Nasdaq Calypso

End User OTC Margin

Version 18

Revision 1.0
February 2024
Approved

Document History

Revision	Published	Summary of Changes
1.0	February 2024	First edition for version 18

The Margin Engine End User function allows end users to simulate the initial margin for what-if trades captured in the Pricing Sheet.

[NOTE: The indicative margin requirements generated by the HistSimMargin report are estimates which are provided for reference purposes only. The actual margins imposed by the exchange may differ from these indicative margin requirements. Calypso Technology and its affiliates will not be liable for any loss suffered due to any omission, error, inaccuracy, incompleteness, or otherwise any reliance on these indicative margin requirements]

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Installation and Setup

1.1 Installation

The Margin calculators are installed as part of the Calypso Installer when you select the “Clearing Member” and “Margin Engine” modules.

In addition to core Calypso, you need the following modules:

- Clearing Member
- Collateral
- Data Uploader
- Enterprise Risk
- Margin Engine

Please refer to the Calypso Clearing Member Setup Guide for installation details.

Margin Calculators

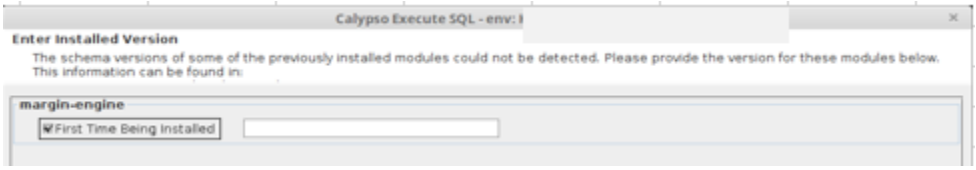
Please contact Calypso Product Support for obtaining the margin calculators. They will be delivered via HD calls.

Database Upgrade

When you run Execute SQL as part of your installation, the data files will be already loaded.

For first-time installation, check “First Time Being Installed”.

In case of upgrade, please enter value of 1.0.0 for previous version.



1.2 Limit Check Setup

For complete details on Limit Check setup, please also refer to the Calypso Messaging Framework Integration Guide.

1.2.1 Environment Properties

Please set the following environment properties:

Property Name	Property Value	Description
datagrid.impl	hazelcast	In-memory data grid.
DATAPERSISTOR_MAX_RETRIES	3	Number of times to retry if the persistence fails.
DATAPERSISTOR_RETRY_DELAY	1000	Delay between retry attempts in milliseconds.
DU_MESSAGING_SERVER_URL	tcp://<host>:port	Host / port of the Uploader Messaging Server for the Data Persistor. Must be the same as RISKCONTROLEVENTSERVERURL. Example: tcp://cpc-vPS-029.calypso.com:61916
RISKCONTROLEVENTSERVERURL	tcp://localhost:61919	Host name and port number of the Uploader Messaging Server.
NDPERSISTOREVENTSERVERURL	tcp://localhost:1974	Host name and port number of Non Durable Persistor Event Server. Must be different from DU_MESSAGING_SERVER_URL and RISKCONTROLEVENTSERVERURL.
HEADROOMCHECK_NPV_RULE	See description.	Determines if the NPV should be included in limit check: ALWAYS - NPV is included for all trades. NEVER - NPV is never included. BACKDATED_TRADE - NPV is included only for back-dated trades.
LIMIT_SYSTEM_TYPE		RISKCONTROL

1.2.2 Domain Values

Domain MarginEngine

The following domain values need to be defined in the domain “MarginEngine”.

Value = HEADROOMCHECK_PRICING_ENV

Comment = Pricing environment used to compute Limit Check. It defines what base currency is used for client level calculation.

Value = HRC_MAX_DAYS_BACK

Comment = Number of days to evaluate back-loaded trades. If Trade Date (of incoming trade) < Valuation Date – (number of days), the trade is considered back-loaded, trade keyword CCPBackLoad = true.

Value = HEADROOMCHECK_RULES

Comment = Limit Check rule. You can set:

- CMFMarginAccountRules - Checks limits at the account level only.
- CMFClientAndMarginAccountRules - Checks limits at the account and aggregation levels.
- OriginHeadroomTotalIM – Checks limits for hierarchies with a single level.
- ClientHeadroomTotalIM - Checks headroom limits (Collateral + Limit – TOTAL IM>0 or risk reducing) and IM limit (Limit – IM > 0 or risk reducing) at the Clearing Member level.

Default value is CMFClientAndMarginAccountRules.

Value = HRC_PS_TIMEOUT

Data Persistor timeout in ms.

Domain MarginEngine.BATCH_NAMES

This domain must contain the list of HistSimMargin batch names required for limit check on incremental updates. The batch names are defined later in the document.

1.2.3 Limits

Limits can be imported using the Data Uploader.

Limits can be set to 0 by default.

Limits can be updated in bulk for all margin accounts, or for individual margin accounts.

Limits are set based on hierarchies. Sample hierarchies:

CCP

Clearing Member 1

House (CCP limit)

Client (CCP Limit)

Client 1 (CMF Limit)

Client 2 (CMF Limit)

CMF

Client 1 (Client Limit)

CCP1 MA (Margin Limit)

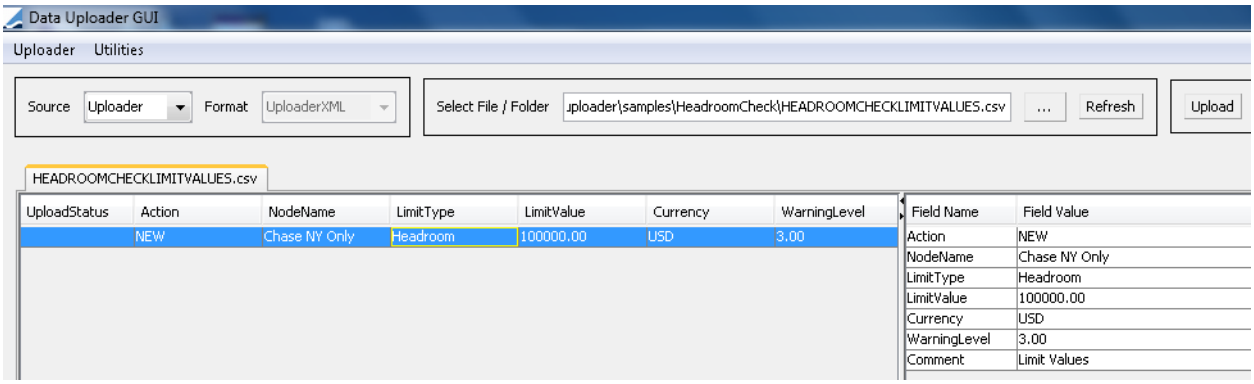
CCP2 MA (Margin Limit)

The Data Uploader supports CSV and XML files. The file names should start with "HEADROOMCHECKLIMITVALUES", for example "HEADROOMCHECKLIMITVALUES_<name>.csv".

Sample files are provided under `<calypso home>/docs/calypso-datauploader/samples/HeadroomCheck`.

Launch the Data Uploader window using **Processing > Tools > Data Uploader** from the Calypso Navigator.

Select a file from your machine, the content for the file is displayed:



» Click **Upload** to load the limit values into Calypso.

1.2.4 Margin Controller Engine

The Margin Controller Engine allows routing the collateral positions changes to the Trade VaR process.

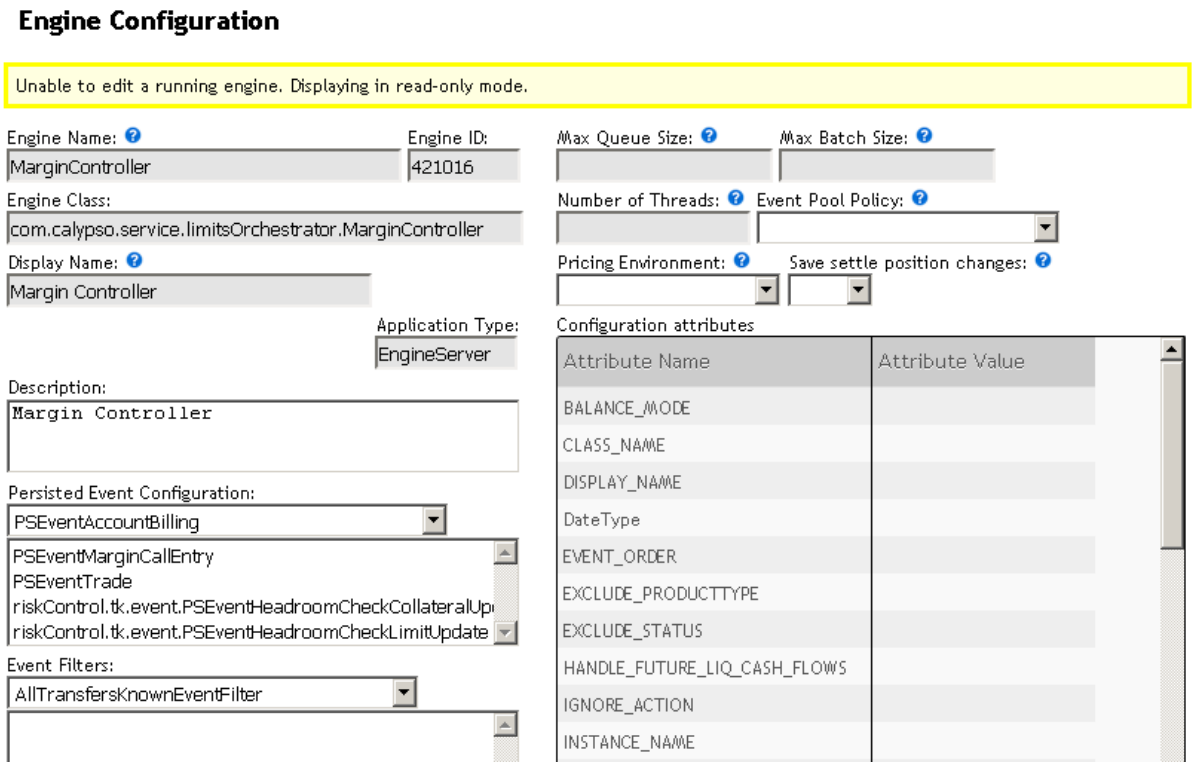
It is configured in the Engine Manager of Web Admin: event subscription and engine parameters.

You may need to add this engine if it is not available for configuration: Create a new engine called MarginController with class name `com.calypso.service.limitsOrchestrator.MarginController`.

It subscribes to:

PSEventHeadroomCheckCollateralUpdate
PSEventHeadroomCheckLimitUpdate
PSEventTrade
PSEventMarginCallEntry

No event filter.



Please refer to Calypso Web Admin documentation for complete details.

1.2.5 Update Manager Engine

The Update Manager engine allows routing of trades, imported collateral and limit updates.

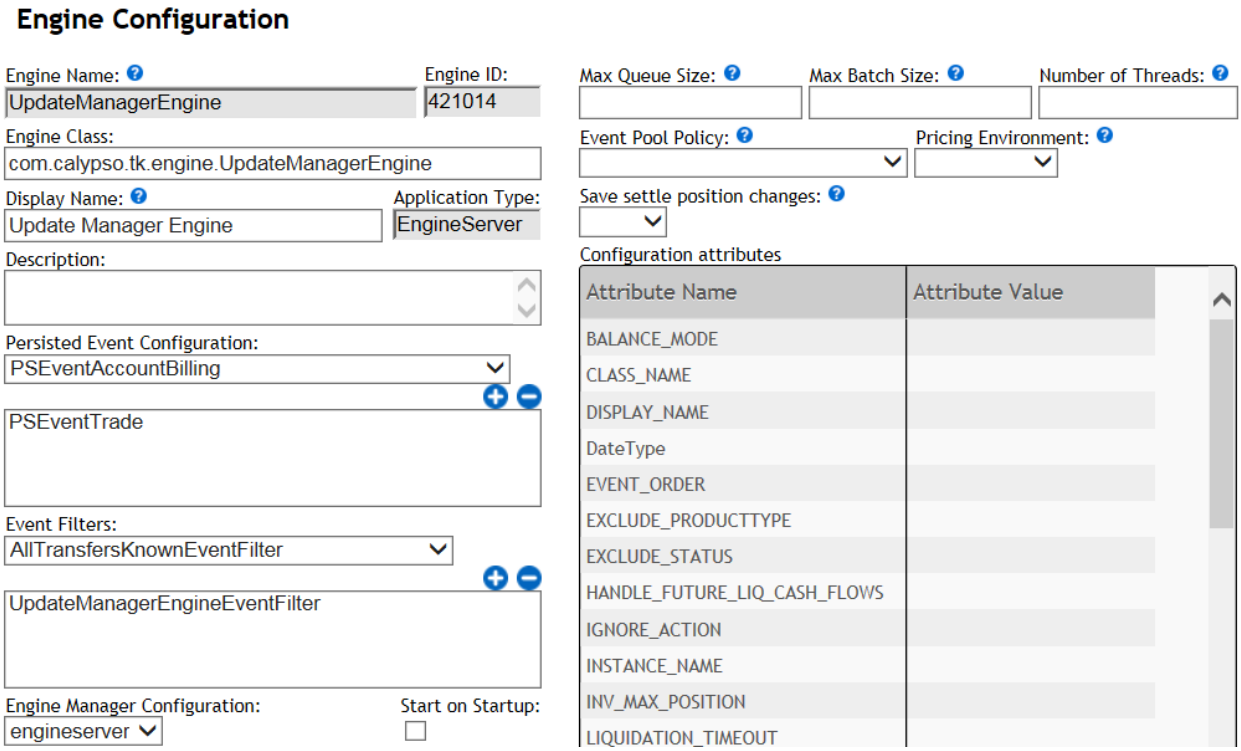
It is configured in the Engine Manager of Web Admin: event subscription and engine parameters.

