FINASTRA

GreenPoint> Financial

FORDHAM UNIVERSITY

FRTB CAPSTONE COURSE 2019

FusionCapital Summit & SA Aggregator

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SPECIAL THANK YOU

GreenPoint> Financial

FORDHAM UNIVERSITY

I want to provide special thank you to the following three people today.

Arnaud and Hugues have provided much of the material (thanks for letting me borrow this) for this and previous lectures in additional to designing the overall system architecture and prototypes early on. They are both quants in our Paris office and part of the Product Management team.

Arnaud Nekam

Hugues Jan

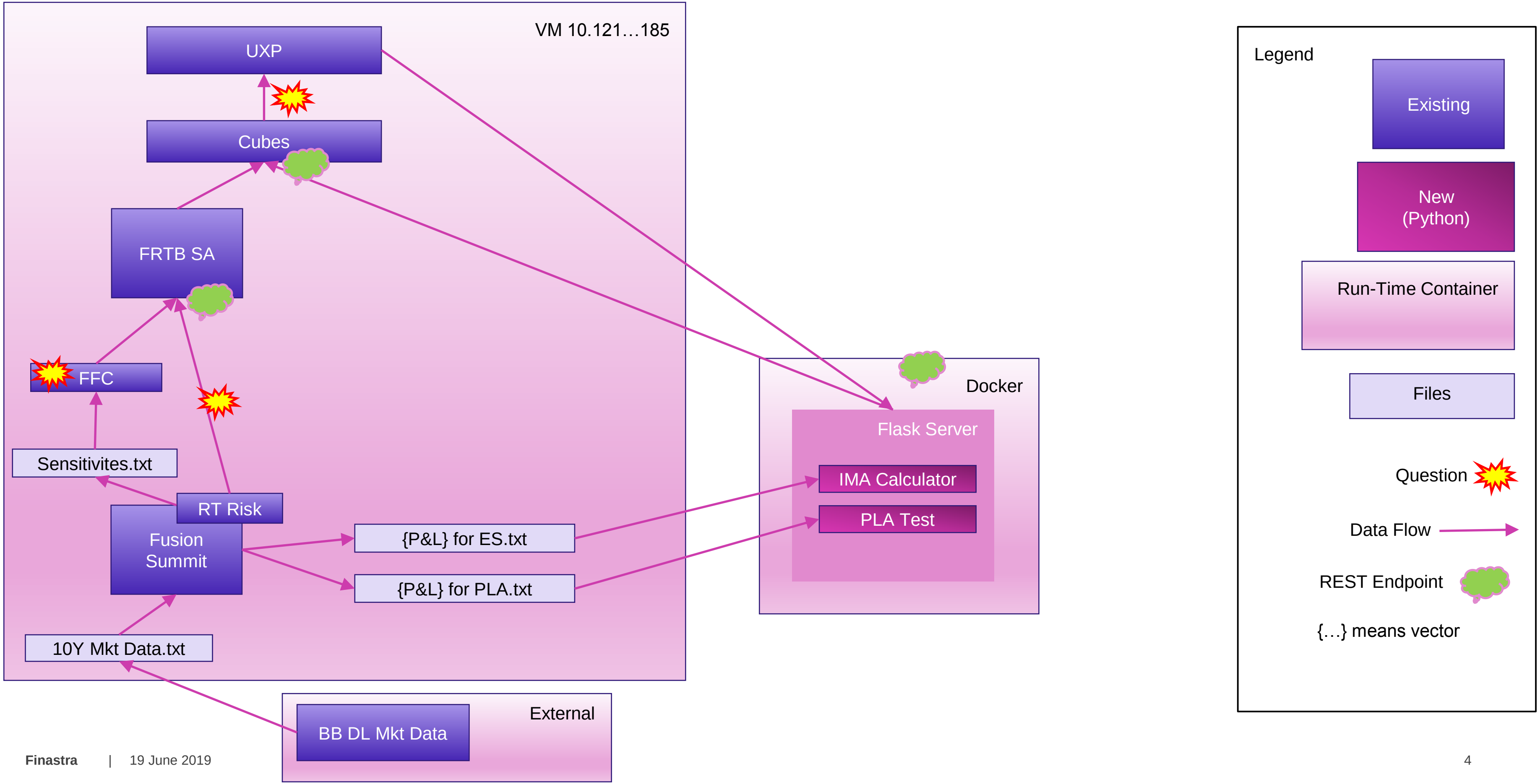
Randolph runs globally our Demo and Workshop systems for Capital Markets. He’s deeply familiar with keeping systems reliable and high performing in addition to being an overall architect and advisor of the Fusion Platform.

Randolph Reyes

ARCHITECTURE

This is real and work in progress

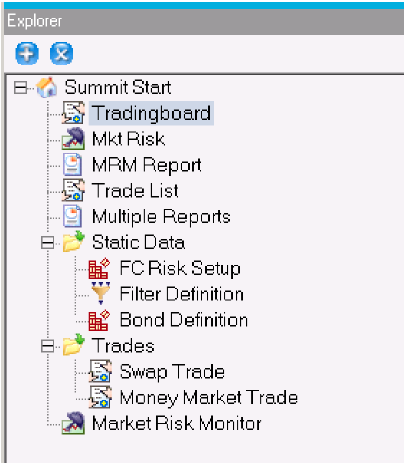
FORDHAM 2019 AND STT CUSTOM APPLICATION ARCHITECTURE

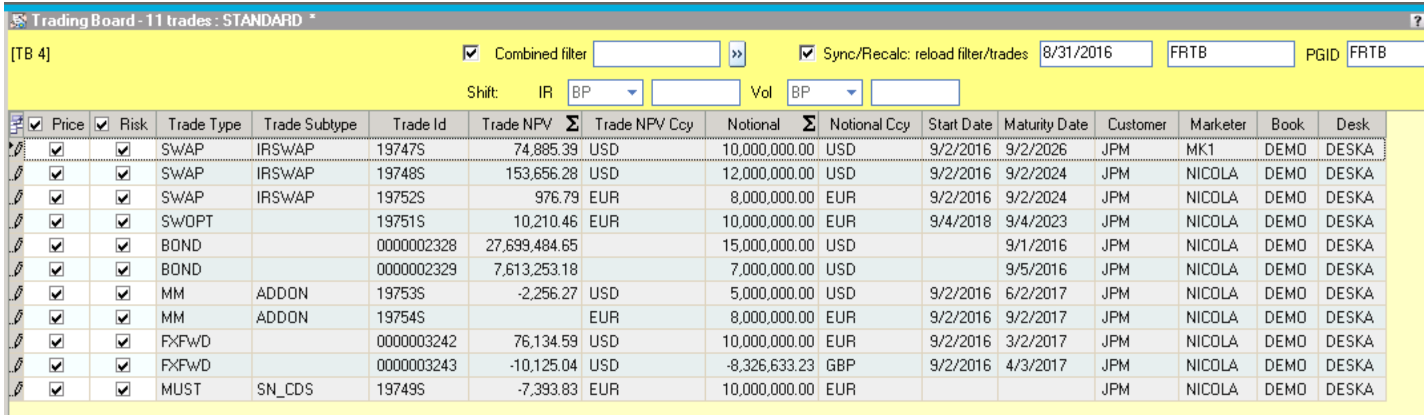


SUMMIT SPECIFICS FOR FRTB EXERCISES OVERVIEW

TRADES

Trade Ids are just <u>samples</u>. Please create your own trades that match the description provided earlier.

