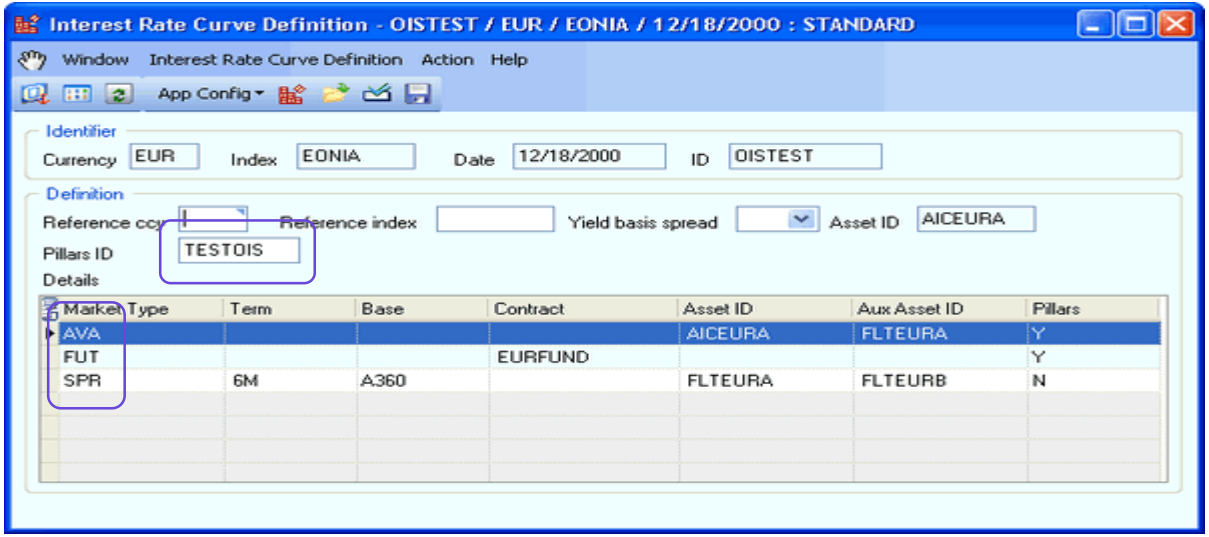
OIS CURVE DEFINITION SETUP

Segments shown