You may need to add this engine if it is not available for configuration: Create a new engine called UpdateManagerEngine with class name `com.calypso.tk.engine.`UpdateManagerEngine.

It subscribes to:

- PSEventTrade

Event filter = UpdateManagerEngineEventFilter



Please refer to Calypso Web Admin documentation for complete details.

Configuration Requirements

This section describes the configuration requirements to run the HistSimMargin report.

2.1 Trade Filters

You need to configure a trade filter for each client and for each CCP that contains the trades for which you want to compute IM exposure.

2.2 Trade Workflow

Updated workflow- to include the margin of intraday cleared trades into the running incremental margin, used for what-if Margin estimation.

Sample file provided on the Documentation Portal: EUCTradeExecution.wf

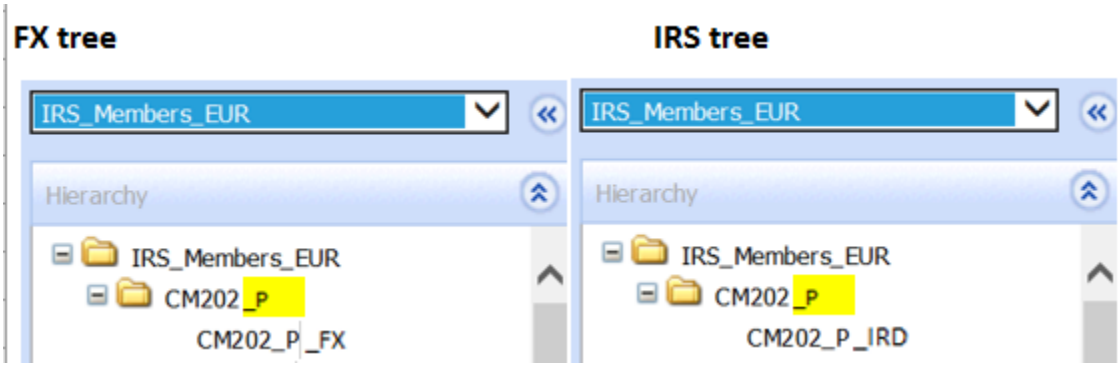
Workflow rule to update the margin account.

Sample file provided on the Documentation Portal: TRADE_WORKFLOW_UPDATE_IM.wf

2.3 Market Risk Hierarchy

Market hierarchies are created using **ERS Risk > admin > Hierarchy Editor**.

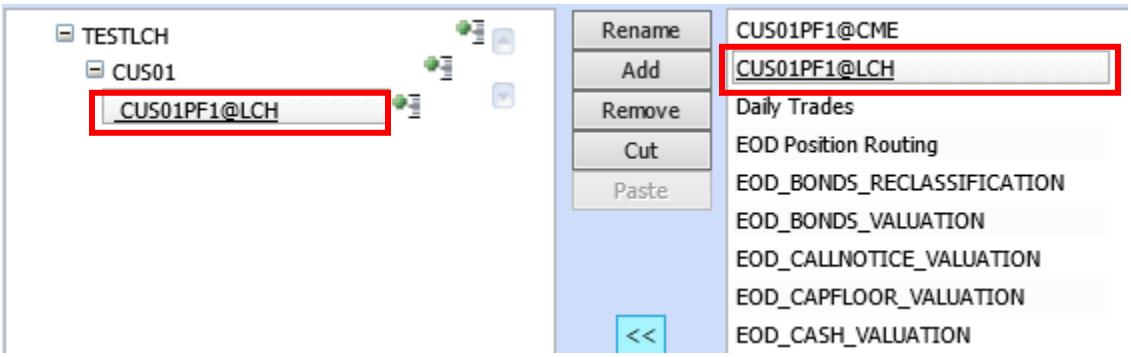
Examples:



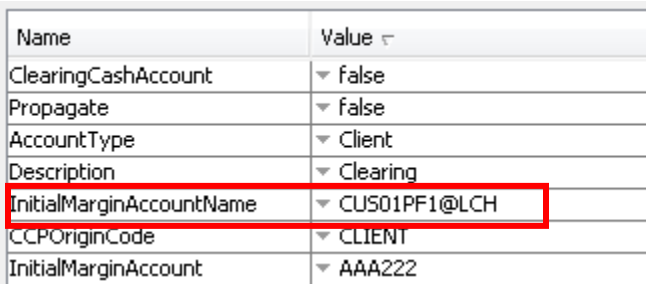
Create a node for each client and each client account. The client account node must be associated with the trade filter previously created.

[NOTE: The client account node MUST have the same name as the trade filter]

Example:



Important Note: Also, the client account node (CUS01PF1@CME or CUS01PF1@LCH in this example) must be set on the account attribute InitialMarginAccountName of the Calypso client clearing accounts. This is used when computing the incremental IM exposure to associate the incoming message with the proper market hierarchy.



Name	Value
ClearingCashAccount	false
Propagate	false
AccountType	Client
Description	Clearing
InitialMarginAccountName	CUS01PF1@LCH
CCPOriginCode	CLIENT
InitialMarginAccount	AAA222

2.4 Data Grid Configuration

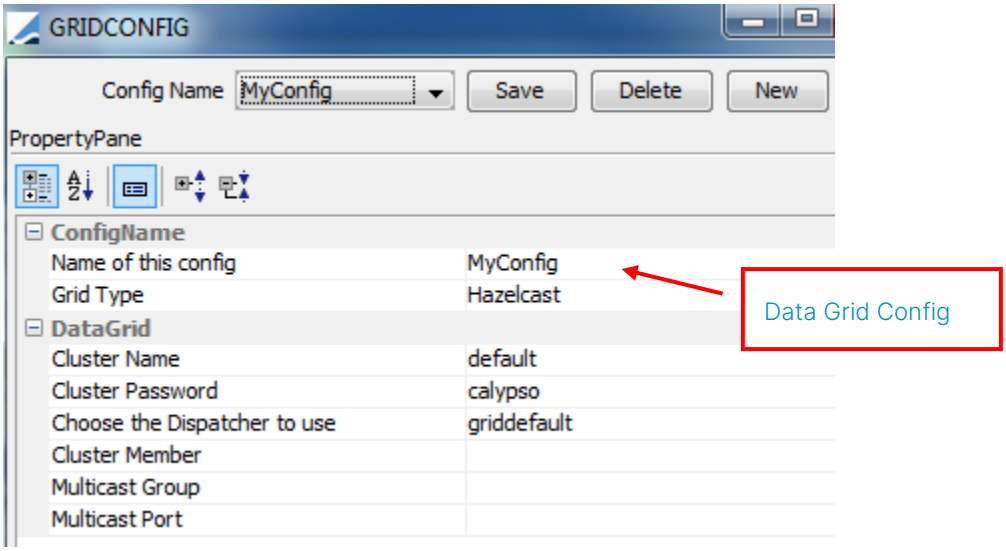
You need to use the in-memory data grid to compute the HistSimMargin analysis.

Calypso currently supports the Hazelcast data grid.

The data grid is created using the scheduled task DATA_GRID_HYDRATE based on a data grid configuration and a HistSimMargin batch name.

The HistSimMargin analysis is then run on the data grid using the scheduled task ERS_ANALYSIS.

Bring up the Data Grid Configuration window (menu action `grid.GridConfigEditor`).



» Enter a name for the configuration. It is used to generate the data grid. Then enter the fields describe below. Then click **Save**.

Fields Details

Fields	Description
Grid Type	Select Hazelcast.
Cluster Name Cluster Password	Enter a cluster name and cluster password. The cluster members (nodes) and clients having the same cluster configuration (i.e. same cluster name and password) form a private cluster.
Choose the Dispatcher to use	Select the dispatcher configuration for the data grid. **[NOTE: You need a dedicated dispatcher configuration for all data grid calculators]** Please refer to the Calypso Installation Guide for information on setting up a dispatcher.
Cluster Member	Enter a cluster member (optional). If no value is entered then Hazelcast client expects the data grid server to be running on the same machine as the client.
Multicast Group	Enter the multicast group IP address. Values can be between 224.0.0.0 and 239.255.255.255.
Multicast Port	Enter the multicast socket port which Hazelcast member listens to and uses to send discovery messages.

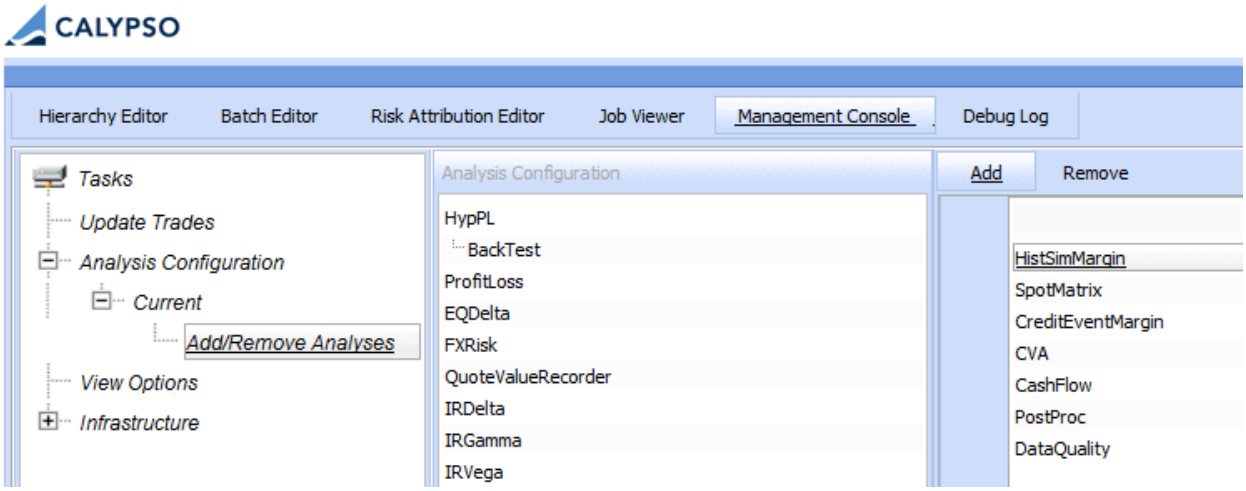
Environment Property

Once you have defined the Data Grid Configuration, set the environment property:

grid.config=<data grid configuration name>

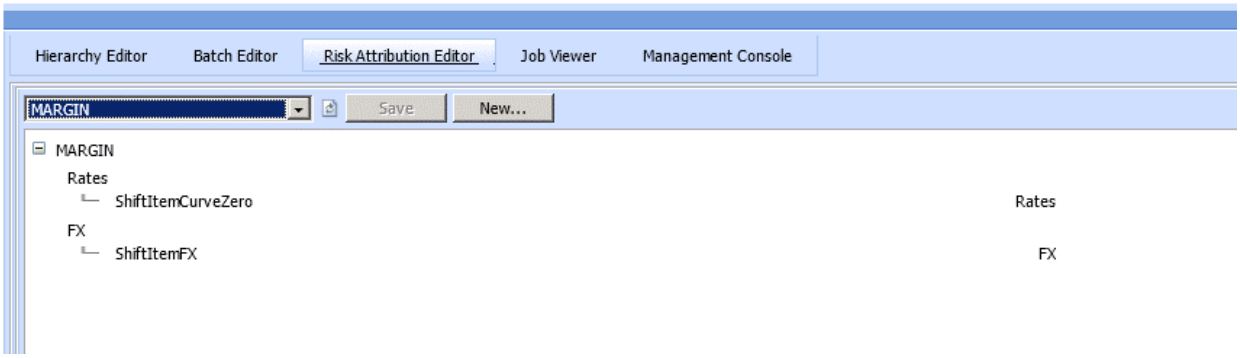
2.5 Configuring the Analysis HistSimMargin

You need to add the HistSimMargin analysis to the ERS module under **ERS Risk > admin > Management Console > Analysis Configuration**.

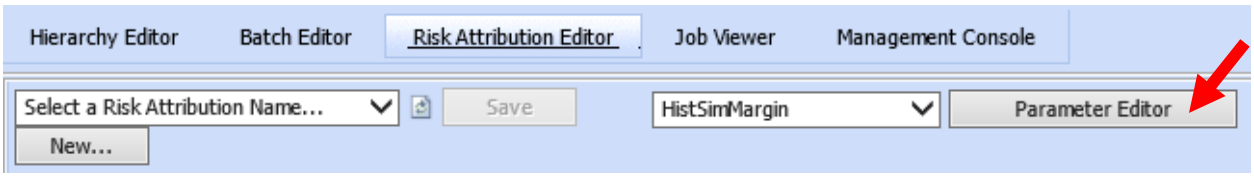


Select "Add/Remove Analyses", and add HistSimMargin.

