# SMART Java Desktop User Guide

5.8.0

07th Feb 2017

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# 1 Executive Summary

The purpose of the SwapClear Margin Approximation Risk Tool (SMART) is to allow members and clients of LCH. ("LCH") SwapClear and Listed service to assess the impact of simulated trades on their Initial Margin Requirements and also to estimate and analyse their Initial Margin, and Initial Margin Addons. The tool also allows users to estimate the results of portfolio margining.

The tool makes it easy to load current portfolios from SwapClear and Listed reports and to input user-defined individual trades and trade portfolios. SMART performs the automatic calculation of sensitivities from user defined trades and portfolios for SwapClear, and also allows the input of user-defined sensitivity profiles. The tool is designed for ease of use and is well suited for running what-if scenarios before submitting trades for clearing.

The user of the tool can specify whether they would like to analyse the "original portfolio", as read from reports, or the additional trades, or the combination of the original portfolio and the additional trades. For SwapClear, the user can also specify which user-defined trades and user sensitivity profiles should be included in the "additional trades". This flexibility makes it easy to analyse what-if scenarios.

SMART runs in both Member and Client modes.

The tool is implemented as a Java desktop application that utilised the SMART API. The front-end works by referencing a number of SwapClear and Listed reports, available daily from LCH.. The reports can be downloaded by the user *(this is typically done by a single admin user within each member firm)* and stored on the local network, where the tool can read them. Alternatively, an option is available to download the market data reports only from the LCH. website.

For SwapClear, SMART can be run for either the SwapClear Global Clearing service or SwapClear US-Domiciled Clearing service depending on which set of reports is chosen. The end-user can choose either service based on its current cleared portfolios and/or based on its requirement as needed.

## 1.1 Related Documents

The following related documents can be found on the LCH. secure website in the Risk Management directory:

| Document Description |
| --- |
| PAIRS V5.0 |
| SwapClear Risk Analytics v 1.2 |
| Liquidity Margin |
| LCH Risk Monitoring of Basis Risk Inc OIS V4 |
| Basis Risk Addon_TIP_v2.2 |
| AddendumToPAIRS_V1.0 |

## 1.2 Change Log

### 1.2.1 Changes in 5.8.0.24 Release Feb 2017

- FPML processing : Bug Fixes to display of trades and issues related to reload.
- Liquidity Add-on column removed from estimated IM table
- Make VNS steps re-editable for regular (non-FPML) VNS trades
- Fixed Curve assignment to include the NOK index OIBOR (curvemap.csv)
- VNS eligibility extended to include CHF,CZK,DKK,HKD,HUF,MXN,NZD,SGD,ZAR (eligibility.csv)

### 1.2.2 Changes in 5.8.0.15 Release Nov 2016

- Provide ability to import FPML trades into desktop
- Fix to support the new name for MXN regulatory body in REP0003

### 1.2.3 Changes in 5.7.6 Release Sept 2016

- Introduction of NOK-NIBOR-OIBOR index (to initially run in tandem, with the NOK-NIBOR-NIBR equivalent)
- VNS support extended for NOK, PLN, SEK
- Eligibilty changes for  DKK, NOK,PLN

### 1.2.4 Changes in 5.7.5 Release Aug 2016

- Support for the new Listed Rates Exchange LDM for Listed Rates and Spider
- The ability to calculate unscaled VAR add-on for Listed Rates and included this in Portfolio Balancing for Spider
- VNS support extended for JPY, CAD and AUD

### 1.2.5 Changes in 5.6.0 Release Nov 2015

- The ability to calculate margin and add-ons (liquidity margin) for Listed Rates
- Revised add-ons for SwapClear
- The ability to run portfolio margining using EOD reports and:
  - View resulting margin and add-ons post portfolio margining
  - View transferred futures
- Manually simulate a portfolio of swaps and futures for the purposes of portfolio margining
- SMART001.dat file, REP00090, REP00X90Spread, and REP00X90Tenor has been enhanced with additional information

Note that SMART will not replicate the portfolio margining results obtained because SMART works on EOD SwapClear reports, whereas the Portfolio Balancer uses a snapshot of the SwapClear portfolio at approximately 5pm EST.

### 1.2.6 Changes in 5.4.1 Release Oct 2014

- SMART has now been extended to support the product/curve extensions
- Supports the new Delta based IMMFP implementation
- Provides ability to load the new client trade report SMART0003C/CL
- Changes to the eligibility as per changes in Swap Clear.
- Valuation fixes for FRA, Basis Swaps and Compounding Swaps
- Basis Risk threshold reduced from 10M to 3M GBP
- MXN is now included for Basis Risk calculations
- Ability to explicitly specify EOM convention of 28$^{th}$ and 29$^{th}$ in GUI and API
- Ability to specify known amount as a alternative to fixed rate in the API and trade csv.
- SMART GUI displays the 50Y ultra long Add On in Liquidity Detail as per the new IMMFP methodology

### 1.2.7 Changes in 5.4.0 Release Jun 2014

- SMART has now been extended to support the product/curve extensions
- Support for MXN Swaps

### 1.2.8 Changes in 5.3.1 Release Feb 2014

- SMART has now been extended to handle zero coupon inflation swaps (ZCIIS)
- Additional reports have been included for inflation curves and seasonality
- Fixed the issue with incorrect sensitivity ladders for forward starting swaps
- Support for package FPML transactions

### 1.2.9 Changes in 5.3.0 Release July 2014

The 5.3.0 release of SMART is a mandatory upgrade which has the following enhancements:

- SMART now supports LIBOR OIS basis swaps (GBP LIBOR OIS Basis Swaps and USD FEDFUND LIBOR Basis Swaps) and JPY TONA OIS swaps
- IM sensitivity reports 102 Ois/Spread/Tenor are no longer available and SMART uses the Tenor sensitivity report 103 instead to calculate Basis Risk Add On
- Performance improvements
- Support for CAD 1M curve (when the curve gets added the VM space).

### 1.2.10 Changes in 5.2.1 Release July 2014

- SMART calculates the new Unscaled Add On to initial margin
- More details are available from the Liquidity Add On and Basis Risk Add On calculations
- Various usability improvements

### 1.2.11 Changes in 5.1.0 Release February 2013

The 5.1.0 release of SMART is a mandatory upgrade which has the following enhancements:

- SMART allows for the use of the Account column in various reports to contain segregated account information.
- The SMART API now supports FRA additional payments in trade FpML.
- Correction to bootstrapper to incorporate compounding swaps.
- SMART now matches Murex as in it discards CAD ois discounting risk included in the CAD hedge trade ladders.
- Correction to IMMFP bucketing to match hedge trade maturities and not the nearest from the par curve.

### 1.2.12 Changes in 5.0.4.0 Release December 2013

- Basis Risk implementation.
- SMART reporting generated for clients and funds to load prexisting positions (SMART002c.dat and SMART002f.dat and 102cl and 102cf)
- Trades with front AND back stubs accepted through the FpML interface.

### 1.2.13 Changes in 5.0.3.0 Release September 2013

- Implement CAD OIS curves and CAD 3M forward curves
- CAD OIS Semi Annual Trade Eligibility
- Configuration update to allow the use of the new index SGD-SOR-VWAP
- Fix to bad data in the configuration file immThresholdsMultipliers5.0-us.csv
- Minor fix to the IMMFP calculation in some edge cases
- Corrected the units of Gamma on the Sensitivities tab
- Fixed issue with processing FpML trades where payment frequency is 1T and calculation period roll convention is set to value other than NONE

***Known Issues***

- Exporting the Estimated IM panel to Excel results in column headings showing the currency incorrectly in Excel
- Basis Risk is not supported for simulated and combined when sensitivities are input from the input sensitivity tab. The GUI will warn when sensitivities are input and shows N/A for simulation and combined.
- Basis Risk is not correct for combined when basis risk 102 reports (Ois, Tenor & Spread) are missing but 102 is present. GUI shows an incorrect number.

# 2 Getting Started

## 2.1 Obtaining SMART

- The SMART Desktop application can be downloaded from the LCH website. Please register for access to the folder SMART Tools and Analytics in the LCH Secure Area (https://secure-area.lch.com/secure_area/register.asp).

The download is in the form of a zip file that contains all the required components, including the Java runtime. To install SMART simply unpack the zip file to a folder on your local drive.

For the best user experience a high resolution screen (at least 1680 x 1050) is recommended.

## 2.2 Running SMART

The steps a user has to go though to get up and running are:

- If access to portfolio data is required, then download the reports from LCH. (see below).
- Start the SMART application by double-clicking on the `smart.bat` file in the SMART installation folder.
- If accessing reports previously downloaded, provide a path to the folder on the local network where the reports are stored – this is selected via the 'Select Reports' option on the 'Reports' menu at the top left corner of the application. Alternatively select the 'Download' option to automatically download reports from the LCH Website – this option excludes the portfolio sensitivity and Listed trade level data.

## 2.3 Download of Reports from LCH.

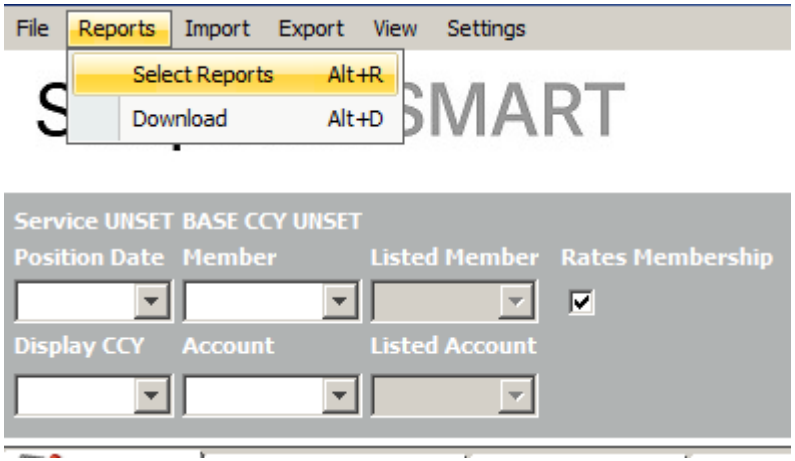
SMART requires access to multiple SwapClear and Listed End of day reports.

Please see the appendix 9.1.1 for a complete list of required reports.

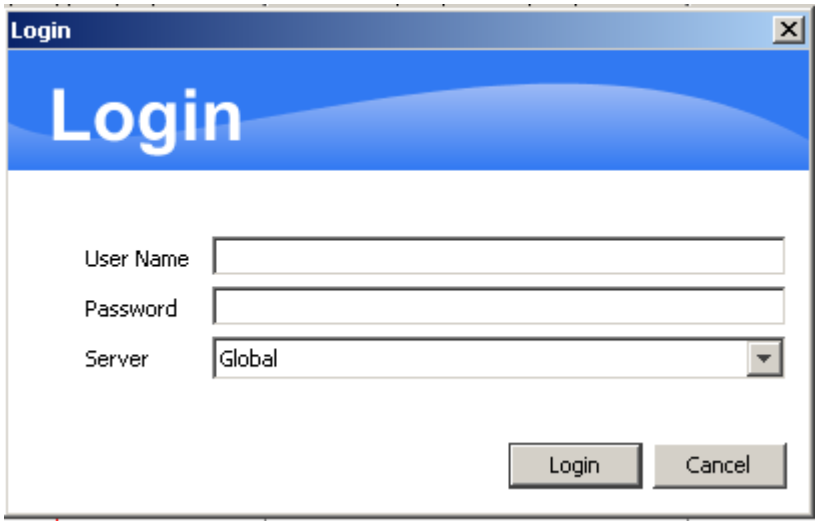
## 2.4 Update of the path to the report directory

When the user has started the application, the reports need to be loaded.

If the user has reports available in a local folder, the clicking the ‘Select Reports’ option from the Reports menu allows the user to specify the report location:




Alternatively, choosing the Download option will open up a dialog that prompts the user to enter their login credentials for the LCH. Secure Website.




The reports will be downloaded automatically and loaded by SMART. Note that this option excludes portfolio sensitivity and Listed positions data; hence the user must load their entire trade population to obtain correct IM estimates.

## 2.5 Available Views

There are three available views in the SMART tool. Each view can be accessed by clicking View from the top menu bar and selecting the desired view. A summary of available views include:

SwapClear View: allows users to estimate margin related to their OTC positions SMART Spider View: allows users to estimate the results of portfolio margining

Listed IM View: allows users to estimate margin related to Listed Rates positions

## 2.6 Add trades

To add simulation trades in the SwapClear view, users can use the New Trade form. The IM estimate is calculated and shown in the Summary panel at the top.

To add simulation trades in the SMART Spider view, users can simply click the cell under the “Simulator” column related to the contract they are looking to update in the view, and update it with the position accordingly. To update the portfolio margining results, simply click the “Run Balancer” button.

Similarly, to add simulation trades in the Listed IM view, users can simply click the cell under the “Simulated Position” column related to the contract they are looking to update in the view and update it with the position accordingly. To update the portfolio margining results, simply click the “Calculate IM” button.

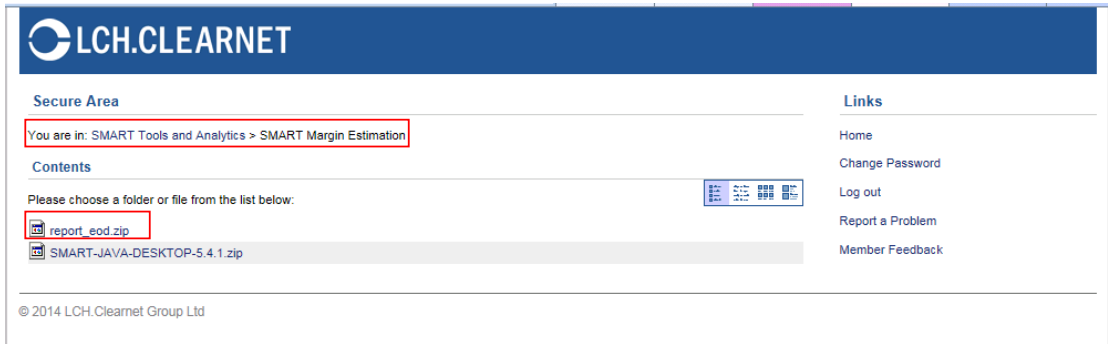
## 2.7 Downloading reports (all views)

The application allows reports to be downloaded automatically from the LCH. Secure Area. The download option does not include portfolio sensitivities or position files (Listed) hence the user must either manually enter the base portfolio sensitivity (see section 3.5 on how to do this) or upload their entire trade population into SMART via a local folder (see Section 2.7.1).

To download reports from the LCH. Secure Area choose the “Download” option from the Reports menu. The user will be prompted to enter their login details – please enter the email id, and password that you use to access the LCH. secure area. Note that multiple failed attempts to access the secure area will cause the user’s account to be locked; if the first attempt fails, please check access to the secure area using a regular Web Browser to ensure that the credentials are correct.