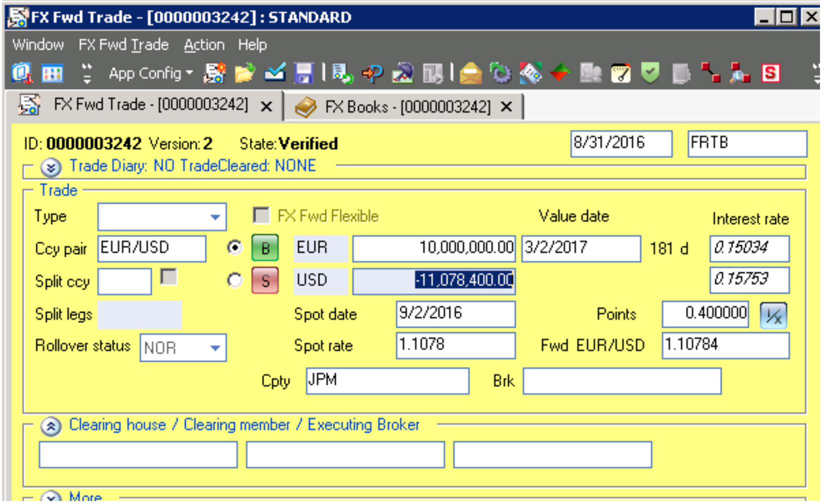


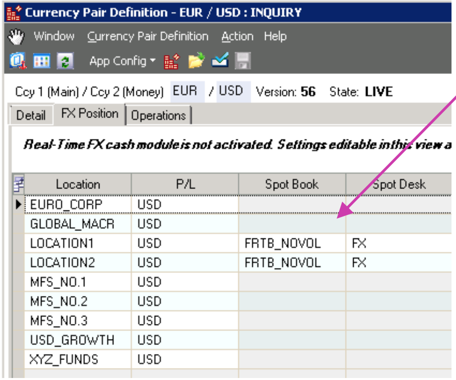


Price	Risk	Trade Type	Trade Subtype	Trade Id	Trade NPV	Trade NPV Ccy	Notional	Notional Ccy	Start Date	Maturity Date	Customer	Marketer	Book	Desk
☑	☑	SWAP	IRSWAP	19747S	74,885.39	USD	10,000,000.00	USD	9/2/2016	9/2/2026	JPM	MK1	DEMO	DESKA
☑	☑	SWAP	IRSWAP	19748S	153,656.28	USD	12,000,000.00	USD	9/2/2016	9/2/2024	JPM	NICOLA	DEMO	DESKA
☑	☑	SWAP	IRSWAP	19752S	976.79	EUR	8,000,000.00	EUR	9/2/2016	9/2/2024	JPM	NICOLA	DEMO	DESKA
☑	☑	SWOPT		19751S	10,210.46	EUR	10,000,000.00	EUR	9/4/2018	9/4/2023	JPM	NICOLA	DEMO	DESKA
☑	☑	BOND		0000002328	27,699,484.65		15,000,000.00	USD		9/1/2016	JPM	NICOLA	DEMO	DESKA
☑	☑	BOND		0000002329	7,613,253.18		7,000,000.00	USD		9/5/2016	JPM	NICOLA	DEMO	DESKA
☑	☑	MM	ADDON	19753S	-2,256.27	USD	5,000,000.00	USD	9/2/2016	6/2/2017	JPM	NICOLA	DEMO	DESKA
☑	☑	MM	ADDON	19754S		EUR	8,000,000.00	EUR	9/2/2016	9/2/2017	JPM	NICOLA	DEMO	DESKA
☑	☑	FXFWD		0000003242	76,134.59	USD	10,000,000.00	EUR	9/2/2016	3/2/2017	JPM	NICOLA	DEMO	DESKA
☑	☑	FXFWD		0000003243	-10,125.04	USD	-8,326,633.23	GBP	9/2/2016	4/3/2017	JPM	NICOLA	DEMO	DESKA
☑	☑	MUST	SN_CDS	19749S	-7,393.83	EUR	10,000,000.00	EUR			JPM	NICOLA	DEMO	DESKA

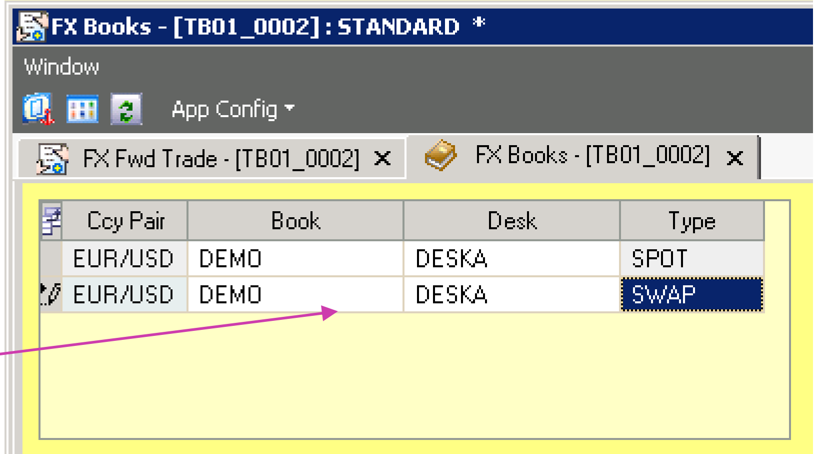
TRADES CONT

FX Forwards have explicit books to set





Defaults not used



Set explicitly
FXFwdTrade->Maintenance->Books

MARKET DATA

FRTB curve id exists for today. Each team creates Their own curve ids and maintains the market data

Multiple Panes : Curve Browser - 11 trades : STANDARD

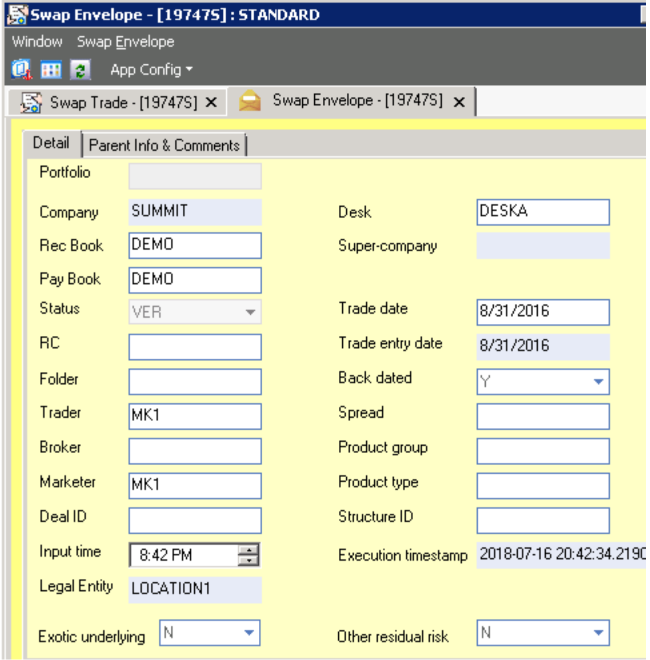
Trading Board - 11 trades | Curve Browser - 11 trades