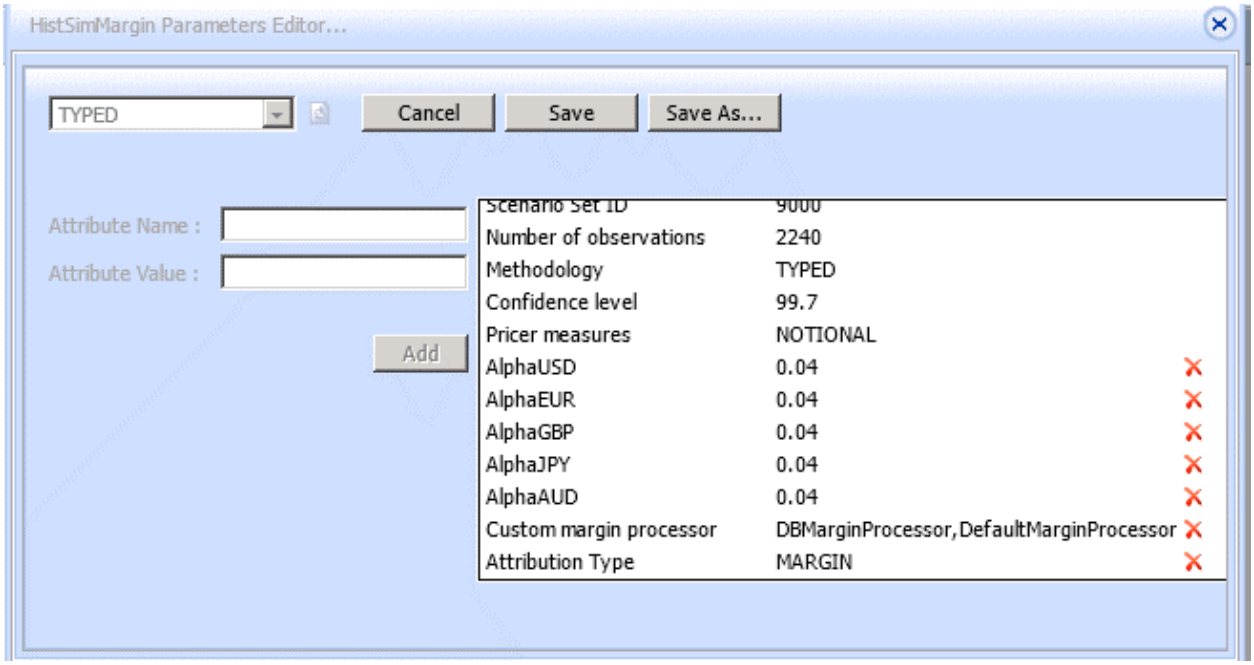
Add the following attribution types using **ERS Risk > admin > Risk Attribution Editor**:



Then select the HistSimMargin analysis, and click **Parameter Editor** to set the analysis parameters.



CME Parameters



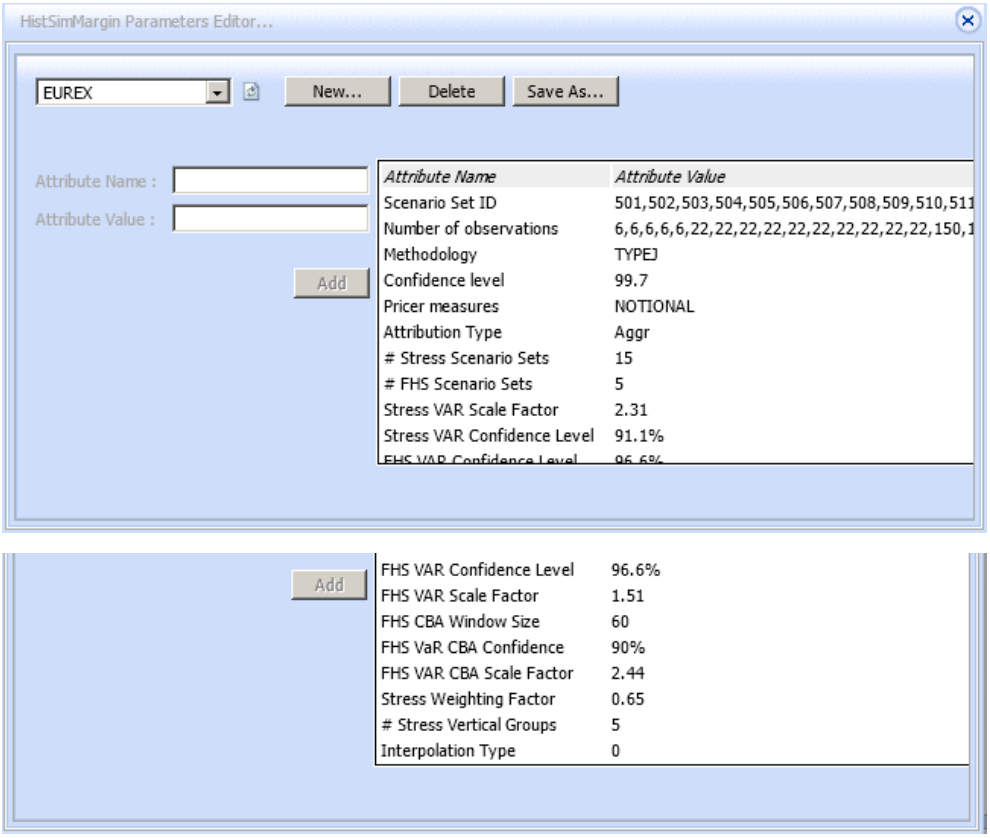
- Scenario Set ID – Enter the scenario set ID for the historical simulation.
- Number of observations – Enter the number of observations (scenarios) for the historical simulation.
- Methodology – Select “TYPED”.
- Confidence Level – Enter the confidence interval for the VAR calculation.
- Pricer measures – Select pricer measures as needed. Only NOTIONAL is currently supported.
- Alpha<currency> should be added to the parameters for each currency. Currently alpha is 0.04 for each ccy.
- Horizon

LCH Parameters

- Methodology – Select “TYPEH”.
- Confidence Type
  - Percentage - Allows setting the confidence level as a percentage.
  - Absolute - Allow setting the confidence level as an absolute number of losses.
- Confidence Level - Percentage
  - PL vectors are sorted from the smallest to the largest value
  - ETL is the average[(rounddown(p*(n+1)),0):1st PL] where p is 1-confidence interval and n the number of observations
- Confidence Level – Absolute Number of Losses

  - PL vectors are sorted from the smallest to the largest value
  - ETL is the average of xth PL to 1st PL
- Horizon

EUREX Parameters



- Scenario Set ID: List of comma-separated list of scenario ids.
- Number of observations: List of comma-separated list of number of observations. The first one will be used for FHS VaR and the second one will be used for SP VaR.
- Methodology – Select “TYPEJ”.
- Stress Confidence Level: Specify the confidence level for stress VaR.
- FHS Factor: Scaling factor to be multiplied by FHS VaR.
- SP Factor: Scaling factor to be multiplied by Stress VaR.
- CBA Factor: Scaling factor to be multiplied by correlation break adjustment.
- CBA Moving Window: N days moving window for calculating CBA.
- SP VaR Weight: Weighting factor on SP VaR.
- Horizon

2.6 Market Data

Importing Variation Margin Curves

CCPs often use different curves to price trades to calculate NPV and Variation Margin than they do to calculate Initial Margin requirements. This is especially true for CME, where the curves used for VM have daily points that go out 50 years. You would NEVER want to try to run a curve with this many points through a Historical Simulation required for IM calculation because it would take too long. The VM curve names vary by CCP, and they are mapped to curve names in Calypso through the Calypso Mapping window. We recommend to users to create pricer configurations called "CME_VM", "LCH_VM", etc. to hold VM curves.

VM curves are imported daily using the scheduled task CLEARING_IMPORT_MARKET_DATA.

Importing Initial Margin Curves

Very similarly to VM cures, IM curves are separate curves that are used in the Pricing Environment for IM calculations: "CME_IM" and "LCH_IM" pricer configurations.

IM curves are imported daily using the scheduled task CLEARING_IMPORT_MARKET_DATA.

Importing Quotes

Rate Index quotes and FX quotes provided by the CCP are imported using the scheduled task CLEARING_MARKET_DATA_IMPORT.

Importing Curve Shifting Scenarios

You can import the set of curve shifting scenarios that can be used to calculate VaR and IM through the CLEARING_IMPORT_SCENARIO_SHIFTS scheduled task. These curves are stored in the ERS Risk tables.

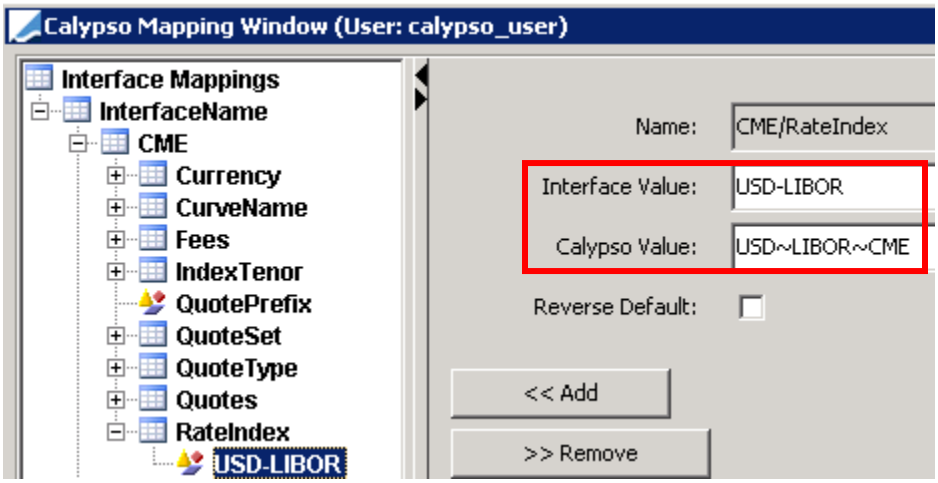
2.6.1 Mapping Configuration

There is additional configuration required within the Calypso Mapping Window (menu action `mapping.CalypsoMappingWindow`).

Rate Indices

The Rate Index Definition is defined using the standard process to generate a quote name for a given index. For our example we will use “MM.USD.LIBOR.tenor.CME” as our set of indices.

To map all of the tenors, we simply need one mapping for USD LIBOR as shown here:



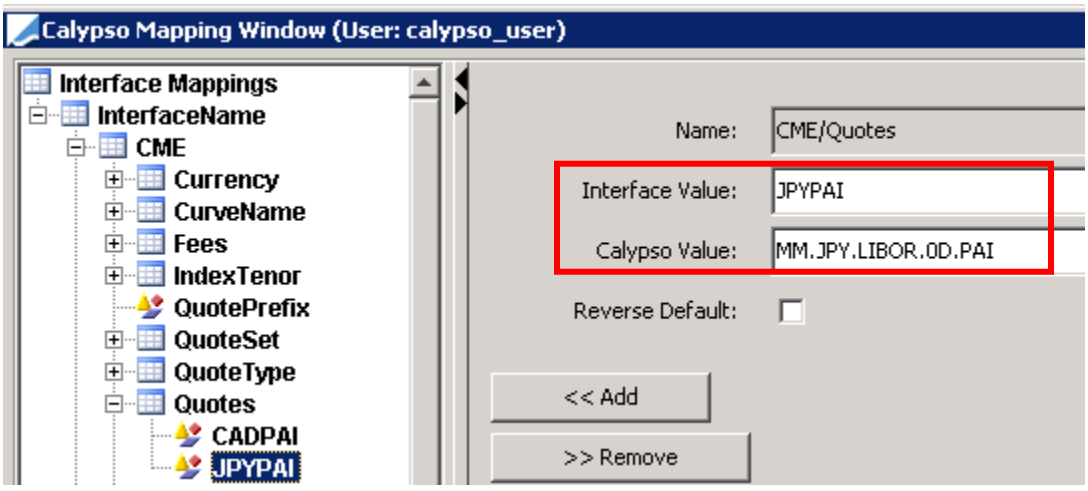
The Calypso Value “USD~LIBOR~CME” has some logic behind it to map the correct tenors of the quote name form “MM.USD.LIBOR.tenor.CME”. In other words, all tenors of USD LIBOR will be imported with this one mapping.

CME Quotes

You can define quote mapping under CME > Quotes.

For example the quotes returned from CME are in the form "JPYPAI", "CADPAI" etc. They come from the file “CMEPAI_$date_stamp.csv”.

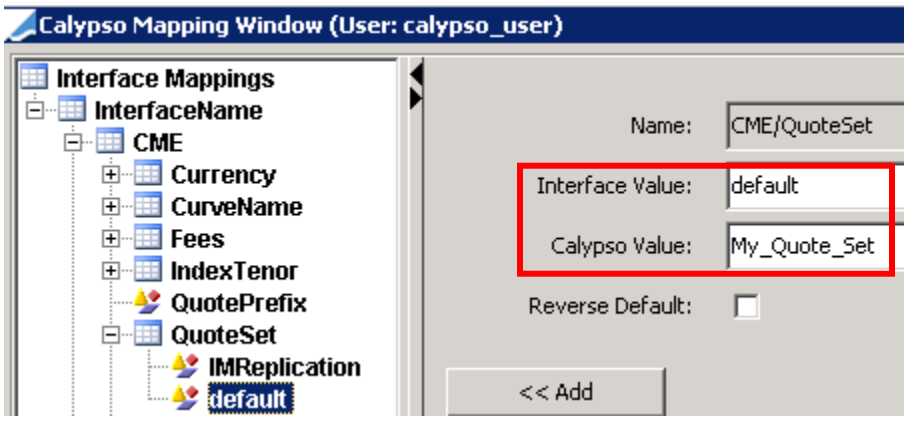
You then define the mapping for the specific interface name. For example JPYPAI (interface value) can map to MM.JPY.LIBOR.0D.PAI (Calypso value).