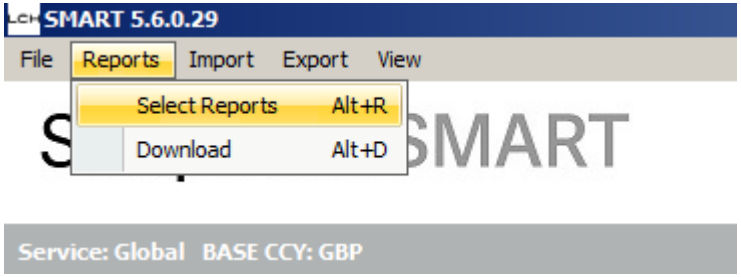
For the SwapClear Global Clearing Service, the user must have access to the following location in LCH. secure web site:

SMART Tools & Analytics




### 2.7.1 Loading Reports from Local Folder

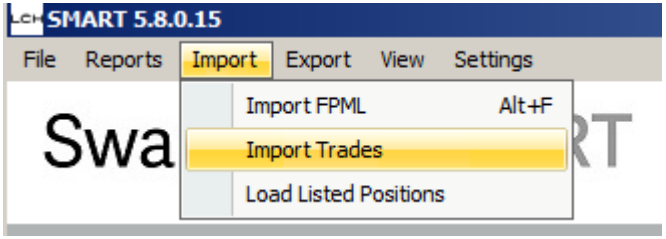
If the SwapClear and Listed End of Day reports are available in a local folder, then SMART can load the reports from that folder. The user must specify the folder to use by choosing "Select Reports" from the Reports menu. A File Open dialog is displayed that allows users to navigate to the local directory where the reports are located. Only directories are displayed in the dialog.




The folder must contain reports for a particular business date. SMART validates the business date across various reports and will fail to load the reports if this is inconsistent.

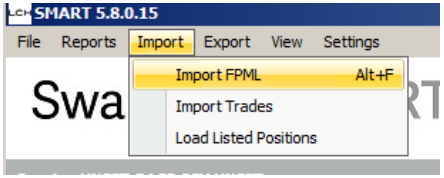
### 2.7.2 Load Trades from the Trade Report (SwapClear IM view only)

If an user then wishes to load the trades from the Swap Clear Trade Report then they may do so by choosing the option Import Trades under the import menu. These trade when successfully imported are presented in the Trade List Panel along with the other trades that were manually entered



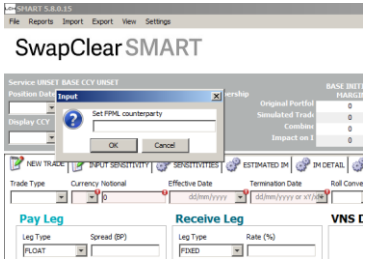

### 2.7.3 Load Trades from FPMLs

If an user wishes to import FPMLs then they may do so by choosing Import FPML user the import menu. The user would need to direct the application to a directory containing the FPMLs. All FPMLs would need to be valid FPML representations and would need to have a file extension of .xml otherwise they would not be considered.

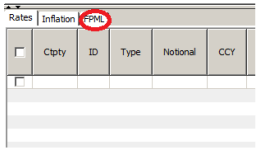



Prior to importing the FPMLs the user is expected to let the application know about the representation of the counterparty in the FPMLs. This can be done by invoking the menu item from Settings called set FPML Party


This brings up the dialog where the counterparty as specified in the FPML trade representation would need to be specified.




The imported FPMLs would be the available to view the Trade Display Panel under a tab named FPML.




### 2.7.4 SMART Spider Reports

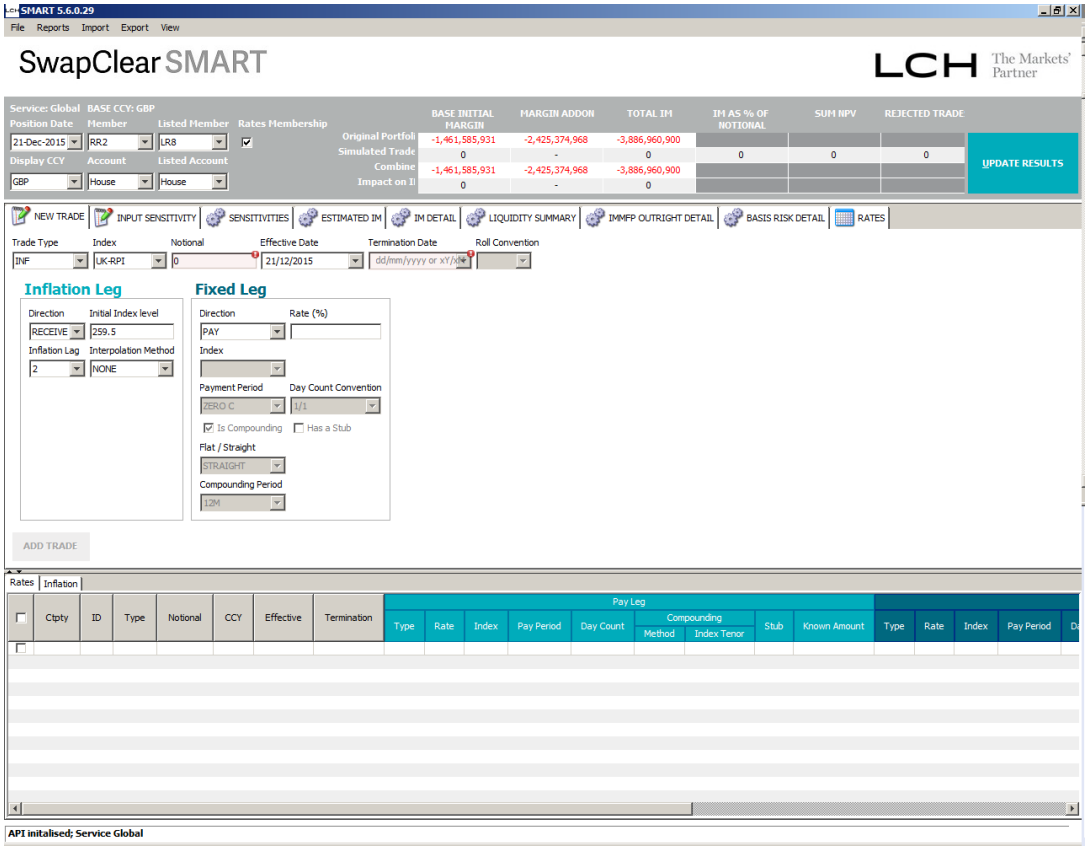
Note that SMART may not exactly replicate the portfolio margining results obtained because SMART works on EOD SwapClear reports, whereas Spider uses a snapshot of the SwapClear portfolio at approximately 5pm EST.

## 2.8 Export to Excel

An “Export to Excel” option is provided on the Export menu at the top left corner of the screen. This allows data from the current tab to be exported into an Excel document.

# 3 SwapClear IM View Operating Instructions

## 3.1 Overview



The **SMART** application has three major areas:

### 3.1.1 Top Area

The top area is made up of the Summary Panel. This panel allows the user to make global changes to the IM estimation, including the account for which an IM estimate is desired, etc.

Also displayed is a summary of the IM calculation. The Summary Panel is described further in section 3.2.

Please take note of the "Rates Membership" checkbox where once clicked Liquidity margin will be calculated across both OTC and Listed as it is calculated in the Rates Membership. As such, once checked, both positions in the selected Listed member and the selected SwapClear member will be taken into consideration in the Liquidity Add-On calculation. If left unchecked Listed positions will not be taken into consideration in the Liquidity Add On.

### 3.1.2 Middle area

The middle area consists of eight tabs:

- "New Trade" – described in section 3.3.
- "Input Sensitivity" described in section 3.5.
- "Sensitivities" described in section 3.6.
- "Estimated IM" – described in section 3.7.
- "IM Detail" – described in section section 3.8.
- "Liquidity Summary" – described in section 3.9.
- "IMMFP Outright Detail" – described in section section 3.10
- "Basis Risk Detail" – described in section 3.11.
- "Rates" – described in section 3.12.

### 3.1.3 Lower area

The lower area contains the Trade List Panel that displays the input trades that are participating in the IM estimation. The user can also edit trades, or paste trades into this area. The Trade List Panel is further described in section 3.4.

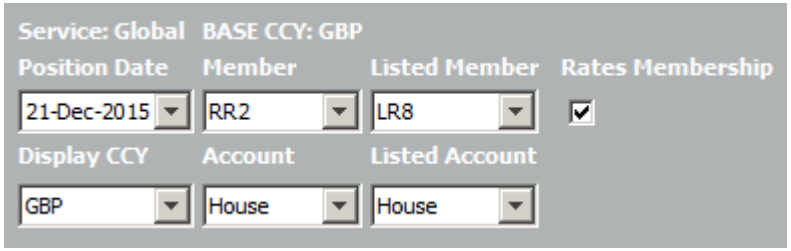
### 3.1.4 Spider Results

Note that SMART may not exactly replicate the portfolio margining results as SMART works on EOD SwapClear reports, whereas the Portfolio Balancer uses a snapshot of the SwapClear portfolio at approximately 5pm EST.

## 3.2 Top Area – Summary Panel

### 3.2.1 Summary Panel Control Data

The top left section of the summary panel contains the global settings that affect the IM estimation.




The “Position Date” displays the business date for which data is available. The business date is determined from the input reports.

The “Member” field displays the member mnemonic from report 102/102c and the Listed Rates Position file (Listed Member). If these reports are not available, this field will be blank.

The “Display Currency” field shows the currency in which the user wants to see the results of the IM estimation. The spot FX rate obtained from reports 16a, 16c or 18 is used to convert the values into the desired currency. The IM calculations are always done in BASE CCY – the Display Currency is used to convert the Initial Margin to the desired currency after the IM Calculations are completed.

The “Account” and “Listed Account” fields show the list of accounts available. This is further described below. Listed Accounts will only display when the Rates Membership box is checked. Refer to section 3.1.1 for behaviour of the Rates Membership checkbox.

### 3.2.2 Account

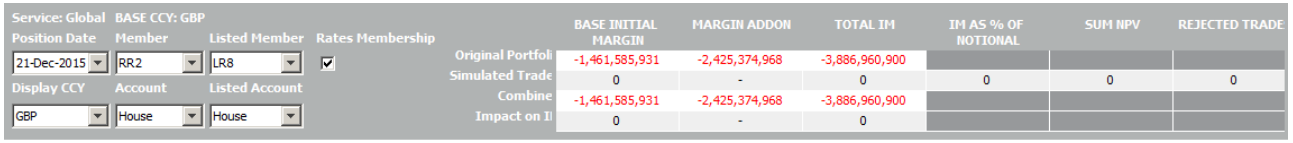
The available accounts and portfolio data vary depending upon the reports available. There is also a 102 for clients and fund managers – 102cl and 102cf. The semantics below though continues.

| Reports Availability | Behaviour |
|---|---|
| Both 102 and 102c present | The House, Client and individual client accounts are displayed.<br><br>If House account is used when calculating IM, the IM will be as per member mode.<br><br>If Client account is used, the result will be in IM in client mode but without a base portfolio.<br><br>If an individual client account is used when calculating IM, the IM will be in Client mode – base portfolio data is included. |
| Only 102 is present | The House and Client accounts are displayed.<br><br>Using House account in IM calculation will trigger member mode IM - base portfolio in report 102 will be included.<br><br>Choosing Client account in IM calculation will trigger Client mode IM - base portfolio will not be available. |
| Only 102c is present | The Client and individual client accounts are displayed.<br><br>The IM will be in client mode when any of the accounts is used.<br><br>If the Client account is used when calculating IM, it will mean Client mode IM without base portfolio. This |

| | |
|---|---|
| | option is meant to be used for new/unknown clients. |
| Neither 102 nor 102c present | The Client and House accounts are displayed.<br><br>There will not be a base portfolio for either account.<br><br>If Client account is used in the IM calculation then the IM will be in Client mode – no base portfolio.<br><br>If House account is used in the IM calculation then the IM will be in house mode – no base portfolio. |
| Listed Position Statement Report is present | All Listed accounts are displayed (includes all relevant House and Client accounts) |
| Listed Position Statement Report is not present | No Listed accounts will be displayed or be used in the liquidity Add On calculation |

### 3.2.3 Summary Panel IM Estimate

The summary panel shows the estimated IM values in a table to the right of the control data.




The “Original Portfolio” row shows the Initial Margin and IM Addons for the base portfolio provided in reports 102 or 102c.

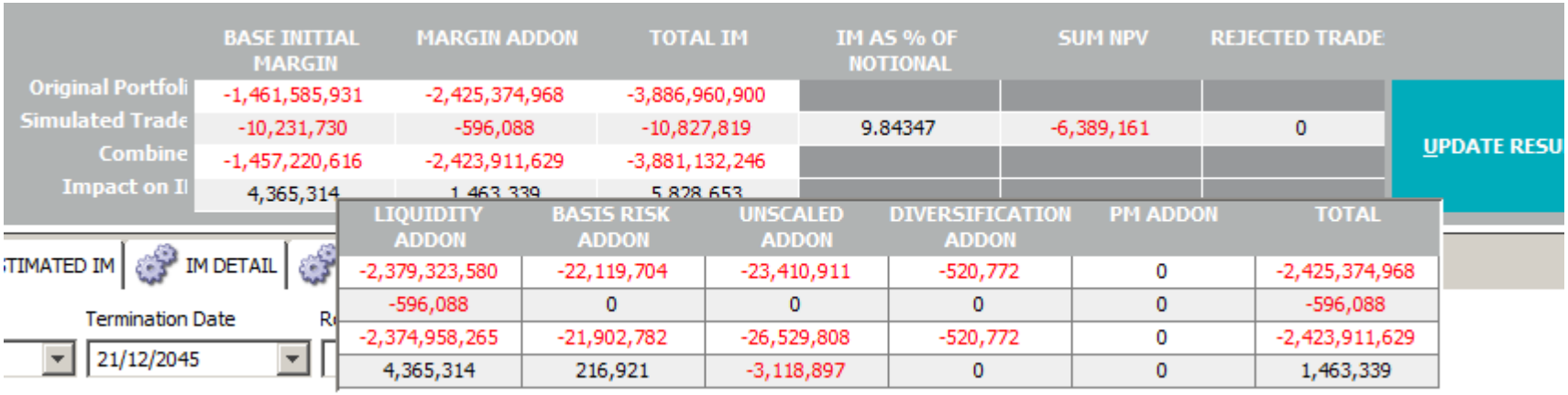
The “Simulated Trades” row shows the Initial Margin and IM Addons for the manually input trades and sensitivities. Only those trades/sensitivities are included that have the inclusion checkbox ticked. Following additional information is shown for the simulation trades:

- IM AS % OF NOTIONAL – this shows the Initial Margin as percentage of the sum of notional – all converted to display currency. For VNS trades only the initial notional amount is considered.
- SUM NPV – this is the sum of NPVs of the individual trades, converted to display currency.
- REJECTED TRADES – this shows the number of trades that failed validation and could not be processed.