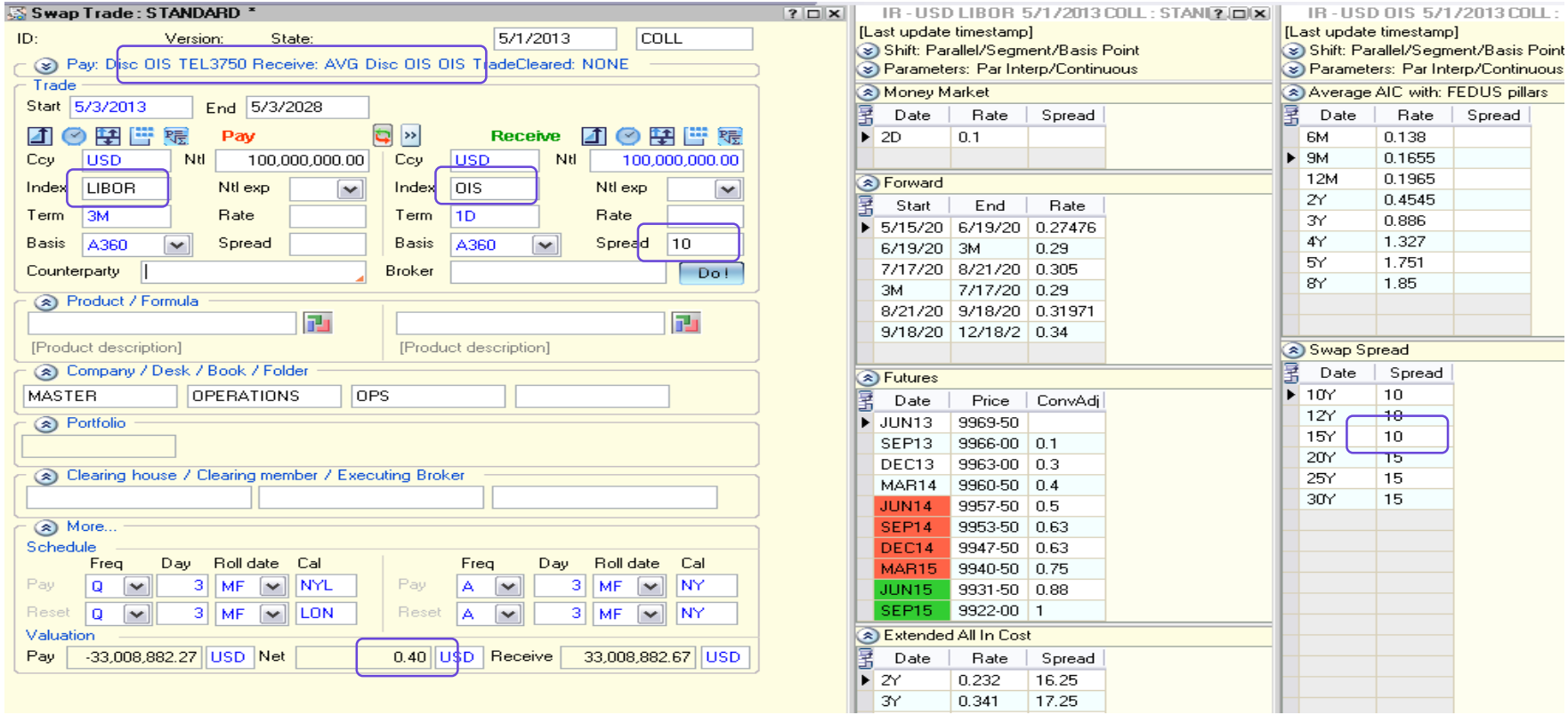
- Average All-in-cost
- Fed Fund futures
- Swap Spreads