Sample rate reset quote mapping:

[NOTE: The Calypso Value depends on the interest rate definition: "MM.<currency>.<rate index>.<tenor>.<source>"]

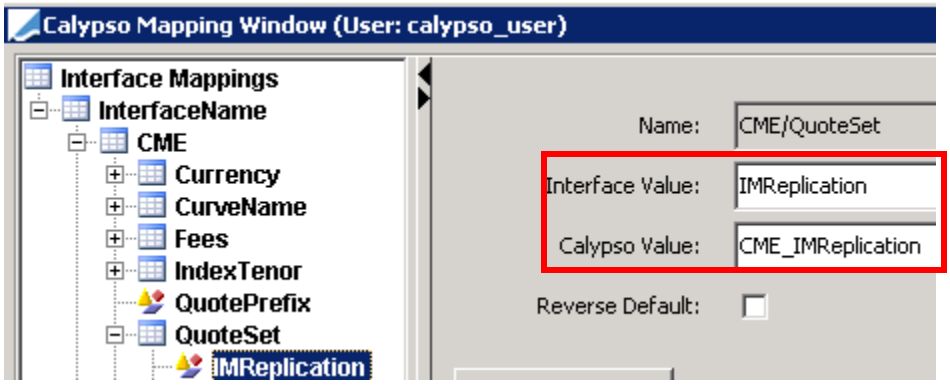
The quotes for the rate indices are stored into the default quote set, unless the user maps the default quote set to another quote set using the mapping below.



The CLEARING_IMPORT_MARKET_DATA scheduled task also imports the FX rates used by CME for IM replication into a specific quote set (because CME publishes unique FX rates that are specific to Initial Margin calculations).

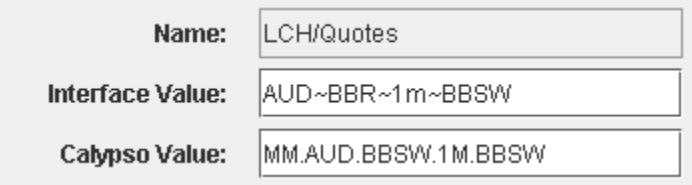
The quote set must be defined in the Data Mapping window for InterfaceName = CME/QuoteSet, and Interface Value = IMReplication.

Example:



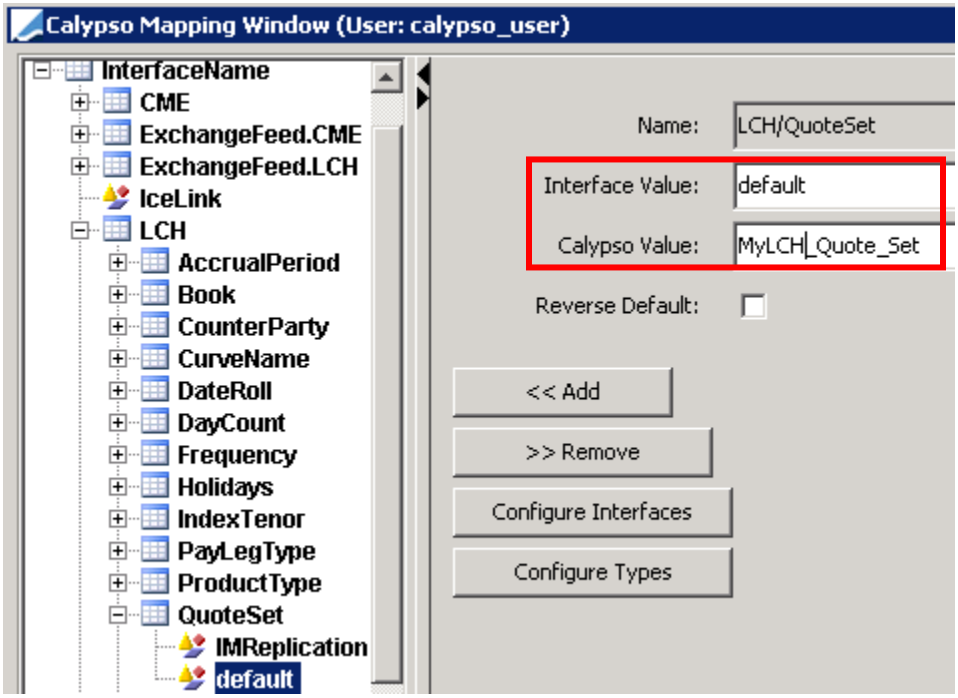
LCH Quotes

Sample rate reset quote mapping:



[NOTE: The Calypso Value depends on the interest rate definition: "MM.<currency>.<rate index>.<tenor>.<source>"]

The quotes for the rate indices are stored into the default quote set, unless the user maps the default quote set to another quote set using the mapping below.



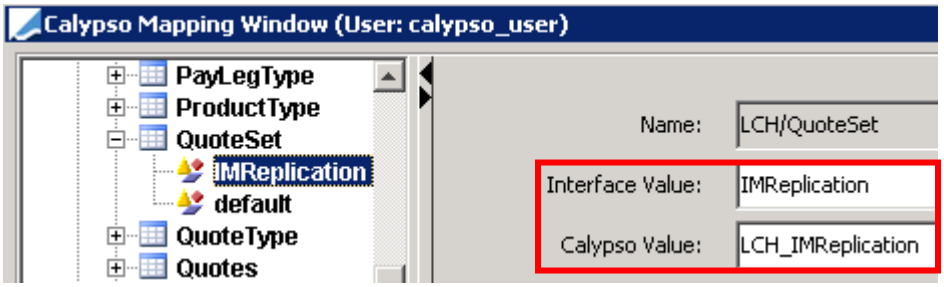
The CLEARING_IMPORT_MARKET_DATA scheduled task also imports the FX rates used by LCH for IM replication into a specific quote set (because LCH publishes unique FX rates that are specific to Initial Margin calculations).

No Calypso mapping in necessary for FX quotes, as LCH directly provides Quotes in the form "FX.cur1.cur2".

Please note that both CME and LCH are only providing the "Close" FX quotes – So only Close quotes are saved in the system.

The quote set must be defined in the Data Mapping window for InterfaceName = LCH/QuoteSet, and Interface Value = IMReplication.

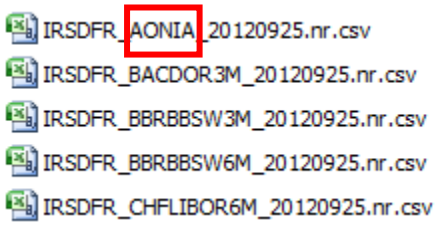
Example:

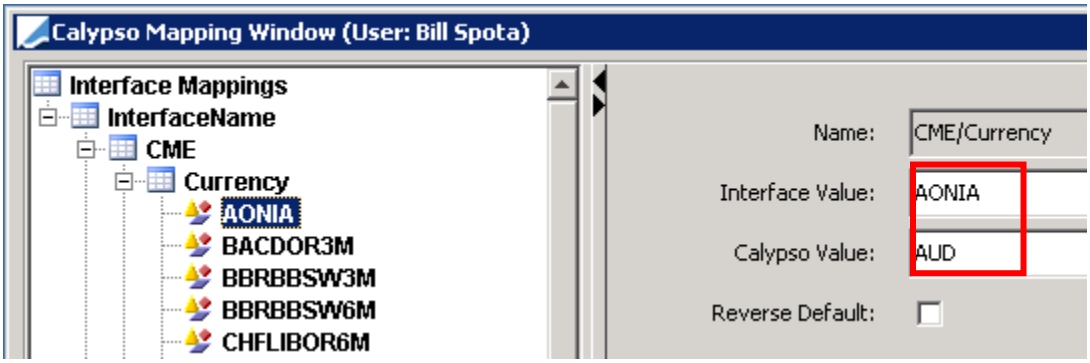


CME Curves

This scheduled task is used for importing the various IRSDFR curves published by CME so that IM can be reconciled. Sample mapping is shown below, and you will need to create simple shell curves for a date that is before the date you intend to import.

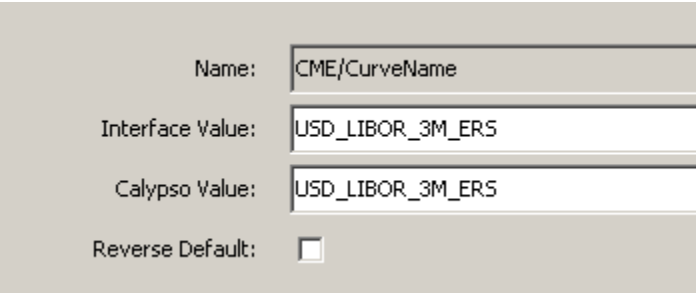
Let's start with the Calypso Mapping Window.



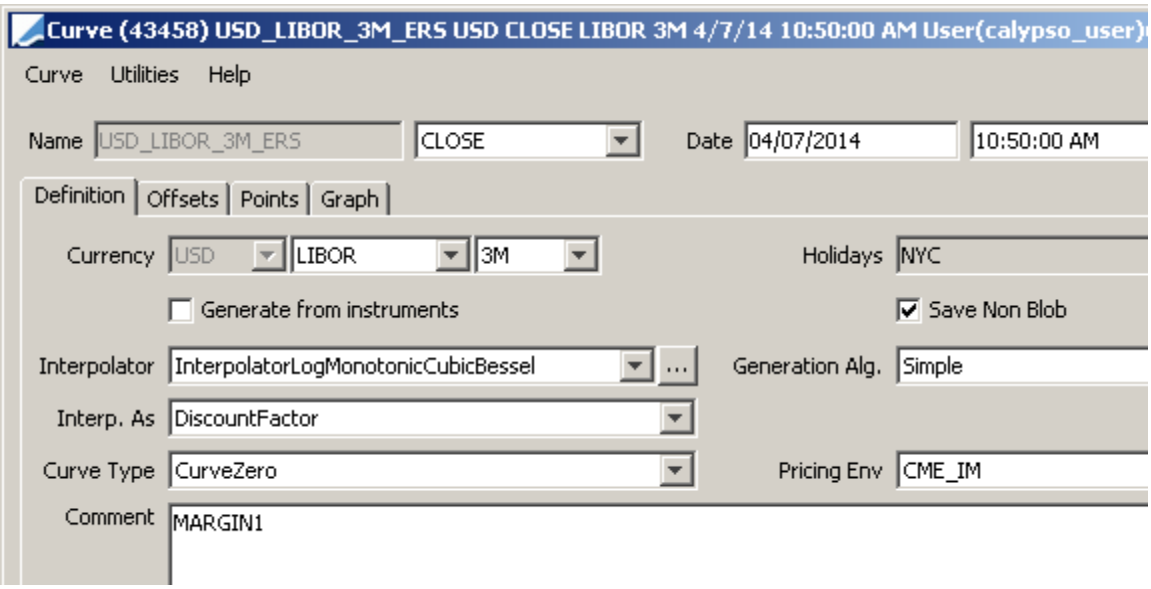


In the above example, you will map the middle section of the IRSDFR file name to a specific currency. This takes some basic knowledge of IRS Clearing to determine what currency is associated with what name. Example AONIA is the discount curve used for VM in AUD whereas BACDOR3M is the forecast curve for CAD.

You then need to map that name to an actual curve name in Calypso, a simple discount curve.



The curve "USD_LIBOR_3M_ERS" in this example, must be defined under **Market Data-> Interest Rate Curves > Zero Yield Curve**.



The interpolator should set as InterpolatorLogMonotonicCubicBessel and Interp. As DiscountFactor.

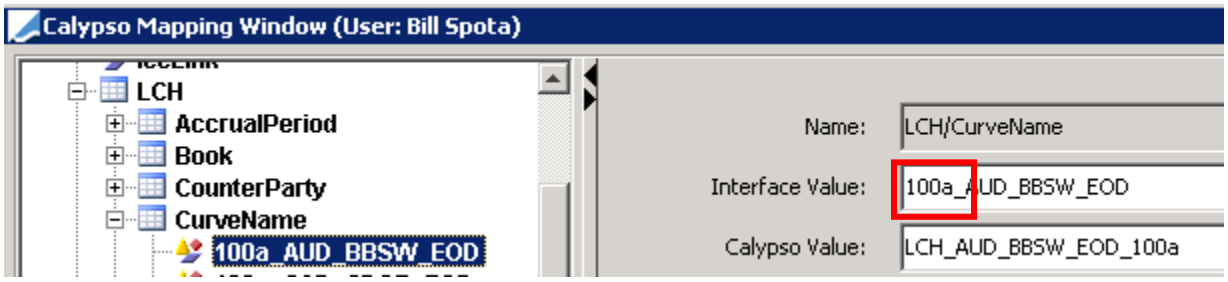
LCH Curves

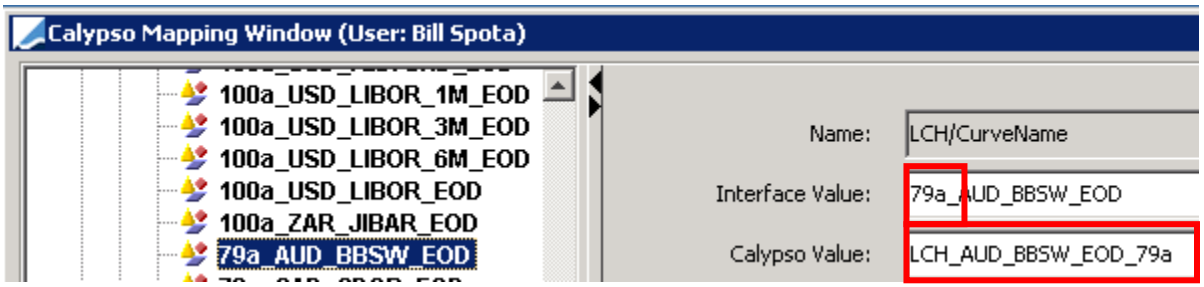
This scheduled task is used for importing the various IM and VM curves published by LCH on reports 79/100 so that both can be reconciled. Additionally, it is used to import the FX and PAI rates.