The "Combined" row shows the Initial Margin estimate for the combined portfolio containing the base portfolio and the manually input trades and sensitivities. Only those trades/sensitivities are included that have the inclusion checkbox ticked.

The "Impact on IM" row shows the change to Initial Margin as a result of the manually input trades/sensitivities.

The "Margin AddOn" column shows the total sum of IM Add Ons across: Liquidity Add On, Basis Risk Add On, Unscaled Add On, Diversification Add On and PM Add On as explained throughout this guide. Hovering over the Margin AddOn column will show the breakdown of each Add On to the total Margin Add On figure.



| | BASE INITIAL MARGIN | MARGIN ADDON | TOTAL IM | IM AS % OF NOTIONAL | SUM NPV | REJECTED TRADE |
|---|---|---|---|---|---|---|
| Original Portfoli | -1,461,585,931 | -2,425,374,968 | -3,886,960,900 | | | |
| Simulated Trade | -10,231,730 | -596,088 | -10,827,819 | 9.84347 | -6,389,161 | 0 |
| Combine | -1,457,220,616 | -2,423,911,629 | -3,881,132,246 | | | |
| Impact on I | 4,365,314 | 1,463,339 | 5,828,653 | | | |

UPDATE RESU

TIMATED IM | IM DETAIL

Termination Date

21/12/2045

| LIQUIDITY ADDON | BASIS RISK ADDON | UNSCALED ADDON | DIVERSIFICATION ADDON | PM ADDON | TOTAL |
|---|---|---|---|---|---|
| -2,379,323,580 | -22,119,704 | -23,410,911 | -520,772 | 0 | -2,425,374,968 |
| -596,088 | 0 | 0 | 0 | 0 | -596,088 |
| -2,374,958,265 | -21,902,782 | -26,529,808 | -520,772 | 0 | -2,423,911,629 |
| 4,365,314 | 216,921 | -3,118,897 | 0 | 0 | 1,463,339 |

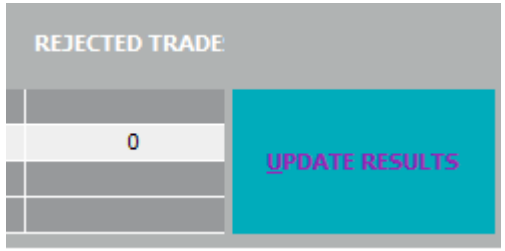
- Liquidity Add On – this Add On is charged for concentrated risk positions

- Basis Risk Add On –this Add On is computed based on tenor basis exposures. Further details are available on the "Basis Risk Detail" tab and in the related document, "Basis Risk Addon_TIP_v2.2.pdf."
- Un-Scaled Add On -- this Add On is required when an VaR figure run with unscaled scenarios is more negative than the traditional PAIRS base initial margin calculation. This add-on will also take into account STIR scenarios for margined futures trades in Swapclear account. Please also see "Addendum To PAIRS_V1.0.pdf."
- Diversification Add On -- Diversification benefit between futures and minor currency swaps (ρ23) will be limited via an Add On.
- PM Add On -- applied to margin savings due to Portfolio Balancing. The charge is a percentage of the savings in basic Initial Margin. This Add on is applied only if listed positions are balanced to Swapclear accounts.

The user can copy the values in the table to the Clipboard by selecting the data using the cursor or mouse and then pressing **Ctrl+C**. The data can be pasted into Excel. Note that the headings are not copied.

### 3.2.4 Update Results

In the Summary Panel there is an "UPDATE RESULTS" button – this can be used at any time to recalculate the Initial Margin. Normally SMART will automatically recalculate Initial Margin as trades are added. However, under certain circumstances the user must manually invoke the UPDATE RESULTS button – the text on the button turns to the colour purple as shown below when the Initial Margin estimate is deemed to be stale.



## 3.3 Adding Simulation Trades

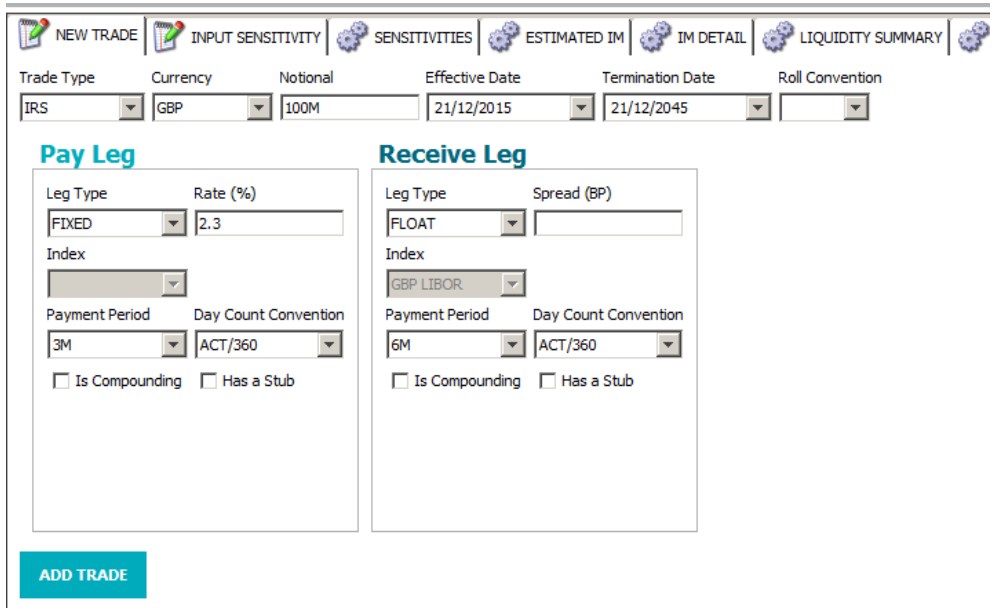
The user has several options for adding simulated trades to the portfolio.

### 3.3.1 "New Trade" Tab

The New Trade tab can be used to input a new trade manually.

The fields displayed in the New Trade form change depending upon the trade type.

### 3.3.2 IRS or OIS Trades

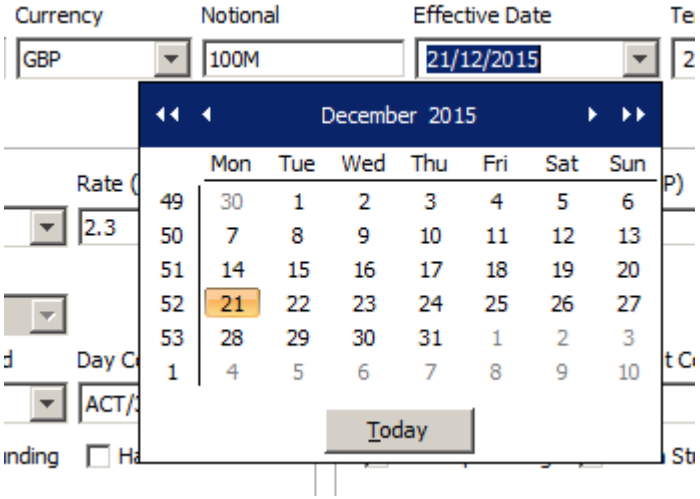


The “Trade Type” field shows the list of trade types supported. Depending upon the trade type selected, the layout of the form is changed.

The “Currency” field displays a list of available currencies for the chosen trade type.

The “Notional” field allows user to enter the notional amount. The notional amount can be specified in millions by adding the suffix M.

The “Effective Date” field allows user to enter the effective date (the user can input the date “dd/mm/yyyy”, or “dd/mm/yy”) or select it using the Date Picker.




The “Termination Date” field allows the user to enter a termination date or pick a date using the Date Picker. The user can also enter a swap term in months or years by supplying a suffix ‘m’ or ‘y’. For example, 10y for 10 years. Pressing tab after entering the swap term causes the termination date to be calculated from the effective date based on the term.

The “Roll Convention” can be left blank normally, but allows entering special conventions such as EOM or IMM.

The Swap Legs are entered in the Pay Leg and Receive Leg panels. The contents of these panels are identical.

The “Leg Type” field allows the leg to be specified as FIXED or FLOAT.

For FIXED legs, the “Rate” field should be used to enter the fixed rate as a percentage.

For FLOAT legs, the “Spread” field should be used to enter a spread in basis points. Note that OIS trades do not support spreads.

For FLOAT legs there is also an optional “Index” field which is generally auto populated depending on trade type. For IRS basis swaps, however, the user must explicitly choose either one LIBOR and one OIS index (supported currencies only), or two LIBOR legs with different tenors.

The “Payment Period” field specifies the frequency of coupon payments. For Zero Coupon swaps, the option “ZERO C” should be used. This option should also be used for OIS trades where there is a single payment period.

The “Day Count Fraction” field specifies the day count fraction to be used.

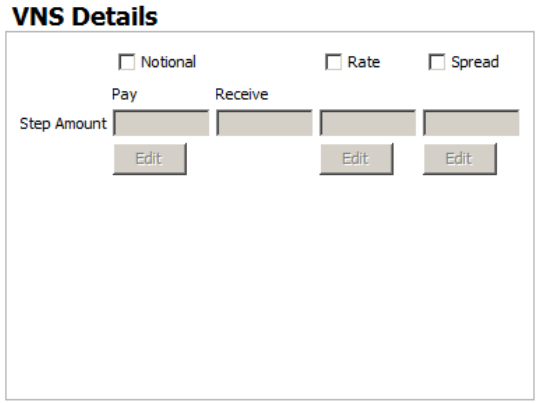
For compounding trades, the “Is Compounding” checkbox should be enabled. This allows the user to enter the compounding frequency via “Compounding Period”, and the compounding method via the field “Flat / Straight”. **Note that OIS trades should be specified as plain vanilla and not compounding.**

The user can optionally specify a stub type. Checking “Has a stub” enables the stub to be specified. The available options are “Front/Short”, “Front/Long”, “Back/Short”, and “Back/Long”. Note that if the stub is not specified, SMART will attempt to infer a Front Short or Long stub if the schedule has an irregular start or end date.

### 3.3.3 VNS Trades

For “VNS” trades, in addition to fields described in “IRS” the user needs to specify the notional, fixed rate and/or spread steps.

Selecting the VNS trade type displays an additional panel.

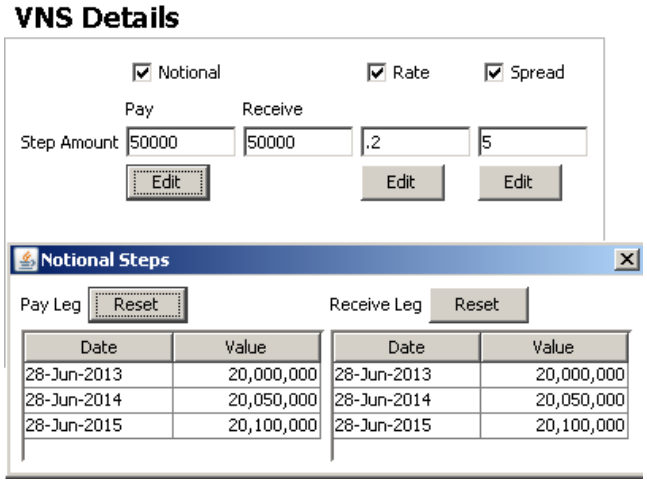



The three checkboxes named “Notional”, “Rate” and “Spread” control whether the respective steps are to be generated or not.

The Step amount is used to assist in generating the steps – note that the user is expected to customise the steps using the “Edit” button.

Clicking the edit button opens a step editor dialog for the user to modify the steps.

The Notional steps dialog is shown below.



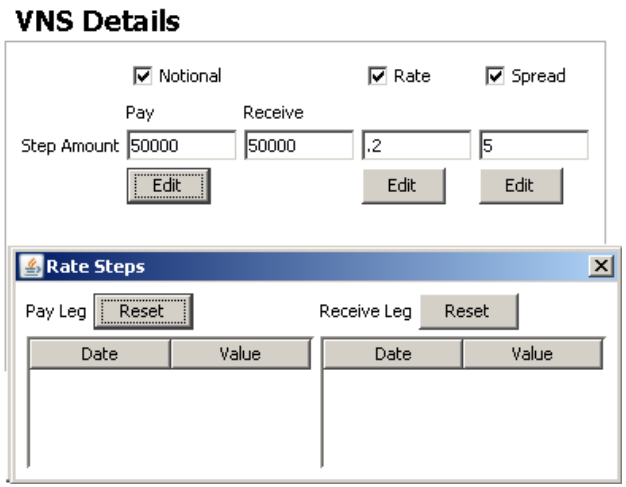

The “Reset” button on the dialog causes the steps to be regenerated. Any changes made by the user will be lost. Note that the step schedule is derived from the payment schedule of the swap trade; hence if the user changes the payment schedule, she must also reset the steps in the editor. SMART does not automatically change the steps if the user makes changes to the payment schedule.

The step values can be edited. The step dates cannot be edited. All steps need to be provided.

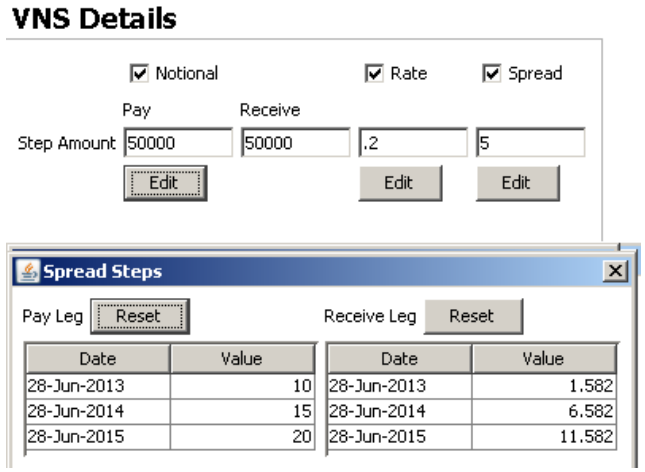
By selecting the steps and pressing **Ctrl+C** the user can copy the steps and paste to Excel. The step values only can be pasted back by positioning the cursor on the first value and then pressing **Ctrl+V**.

Closing the Step Editor dialog saves the changes. There is no option for cancelling changes.

The fixed rate step editor is similar and is shown below.