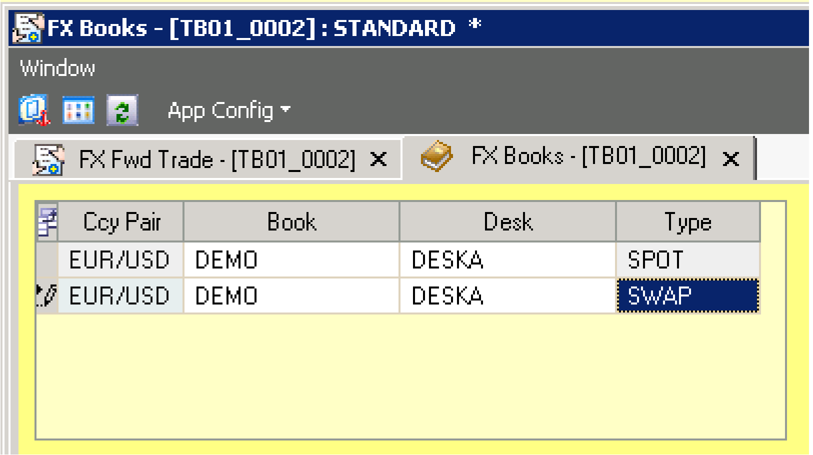
Default curve ID: FRTB

Type	Curve Description	ID	Ref Curve	Zero Record	CS Cache	Source	Curve Time Stamp
ZERO	ZERO/USD/FED	FRTB	N	N	N	DB	9/6/2017 5:22:37 PM
ZERO	ZERO/USD/LIB3M	FRTB	N	N	N	DB	11/9/2016 12:32:23 PM
ZERO	ZERO/EUR/EUR3M	FRTB	N	N	N	DB	11/9/2016 12:32:23 PM
FWVL	FWVL IRFWDVOL/EUR/EUR3M/SWOPT/LOGNORMAL/IBOR	FRTB	N	N	N	DB	11/9/2016 1:31:19 PM
FND_SPRD	FND_SPRD BOND~USD~BOND~T5.375_FEB31	FRTB	N	N	N	DB	7/17/2018 5:43:24 PM
ZERO	ZERO/USD/TREAS	FRTB	N	N	N	DB	11/9/2016 12:32:25 PM
ZERO	ZERO/USD/LIBOR	FRTB	N	N	N	DB	12/15/2016 2:12:55 PM
FND_SPRD	FND_SPRD BOND~USD~EURO~NIB_2.25_30SEP21	FRTB	N	N	N	DB	9/5/2017 11:22:03 AM
ZERO	ZERO/EUR/EONIA	FRTB	N	N	N	DB	9/7/2017 6:01:31 PM
ZERO	ZERO/EUR/XUSD	FRTB	N	N	N	DB	9/6/2017 12:36:30 PM
FXRT	FXRT FXRATE/EUR/USD	FRTB	N	N	N	DB	11/9/2016 12:32:02 PM
ZERO	ZERO/GBP/GBP3M	FRTB	N	N	N	DB	11/9/2016 12:32:23 PM
ZERO	ZERO/GBP/XUSD	FRTB	N	N	N	DB	9/6/2017 12:38:39 PM
FXRT	FXRT FXRATE/GBP/USD	FRTB	N	N	N	DB	9/7/2017 9:37:40 AM
CESNDP	VLVY SNRFOR EUR	FRTB	N	N	N	DB	11/9/2016 12:32:28 PM
CERR	VLVY SNRFOR EUR	FRTB	N	N	N	DB	11/9/2016 12:32:26 PM