Fed meeting dates via Date Rule

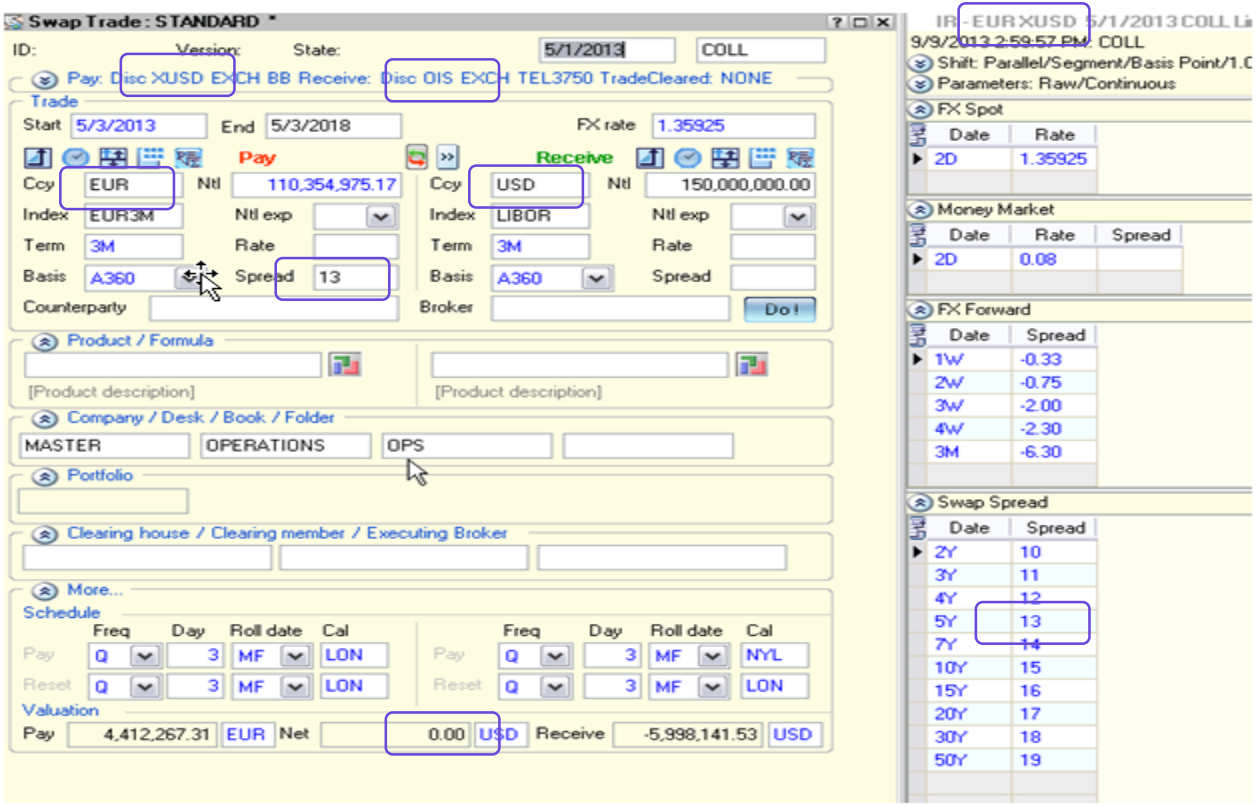




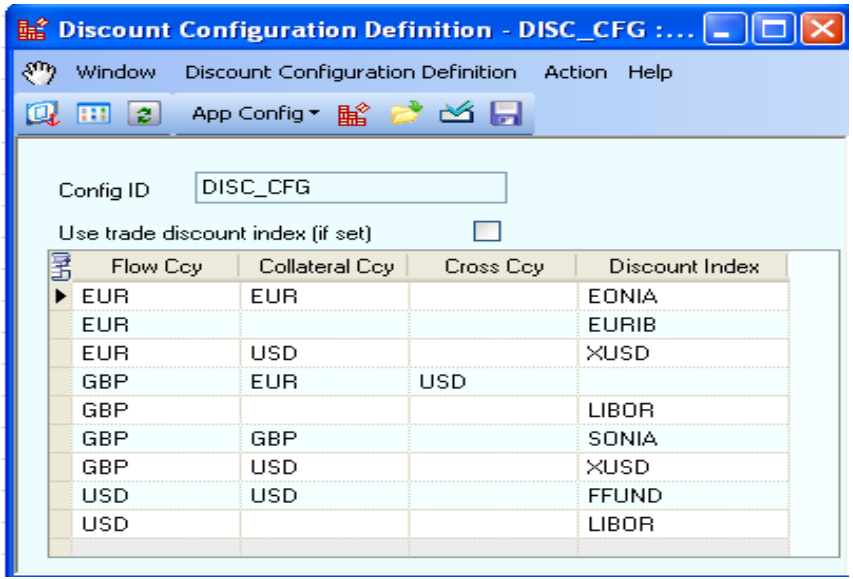
BASIS SWAP OIS VS LIBOR 15Y



EUR FLOW WITH USD COLLATERAL



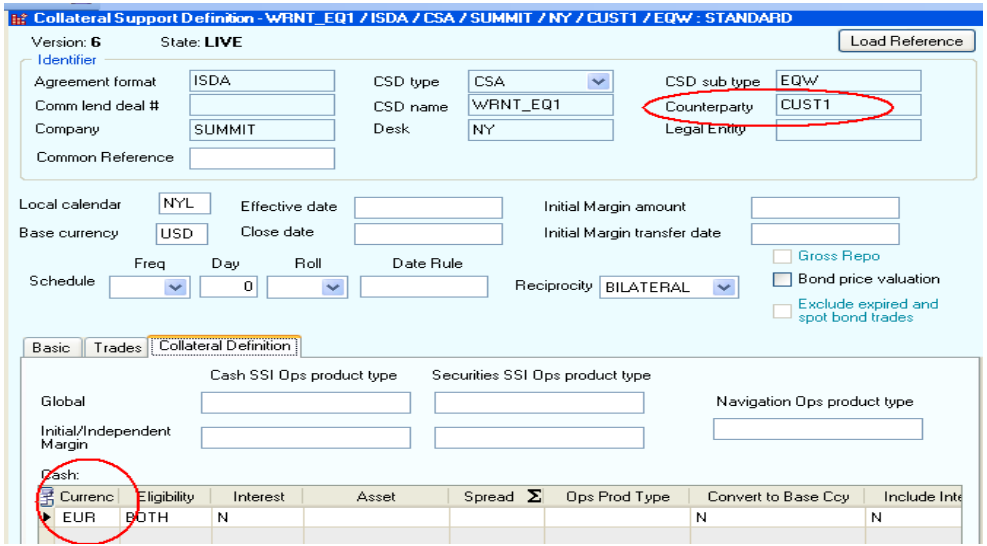
DISCOUNT CONFIGURATION SETUP

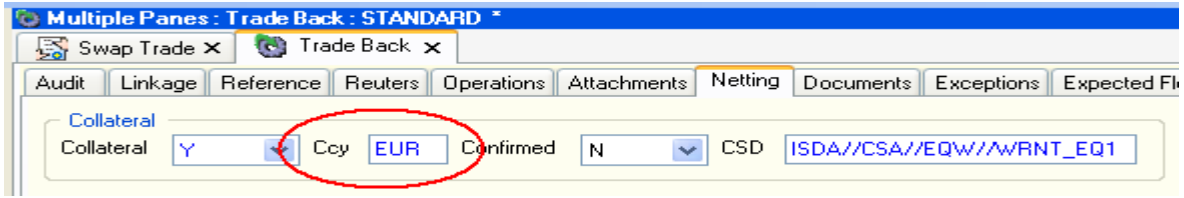


Flow Ccy	Collateral Ccy	Cross Ccy	Discount Index
EUR	EUR		EONIA
EUR			EURIB
EUR	USD		XUSD
GBP	EUR	USD	
GBP			LIBOR
GBP	GBP		SONIA
GBP	USD		XUSD
USD	USD		FFUND
USD			LIBOR

- Easy to maintain
- USD flows with no collateral -> USD LIBOR
- USD flows with USD collateral -> USD FFUND
- EUR flows with no collateral -> EUR EURIB
- EUR flows with EUR collateral -> EUR EONIA
- EUR flows with USD collateral -> EUR XUSD