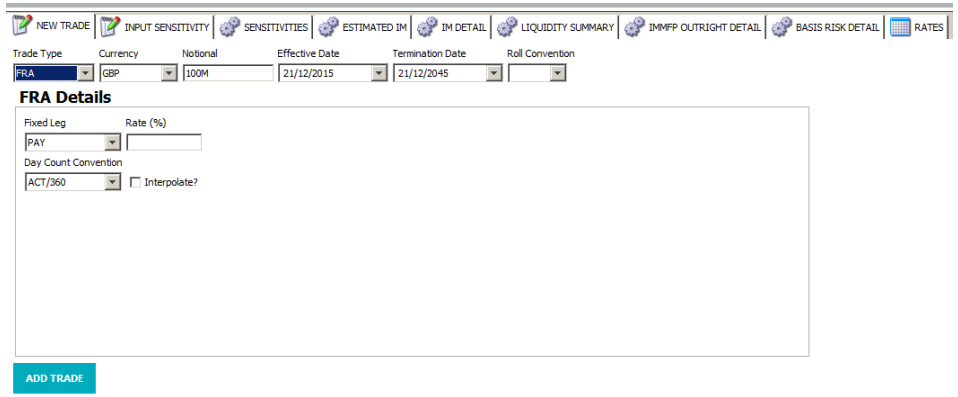



The spread steps editor is similar and is shown below.




### 3.3.4 FRA trades

Choosing the FRA trade type shows the following panel.



The “Trade Type” must be set to FRA.

The “Currency” field displays a list of available currencies for the FRA trade type.

The “Notional” field allows user to enter the notional amount. The notional amount can be specified in millions by adding the suffix M.

The “Effective Date” field allows user to enter the FRA settlement date (the user can input the date “dd/mm/yyyy”, or “dd/mm/yy”) or select it using the Date Picker.

The “Termination Date” field allows user to enter the FRA maturity date (the user can input the date “dd/mm/yyyy”, or “dd/mm/yy”) or select it using the Date Picker.

“Roll Convention” is not applicable for a FRA and should be left blank.

The “Fixed Leg” field is used to specify whether the user wants a buyer’s view (PAY) or seller’s view (RECEIVE).

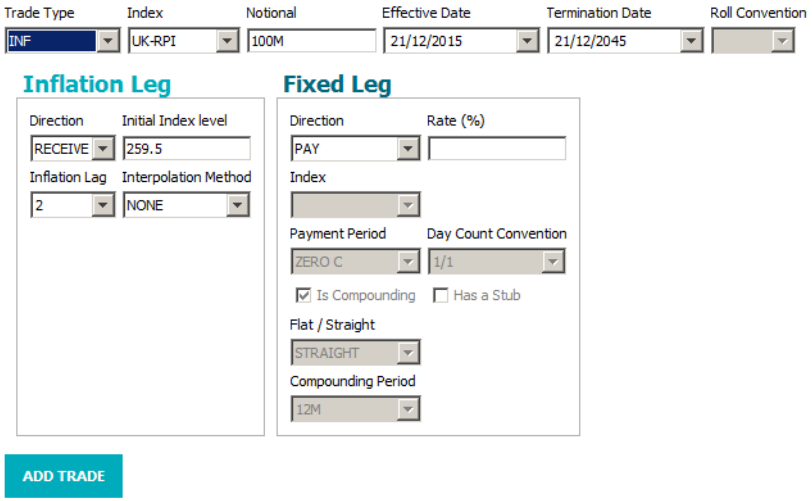
The “Rate” field should be used to enter the fixed rate as a percentage.

The “Day Count Convention” is used to specify the day count fraction.

The “Interpolate” check box should be enabled if the user wants SMART to interpolate using the nearest tenors on the floating rate calculation. If unspecified, SMART will use the closest tenor for the floating side.

### 3.3.5 Inflation Trades

Inflation trades can be added to SMART via the New Trade tab or by pasting directly into the new Inflation Trade tab on the simulated trade grid.




Under the “New Trade” tab, the “Trade Type” must be set to INF.

The “Index” field displays a list of available indexes for the INF trade type. The current set of available indexes are UK-RPI, EUR-EXT-CPI, USA-CPI-U and FRC-EXT-CPI

The “Notional” field allows user to enter the notional amount. The notional amount can be specified in millions by adding the suffix M.

The “Effective Date” field allows user to enter the FRA settlement date (the user can input the date “dd/mm/yyyy”, or “dd/mm/yy”) or select it using the Date Picker.

The “Termination Date” field allows user to enter the FRA maturity date (the user can input the date “dd/mm/yyyy”, or “dd/mm/yy”) or select it using the Date Picker.

“Roll Convention” is not applicable for an inflation trade and hence is disabled for this trade type.

The Swap Legs are entered in the Inflation Leg and Fixed Leg panels.

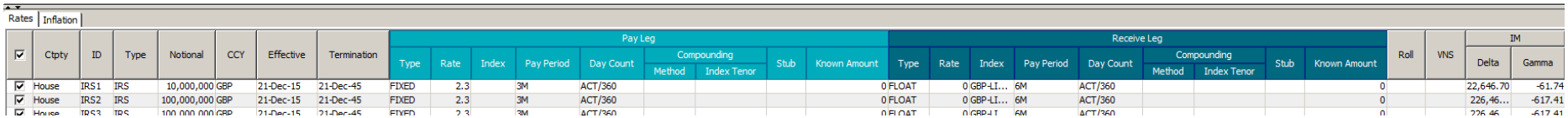
The “Direction” field allows the leg to be specified as PAY or RECEIVE.

For the FIXED leg, the “Rate” field should be used to enter the fixed rate as a percentage.

For the INFLATION leg, the “Initial Index Level”, “Inflation Lag” and “Interpolation Method” fields are defaulted based on the chosen index but can be overidden by the user.

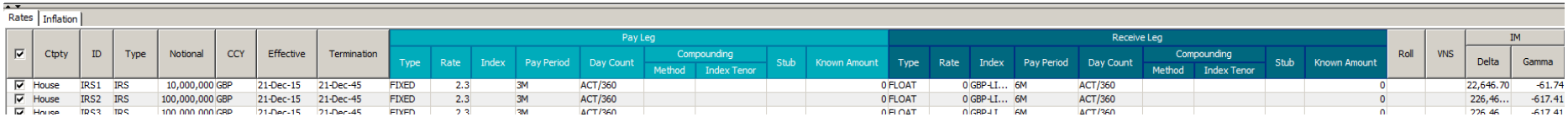
### 3.3.6 Adding a Trade

After completing the New Trade form, the user must click on the “ADD TRADE” button to add the trade to the session. All trades added to the session are shown in the bottom area inside the Trade List Panel.

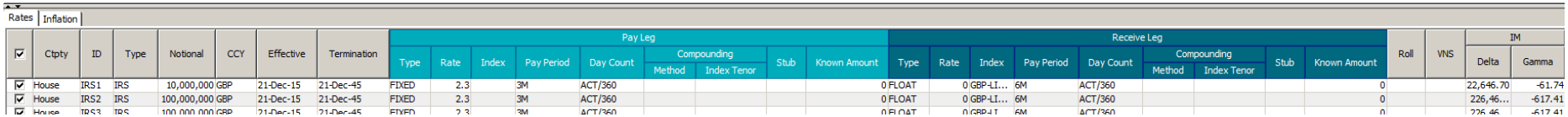



## 3.4 The Trade List Panel

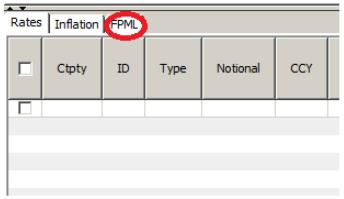
The Trade List Panel is where all the trades added to the session are displayed.




This panel does not allow entry of a new trade manually – the new trade must be input using the New Trade form. However, existing trades can be copied and pasted, and edited within the Trade List panel.



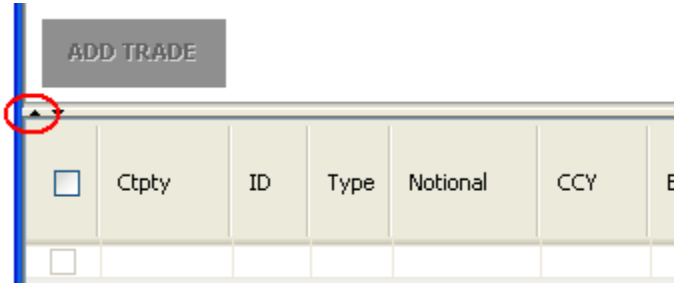

Inflation trades are shown on a separate panel customised to show inflation column as shown above. This panel displays forward inflation and OIS discount sensitivities (delta and gamma) separately, as well as total cross gamma and VM NPV .




Any FPML trades that have been loaded into the system would be should in the tab named 'FPML'. All FPML trade types including IRS, OIS, Inflation and FRA would be shown here.

### 3.4.1 Expanding the Trade List Panel Window

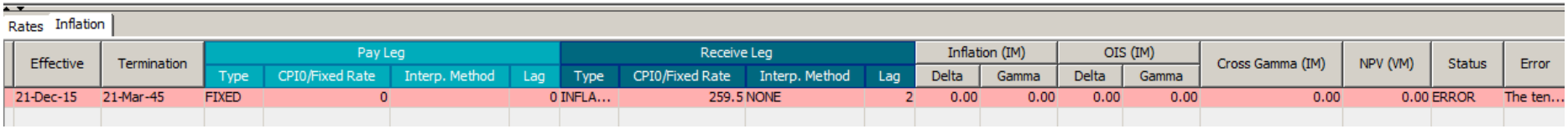
The Trade List Panel window can be expanded to fill the view by clicking on the icon shown below.




To revert to a smaller window, the user can click on the downward arrowhead next to the icon above.

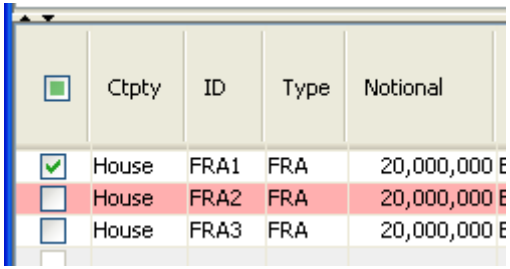
### 3.4.2 Error Trades in Trade List Panel

Trades that have failed validation will show up coloured in a shade of magenta as shown below. The user will be shown an error message if the mouse is positioned over the row.




### 3.4.3 Selecting Trades for IM Calculation

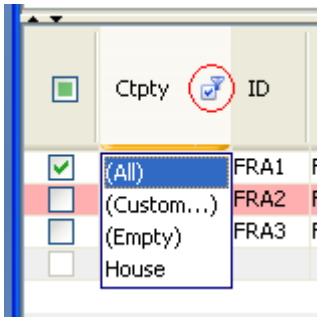
The Trade List panel has a checkbox that controls whether the trade is included in the IM calculation. If this checkbox is not enabled then the trade will be excluded.




In the example above, the trade FRA1 will be included in the Initial Margin calculation, but FRA3 will not be. Trades in error are always excluded regardless of the checkbox setting.

### 3.4.4 Ctpty Field

The Trade List displays a column called CTPTY. This column is for user convenience – it is populated by default with the Account name when the trade was added. The primary use case for this field is to allow quick selection of trades that have the same value in the CTPTY field. To perform a quick selection, the user must follow these steps:




Click the icon shown to the right of the CTPTY field name – the icon becomes visible if the user scrolls the cursor over the field name.

A drop down displays the available values in this field. The user can select a particular value to quickly filter the list to trades that contain this value.

Note that the trades that are selected by the filter are automatically included in the Initial Margin calculation and the checkbox against the trade shows enabled status. Trades not selected by the filter are excluded.

**The CTPTY field has no other effect on the Initial Margin calculation; in particular it is unrelated to the Account field.**

### 3.4.5 Filtering Trades in Trade List Panel

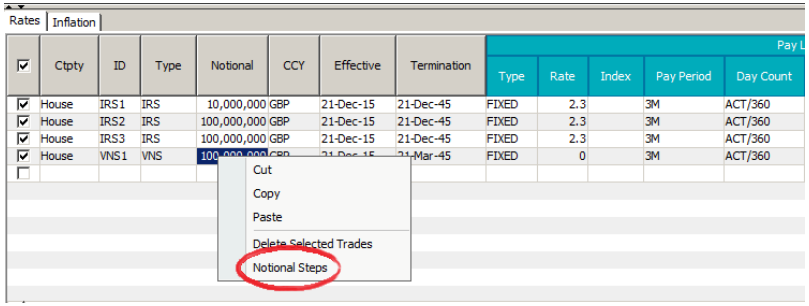
Most data columns can be used to filter the trades in the manner described above. The Initial Margin calculation is automatically set to consider only trades selected by the filter.

### 3.4.6 Editing Trades in Trade List Panel

The trades that appear in the Trade List Panel can be edited in place. Double click on any cell to start the cell editor. The user can move around the cells using the mouse, cursor keys or TAB key.

Limitation: The currency drop down shows all currencies rather than the currencies available to each trade type.

To edit the VNS steps associated with a VNS trade, the user must position the cursor over the notional, rate or spread fields and right click with the mouse. A popup menu appears that will allow the user to edit the steps. The step editor is identical to the one available in the New Trade form; a limitation currently is that user cannot modify the default step amount.




The VNS steps are shown in XML format in a column named VNS. Users must not amend this data directly, instead the steps editor should be used as described above.

### 3.4.7 Copying and Pasting Trades

It is possible to copy trades from the SMART application to Excel, and also paste trades back into the application from Excel.

To copy trades from the application, simply select the trades or the columns you want to copy, and press **Ctrl+C**. You can now paste into Excel by pressing **Ctrl+V**.

To copy from Excel into the application, the user must ensure that the columns in Excel match the columns in the application. Also only the input columns should be pasted; the computed outputs should not be pasted. For date values to be parsed correctly the Excel date values should be formatted as either DD-MMM-YY or DD/MM/YYYY.

To paste values from Excel into the application, position the cursor on the cell from where the data should be pasted, and press **Ctrl+V**. When pasting trades, the application may take a few seconds to revalue the trades. Any trades that have errors will be flagged in magenta.

By choosing on “EXPORT TO EXCEL” from the Export menu at the top left corner of the SMART Desktop, the user can save the data in the Trade List Panel to an Excel document.

### 3.4.8 Deleting Trades

The user can delete trades from the Trade List Panel by positioning the cursor on a trade, and selecting the “Delete Selected Trades” option from the Popup menu that can be accessed by right clicking. Multiple trades can be deleted by selecting the trades prior to invoking the Popup menu.

## 3.5 Adding a Sensitivity Profile

Users can input sensitivity profiles to be incorporated on the population of Simulated Trades.

Select the tab “Input Sensitivity”.

| | Profile 1 | Profile 2 | Profile 3 | Profile 4 | Profile 5 | Profile 6 | Profile 7 |
|---|---|---|---|---|---|---|---|
| Cparty | | | | | | | |
| Name | Profile 1 | Profile 2 | Profile 3 | Profile 4 | Profile 5 | Profile 6 | Profile 7 |
| IM Curve | | | | | | | |
| Include | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| | | | | | | | |
| | | | | | | | |
| Tenor | Delta | Delta | Delta | Delta | Delta | Delta | Delta |
| 1D | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1W | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2W | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3W | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1M | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2M | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3M | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4M | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5M | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6M | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7M | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8M | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9M | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10M | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11M | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12M | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Up to 30 sensitivity profiles can be entered.