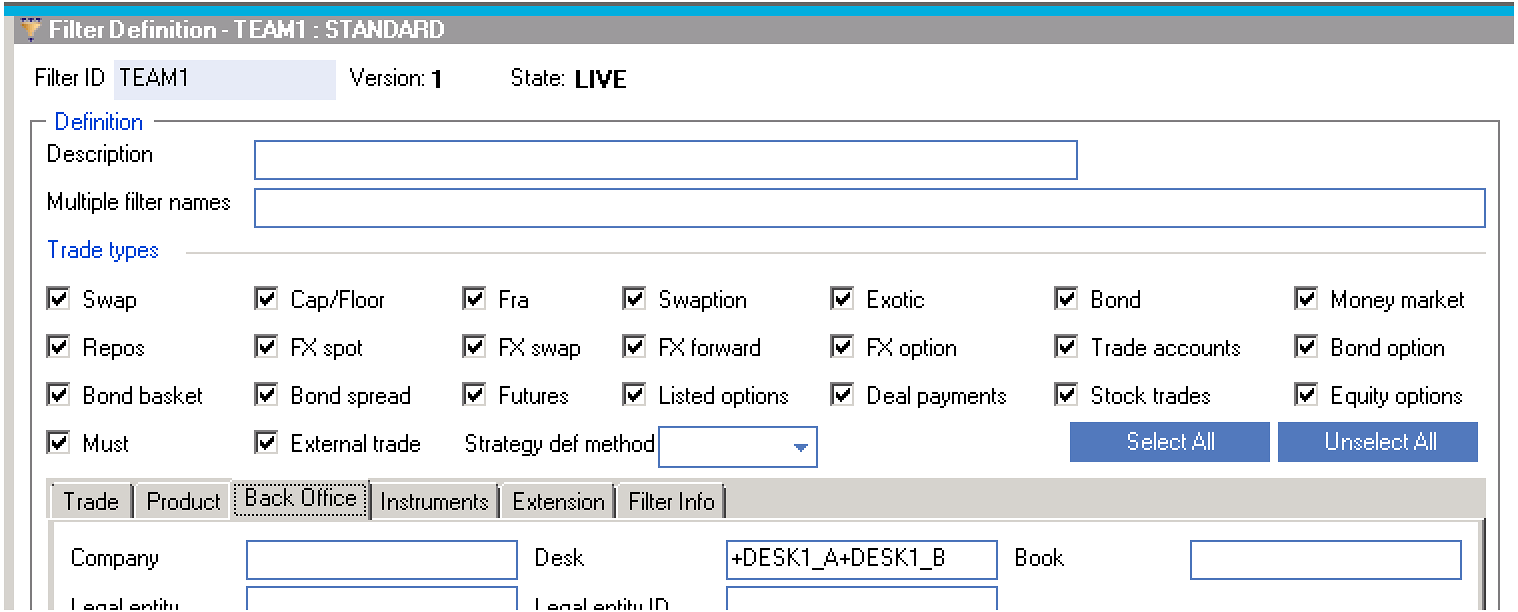
BOOKING HIERARCHY

Good naming conventions makes life easy





FILTER

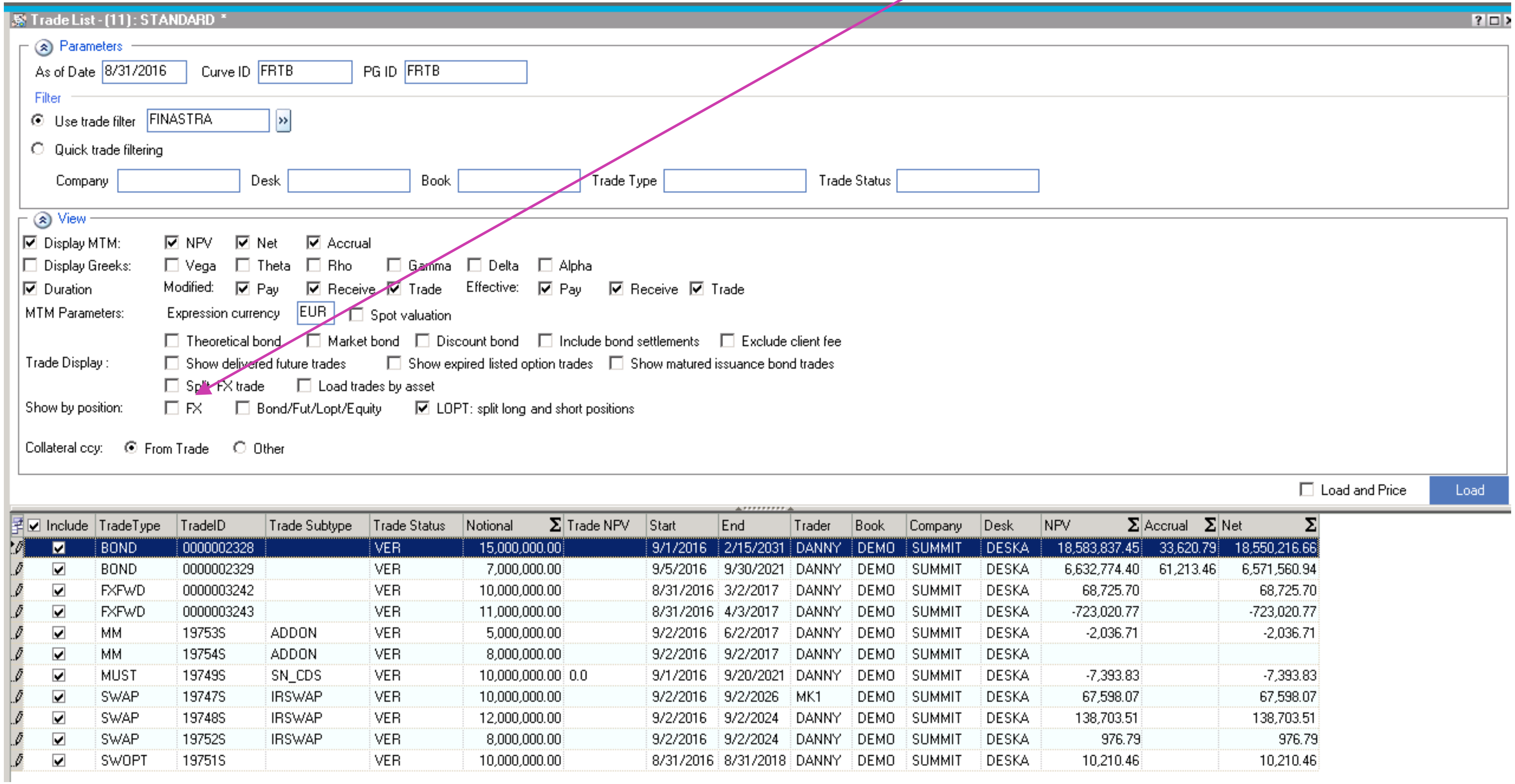


Filter Definition - TEAM1 : STANDARD
Filter ID
TEAM1
Version: 1
State: LIVE
Definition
Description
Multiple filter names
Trade types
Swap
Cap/Floor
Fra
Swaption
Exotic
Bond
Money market
Repos
FX spot
FX swap
FX forward
FX option
Trade accounts
Bond option
Bond basket
Bond spread
Futures
Listed options
Deal payments
Stock trades
Equity options
Must
External trade
Strategy def method
Select All
Unselect All
Trade
Product
Back Office
Instruments
Extension
Filter Info
Company
Desk
+DESK1_A+DESK1_B
Book

TRADE LIST

Lists trade details and MTM

Unselect FX Positions and Split



Include	TradeType	TradeID	Trade Subtype	Trade Status	Notional Σ	Trade NPV	Start	End	Trader	Book	Company	Desk	NPV Σ	Accrual Σ	Net Σ
✓	BOND	0000002328		VER	15,000,000.00		9/1/2016	2/15/2031	DANNY	DEMO	SUMMIT	DESKA	18,583,837.45	33,620.79	18,550,216.66
✓	BOND	0000002329		VER	7,000,000.00		9/5/2016	9/30/2021	DANNY	DEMO	SUMMIT	DESKA	6,632,774.40	61,213.46	6,571,560.94
✓	FXFWD	0000003242		VER	10,000,000.00		8/31/2016	3/2/2017	DANNY	DEMO	SUMMIT	DESKA	68,725.70		68,725.70
✓	FXFWD	0000003243		VER	11,000,000.00		8/31/2016	4/3/2017	DANNY	DEMO	SUMMIT	DESKA	-723,020.77		-723,020.77
✓	MM	19753S	ADDON	VER	5,000,000.00		9/2/2016	6/2/2017	DANNY	DEMO	SUMMIT	DESKA	-2,036.71		-2,036.71
✓	MM	19754S	ADDON	VER	8,000,000.00		9/2/2016	9/2/2017	DANNY	DEMO	SUMMIT	DESKA			
✓	MUST	19749S	SN_CDS	VER	10,000,000.00	0.0	9/1/2016	9/20/2021	DANNY	DEMO	SUMMIT	DESKA	-7,393.83		-7,393.83
✓	SWAP	19747S	IRSWAP	VER	10,000,000.00		9/2/2016	9/2/2026	MK1	DEMO	SUMMIT	DESKA	67,598.07		67,598.07
✓	SWAP	19748S	IRSWAP	VER	12,000,000.00		9/2/2016	9/2/2024	DANNY	DEMO	SUMMIT	DESKA	138,703.51		138,703.51
✓	SWAP	19752S	IRSWAP	VER	8,000,000.00		9/2/2016	9/2/2024	DANNY	DEMO	SUMMIT	DESKA	976.79		976.79
✓	SWOPT	19751S		VER	10,000,000.00		8/31/2016	8/31/2018	DANNY	DEMO	SUMMIT	DESKA	10,210.46		10,210.46

TRADING BOARD

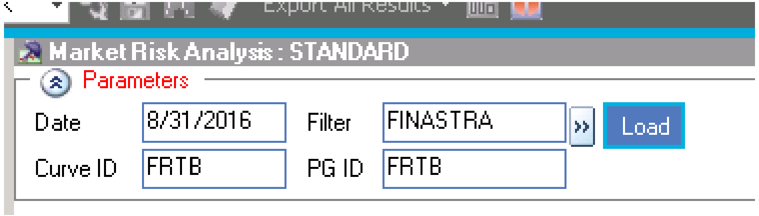
Trading Board - 11 trades : STANDARD *

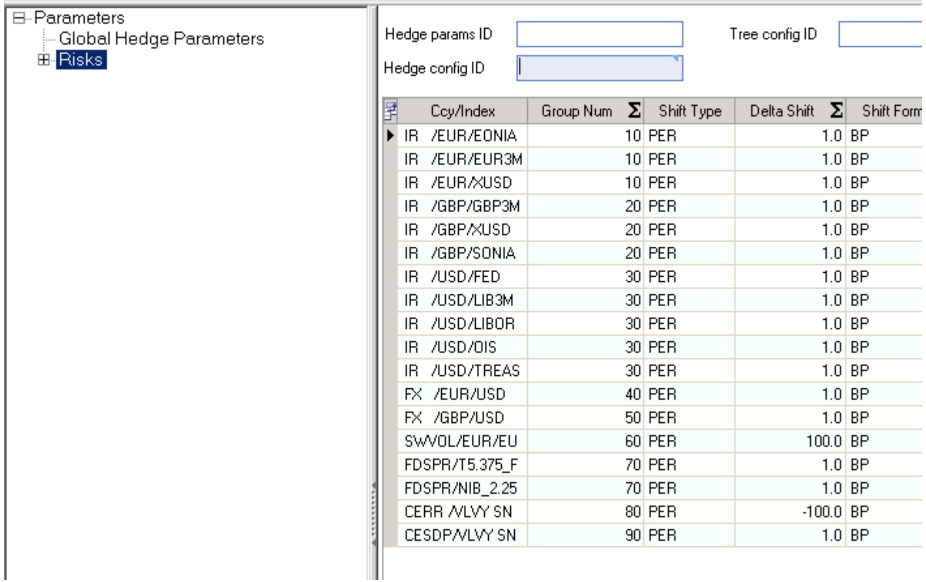
[TB 4] Combined filter ›› Sync/Recalc: reload filter/trades 8/31/2016 FRTB PGID FRTB