CUSTOMER LINK TO COLLATERAL CURRENCY

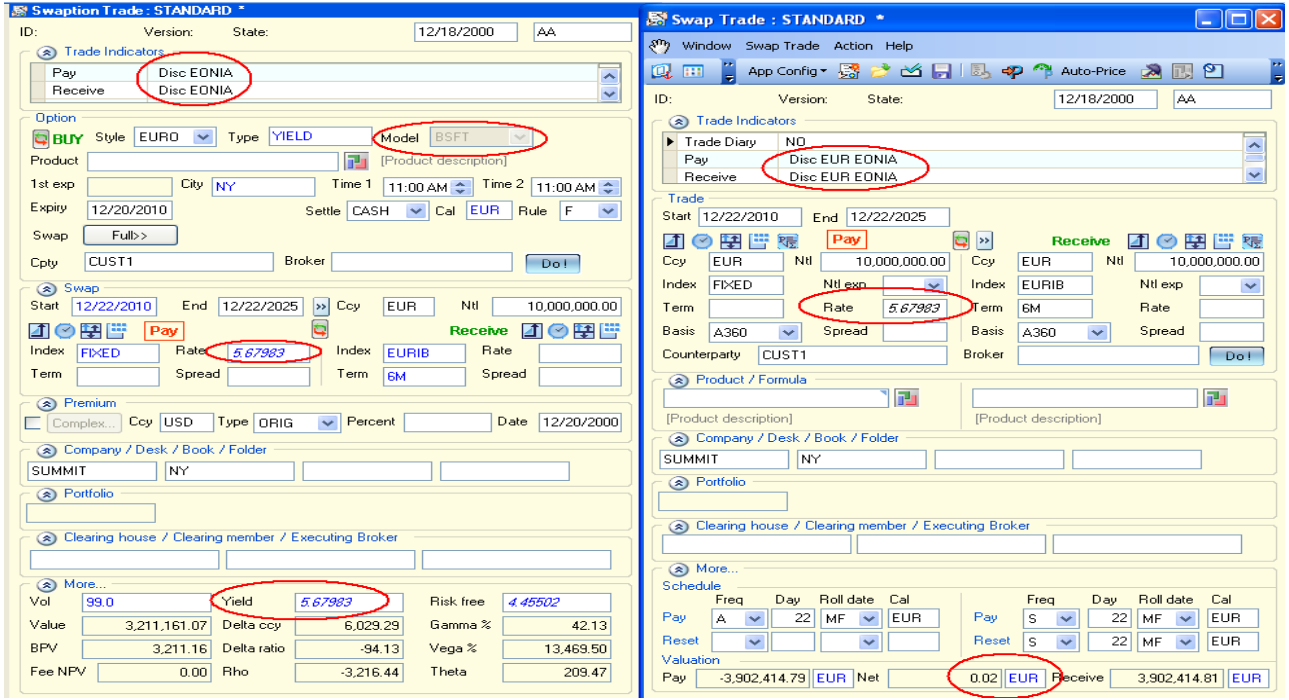




Customer links CSA

CSA defines Ccy

BLACK SCHOLES AND OIS



Swaption ATM rate equals Collateralized swap rate

BSFT model stays valid

Volatility can be collateralized or not

HULL&WHITE AND OIS

THWT = Trinomial Hull and White Tree pricing

$$dr_d(t) = [\theta_{d(t)} - a \cdot r_d(t)]dt + \sigma(t) \cdot dW_t$$

Key Idea: Model on discount rate,

projection = discount + deterministic spread

$$P_{discount}(r(t), t, T) = A(t,T)e^{-B(t,T)r_d(t)}$$

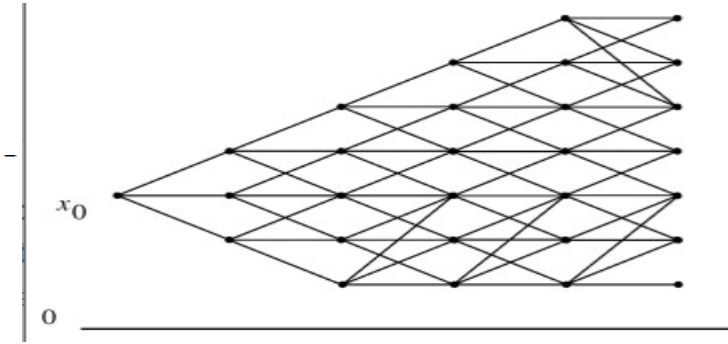
With:

$$B(t,T) = \frac{1 - e^{-a(T-t)}}{a}$$

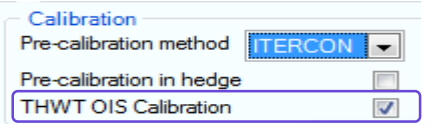
$$A(t,T) = exp\left\{\int_t^T \frac{\sigma^2(s)B^2(s,T)}{2} - \theta(s)B(s,T)\ ds\right\}$$

The zero coupon bond price for projection curve is equal to:

$$P_{project}(r(t), t, T) = P_{discount}(r(t), t, T) \cdot S_{spread}(t,T)$$



Calibration with project index vol



RECAP

Discount curve configuration on pricing model level

LIBOR curve generation with collateralized swaps

Leg of OIS spread curve definable

OIS – LIBOR curve generation in pair

Convexity adjustment auto-re-computation in Futures segment

1 day forward rates are step functions between meeting dates

FX forward points based on points or outright rates

Curve generation with collateralized FRA

Cross currency basis curves are in the cross ccy OIS framework

Domestic basis curves are OIS enabled