The “Cparty” field can be optionally set to a counterparty name. This is for information only – SMART does not use this value.

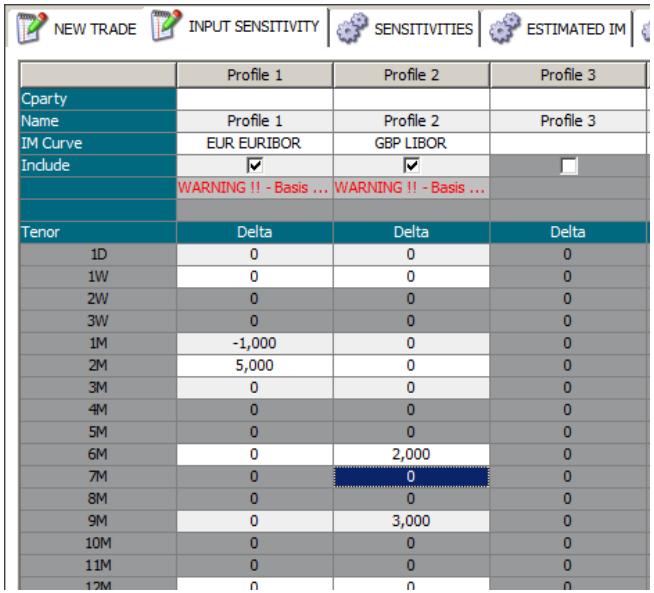
The “Name” field must have a unique name for the Sensitivity Profile.

The “IM Curve” field shows a list of valid currency/index pairs. User must choose the currency/index pair she wants to enter values for.

Once a CCY/Index pair is chosen, the available tenors for that CCY/Index get enabled.

The “Include” field is a checkbox – enable this for the profile to be considered in the Initial Margin calculation.

The user can key in, or paste, sensitivities into the pre-formatted sensitivity grid.




| | Profile 1 | Profile 2 | Profile 3 |
|---|---|---|---|
| Cparty | | | |
| Name | Profile 1 | Profile 2 | Profile 3 |
| IM Curve | EUR EURIBOR | GBP LIBOR | |
| Include | ☑ | ☑ | ☐ |
| | WARNING !! - Basis ... | WARNING !! - Basis ... | |
| | | | |
| Tenor | Delta | Delta | Delta |
| 1D | 0 | 0 | 0 |
| 1W | 0 | 0 | 0 |
| 2W | 0 | 0 | 0 |
| 3W | 0 | 0 | 0 |
| 1M | -1,000 | 0 | 0 |
| 2M | 5,000 | 0 | 0 |
| 3M | 0 | 0 | 0 |
| 4M | 0 | 0 | 0 |
| 5M | 0 | 0 | 0 |
| 6M | 0 | 2,000 | 0 |
| 7M | 0 | 0 | 0 |
| 8M | 0 | 0 | 0 |
| 9M | 0 | 3,000 | 0 |
| 10M | 0 | 0 | 0 |
| 11M | 0 | 0 | 0 |
| 12M | 0 | 0 | 0 |

If the user wishes to include only Delta Sensitivity Profiles, this is permitted. Note however that the Initial Margin Approximation will have less precision, as it will not include the Gamma impact of those sensitivity profiles.

### 3.5.1 Copy/Paste Sensitivity Profile

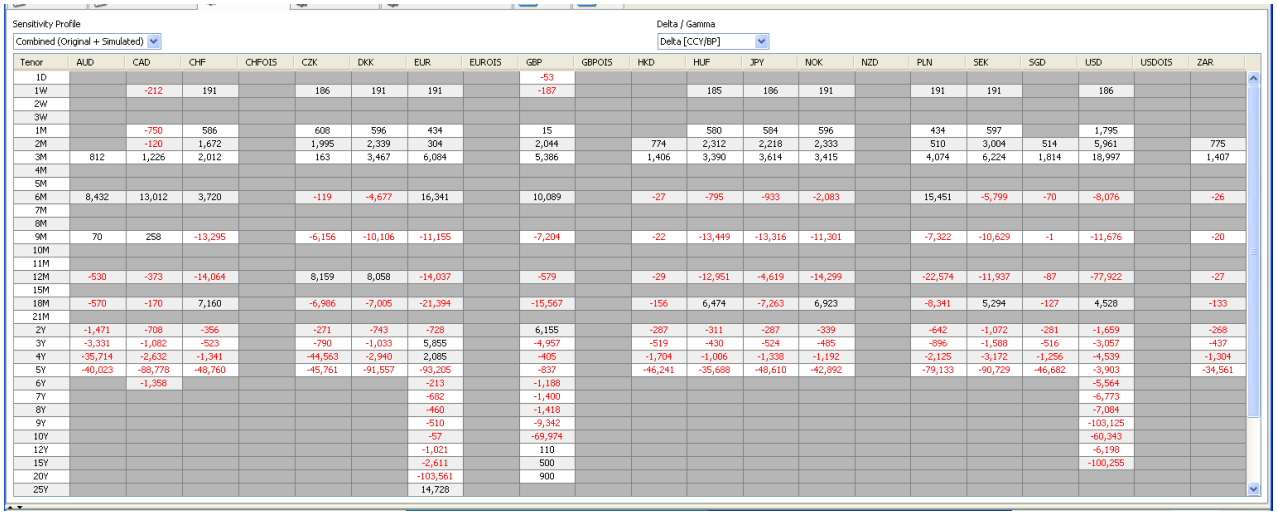
The user can paste data into the Input Sensitivity panel. The data must contain the same number of rows as displayed on the screen; disabled tenor values if present will be ignored.

In order to paste values, the user must place the cursor on the cell from where the paste should begin, and press **Ctrl+V**. The data will be pasted to the right and down from the cursor position.

By choosing on “EXPORT TO EXCEL” from the Export menu at the top left corner of the SMART Desktop, the user can save the input sensitivities data to an Excel document.

## 3.6 Sensitivities Tab

The “Sensitivities” tab displays the sensitivities used in the Initial Margin calculation. The user can see the data for the “Original Portfolio”, “Simulated Trades” or “Combined”.



Sensitivity Profile: Combined (Original + Simulated)

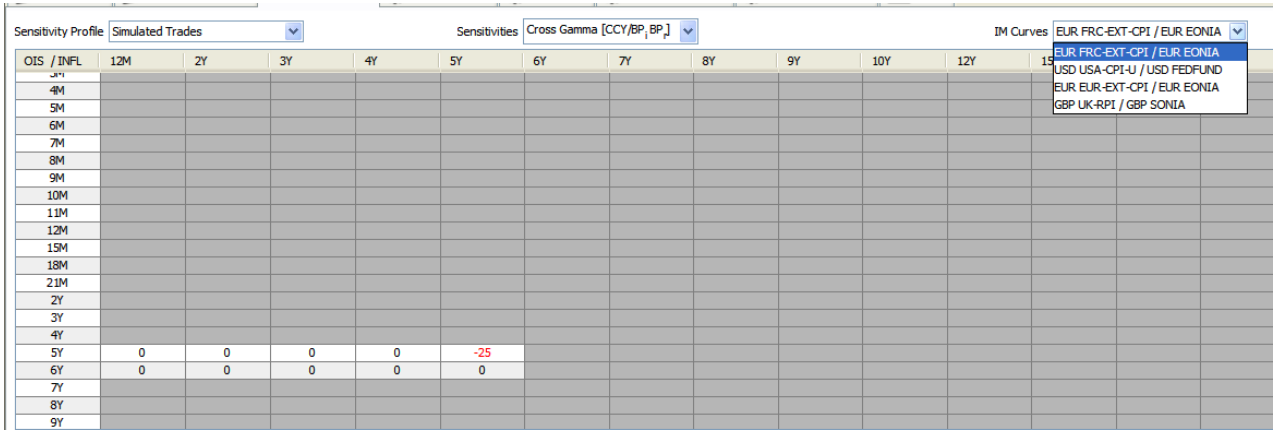
Delta / Gamma: Delta [CCY/BP]

| Tenor | AUD | CAD | CHF | CHFOIS | CZK | DKK | EUR | EUROIS | GBP | GBPOIS | HKD | HUF | JPY | NOK | NZD | PLN | SEK | SGD | USD | USDOIS | ZAR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1D | | | | | | | | | -53 | | | | | | | | | | | | |
| 1W | | -212 | 191 | | 186 | 191 | 191 | | -187 | | | 185 | 186 | 191 | | 191 | 191 | | 186 | | |
| 2W | | | | | | | | | | | | | | | | | | | | | |
| 3W | | | | | | | | | | | | | | | | | | | | | |
| 1M | | -750 | 586 | | 608 | 596 | 434 | | 15 | | | 580 | 584 | 596 | | 434 | 597 | | 1,795 | | |
| 2M | | -120 | 1,672 | | 1,995 | 2,339 | 304 | | 2,044 | | 774 | 2,312 | 2,218 | 2,333 | | 510 | 3,004 | 514 | 5,961 | | 775 |
| 3M | 812 | 1,226 | 2,012 | | 163 | 3,467 | 6,084 | | 5,386 | | 1,406 | 3,390 | 3,614 | 3,415 | | 4,074 | 6,224 | 1,814 | 18,997 | | 1,407 |
| 4M | | | | | | | | | | | | | | | | | | | | | |
| 5M | | | | | | | | | | | | | | | | | | | | | |
| 6M | 8,432 | 13,012 | 3,720 | | -119 | -4,677 | 16,341 | | 10,089 | | -27 | -795 | -933 | -2,083 | | 15,451 | -5,799 | -70 | -8,076 | | -26 |
| 7M | | | | | | | | | | | | | | | | | | | | | |
| 8M | | | | | | | | | | | | | | | | | | | | | |
| 9M | 70 | 258 | -13,295 | | -6,156 | -10,106 | -11,155 | | -7,204 | | -22 | -13,449 | -13,316 | -11,301 | | -7,322 | -10,629 | -1 | -11,676 | | -20 |
| 10M | | | | | | | | | | | | | | | | | | | | | |
| 11M | | | | | | | | | | | | | | | | | | | | | |
| 12M | -530 | -373 | -14,064 | | 8,159 | 8,058 | -14,037 | | -579 | | -29 | -12,951 | -4,619 | -14,299 | | -22,574 | -11,937 | -87 | -77,922 | | -27 |
| 15M | | | | | | | | | | | | | | | | | | | | | |
| 18M | -570 | -170 | 7,160 | | -6,986 | -7,005 | -21,394 | | -15,567 | | -156 | 6,474 | -7,263 | 6,923 | | -8,341 | 5,294 | -127 | 4,528 | | -133 |
| 21M | | | | | | | | | | | | | | | | | | | | | |
| 2Y | -1,471 | -708 | -356 | | -271 | -743 | -728 | | 6,155 | | -287 | -311 | -287 | -339 | | -642 | -1,072 | -281 | -1,659 | | -268 |
| 3Y | -3,331 | -1,082 | -523 | | -790 | -1,033 | 5,855 | | -4,957 | | -519 | -430 | -524 | -485 | | -896 | -1,588 | -516 | -3,057 | | -437 |
| 4Y | -35,714 | -2,632 | -1,341 | | -44,563 | -2,940 | 2,085 | | -405 | | -1,704 | -1,006 | -1,338 | -1,192 | | -2,125 | -3,172 | -1,256 | -4,539 | | -1,304 |
| 5Y | -40,023 | -88,778 | -48,760 | | -45,761 | -91,557 | -93,205 | | -837 | | -46,241 | -35,688 | -48,610 | -42,892 | | -79,133 | -90,729 | -46,682 | -3,903 | | -34,561 |
| 6Y | | -1,358 | | | | | -213 | | -1,188 | | | | | | | | | | -5,564 | | |
| 7Y | | | | | | | -682 | | -1,400 | | | | | | | | | | -6,773 | | |
| 8Y | | | | | | | -460 | | -1,418 | | | | | | | | | | -7,084 | | |
| 9Y | | | | | | | -510 | | -9,342 | | | | | | | | | | -103,125 | | |
| 10Y | | | | | | | -57 | | -69,974 | | | | | | | | | | -60,343 | | |
| 12Y | | | | | | | -1,021 | | 110 | | | | | | | | | | -6,198 | | |
| 15Y | | | | | | | -2,611 | | 500 | | | | | | | | | | -100,255 | | |
| 20Y | | | | | | | -103,561 | | 900 | | | | | | | | | | | | |
| 25Y | | | | | | | 14,728 | | | | | | | | | | | | | | |

The “Sensitivity Profile” dropdown allows the user to select the data being viewed.

The “Delta / Gamma / Cross Gamma” dropdown allows user to switch between delta, gamma or inflation cross gamma values.

When the user selects Cross Gamma, they would need to select a specific curve pair to see the cross gamma values for the pair




The user can copy the data from the table by select the cells and pressing **Ctrl+C**.

By choosing on “EXPORT TO EXCEL” from the Export menu at the top left corner of the SMART Desktop, the user can save the Sensitivities to an Excel document.

## 3.7 Estimated IM Tab

The Estimated IM tab displays a breakdown of Initial Margin Results per Currency/Index pair.

The “Sensitivity Profile” dropdown allows the user to choose between the “Original Portfolio”, “Simulated Trades” or “Combined” views.

The “IM (CCY) TDG Approx” field displays the calculated Initial Margin for the selected view.

The “Scenarios” field displays the scenarios that triggered the IM.

“Method 1 IMM” displays the IM Multiplier calculated as per Method 1.

The main table shows the IM breakdown by IM curve.

The “Base Initial Margin (CCY)” column displays the base IM contribution by the currency/index pair calculated using Taylor approximation.

The “Delta (CCY) [CCY/BP]” displays the delta of the portfolio by IM curve.

The “Liquidity Addon (CCY)” column displays the IMM multiplier computed as per method 2 (IMM First Principles).

The “Undiversified Scenarios” column displays the worst 6 loss scenarios for each IM curve/risk factor considered in isolation.

The “Undiversified Shortfall (CCY)” column displays the expected shortfall per currency/pair as per the scenarios shown in the column to the left. The loss is converted to the Display Currency using Spot FX rate.