Shift: IR BP Vol BP

Price	Risk	Trade Type	Trade Subtype	Trade Id	Trade NPV Σ	Trade NPV Ccy	Notional Σ	Notional Ccy	Start Date	Maturity Date	Customer	Marketer	Book	Desk
☑	☑	SWAP	IRSWAP	19747S	74,885.39	USD	10,000,000.00	USD	9/2/2016	9/2/2026	JPM	MK1	DEMO	DESKA
☑	☑	SWAP	IRSWAP	19748S	153,656.28	USD	12,000,000.00	USD	9/2/2016	9/2/2024	JPM	NICOLA	DEMO	DESKA
☑	☑	SWAP	IRSWAP	19752S	976.79	EUR	8,000,000.00	EUR	9/2/2016	9/2/2024	JPM	NICOLA	DEMO	DESKA
☑	☑	SWOPT		19751S	10,210.46	EUR	10,000,000.00	EUR	9/4/2018	9/4/2023	JPM	NICOLA	DEMO	DESKA
☑	☑	BOND		0000002328	27,699,484.65		15,000,000.00	USD		9/1/2016	JPM	NICOLA	DEMO	DESKA
☑	☑	BOND		0000002329	7,613,253.18		7,000,000.00	USD		9/5/2016	JPM	NICOLA	DEMO	DESKA
☑	☑	MM	ADDON	19753S	-2,256.27	USD	5,000,000.00	USD	9/2/2016	6/2/2017	JPM	NICOLA	DEMO	DESKA
☑	☑	MM	ADDON	19754S		EUR	8,000,000.00	EUR	9/2/2016	9/2/2017	JPM	NICOLA	DEMO	DESKA
☑	☑	FXFWD		0000003242	76,134.59	USD	10,000,000.00	EUR	9/2/2016	3/2/2017	JPM	NICOLA	DEMO	DESKA
☑	☑	FXFWD		0000003243	-10,125.04	USD	-8,326,633.23	GBP	9/2/2016	4/3/2017	JPM	NICOLA	DEMO	DESKA
☑	☑	MUST	SN_CDS	19749S	-7,393.83	EUR	10,000,000.00	EUR			JPM	NICOLA	DEMO	DESKA