In the Calypso Mapping Window, under the interface LCH > CurveName, specify the value of the interface name. For example this could be AUD_BBSW_EOD, and map this to a Calypso value (example LCH_AUD_BBSW).

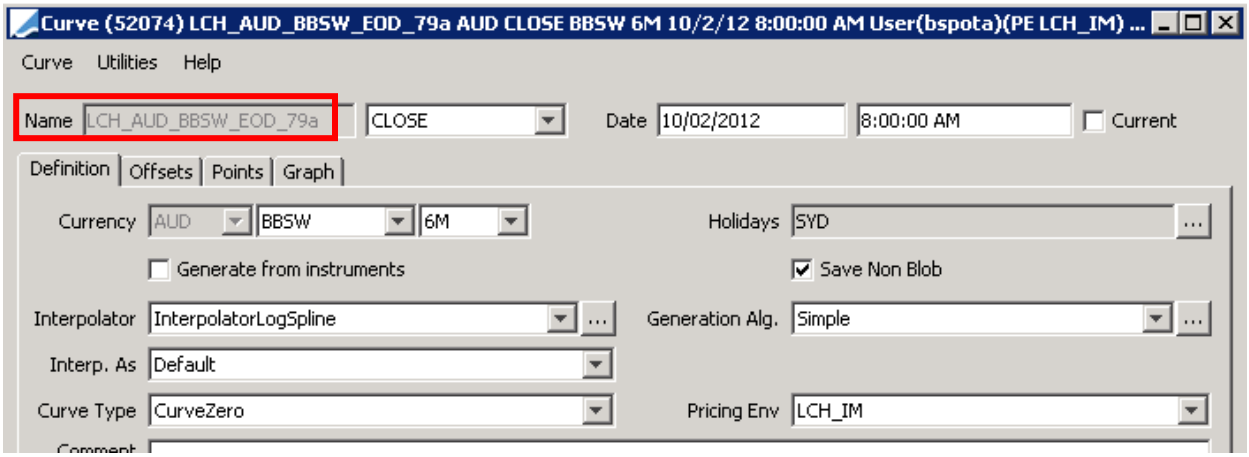
However, there are two LCH reports we use to import these data, REP00079 and REP000100. The same CurveName can exist in both reports but yet have different values as "79" is for IM and "100" is for VM. To ensure we distinguish the two data from both reports with same name, you should use the following naming convention:

- 79a_CHF_LIBOR_EOD mapped to Calypso value (example LCH_CHF_LIB_3M_EOD_79a)
- 100a_CHF_LIBOR_EOD mapped to Calypso value (example LCH_CHF_LIB_3M_EOD_100a).





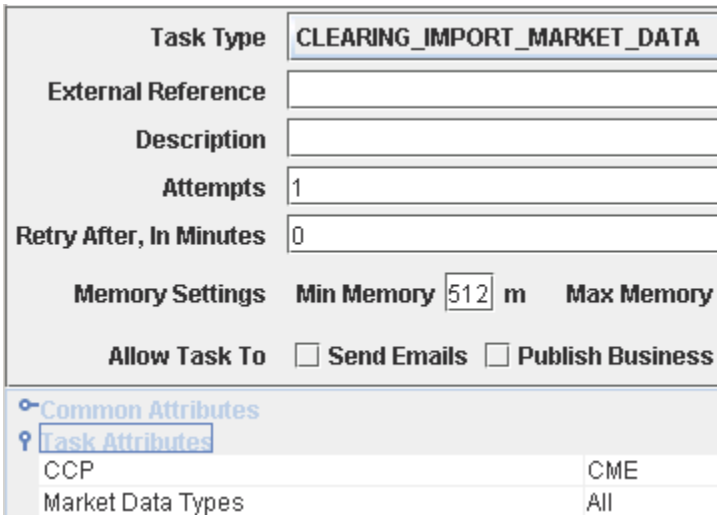
The curves “LCH_AUD_BBSW_EOD_100a” and “LCH_AUD_BBSW_EOD_79a” in this example, must be defined under **Market Data-> Interest Rate Curves > Zero Yield Curve**.



In the above examples you can see that there is a curve named "AUD_BBSW_EOD" in both reports 79 and 100, and that each LCH curve is mapped to a different curve in Calypso.

2.6.2 CLEARING_IMPORT_MARKET_DATA

This scheduled task is used to import curves, quotes, and rate resets.



Attributes

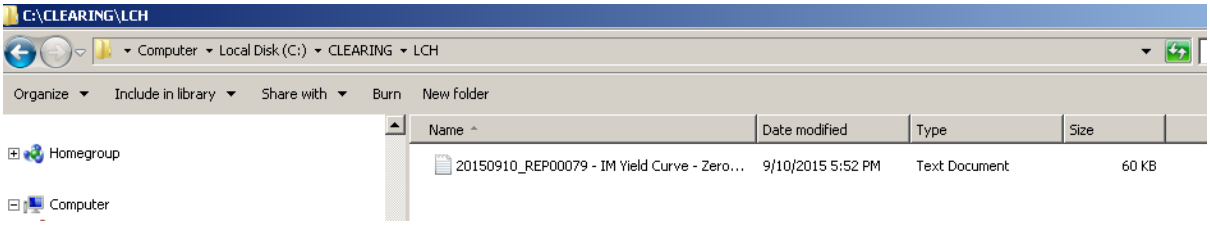
- Select a CCP.
- Select the market data types: All, Curves, FX Rates, Holidays, Quotes, QuotesIM, or Rate Reset.

The files are imported based on the locations defined in “clearingconnection.properties” file:

LimitsMultiplexer_MARGIN_150013.log | clearingconnection.properties

```
# Key format is
#
# <CCP short name>.<Firm ID (PO LE attribute)>.<configurationKey>
#
# URI format must include protocol, host and port (where applicable)
#
# For public key SFTP authentication, keyPassphrase is optional. Key
# path can be an absolute filesystem path, or a resource path within
# the classpath. Filesystem paths take precedence
#

CME.4Q0.URI=sftp://sftpng.cmegroup.com:22
CME.4Q0.user=4Q0_SFTP_user
CME.4Q0.password=******

LCH.CC1.URI=file://c:/clearing/LCH

LCH.CC2.URI=sftp://195.246.228.9:6022
LCH.CC2.user=CC2_SFTP_user
LCH.CC2.key=/path/to/CC2/key
LCH.CC2.keyPassphrase=CC2_key_passphrase

EUREX.ABCFR.URI=file:///home/clearing/Calypso/EUREX
```

Example:



This scheduled task is used to import the market data from the following CCP files:

LCH

- VM and IM Curves - REP00079 and REP00100
- Quotes - DailyExchangeRates REP00018
- Rate Reset – HistoricalIndexRates REP00003 and FX rates REP00016c
- Holidays – Holidays REP00006 - The holiday calendars must be mapped in the Calypso Mapping Window for the interface name LCH/Holidays.

CME

- VM Curves – IRSDFRCurve_* "IRSDFR_*.csv"
- IM Curves - "Base_Curves_*DATE.csv"
- Quotes – CMEPAIQuote "CMEPAI_*.csv"
- Rate Resets - CMEIRSRateReset "IRSRR_*"
- QuotesIM – FX rates "IRSMR3_*.csv"

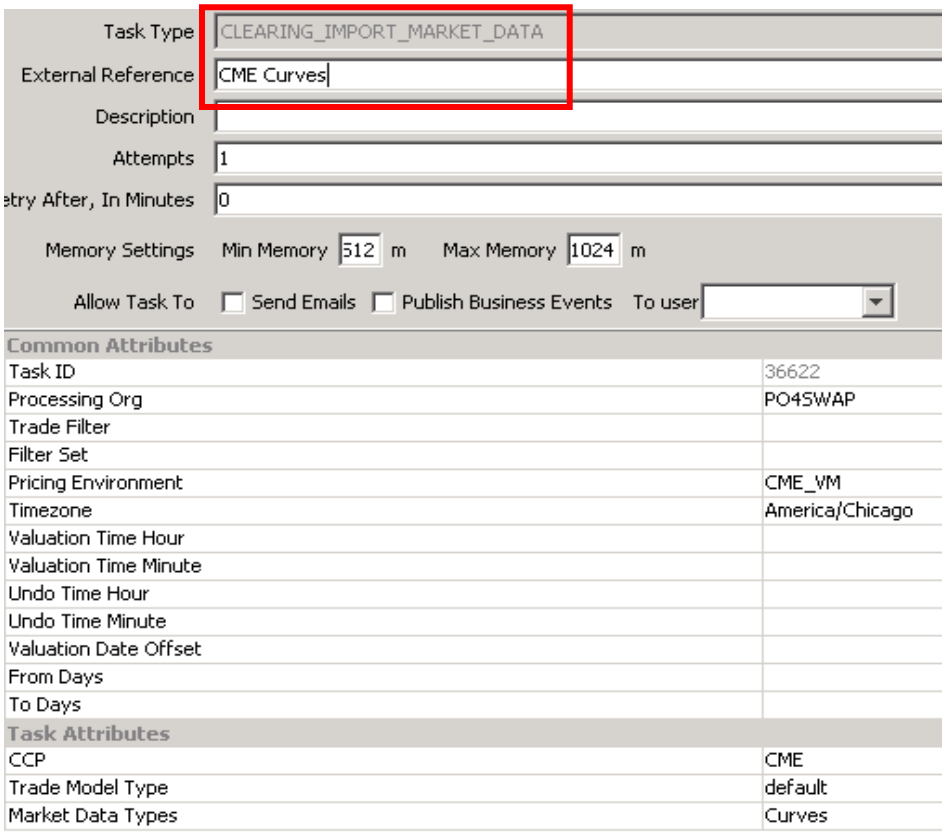
[NOTE: The performance can be improved by adding the value CLEARING_IMPORT_MARKET_DATA to the domain "Clearing.ParallelDownloadTasks". This allows the scheduled task CLEARING_IMPORT_MARKET_DATA to perform parallel download]

CME Example

Sample CME Curves

Once all the mappings are done for each currency/curve name for discount and forecast curves, you then run the CLEARING_IMPORT_MARKET_DATA scheduled task.

Note: There is not a discount curve for every currency, and in this case, the forecast curve is used for both discounting and forecasting.



Task Type	CLEARING_IMPORT_MARKET_DATA
External Reference	CME Curves
Description	
Attempts	1
etry After, In Minutes	0
Memory Settings	Min Memory 512 m Max Memory 1024 m
Allow Task To	Send Emails Publish Business Events To user
Common Attributes	
Task ID	36622
Processing Org	PO4SWAP
Trade Filter	
Filter Set	
Pricing Environment	CME_VM
Timezone	America/Chicago
Valuation Time Hour	
Valuation Time Minute	
Undo Time Hour	
Undo Time Minute	
Valuation Date Offset	
From Days	
To Days	
Task Attributes	
CCP	CME
Trade Model Type	default
Market Data Types	Curves

Sample CME QuotesIM

The CLEARING_IMPORT_MARKET_DATA scheduled task also imports the FX rates used by CME for IM replication. The data comes from the report “IRSMR3_yyyymmdd.csv”.

If the FX rate supplied on this report comes in nonstandard market quote convention, there is logic in the scheduled task to use the position pair reference as per each currency pair definition. For example, the report provides USD/JPY quotes, whereas the convention is JPY/USD quotes so the scheduled task will invert the quote in that case.

The configuration of the task requires the user to choose the QuotesIM attribute located under Market Data Types:

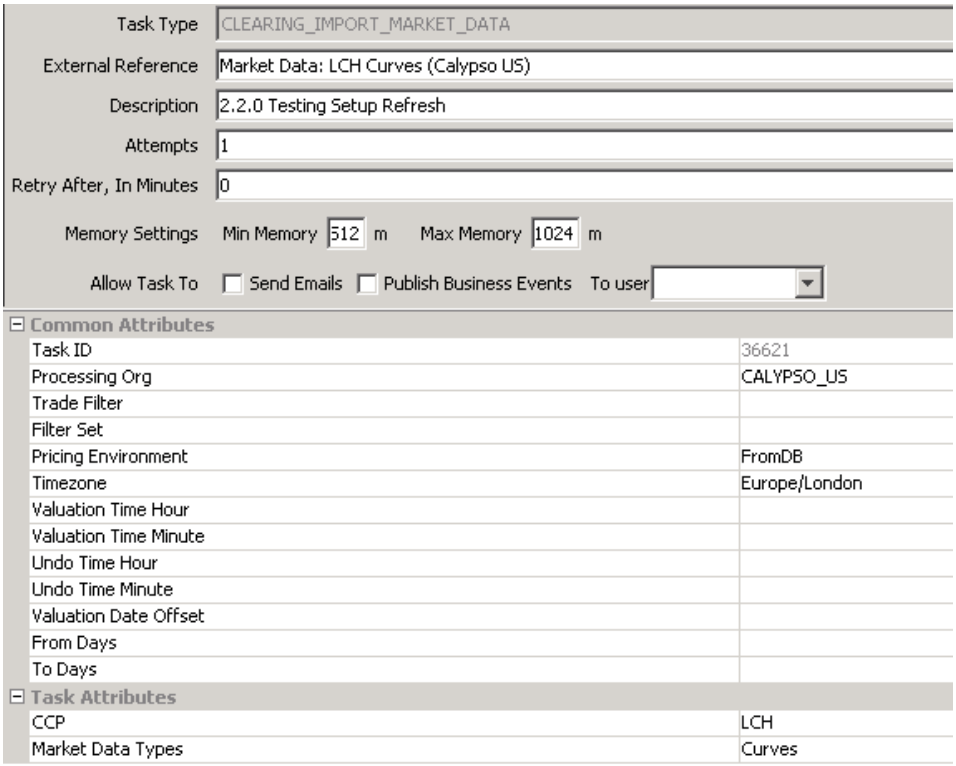
Task Attributes	
CCP	CME
Market Data Types	QuotesIM

By choosing this attribute, the task will look for the CME IRSMR3 report, and will save the FX rates as of the day before.