Sensitivity Profile: Simulated Trades | IM (GBP) TDG Approx: -1,248,383 | IM Scenarios: 1515 1513 1514 1530 1512 1532 | Method 1 IMM: 0 | Basis Risk Addon: 0

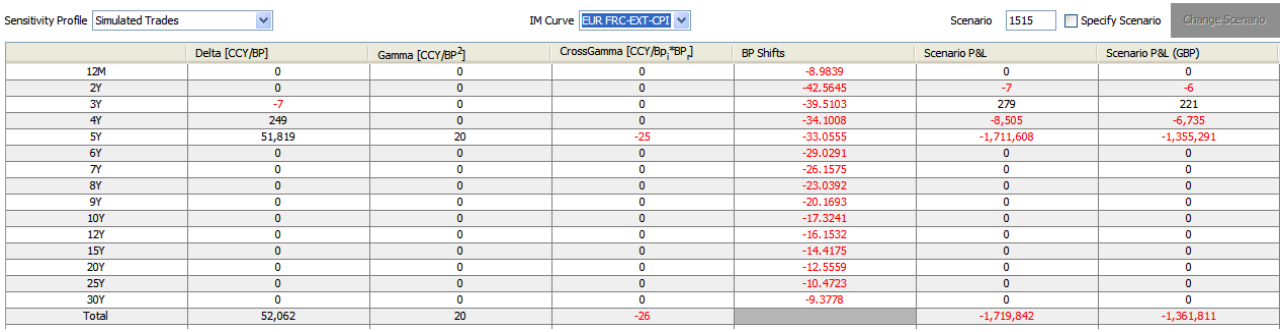
| IM Curve | Base Initial Margin (GBP) | Delta (GBP) [CCY/BP] | Liquidity Addon (GBP) | Undiversified Scenarios | Undiversified Shortfall (GBP) |
|---|---|---|---|---|---|
| AUD BBSW | | | | | |
| CAD CDOR | | | | | |
| CAD CORRA | | | | | |
| CHF LIBOR | | | | | |
| CHF TOIS | | | | | |
| CZK PRIBOR | | | | | |
| DKK CIBOR | | | | | |
| EUR EONIA | -26,085 | 2,275 | 0 | 1499 801 823 1518 1537 1520 | -56,043 |
| EUR EUR-EXT-CPI | -11,119 | 415 | -830 | 1515 1513 1532 1495 1530 1531 | -11,820 |
| EUR EURIBOR | | | | | |
| EUR FRC-EXT-CPI | -1,205,557 | 41,496 | -83,009 | 1515 1513 1514 1512 1530 1532 | -1,215,878 |
| GBP LIBOR | | | | | |
| GBP SONIA | 156 | -20 | 0 | 1613 319 1617 320 1615 1616 | -694 |
| GBP UK-RPI | -7,115 | 520 | -1,040 | 1530 1497 1528 1527 1529 1498 | -20,652 |
| HKD HIBOR | | | | | |
| HUF BUBOR | | | | | |
| JPY LIBOR | | | | | |
| JPY TONA | | | | | |
| NOK NIBOR | | | | | |
| NZD BKBM | | | | | |
| PLN WIBOR | | | | | |
| SEK STIBOR | | | | | |
| SGD SOR | | | | | |
| USD FEDFUND | 5 | 2 | 0 | 1499 1492 1726 1685 1531 1521 | -76 |
| USD LIBOR | | | | | |
| USD USA-CPI-U | 1,333 | 308 | -771 | 1498 1497 1496 1517 1495 1499 | -17,973 |
| ZAR JIBAR | | | | | |
| Total | -1,248,382 | 44,998 | -85,652 | | |

The impact of inflation curves and their contributions are shown separately by inflation curve and discount curve as shown above with the cross gamma effects aggregated within inflation curves.

By choosing on “EXPORT TO EXCEL” from the Export menu at the top left corner of the SMART Desktop, the user can save the Estimated IM view to an Excel document.

## 3.8 IM Detail

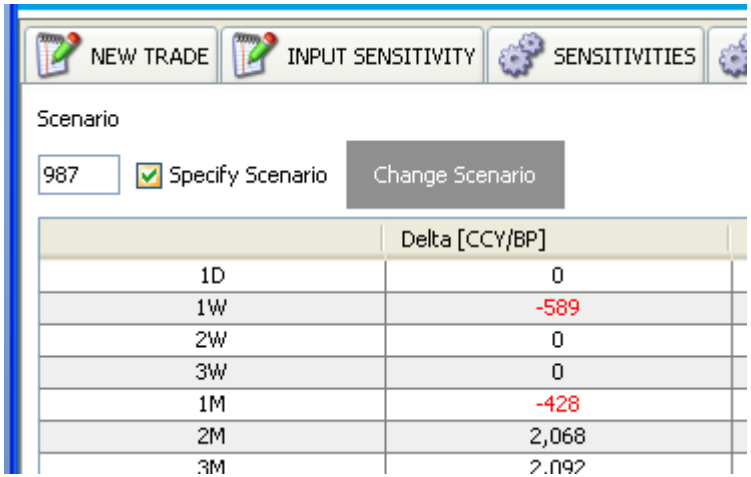
The “IM Detail” Tab displays a breakdown of the Initial Margin Contribution for a selected IM curve for a particular scenario.


Sensitivity Profile: Simulated Trades  IM Curve: EUR FRC-EXT-CPI  Scenario: 1515  Specify Scenario  Change Scenario

| | Delta [CCY/BP] | Gamma [CCY/BP$^2$] | CrossGamma [CCY/Bp$_i$*BP$_j$] | BP Shifts | Scenario P&L | Scenario P&L (GBP) |
|---|---|---|---|---|---|---|
| 12M | 0 | 0 | 0 | -8.9839 | 0 | 0 |
| 2Y | 0 | 0 | 0 | -42.5645 | -7 | -6 |
| 3Y | -7 | 0 | 0 | -39.5103 | 279 | 221 |
| 4Y | 249 | 0 | 0 | -34.1008 | -8,505 | -6,735 |
| 5Y | 51,819 | 20 | -25 | -33.0555 | -1,711,608 | -1,355,291 |
| 6Y | 0 | 0 | 0 | -29.0291 | 0 | 0 |
| 7Y | 0 | 0 | 0 | -26.1575 | 0 | 0 |
| 8Y | 0 | 0 | 0 | -23.0392 | 0 | 0 |
| 9Y | 0 | 0 | 0 | -20.1693 | 0 | 0 |
| 10Y | 0 | 0 | 0 | -17.3241 | 0 | 0 |
| 12Y | 0 | 0 | 0 | -16.1532 | 0 | 0 |
| 15Y | 0 | 0 | 0 | -14.4175 | 0 | 0 |
| 20Y | 0 | 0 | 0 | -12.5559 | 0 | 0 |
| 25Y | 0 | 0 | 0 | -10.4723 | 0 | 0 |
| 30Y | 0 | 0 | 0 | -9.3778 | 0 | 0 |
| Total | 52,062 | 20 | -26 | | -1,719,842 | -1,361,811 |

The “IM Curve” dropdown lists the available curves.

By default the form loads the first Initial Margin scenario for the selected portfolio and IM curve. If the user wants to analyse the P&L for a different scenario, she can tick the box “Specify Scenario”, manually type the scenario number on the field “Scenario” and click on “Change Scenario” button.




By choosing on "EXPORT TO EXCEL" from the Export menu at the top left corner of the SMART Desktop, the user can save the Currency Breakdown view to an Excel document.

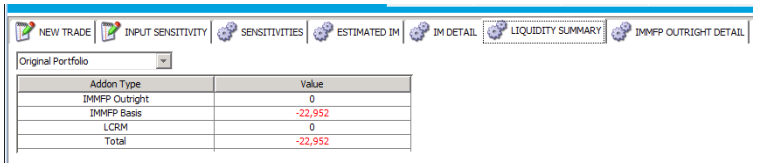
## 3.9 Liquidity Summary

The Liquidity Summary tab provides detail into the breakdown of IMM2 – outright interest rate risk, swap vs futures basis risk and LCRM.

IMM2 : Captures the concentration risk for listed and OTC trades

- Outright interest rate risk: The existing SwapClear IMM FP methodology will be used to capture concentrated outright directional risks across the combined listed/OTC rates service.
- Swap vs futures basis risk: An additional component of IMM FP will be introduced to cater for futures vs swap basis risk.
- LCRM: Captures the concentration risk for all ineligible products for margining (Bond futures).

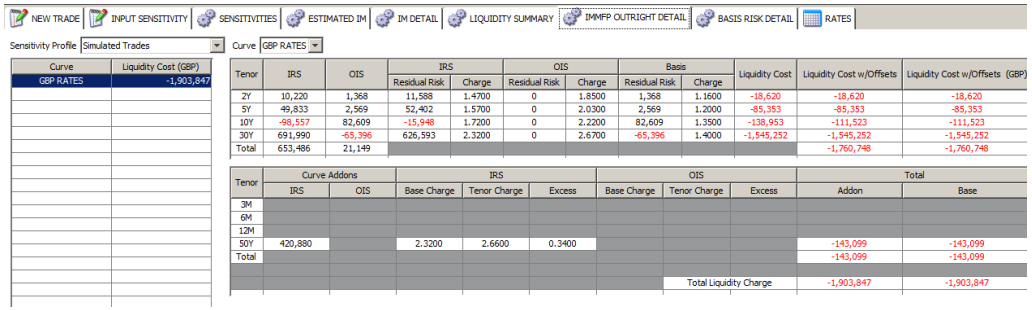
Please refer to the below screenshot in the SwapClear IM View:




| Addon Type | Value |
|---|---|
| IMMFP Outright | 0 |
| IMMFP Basis | -22,952 |
| LCRM | 0 |
| Total | -22,952 |

## 3.10 IMMFP Outright Detail

The IMMFP Outright Detail table provides the breakdown for the IMMFP calculation.




| Curve | Liquidity Cost (GBP) |
|---|---|
| GBP RATES | -1,903,847 |

| Tenor | IRS | OIS | IRS | | OIS | | Basis | | Liquidity Cost | Liquidity Cost w/Offsets | Liquidity Cost w/Offsets (GBP) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Residual Risk | Charge | Residual Risk | Charge | Residual Risk | Charge | | | |
| 2Y | 10,220 | 1,368 | 11,588 | 1.4700 | 0 | 1.8500 | 1,368 | 1.1600 | -18,620 | -18,620 | -18,620 |
| 5Y | 49,833 | 2,569 | 52,402 | 1.5700 | 0 | 2.0300 | 2,569 | 1.2000 | -85,353 | -85,353 | -85,353 |
| 10Y | -98,557 | 82,609 | -15,948 | 1.7200 | 0 | 2.2200 | 82,609 | 1.3500 | -138,953 | -111,523 | -111,523 |
| 30Y | 691,990 | -65,396 | 626,593 | 2.3200 | 0 | 2.6700 | -65,396 | 1.4000 | -1,545,252 | -1,545,252 | -1,545,252 |
| Total | 653,486 | 21,149 | | | | | | | | -1,760,748 | -1,760,748 |

| Tenor | Curve Addons | | IRS | | | OIS | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | IRS | OIS | Base Charge | Tenor Charge | Excess | Base Charge | Tenor Charge | Excess | Addon | Base |
| 3M | | | | | | | | | | |
| 6M | | | | | | | | | | |
| 12M | | | | | | | | | | |
| 50Y | 420,880 | | 2.3200 | 2.6600 | 0.3400 | | | | -143,099 | -143,099 |
| Total | | | | | | | | | -143,099 | -143,099 |
| | | | | | | | Total Liquidity Charge | | -1,903,847 | -1,903,847 |

The summary tab on the left provides the break down by currency


| Curve | Liquidity Cost (GBP) |
|---|---|
| GBP RATES | -1,903,847 |

The tab on the right provides the detailed calculation

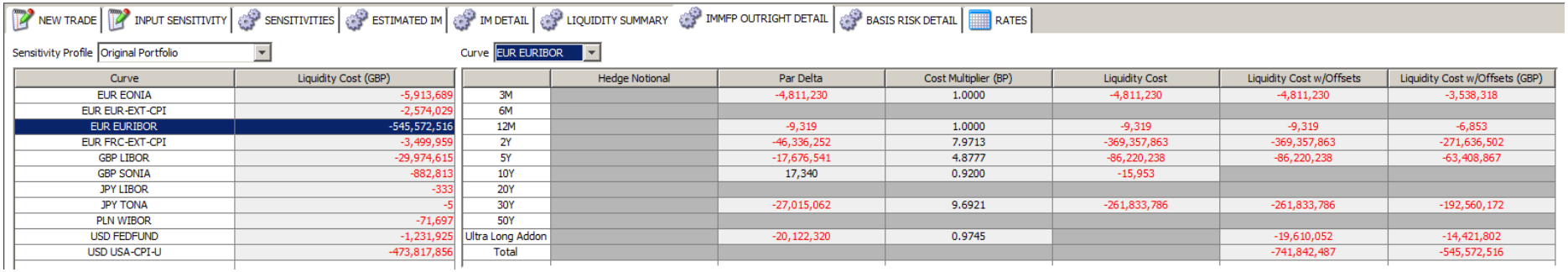
Curve GBP RATES

| Tenor | IRS | OIS | IRS | | OIS | | Basis | | Liquidity Cost | Liquidity Cost w/Offsets | Liquidity Cost w/Offsets (GBP) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Residual Risk | Charge | Residual Risk | Charge | Residual Risk | Charge | | | |
| 2Y | 10,220 | 1,368 | 11,588 | 1.4700 | 0 | 1.8500 | 1,368 | 1.1600 | -18,620 | -18,620 | -18,620 |
| 5Y | 49,833 | 2,569 | 52,402 | 1.5700 | 0 | 2.0300 | 2,569 | 1.2000 | -85,353 | -85,353 | -85,353 |
| 10Y | -98,557 | 82,609 | -15,948 | 1.7200 | 0 | 2.2200 | 82,609 | 1.3500 | -138,953 | -111,523 | -111,523 |
| 30Y | 691,990 | -65,396 | 626,593 | 2.3200 | 0 | 2.6700 | -65,396 | 1.4000 | -1,545,252 | -1,545,252 | -1,545,252 |
| Total | 653,486 | 21,149 | | | | | | | | -1,760,748 | -1,760,748 |

| Tenor | Curve Addons | | IRS | | | OIS | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | IRS | OIS | Base Charge | Tenor Charge | Excess | Base Charge | Tenor Charge | Excess | Addon | Base |
| 3M | | | | | | | | | | |
| 6M | | | | | | | | | | |
| 12M | | | | | | | | | | |
| 50Y | 420,880 | | 2.3200 | 2.6600 | 0.3400 | | | | -143,099 | -143,099 |
| Total | | | | | | | | | -143,099 | -143,099 |
| | | | | | | | | | | |
| | | | | | | | Total Liquidity Charge | | -1,903,847 | -1,903,847 |

The top portion of this screen provides the liquidity cost by tenor sub-classified against the IRS and the OIS. The Basis change reflects any risk that has been identified as as basis. The allocation of risk to basis is as per the new methodology outlined in the documentation published on the LCH secure area (Liquidity Margin for OIS- IBOR).