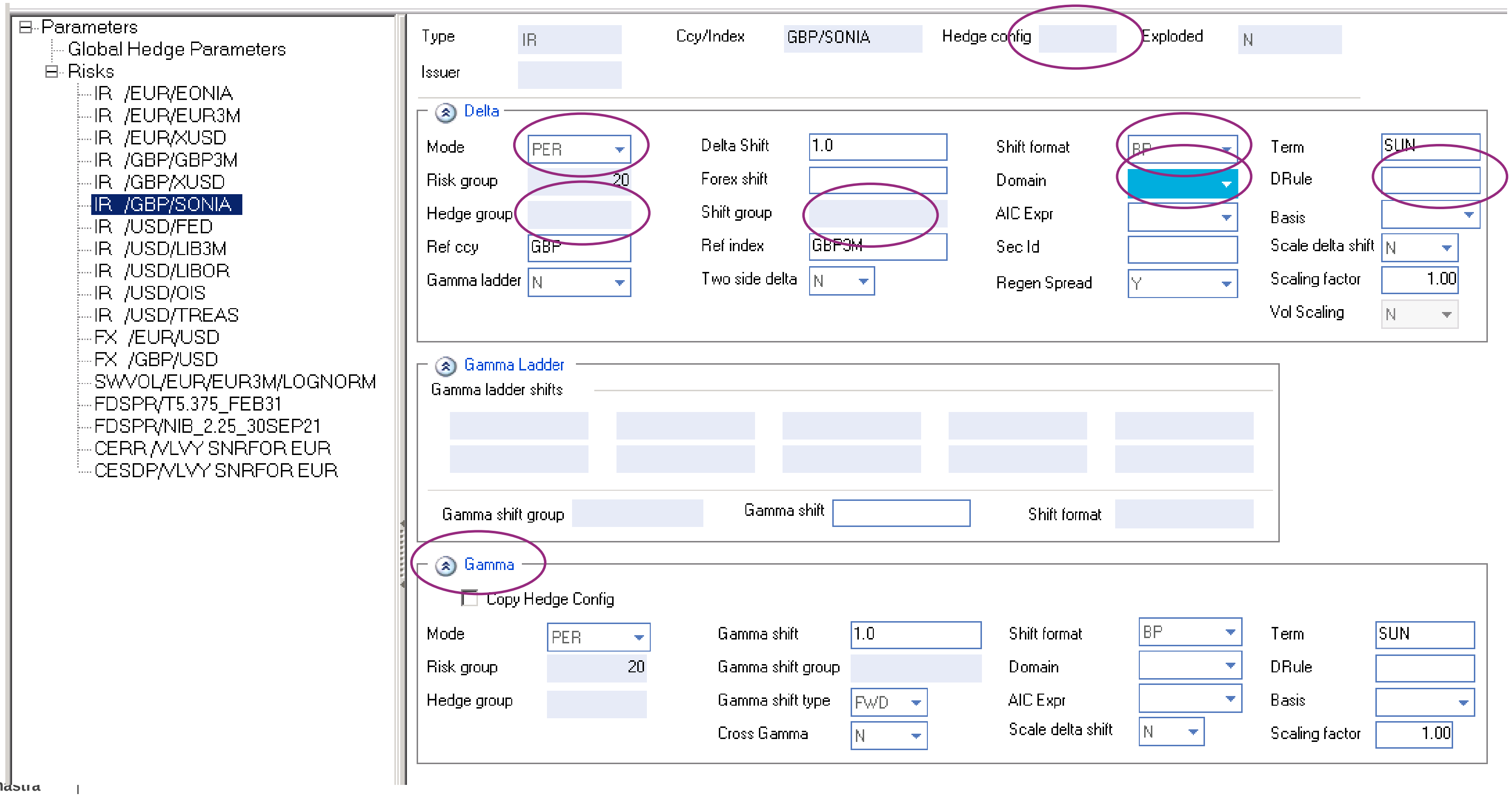
MARKET RISK





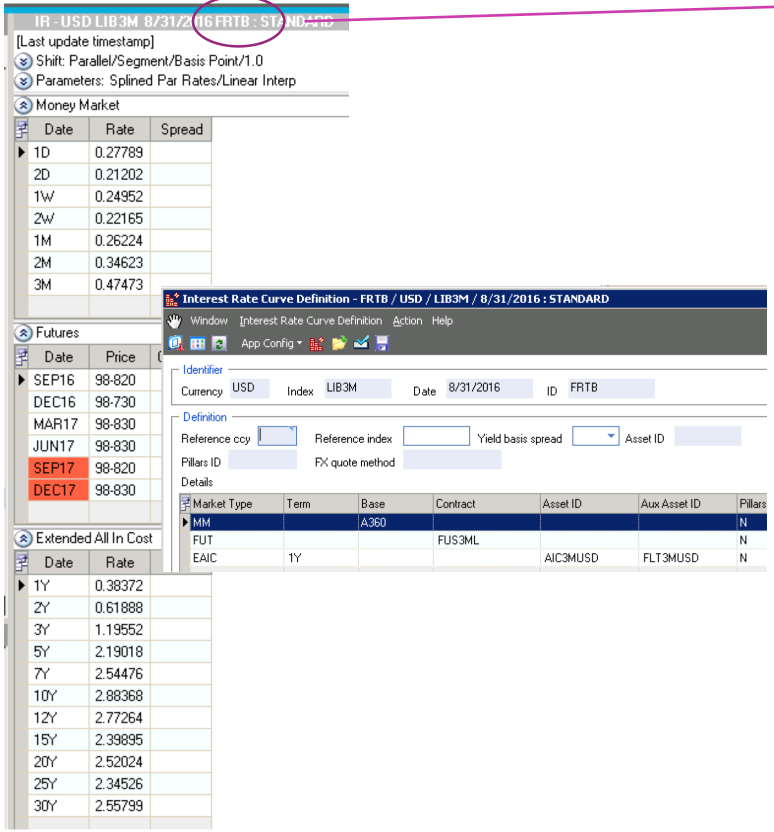
Ccy/Index	Group Num	Shift Type	Delta Shift	Shift Form
IR /EUR/EONIA	10	PER	1.0	BP
IR /EUR/EUR3M	10	PER	1.0	BP
IR /EUR/XUSD	10	PER	1.0	BP
IR /GBP/GBP3M	20	PER	1.0	BP
IR /GBP/XUSD	20	PER	1.0	BP
IR /GBP/SONIA	20	PER	1.0	BP
IR /USD/FED	30	PER	1.0	BP
IR /USD/LIB3M	30	PER	1.0	BP
IR /USD/LIBOR	30	PER	1.0	BP
IR /USD/OIS	30	PER	1.0	BP
IR /USD/TREAS	30	PER	1.0	BP
FX /EUR/USD	40	PER	1.0	BP
FX /GBP/USD	50	PER	1.0	BP
SWVOL/EUR/EU	60	PER	100.0	BP
FDSPR/T5.375_F	70	PER	1.0	BP
FDSPR/NIB_2.25	70	PER	1.0	BP
CERR /VLVY SN	80	PER	-100.0	BP
CESDP/VLVY SN	90	PER	1.0	BP

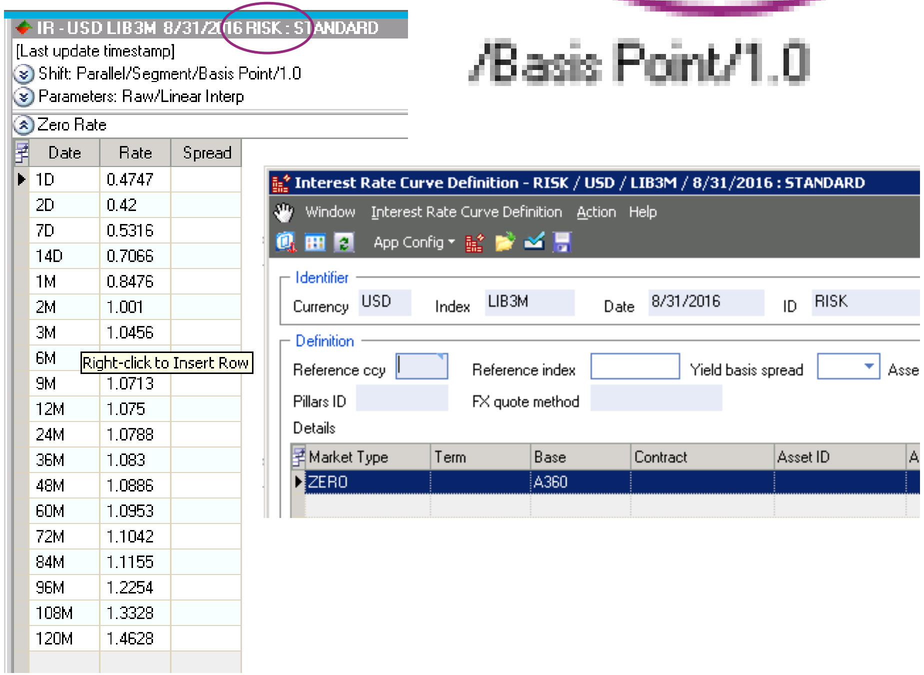
MARKET RISK CONT



MARKET DATA AND CURVE IDS

Curve Ids are used to have multiple sets of market data





MARKET DATA IMPORT

Curve Ids are used to have multiple sets of market data

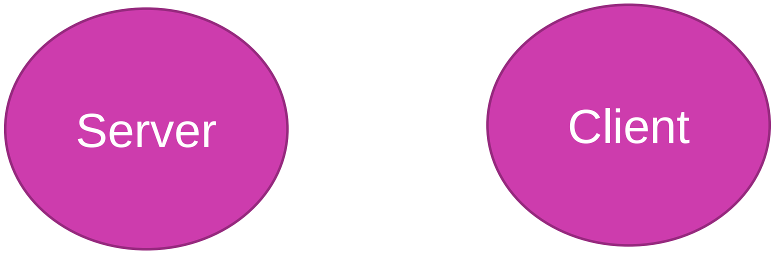
- Multitude of ways to import market data in production
  - Bloomberg real-time
  - Reuters real-time
  - APIs for internal data feeds – common in larger institutions
  - Snapshot mode

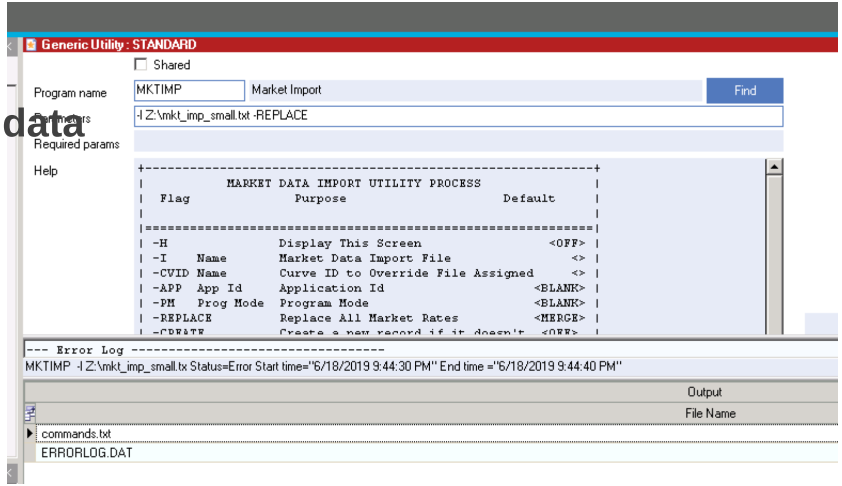
Good for production
Needs daily runs

- Text file imports
  - Easy and very flexible to do
  - Requires mapping of data into text files
  - Mktimp.exe takes text file as input, validates data roughly, loads data and builds curve
    - Zero curve stored in DB. No need to rebuild for HVaR
    - You can run from Summit FT or better from command line (source environment from cmd line)
    - Running scripts is almost always more efficient than using User Interfaces
  - Supports AsOf, CurveId and any market data
  - Cmd: mktimp.exe –h provides all command line options

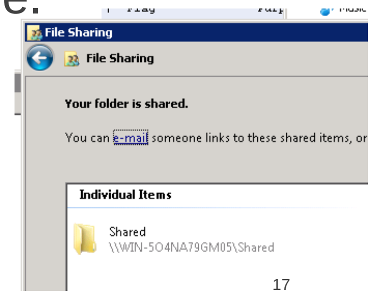
MARKET DATA IMPORT (CONT)