LCH Example

Sample LCH Curves

Once all the mappings are done for each curve name for discount and forecast curves, you then run the CLEARING_IMPORT_MARKET_DATA scheduled task.

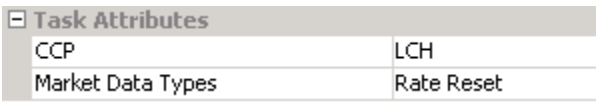


Sample LCH Rate Resets and FX Rates

The CLEARING_IMPORT_MARKET_DATA scheduled task also imports the FX rates used by LCH for IM estimation. The data comes from the report “REP00016c”.

If the FX rate supplied on this report comes in non-standard market quote convention, there is logic in the scheduled task to use the position pair reference as per each currency pair definition. For example, the report provides USD/JPY quotes, whereas the convention is JPY/USD quotes so the scheduled task will invert the quote in that case.

The configuration of the task requires the user to choose the Rate Reset attribute located under Market Data Types:



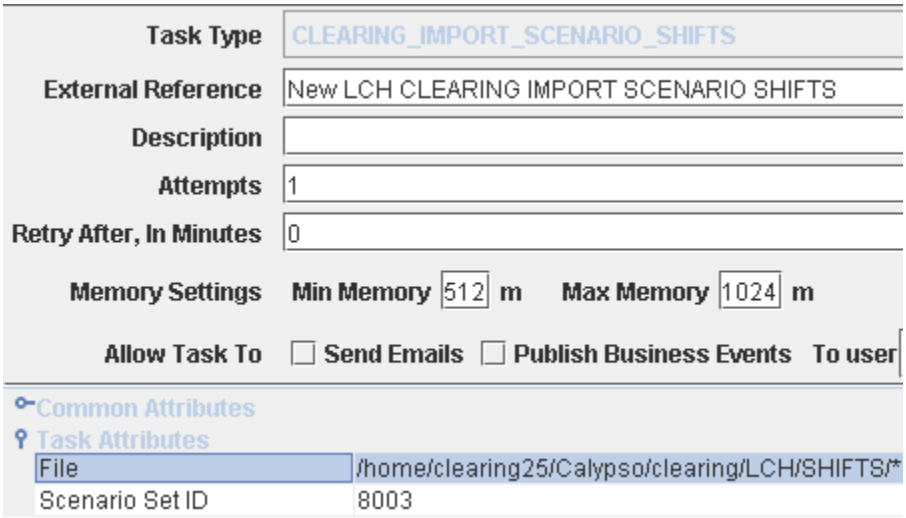
By choosing this attribute, the task will look for the REP00016c report, and will save the FX rates as of the day before.

2.6.3 CLEARING_IMPORT_SCENARIO_SHIFTS

This scheduled task is used to import curve shifting scenarios into ERS Risk. This is used for margin replication.

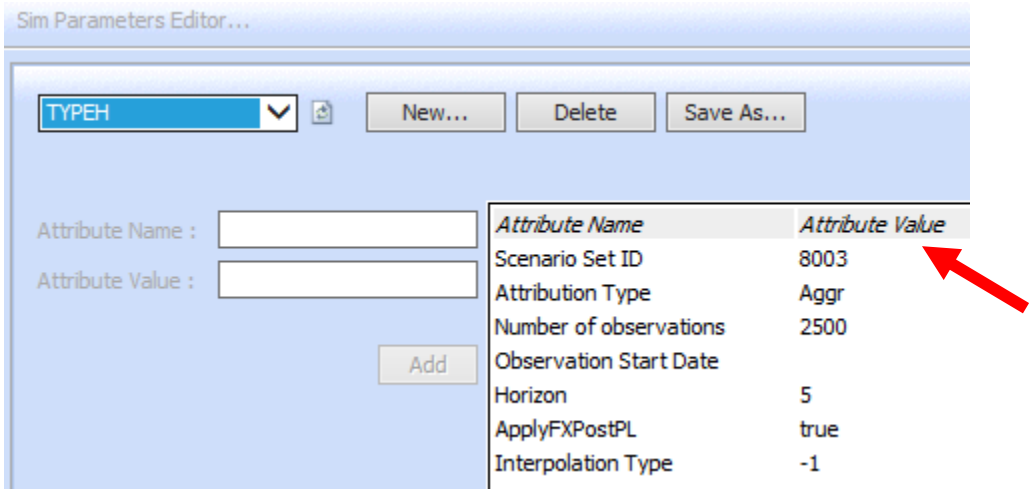
[NOTE: It is recommended to execute this schedule task every day as scenario shifts provided by CCPs are changing every day]

Example for LCH:



Attributes

- Select the file to be imported:
  - LCH - REP00090 – SwapClear Scenario Report
  - CME – Log Return
- Set the scenario set ID to the scenario defined in the parameters of the Sim analysis in ERS Risk.



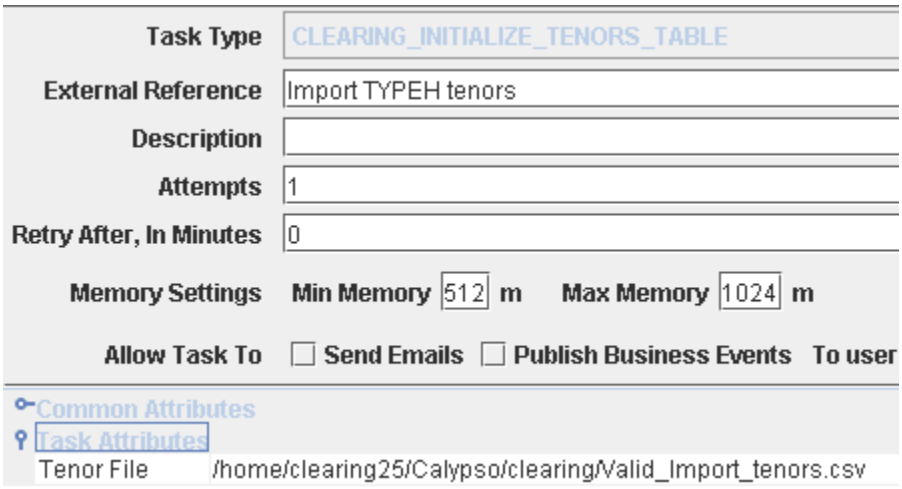
If the TYPEH_TENORS table is empty, the scheduled task fails. You need to run the scheduled task CLEARING_INITIALIZE_TENORS_TABLE to re-initialize the TYPEH_TENORS table. See below.

If the table exists and some tenors are missing, the scheduled task is successful, and a warning message reports the missing tenors in the table.

If the table exists and the file doesn't have data for all the tenors in the table, the scheduled task is successful, and a warning message reports the missing tenors in the file.

2.6.4 CLEARING_INITIALIZE_TENORS_TABLE

This scheduled task should be run when the scheduled task CLEARING_IMPORT_SCENARIO_SHIFTS fails.



This scheduled task populates the table TYPEH_TENORS with valid tenors only.

Example:

CCY	INDEX	TENOR
AUD	BBSW	O/N
AUD	BBSW	1W
AUD	BBSW	1M

2.7 Margin OTC VM Calculator

The scheduled task MARGIN_OTC_VM_CALCULATOR can be used to:

- Store the initial margin results from HistSimMargin as P&L marks for the Collateral Exposure trades
- Compute the variation margin as P&L marks on the Collateral Exposure trades

This scheduled task can only be used with HistSimMargin.

The IM is computed at the margin account level.

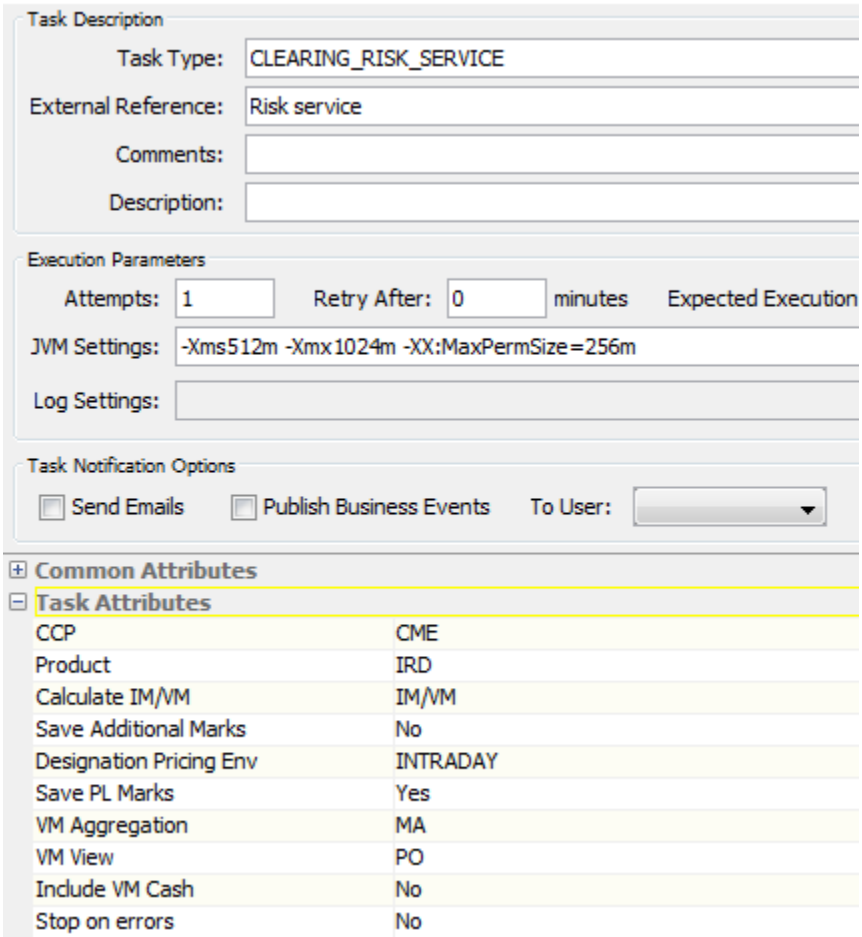
The VM can be computed at the following levels:

- Margin Account (at a CCP) – The margin account is mapped to a Margin Call Contract attribute (ACCOUNT_NAME), a Collateral Exposure trade attribute (IM_PORTFOLIO_NAME), and an ERS Hierarchy node – They must all have the same value.
- Position Account (at a CCP) – The position account is mapped to a Margin Call Contract attribute (CCP_REFERENCE), a Collateral Exposure trade attribute (CCPAccountReference), and an ERS Hierarchy node - They must all have the same value.

The trade attribute IM_PORTFOLIO_NAME can be automatically set on the trades by the workflow rule UpdateIMPortfolioName. It creates the trade attribute as "<Produc tFamily>@<CCP>@<CCPClearingBroker>", and verifies that it exists in the domain "MarginAccount". The rule can be set on any action in the trade workflow as needed.

The trade attribute must be populated manually otherwise.

The scheduled task requires funding rates to compute PAI.



Common Attributes

- Trade Filter: Select the trade filter.

Task Attributes

- CCP: Select the CCP.
- Product: Select the product type.
- Calculate IM/VM: Select IM, VM, or IM/VM for both.
- Save Additional Marks: Select Yes to save additional PL Marks for NPV and DELTA, or No otherwise.
- Designation Pricing Env: Select the pricing environment used to calculate the marks.
- Save PL Marks: Select Yes to save the PL marks, or No otherwise.
- VM Aggregation: Select the aggregation level for the VM: MA for margin account or PA for position account.
- VM View: Select the direction of the VM: from PO or from Counterparty.
- Include VM Cash: Select Yes to include VM_CAH in VM_EXPOSURE, or No otherwise.
- Stop on errors: Select Yes to stop when an error is encountered, or No to continue.

If the scheduled task is run for valuation date = T, it uses a HistSimMargin output with valuation date = T, and PL Marks are stored with valuation date = T.

The scheduled task creates the following PL Marks:

- VM
- VM_VASH
- VM_EXPOSURE
- NPV_ADJ
- IM_EXPOSURE
- MARGIN_CALL = IM_EXPOSURE for IM Collateral Exposure trades, or VM_EXPOSURE for VM_EXPOSURE trades
- PAI
- Additional measures: NPV and DELTA

They can be used to price the Collateral Exposure trades using “PricerFromDB”, provided they are also defined as pricer measures.