The bottom portion of the screen provides the breakdown for the risk on the short end and long end of the curve. The First Principles calculation has be modified to redistribute the 2Y delta bucket between 3M, 6M, 1Y and 2Y buckets, and additional cost will be added where appropriate to address any potentially large short maturity positions that are currently netted off in the 2Y bucket. This is consistent with the 50Y long add-on.




| Curve | Liquidity Cost (GBP) |
|---|---|
| EUR EONIA | -5,913,689 |
| EUR EUR-EXT-CPI | -2,574,029 |
| EUR EURIBOR | -545,572,516 |
| EUR FRC-EXT-CPI | -3,499,959 |
| GBP LIBOR | -29,974,615 |
| GBP SONIA | -882,813 |
| JPY LIBOR | -333 |
| JPY TONA | -5 |
| PLN WIBOR | -71,697 |
| USD FEDFUND | -1,231,925 |
| USD USA-CPI-U | -473,817,856 |

| | Hedge Notional | Par Delta | Cost Multiplier (BP) | Liquidity Cost | Liquidity Cost w/Offsets | Liquidity Cost w/Offsets (GBP) |
|---|---|---|---|---|---|---|
| 3M | | -4,811,230 | 1.0000 | -4,811,230 | -4,811,230 | -3,538,318 |
| 6M | | | | | | |
| 12M | | -9,319 | 1.0000 | -9,319 | -9,319 | -6,853 |
| 2Y | | -46,336,252 | 7.9713 | -369,357,863 | -369,357,863 | -271,636,502 |
| 5Y | | -17,676,541 | 4.8777 | -86,220,238 | -86,220,238 | -63,408,867 |
| 10Y | | 17,340 | 0.9200 | -15,953 | | |
| 20Y | | | | | | |
| 30Y | | -27,015,062 | 9.6921 | -261,833,786 | -261,833,786 | -192,560,172 |
| 50Y | | | | | | |
| Ultra Long Addon | | -20,122,320 | 0.9745 | | -19,610,052 | -14,421,802 |
| Total | | | | | -741,842,487 | -545,572,516 |

## 3.11 Basis Risk Detail

The Basis Risk Details tab shows the details underlying the basis risk add-on calculation. The top table displays summary results for the four different approaches used in calculating the basis add-on: Pure IM, OIS IM, Tenor IM, and Stress. For each of these, the total incremental add-on, including thresholds, is shown on the bottom line. Further details on the Basis Risk calculation are available in the related document, Basis Risk Addon_TIP_v2.2.pdf.

| | Pure IM | OIS IM | Tenor IM | Stress Approach | Final |
|---|---|---|---|---|---|
| Scenarios | 1476,1477,1478,254 | 1476,254,1478,1477 | 1476,1477,1478,254 | 1466,1468,1467,1406 | |
| IM (outright) | -13,391,550,275 (A) | -14,376,926,969 (B) | -13,057,588,253 (C) | -46,227,152 (D) | |
| Difference | | -985,376,693 (w) | 1,319,338,716 (x) | | |
| Basis Adjustment Charge | | | 0 (y) | -46,227,152 (z) | -46,227,152 |

A. Pure IM - Expected shortfall calculated using the standard PAIRS methodology and the standard IM curve assignments, but with a reduced set of scenarios (from Dec 2008) and averaging the worst 4 (rather than the worst 6) outcomes.
B. OIS IM - Similar to the Pure IM, but using OIS curve assignments for discounting.
C. Tenor IM - Similar to Pure IM, but using the full VM curve mapping, including OIS discounting and tenor forward curves.
D. Stress Approach - Applies observed historical changes in tenor basis spreads to portfolios' net basis risk position considered in isolation to calculate future potential losses due to widening or narrowing of the basis.

w = the difference between OIS and Pure IM, (B - A)

x = the difference between Tenor and OIS IM, (C – B)

y = the combined IM approach add-on defined as the sum of the OIS and Tenor IM differences provided it is negative, (MIN(w + x, 0))

z = the difference between the stress result and Tenor IM difference provided is less than £-3MM, (D – MIN(x, 0) if < £-3MM)

Final basis risk add-on = the combined IM approach add-on and stress adjustment, provided they are below the £-10MM call tolerance, y + z if < £-10MM

The table on the lower left is controlled by the Basis Risk Approach select box. Under the IM approach, it shows a table of the three IM approaches, broken down by curve. Selecting any one of these cells will further show the detailed scenario results for that curve and approach on the lower right table. Alternatively, choosing Stress will show the stress approach breakdown, with individual scenario results again shown on the lower right.

The bottom tables on the Basis Risk Details tab allow you to explore the detailed scenario results under each approach used in the basis risk calculation.

When choosing the IM approach, the left table shows the IM break down by curve under the various curve assignments of the three IM approaches, Pure, OIS, and Tenor. Currencies with multiple curves are expandable. Selecting an individual cell representing a specific approach and curve shows the scenario details on the lower right table, defaulting to an average of the worst four scenarios for that approach.

Basis Risk Approach IM

| CCY | Pure IM (GBP) | OIS IM (GBP) | Tenor IM (GBP) |
|---|---|---|---|
| AUD | 12,509,442 | 12,510,705 | 12,510,705 |
| CAD (+) | 25,719,369 | 25,652,091 | 25,652,091 |
| CHF (+) | 1,135,471 | 1,137,921 | 1,137,921 |
| CZK | -104,349 | -104,378 | -104,378 |
| DKK | -941,307 | -937,651 | -937,651 |
| EUR (+) | -2,709,041,763 | -3,020,989,921 | -2,643,477,430 |
| GBP (-) | -10,895,510,019 | -11,587,726,183 | -11,233,080,446 |
| --Standard | -18,860,257,073 | -19,921,166,156 | 117,450 |
| --SONIA | 7,964,747,055 | 8,333,439,974 | 8,333,439,974 |
| --Tenor (-) | | | -19,566,637,869 |
| ----LIBOR 1M | | | -5,826,308 |
| ----LIBOR 3M | | | -19,561,622,412 |
| ----LIBOR 6M | | | 492,110 |
| ----LIBOR 12M | | | 318,741 |
| HKD | 6,255,077 | 6,255,098 | 6,255,098 |
| HUF | -57,439 | -57,422 | -57,422 |
| JPY (+) | -24,625 | -32,535 | -30,947 |
| NOK | -1,226,714 | -1,226,753 | -1,226,753 |
| NZD | -395,892 | -395,928 | -395,928 |
| PLN | -1,589,597 | -1,590,179 | -1,590,179 |
| SEK | -2,889,772 | -2,889,099 | -2,889,099 |
| SGD | -5,737,248 | -5,737,233 | -5,737,233 |
| USD (+) | 180,855,935 | 199,710,654 | 786,889,555 |
| ZAR | -506,844 | -506,160 | -506,160 |

Scenario Average IM OIS Curve GBP SONIA

| Tenor | Delta [CCY/BP] | BP Shifts | Scenario P&L | Scenario P&L (GBP) |
|---|---|---|---|---|
| 1D | -274,038 | -41.5618 | 11,389,509 | 11,389,509 |
| 1W | -1 | -16.4007 | 14 | 14 |
| 2W | 1 | -11.6953 | -9 | -9 |
| 3W | 0 | -10.3139 | 0 | 0 |
| 1M | -18 | -8.5521 | 151 | 151 |
| 2M | 2,240 | -5.4086 | -12,114 | -12,114 |
| 3M | 34,526 | -3.4190 | -118,046 | -118,046 |
| 4M | 2,072 | -2.4382 | -5,053 | -5,053 |
| 5M | 4,034 | -1.5459 | -6,236 | -6,236 |
| 6M | 78,037 | -0.3228 | -25,194 | -25,194 |
| 7M | 6,764 | 0.5936 | 4,015 | 4,015 |
| 8M | -56,143,094 | 1.8824 | -105,686,568 | -105,686,568 |
| 9M | -3,863,603 | 2.2834 | -8,822,247 | -8,822,247 |
| 10M | -38 | 3.0782 | -117 | -117 |
| 11M | 233,354 | 3.8494 | 898,268 | 898,268 |
| 12M | 404,561 | 3.4939 | 1,413,487 | 1,413,487 |
| 15M | 820,381 | 6.2407 | 5,119,754 | 5,119,754 |
| 18M | 1,126,757 | 8.2477 | 9,293,157 | 9,293,157 |
| 21M | 1,540,081 | 9.4377 | 14,534,863 | 14,534,863 |
| 2Y | 5,853,781 | 11.2202 | 65,680,736 | 65,680,736 |
| 3Y | 118,563,463 | 11.3688 | 1,347,918,371 | 1,347,918,371 |
| 4Y | 584,751,914 | 11.8716 | 6,941,926,202 | 6,941,926,202 |

When choosing the Stress approach, the bottom left table shows the various tenor spreads for each of the four major currencies and selecting one of these allows you to see scenario specific details in the bottom right table.

Basis Risk Approach STRESS

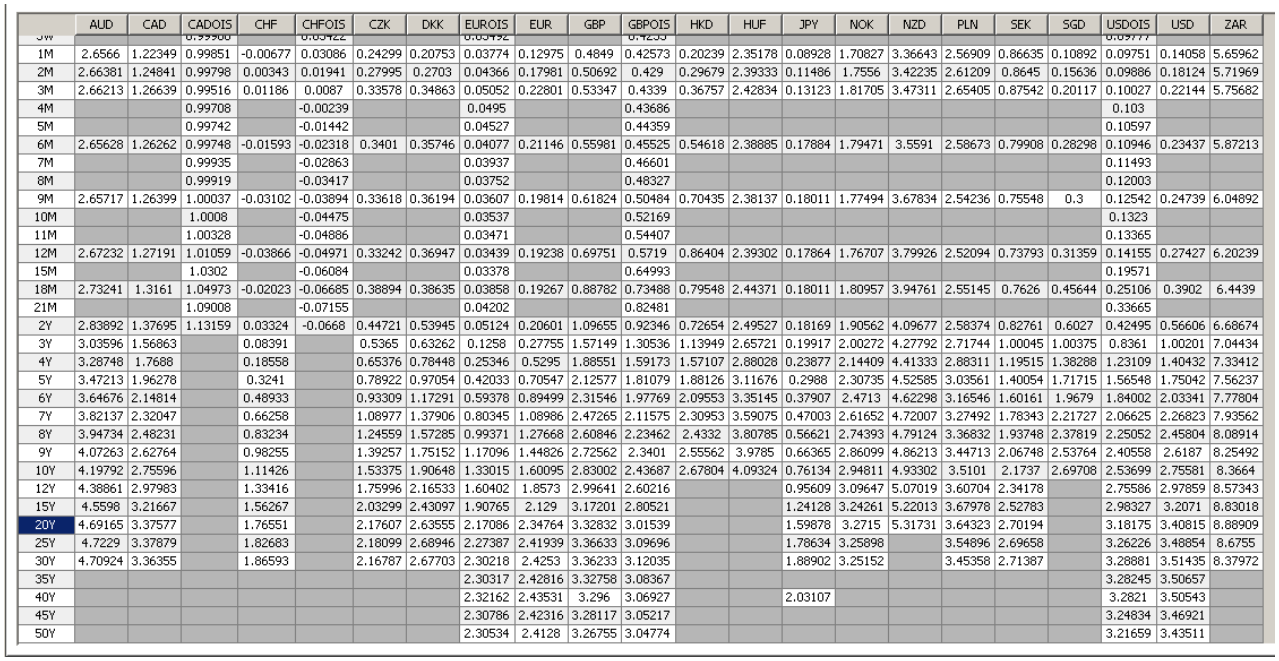
| Basis | Value (GBP) |
|---|---|
| EUR EURIBOR-1Mx6M | 74,707 |
| EUR EURIBOR-3Mx6M | 47,916 |
| EUR EURIBOR-6Mx12M | -6,265,685 |
| GBP LIBOR-1Mx12M | 25,324 |
| GBP LIBOR-1Mx3M | 145,604 |
| GBP LIBOR-1Mx6M | 19,477 |
| GBP LIBOR-3Mx12M | 68,049 |
| GBP LIBOR-6Mx12M | 48,531 |
| JPY LIBOR-1Mx6M | 152 |
| JPY LIBOR-3Mx6M | -27 |
| USD LIBOR-1Mx3M | -42,600,753 |
| USD LIBOR-3Mx12M | 0 |
| USD LIBOR-3Mx6M | 2,110,329 |
| USD LIBOR-6Mx12M | 99,220 |
| Total | -46,227,152 |

Basis EUR EURIBOR-1Mx6M Scenario Average

| Bucket | Delta | BP Shifts | Scenario P&L | Scenario P&L (GBP) |
|---|---|---|---|---|
| 2Y | 0 | 0.6750 | 0 | 0 |
| 5Y | -83,191 | -1.1500 | 95,669 | 74,707 |
| 10Y | 0 | -1.6750 | 0 | 0 |
| 30Y | 0 | -1.5500 | 0 | 0 |
| Total | -83,191 | | 95,669 | 74,707 |

## 3.12 Rates Tab

The “Rates” tab displays the input market data (IM zero curves).