Curve Ids are used to have multiple sets of market data



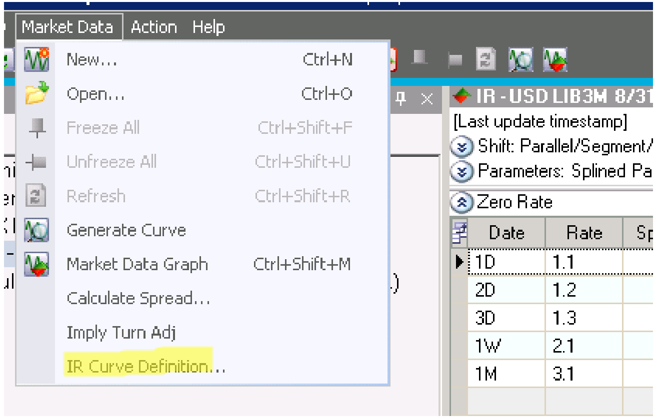


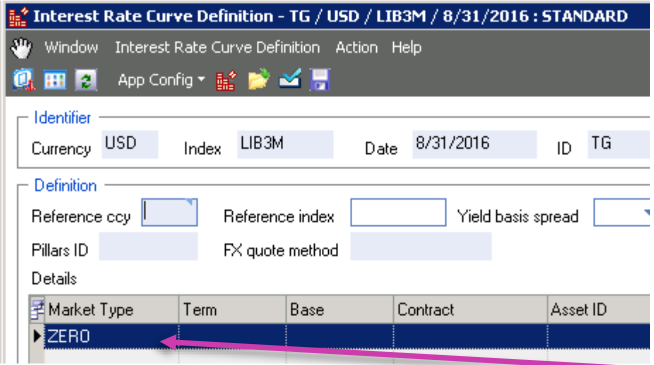
- ➢ We are working on letting you run on cmd line on client
- ➢ Until this is ready run mktimp.exe and hvarexec.exe from Fusion Summit
- ➢ Fusion Summit runs on server so all files need to be on server
- ➢ Client publishes C:\Shared. Server mounts Client folder to Z: drive.
  - ➢ So, add files to C:\Shared and reference Z: in command line



MARKET DATA IMPORT (CONT)

- When importing Rates the IR Curve Definition needs to match the text file data



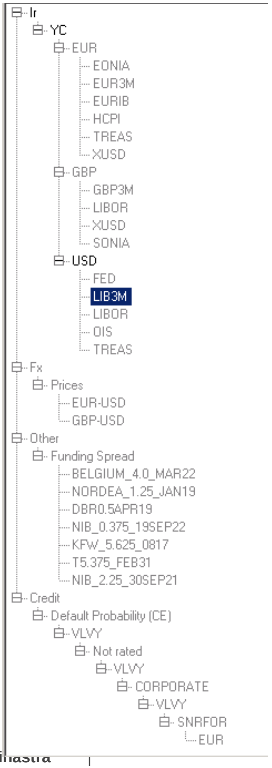


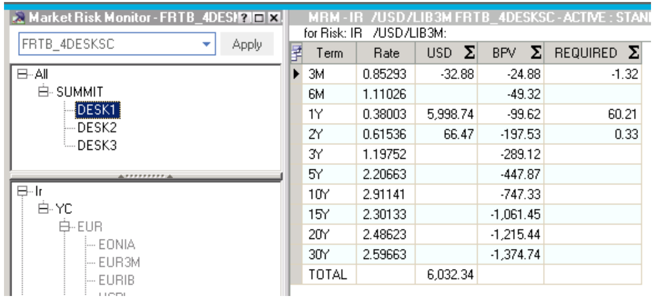

```
CCY      USD
INDEX   LIB3M
DATE     31/8/2016
ID       TG
# Money Market segment
USD      LIB3M     ZERO
1D       1.1
2D       1.2
3D       1.3
1W       2.1
1M       3.1
```