Variation Margin

T+1 currencies:

- NPV_ADJ(T)=NPV(T)-Cash(T+1)
- VM(T)=NPV_Adj(T)-NPV_Adj(T-1)

- VM_CASH(T) = CASH(T) – PreviousDayVMCash + CASH(T+1)
- VM_EXPOSURE(T) = VM_CASH(T) + VM(T) + PAI(T)

T+2 currencies:

- NPV_ADJ (T)=NPV(T)-Cash(T+1)-Cash(T+2)
- VM (T)=NPV_Adj(T)-NPV_Adj(T-1)
- VM_CASH(T) = CASH(T) – PreviousDayVMCash +Cash (T+2)
- VM_EXPOSURE(T) = VM_CASH(T) + VM(T) + PAI(T)

GBP FRAs:

- NPV_ADJ(T)=NPV(T)
- VM (T)=NPV_Adj(T)-NPV_Adj(T-1)

2.8 Scheduled Tasks Execution

The scheduled tasks are executed by the Calypso Scheduler once you have defined triggers as described in the Calypso Scheduled Tasks User Guide.

Important Note – Timezones Considerations

In order to successfully process scheduled tasks which combine the import and processing of EOD files, **you need to run the relevant scheduled tasks for a given day before the EOD of the books where the trades are saved**, based on the book's timezone.

For example, the book's timezone is New York EOD 5pm. To process today's files, you need to run the scheduled tasks before 5pm New York time, regardless of where you run the scheduled tasks from, so that the trades are timestamped as of today, and the settlement date is computed from today.

Sample Process

3.1 Running the Servers

The following servers need to be running. They are located under `<calypso home>/deploy-local/<environment>/`.

Step 1 - Start the Data Server.

Step 2 - Start the Data Grid Nodes using "`dataGridNode.bat\.sh`".

Step 3 - Start the Dispatcher for the configuration specified in the data grid config using "`dispatcher.bat\.sh`".

Once the Dispatcher Monitor is up, select the configuration and click **Start**.

Step 4 - Start the Data Grid Enabled Calculator using "`dataGridEnablesCalculator.bat\.sh`".

It should appear in the Dispatcher Monitor.

Step 5 - Start the ERS Server using "`ersRiskServer.bat\.sh`".

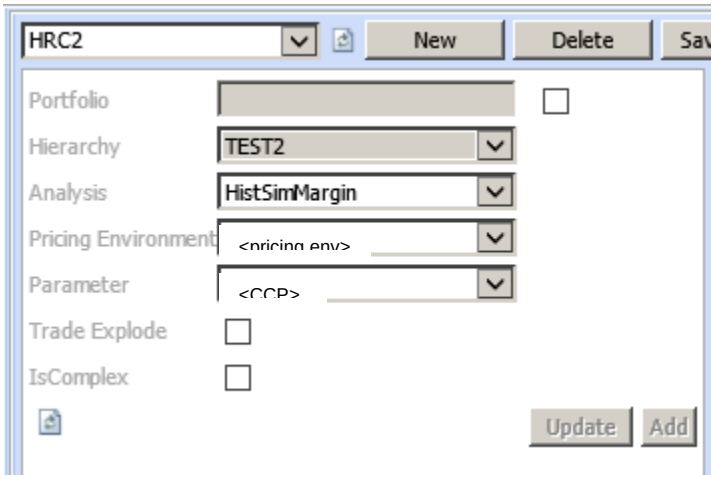
Step 6 - Start the Calypso Scheduler.

3.2 Running HistSimAnalysis at EOD

3.2.1 Create a Batch Configuration

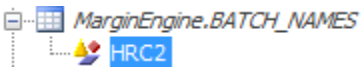
Configure a batch process for each market hierarchy using **ERS Risk > admin > Batch Editor**.

Sample Batch



Add the batch names as values to the domain “MarginEngine.BATCH_NAMES”.

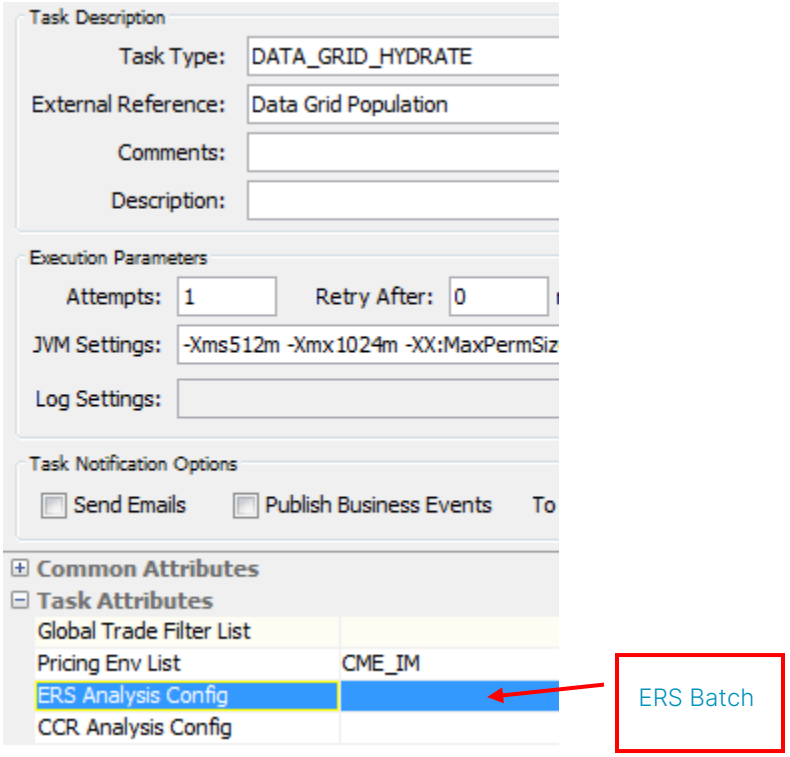
Example:



3.2.2 Populating the Data Grid

From the Calypso Navigator, navigate to **Configuration > Scheduled Tasks** (menu action scheduling.ScheduledTaskListWindow) to configure the scheduled task.

Click **New Task** and select the DATA_GRID_HYDRATE task type.



» Enter a trade filter - It must be the same as the trade filter selected in the CCR analysis configuration.

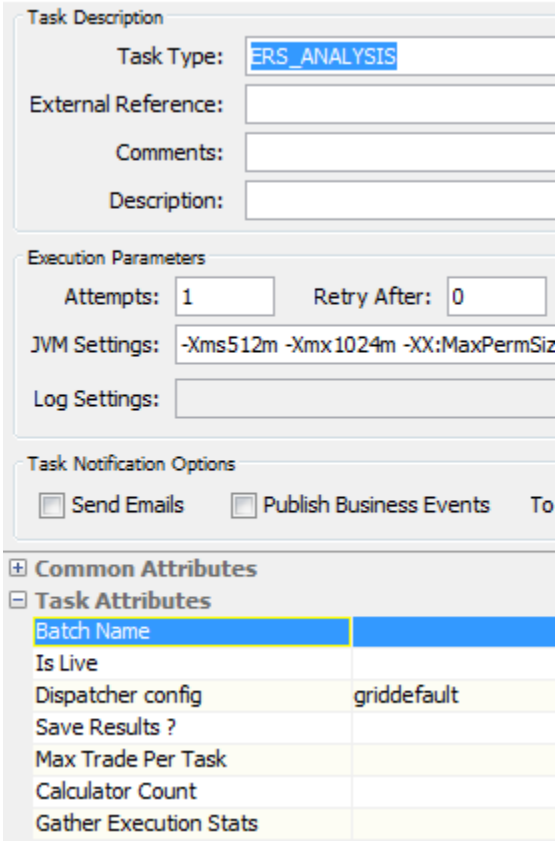
» Enter a pricing environment - It must be the same as the pricing environment selected in the CCR analysis configuration.

» Enter the ERS Batch for which you want to use a data grid.

The CCR Analysis Config attribute does not apply to ERS.

3.2.3 Running HistSimMargin Analysis

Execute the scheduled task ERS_ANALYSIS for each batch previously created:



- Batch Name – Select the ERS Batch to run. It should be the same ERS batch specified in the DATA_GRID_HYDRATE scheduled task.
- Is Live – to be set to False
- Dispatcher config – Select the dispatcher configuration to use.
- Save Results? – True or false. Set to true to save the analysis results to the database.
- If set to false or not set, you can save the results to the database using the scheduled task ERS_SAVE_RESULTS (described below). Optional.
- Max Trade Per Task – For optimization, you can restrict the maximum number of trades that each calculator will process at a time. Optional.
- Calculator Count – For optimization, you can enter the number of calculators. Optional.
- Gather Execution Stats – True of false. Set to true to gather job execution statistics. Optional.

[NOTE: Make sure to set the timezone in the scheduled tasks – It is mandatory]

3.3 Initializing the Limit Check/What-if IM Process

At the start of day, a number of scheduled tasks need to be executed in the following order, to initialize the Limit Check process:

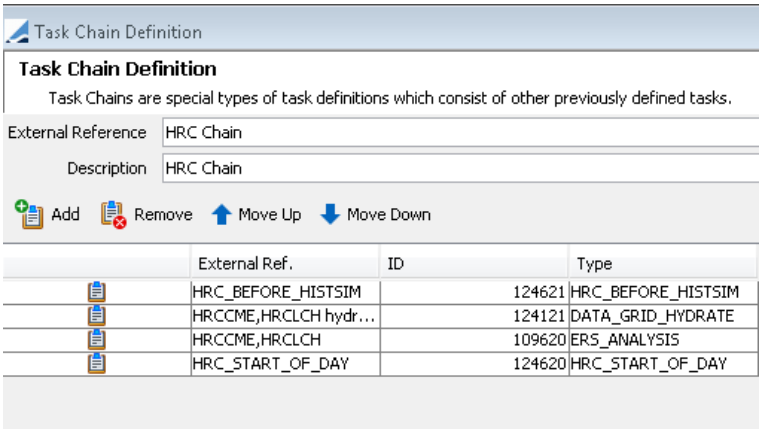
- HRC_CLEAR_NPV – Initialization of cumulative NPV for all portfolios.
- HRC_COLLATERAL_INITIALIZATION – Initialization of collateral amounts.
- HRC_NODE_INITIALIZATION – Initialization of Limit Check results.

You can also use the scheduled task HRC_START_OF_DAY with everything set to true to initialize the process.

You can also use the scheduled task HRC_BEFORE_HISTSIM to initialize headroom statistics or to catch up intraday market data changes in order to update all statistics based on latest market data.

The scheduled task HRC_BEFORE_HISTSIM does not have any attributes.

And if you want to refresh the ERS batch and restart the Margin Engine components, you can run a scheduled task chain like below.



3.4 Starting the Limit Check Process/What-if IM Process

Start the following servers:

- Risk Messaging Server using "`riskMessagingServer.bat\.sh`" (this server must be started first) – It creates in-memory trades for the imported trades.
- Margin Engine OTC Cleared using "`marginEngineOtcCleared.bat\.sh`" – It takes trades routed by the Trade VaR Server and the Margin Controller engine and computes incremental VaR.
- Engine Server– It starts the Margin Controller engine that routes the collateral and limit changes to the Trade VaR process, and starts the Update Manager engine that routes the trades and limit changes to the Margin Controller.

3.4.1 Limit Check Monitor

You can add a menu item for the Limit Check Monitor to view the results of the Limit Check (menu action `hc.apps.monitor.HeadroomCheckMonitor`).

If “IM Exposure – Collateral” <= Limit

=> The trade is accepted

If “IM Exposure – Collateral” > Limit

=> The trade is rejected

In addition, limits are also checked at the trade pair level:

- If both trades of a trade pair are accepted, both trades are accepted
- If any trade of the trade pair is rejected, both trades are rejected

When a new trade is accepted or rejected, the external ref is the CCPTradeID saved in trade keywords.

Trade Id	TRADE_KEYWORD.CCPTradeID	Product Description	Trade Date	Trade Settle Date	E
343457	LCH00005189650	wap/07/15/2038/P:GBP/LIBOR/6M /R:GBP 5.50000	Jul 15, 2013 05:00 AM	07/15/2013	Jul 15

3.4.2 Trade Blotter

You can right-click a trade in the Trade Blotter and choose “Headroom Check Results” to view Limit Check information:

Headroom Check Trade Blotter Window

Trade Blotter

Trade Id	Client	Account	Status	Limit Type	Currency	Limit Util	Limit Util (%)	IM (End)	IM (Start)	Collateral	Date	Headroom Limit
44936	Client1	-	Rejected	Headroom	USD	24,612,678.23	-146.13%	387,321.77	387,321.77	15,000,000.00	04/23/2014 04:08:00 AM	10,000,000.00
44936	Client1	-	Rejected	Total IM	USD	14,612,678.23		387,321.77	387,321.77	15,000,000.00	04/23/2014 04:08:00 AM	10,000,000.00

The Limit Check popup window shows the following information:

- Time of Check
- Start initial margin (at the time of the check)
- Initial margin including the new submitted trade
- Trade NPV (if applicable)
- Initial margin Limit (at the time of check)
- Limit (at the time of check)
- Collateral value (at the time of check)
- Utilization
- Limit Utilization
- STATUS of limit check

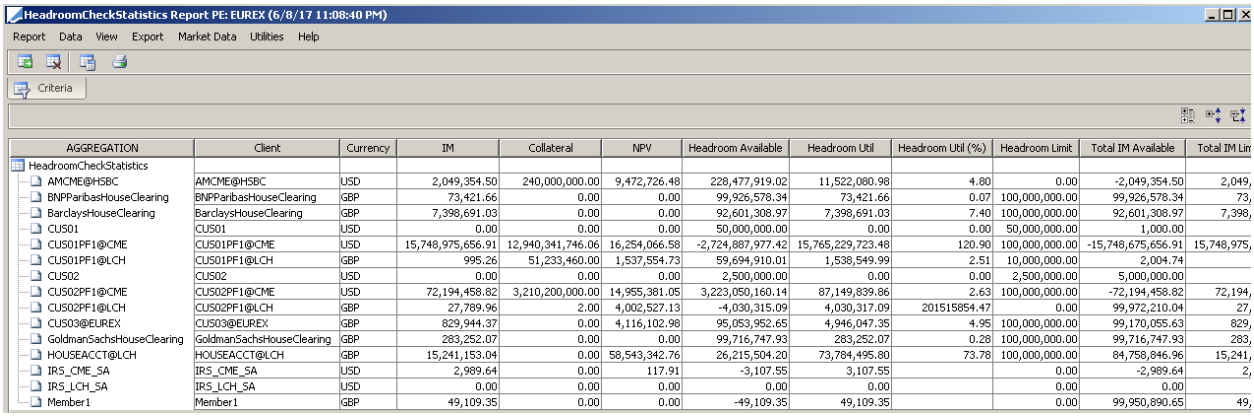
- Corresponding trade in the pair (if applicable)

Limit Utilization is defined as follows:

HRC Utilization = Total IM
HRC Utilization % = Total IM / (Total Collateral+ Limit)
For Headroom Limit, it translates into:
HRC Utilization = Total IM – Total Collateral
HRC Utilization % = Total IM / (Total Collateral+ Limit), limit can be 0.
For IM Limit, it translates into:
HRC Utilization = Total IM
HRC Utilization % = Total IM /Limit (total Collateral = 0)

3.4.3 Headroom Statistics Report

This report displays the intraday IM Exposure and Collateral position:


HeadroomCheckStatistics Report PE: EUREX (6/8/17 11:08:40 PM)

Report Data View Export Market Data Utilities Help

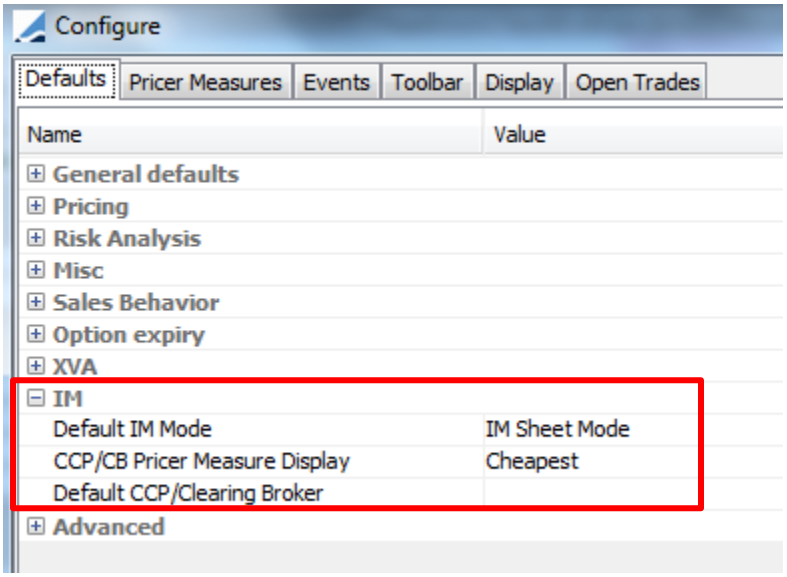
Criteria

AGGREGATION	Client	Currency	IM	Collateral	NPV	Headroom Available	Headroom Util	Headroom Util (%)	Headroom Limit	Total IM Available	Total IM Lim
HeadroomCheckStatistics											
AMCME@HSBC	AMCME@HSBC	USD	2,049,354.50	240,000,000.00	9,472,726.48	228,477,919.02	11,522,080.98	4.80	0.00	-2,049,354.50	2,049,
BNPParibasHouseClearing	BNPParibasHouseClearing	GBP	73,421.66	0.00	0.00	99,926,578.34	73,421.66	0.07	100,000,000.00	99,926,578.34	73,
BarclaysHouseClearing	BarclaysHouseClearing	GBP	7,398,691.03	0.00	0.00	92,601,308.97	7,398,691.03	7.40	100,000,000.00	92,601,308.97	7,398,
CUS01	CUS01	USD	0.00	0.00	0.00	50,000,000.00	0.00	0.00	50,000,000.00	1,000.00	
CUS01PF1@CME	CUS01PF1@CME	USD	15,748,975,656.91	12,940,341,746.06	16,254,066.58	-2,724,887,977.42	15,765,229,723.48	120.90	100,000,000.00	-15,748,675,656.91	15,748,975,
CUS01PF1@LCH	CUS01PF1@LCH	GBP	995.26	51,233,460.00	1,537,554.73	59,694,910.01	1,538,549.99	2.51	10,000,000.00	2,004.74	
CUS02	CUS02	USD	0.00	0.00	0.00	2,500,000.00	0.00	0.00	2,500,000.00	5,000,000.00	
CUS02PF1@CME	CUS02PF1@CME	USD	72,194,458.82	3,210,200,000.00	14,955,381.05	3,223,050,160.14	87,149,839.86	2.63	100,000,000.00	-72,194,458.82	72,194,
CUS02PF1@LCH	CUS02PF1@LCH	GBP	27,789.96	2.00	4,002,527.13	-4,030,315.09	4,030,317.09	201515854.47	0.00	99,972,210.04	27,
CUS03@EUREX	CUS03@EUREX	GBP	829,944.37	0.00	4,116,102.98	95,053,952.65	4,946,047.35	4.95	100,000,000.00	99,170,055.63	829,
GoldmanSachsHouseClearing	GoldmanSachsHouseClearing	GBP	283,252.07	0.00	0.00	99,716,747.93	283,252.07	0.28	100,000,000.00	99,716,747.93	283,
HOUSEACCT@LCH	HOUSEACCT@LCH	GBP	15,241,153.04	0.00	58,543,342.76	26,215,504.20	73,784,495.80	73.78	100,000,000.00	84,758,846.96	15,241,
IRS_CME_SA	IRS_CME_SA	USD	2,989.64	0.00	117.91	-3,107.55	3,107.55		0.00	-2,989.64	2,
IRS_LCH_SA	IRS_LCH_SA	USD	0.00	0.00	0.00	0.00	0.00		0.00	0.00	
Member1	Member1	GBP	49,109.35	0.00	0.00	-49,109.35	49,109.35		0.00	99,950,890.65	49,

Capturing What-If Trades

Bring up the Pricing Sheet and configure the following User Preferences.

In the Defaults panel, set the following parameters:



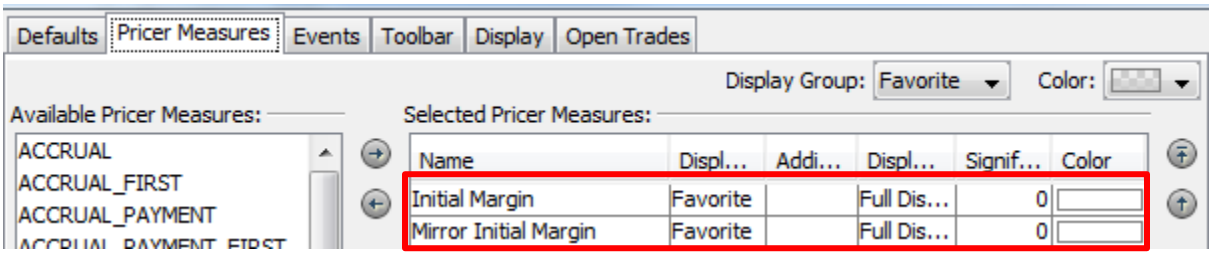
Default IM Mode - Select "IM Sheet Mode" or IM Strategy Mode". Sheet mode calculates incremental IM for all strategies on the active sheet collectively. Strategy mode calculates incremental IM for all strategies independently.

CCP/CB Pricer Measure Display – Select “Cheapest” or “Default”. Cheapest provides the cheapest IM across all available brokers. Default provides the IM for the selected Default CCP/Clearing Broker.

The CCPs and Clearing Brokers are retrieved from the portfolios loaded into the batch names specified in the domain “MarginEngine.BATCH_NAMES”.

Default CCP/Clearing Broker – Select the default CCP or Clearing Broker.

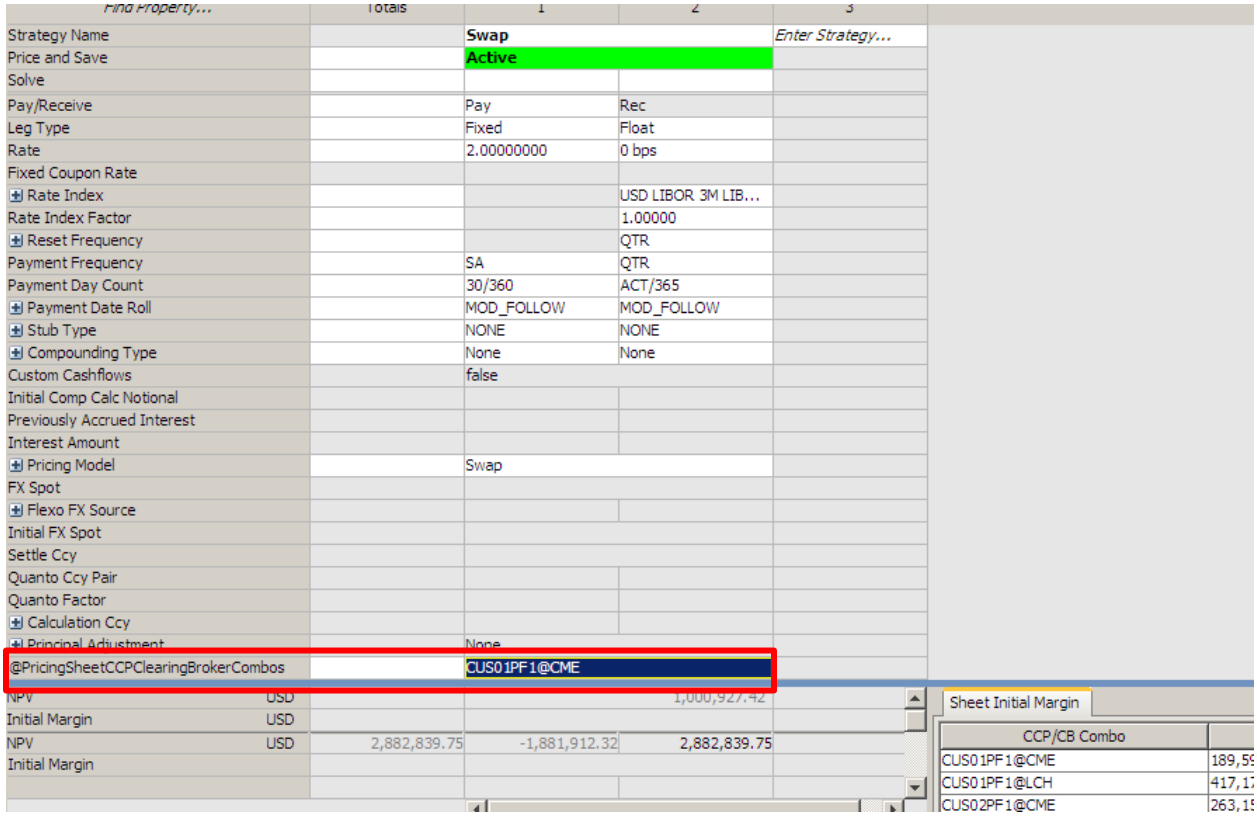
In the Pricer Measures panel, select the following pricer measures as needed:



Initial Margin – To display the initial margin for “regular” trades

Mirror Initial Margin – To display the initial margin for mirror trades, if any.

Capture a trade:



Select **Price & Calc IM** to compute the initial margin.

Results are displayed in Margin Currency if all accounts share the same Margin Currency, or Base Currency otherwise.

If one trade in a set of trades being processed by the Margin Engine fails to compute TradeVaR, the whole set is rejected.

3.5 What If API

API to call synchronous What If calculation:

MarginEngineClient.get().calculateWhatIf(trades, portfolioNames, timeout).

Request

```
/**
 * A What If Request. It contains a Collection of trade for one portfolio.
 */
public interface WhatIfRequest extends Serializable {
        /**
         * @return the portfolio this request is for
         */
```

```
        public String getPortfolio();
        /**
         * @return the Trades to be posted for this WhatIfRequest
         */
        public Collection<Trade> getTrades();
}
```

Response will be a WhatIfOTCMessage

```
public interface WhatIfOTCMessage extends Serializable{
  /**
   * @return the portfolioName requested in the What If Request
   */
  public String getPortfolio();
  /**
   * @return the Previous IM for the given portfolio
   */
  public double getPreviousIM();
  /**
   * @return the Trade IM for the given portfolio
   */
  public double getTradeIM();
  /**
   * @return the IM Currency for the given portfolio
   */
  public String getIMCurrency();
  /**
   * @return the Margin Result Tree for the given portfolio
   */
  public MarginResultTree getInitialMargin();
  /**
   * @return the Rejection for the given portfolio
   */
  public HeadroomCheckRejection getHeadroomCheckRejection();
}
```