FRTB SETUP

Real-time Risk Server Calculates Specifc Risk Exposures

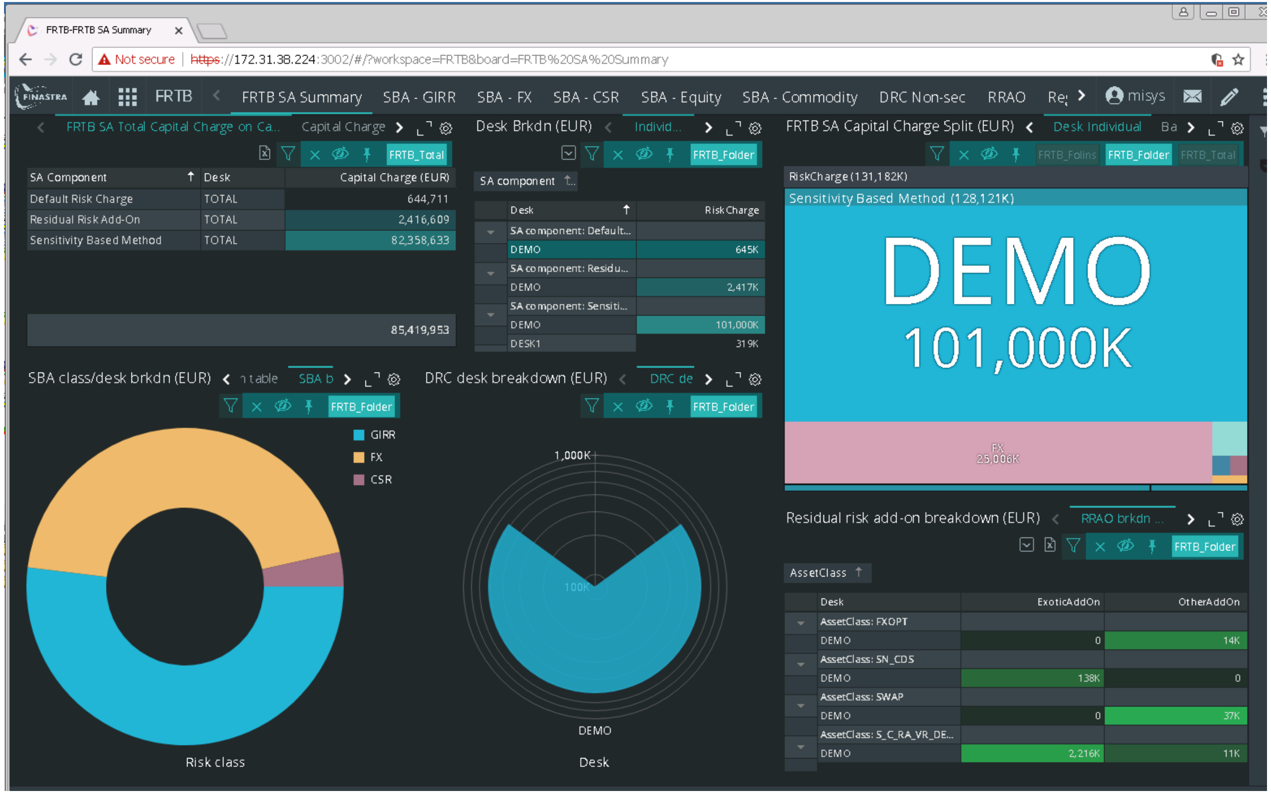
More Details later in class





FRTB AGGREGATOR

Real-time Risk Server Feeds FRTB Aggregator



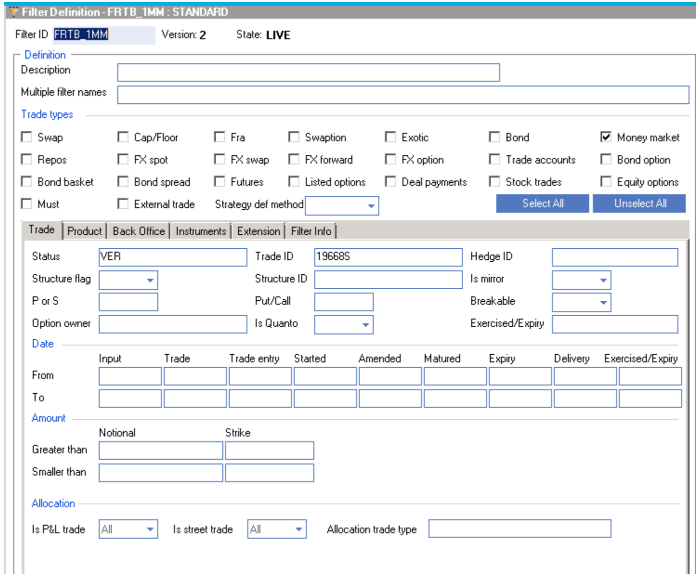
PUTTING IT ALL TOGETHER

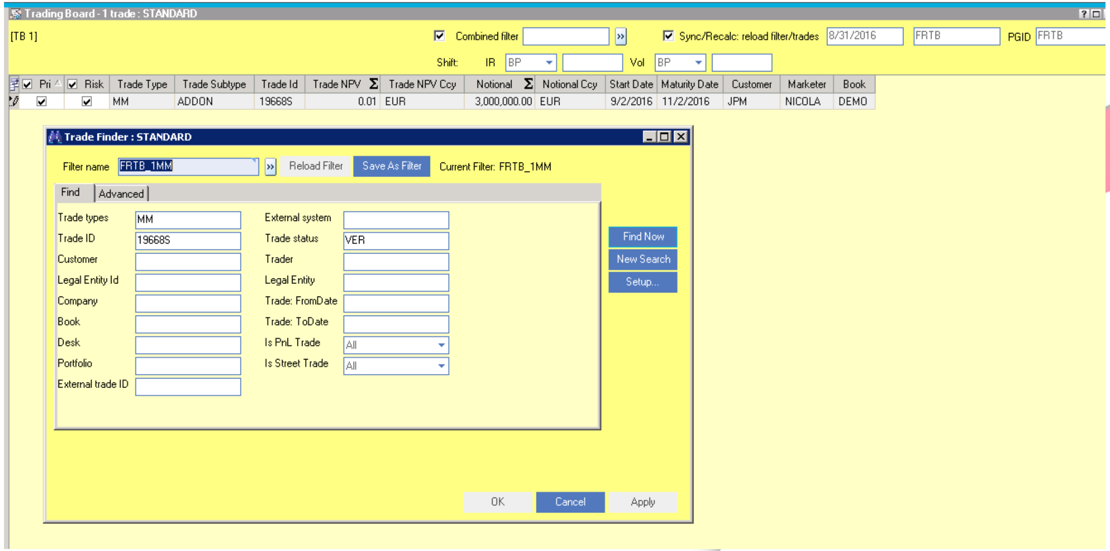
1. Trades to enter
2. Market data setup
3. Filter Setup
4. Market Risk Analysis Configuration
5. Market Risk Run
6. FRTB Aggregator
7. UXP Tool to Display Data

MM TRADE EXAMPLE

Results for one Money Market trade

Filter and Trading board

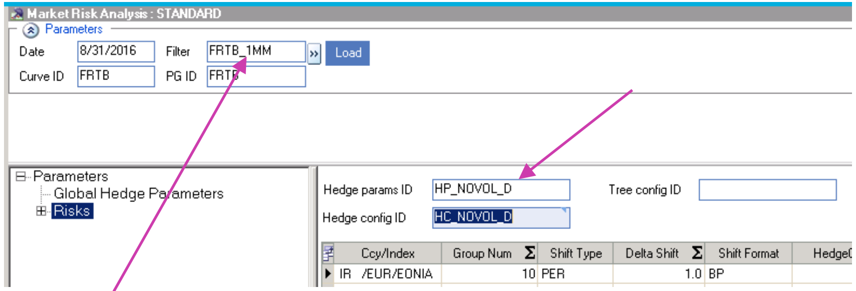


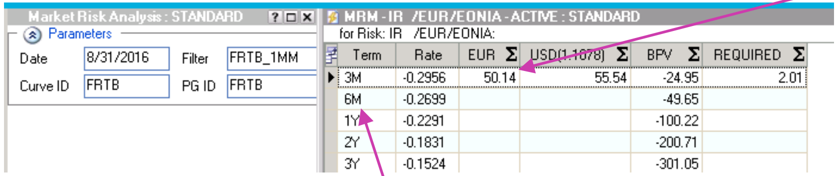


MM TRADE EXAMPLE CONT.

Results for one Money Market trade

To check sensitivities you can run MRM or Trading board.



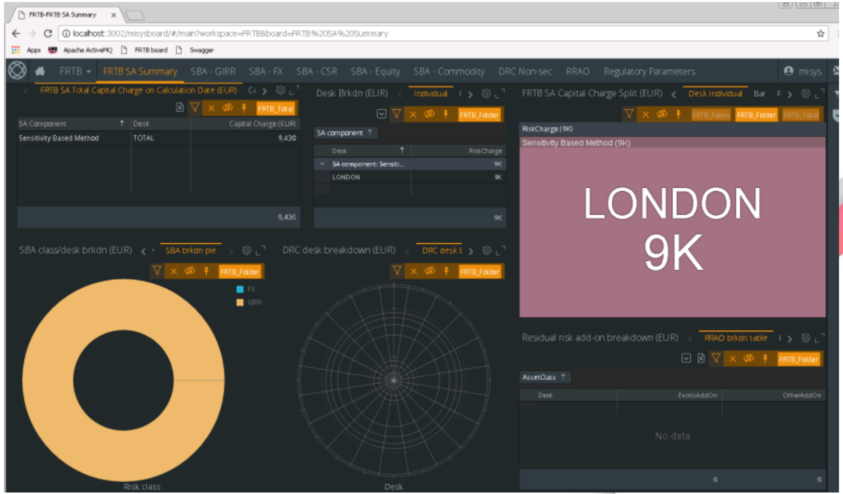


Filter ID	Hedge Parameters ID
FINASTRANOXV	HP_NOVOL_D
FINASTRA_V	HP_VOL_D
FINASTRA_V	HP_VOL_VCV
FINASTRA_X	HP_NOVOL_D
FINASTRA_X	HP_NOVOL_X
FRTB_1FWD	HP_NOVOL_D
FRTB_1MM	HP_NOVOL_D
FRTB_1SPOT	HP_NOVOL_D
FRTB_1SWAP	HP_NOVOL_D
FRTB_4DESKS	HP_NOVOL_D
FRTB_FXO	HP_FXO_CV
FRTB_FXO	HP_FXO_DV
FRTB_FXO	HP_FXO_X
FRTB_NOVOL	HP_NOVOL_D
FRTB_NOVOL_X	HP_NOVOL_D
FRTB_NOVOL_X	HP_NOVOL_X
FRTB_VOL	HP_VOL_D
FRTB_VOL	HP_VOL_VCV

MM TRADE EXAMPLE CONT.

Results for one Money Market trade

FRTB Aggregator listens to folder and pushes data to UXP



ADDITIONAL NOTES

- A few points about the development environment
  - Teams share data setups in FRTB UXP. So, each team should create a new workspace that is owned by the team. The FRTB workspace is for reference only
    - Naming convention for new workspace if ‘Team<#>’. So, team 3 will have workspace Team3.

  - Breakdown of FRTB charge is
    - Company
    - Desk (also called Folder)
    - Desk/TradeType