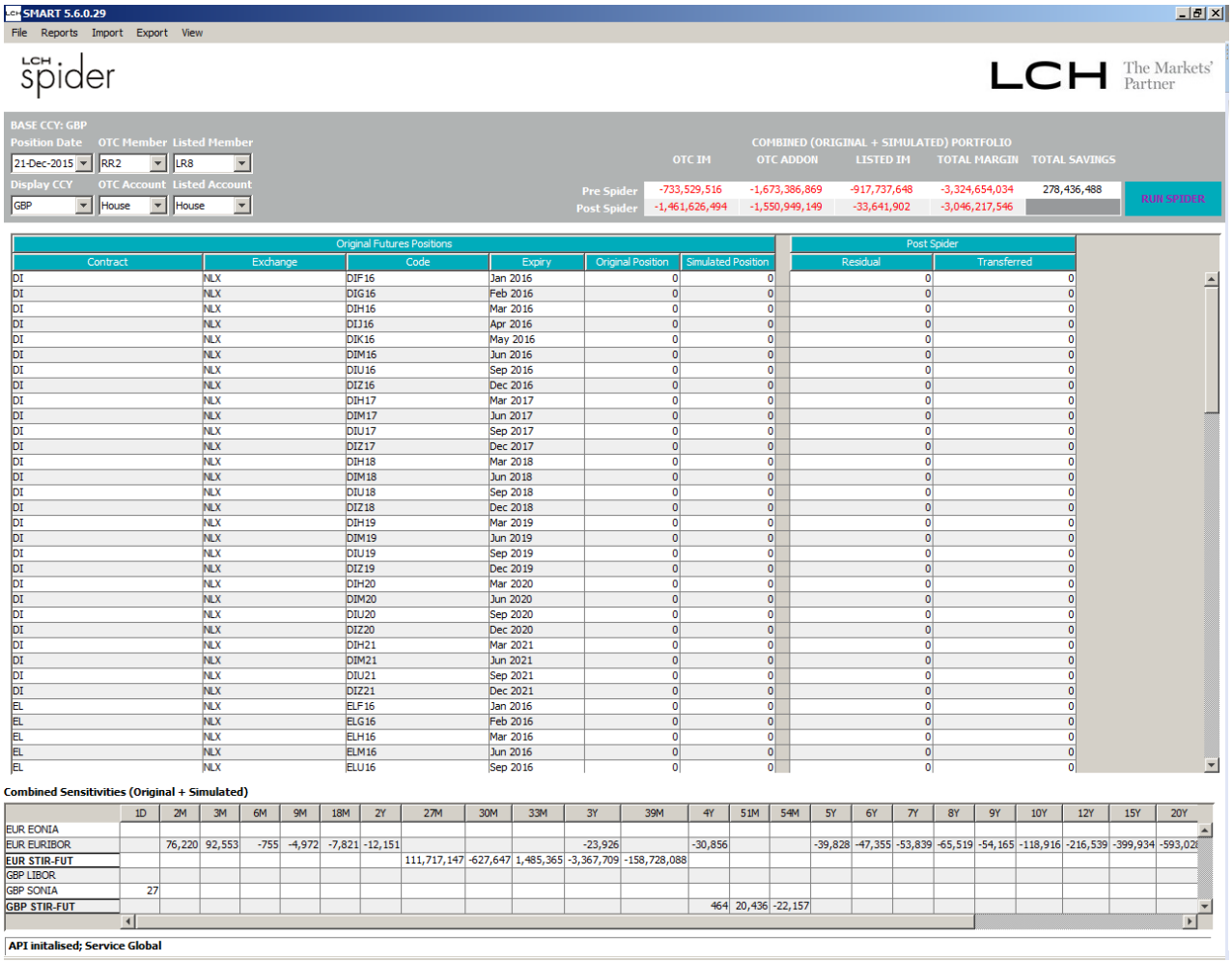


| | AUD | CAD | CADOIS | CHF | CHFOIS | CZK | DKK | EUROIS | EUR | GBP | GBPOIS | HKD | HUF | JPY | NOK | NZD | PLN | SEK | SGD | USDOIS | USD | ZAR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1M | 2.6566 | 1.22349 | 0.99851 | -0.00677 | 0.03086 | 0.24299 | 0.20753 | 0.03774 | 0.12975 | 0.4849 | 0.42573 | 0.20239 | 2.35178 | 0.08928 | 1.70827 | 3.36643 | 2.56909 | 0.86635 | 0.10892 | 0.09751 | 0.14058 | 5.65962 |
| 2M | 2.66381 | 1.24841 | 0.99798 | 0.00343 | 0.01941 | 0.27995 | 0.2703 | 0.04366 | 0.17981 | 0.50692 | 0.429 | 0.29679 | 2.39333 | 0.11486 | 1.7556 | 3.42235 | 2.61209 | 0.8645 | 0.15636 | 0.09886 | 0.18124 | 5.71969 |
| 3M | 2.66213 | 1.26639 | 0.99516 | 0.01186 | 0.0087 | 0.33578 | 0.34863 | 0.05052 | 0.22801 | 0.53347 | 0.4339 | 0.36757 | 2.42834 | 0.13123 | 1.81705 | 3.47311 | 2.65405 | 0.87542 | 0.20117 | 0.10027 | 0.22144 | 5.75682 |
| 4M | | | 0.99708 | | -0.00239 | | | 0.0495 | | | 0.43686 | | | | | | | | | 0.103 | | |
| 5M | | | 0.99742 | | -0.01442 | | | 0.04527 | | | 0.44359 | | | | | | | | | 0.10597 | | |
| 6M | 2.65628 | 1.26262 | 0.99748 | -0.01593 | -0.02318 | 0.3401 | 0.35746 | 0.04077 | 0.21146 | 0.55981 | 0.45525 | 0.54618 | 2.38885 | 0.17884 | 1.79471 | 3.5591 | 2.58673 | 0.79908 | 0.28298 | 0.10946 | 0.23437 | 5.87213 |
| 7M | | | 0.99935 | | -0.02863 | | | 0.03937 | | | 0.46601 | | | | | | | | | 0.11493 | | |
| 8M | | | 0.99919 | | -0.03417 | | | 0.03752 | | | 0.48327 | | | | | | | | | 0.12003 | | |
| 9M | 2.65717 | 1.26399 | 1.00037 | -0.03102 | -0.03894 | 0.33618 | 0.36194 | 0.03607 | 0.19814 | 0.61824 | 0.50484 | 0.70435 | 2.38137 | 0.18011 | 1.77494 | 3.67834 | 2.54236 | 0.75548 | 0.3 | 0.12542 | 0.24739 | 6.04892 |
| 10M | | | 1.0008 | | -0.04475 | | | 0.03537 | | | 0.52169 | | | | | | | | | 0.1323 | | |
| 11M | | | 1.00328 | | -0.04886 | | | 0.03471 | | | 0.54407 | | | | | | | | | 0.13365 | | |
| 12M | 2.67232 | 1.27191 | 1.01059 | -0.03866 | -0.04971 | 0.33242 | 0.36947 | 0.03439 | 0.19238 | 0.69751 | 0.5719 | 0.86404 | 2.39302 | 0.17864 | 1.76707 | 3.79926 | 2.52094 | 0.73793 | 0.31359 | 0.14155 | 0.27427 | 6.20239 |
| 15M | | | 1.0302 | | -0.06084 | | | 0.03378 | | | 0.64993 | | | | | | | | | 0.19571 | | |
| 18M | 2.73241 | 1.3161 | 1.04973 | -0.02023 | -0.06685 | 0.38894 | 0.38635 | 0.03858 | 0.19267 | 0.88782 | 0.73488 | 0.79548 | 2.44371 | 0.18011 | 1.80957 | 3.94761 | 2.55145 | 0.7626 | 0.45644 | 0.25106 | 0.3902 | 6.4439 |
| 21M | | | 1.09008 | | -0.07155 | | | 0.04202 | | | 0.82481 | | | | | | | | | 0.33665 | | |
| 2Y | 2.83892 | 1.37695 | 1.13159 | 0.03324 | -0.0668 | 0.44721 | 0.53945 | 0.05124 | 0.20601 | 1.09655 | 0.92346 | 0.72654 | 2.49527 | 0.18169 | 1.90562 | 4.09677 | 2.58374 | 0.82761 | 0.6027 | 0.42495 | 0.56606 | 6.68674 |
| 3Y | 3.03596 | 1.56863 | | 0.08391 | | 0.5365 | 0.63262 | 0.1258 | 0.27755 | 1.57149 | 1.30536 | 1.13949 | 2.65721 | 0.19917 | 2.00272 | 4.27792 | 2.71744 | 1.00045 | 1.00375 | 0.8361 | 1.00201 | 7.04434 |
| 4Y | 3.28748 | 1.7688 | | 0.18558 | | 0.65376 | 0.78448 | 0.25346 | 0.5295 | 1.88551 | 1.59173 | 1.57107 | 2.88028 | 0.23877 | 2.14409 | 4.41333 | 2.88311 | 1.19515 | 1.38288 | 1.23109 | 1.40432 | 7.33412 |
| 5Y | 3.47213 | 1.96278 | | 0.3241 | | 0.78922 | 0.97054 | 0.42033 | 0.70547 | 2.12577 | 1.81079 | 1.88126 | 3.11676 | 0.2988 | 2.30735 | 4.52585 | 3.03561 | 1.40054 | 1.71715 | 1.56548 | 1.75042 | 7.56237 |
| 6Y | 3.64676 | 2.14814 | | 0.48933 | | 0.93309 | 1.17291 | 0.59378 | 0.89499 | 2.31546 | 1.97769 | 2.09553 | 3.35145 | 0.37907 | 2.4713 | 4.62298 | 3.16546 | 1.60161 | 1.9679 | 1.84002 | 2.03341 | 7.77804 |
| 7Y | 3.82137 | 2.32047 | | 0.66258 | | 1.08977 | 1.37906 | 0.80345 | 1.08986 | 2.47265 | 2.11575 | 2.30953 | 3.59075 | 0.47003 | 2.61652 | 4.72007 | 3.27492 | 1.78343 | 2.21727 | 2.06625 | 2.26823 | 7.93562 |
| 8Y | 3.94734 | 2.48231 | | 0.83234 | | 1.24559 | 1.57285 | 0.99371 | 1.27668 | 2.60846 | 2.23462 | 2.4332 | 3.80785 | 0.56621 | 2.74393 | 4.79124 | 3.36832 | 1.93748 | 2.37819 | 2.25052 | 2.45804 | 8.08914 |
| 9Y | 4.07263 | 2.62764 | | 0.98255 | | 1.39257 | 1.75152 | 1.17096 | 1.44826 | 2.72562 | 2.3401 | 2.55562 | 3.9785 | 0.66365 | 2.86099 | 4.86213 | 3.44713 | 2.06748 | 2.53764 | 2.40558 | 2.6187 | 8.25492 |
| 10Y | 4.19792 | 2.75596 | | 1.11426 | | 1.53375 | 1.90648 | 1.33015 | 1.60095 | 2.83002 | 2.43687 | 2.67804 | 4.09324 | 0.76134 | 2.94811 | 4.93302 | 3.5101 | 2.1737 | 2.69708 | 2.53699 | 2.75581 | 8.3664 |
| 12Y | 4.38861 | 2.97983 | | 1.33416 | | 1.75996 | 2.16533 | 1.60402 | 1.8573 | 2.99641 | 2.60216 | | | 0.95609 | 3.09647 | 5.07019 | 3.60704 | 2.34178 | | 2.75586 | 2.97859 | 8.57343 |
| 15Y | 4.5598 | 3.21667 | | 1.56267 | | 2.03299 | 2.43097 | 1.90765 | 2.129 | 3.17201 | 2.80521 | | | 1.24128 | 3.24261 | 5.22013 | 3.67978 | 2.52783 | | 2.98327 | 3.2071 | 8.83018 |
| 20Y | 4.69165 | 3.37577 | | 1.76551 | | 2.17607 | 2.63555 | 2.17086 | 2.34764 | 3.32832 | 3.01539 | | | 1.59878 | 3.2715 | 5.31731 | 3.64323 | 2.70194 | | 3.18175 | 3.40815 | 8.88909 |
| 25Y | 4.7229 | 3.37879 | | 1.82683 | | 2.18099 | 2.68946 | 2.27387 | 2.41939 | 3.36633 | 3.09696 | | | 1.78634 | 3.25898 | | 3.54896 | 2.69658 | | 3.26226 | 3.48854 | 8.6755 |
| 30Y | 4.70924 | 3.36355 | | 1.86593 | | 2.16787 | 2.67703 | 2.30218 | 2.4253 | 3.36233 | 3.12035 | | | 1.88902 | 3.25152 | | 3.45358 | 2.71387 | | 3.28881 | 3.51435 | 8.37972 |
| 35Y | | | | | | | | 2.30317 | 2.42816 | 3.32758 | 3.08367 | | | | | | | | | 3.28245 | 3.50657 | |
| 40Y | | | | | | | | 2.32162 | 2.43531 | 3.296 | 3.06927 | | | 2.03107 | | | | | | 3.2821 | 3.50543 | |
| 45Y | | | | | | | | 2.30786 | 2.42316 | 3.28117 | 3.05217 | | | | | | | | | 3.24834 | 3.46921 | |
| 50Y | | | | | | | | 2.30534 | 2.4128 | 3.26755 | 3.04774 | | | | | | | | | 3.21659 | 3.43511 | |

By choosing on “EXPORT TO EXCEL” from the Export menu at the top left corner of the SMART Desktop, the user can save the market data to an Excel document.

# 4 SMART Spider View

## 4.1 Overview




### 4.1.1 Top Area

The top area is made up of the Summary Panel. This panel displays a summary of the total margin savings and Add Ons as a result of portfolio margining. The Summary Panel is described further in section 4.2.

### 4.1.2 Middle area

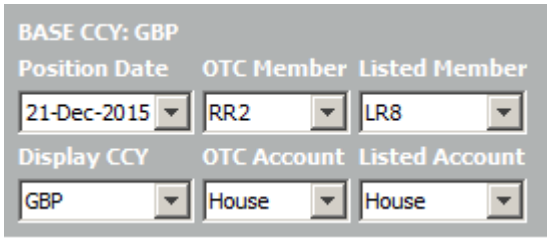
The middle area contains the futures positions included in the IM estimation. The user can also add trades into this area via the “Simulated Position” column. This is further described in section 5.3.

### 4.1.3 Lower Area

The lower area contains a summary of the sensitivities driving the IM Estimation. Sensitivities include those of original positions and any other simulated positions.

## 4.2 Top Area – Summary Panel

The top left section of the summary panel contains the global settings that affect the IM estimation.




The "BASE CCY" field identifies the currency used for IM calculation.

The "OTC Member" field displays the member mnemonic from report 102/102c and the Listed member displays the members from the Listed Rates Position file (Listed member). If these reports are not available, these fields will be blank.

The "Display CCY" field shows the currency in which the user wants to see the results of the IM estimation. The spot FX rate obtained from reports 16a, 16c or 18 is used to convert the values into the desired currency. The IM calculations are always done in BASE CCY – the Display Currency is used to convert the Initial Margin to the desired currency after the IM Calculations are completed.

The "OTC Account" and "Listed Account" fields show the list of accounts available. This is further described below.

| Reports Availability | Behaviour |
|---|---|
| Both 102 and 102c present | The House, Client and individual client accounts are displayed.<br><br>If House account is used when calculating IM, the IM will be as per member mode.<br><br>If Client account is used, the result will be in IM in Client mode but without a base portfolio.<br><br>If an individual client account is used when calculating IM, the IM will be in Client mode – base portfolio data is included. |
| Only 102 is present | The House and Client accounts are displayed.<br><br>Using House account in IM calculation will trigger member mode IM - base portfolio in report 102 will be included.<br><br>Choosing Client account in IM calculation will trigger Client mode IM - base portfolio will not be available. |
| Only 102c is present | The Client and individual client accounts are displayed. |

| | |
|---|---|
| | The IM will be in Client mode when any of the accounts is used.<br><br>If the Client account is used when calculating IM, it will mean Client mode IM without base portfolio. This option is meant to be used for new/unknown clients. |
| Neither 102 nor 102c present | The Client and House accounts are displayed.<br><br>There will not be a base portfolio for either account.<br><br>If Client account is used in the IM calculation then the IM will be in Client mode – no base portfolio.<br><br>If House account is used in the IM calculation then the IM will be in house mode – no base portfolio. |
| Listed Position Statement Report is present | All Listed accounts are displayed (includes all relevant House and Client accounts) |
| Listed Position Statement Report is not present | No Listed accounts will be displayed or be used in the Liquidity Add On calculation |

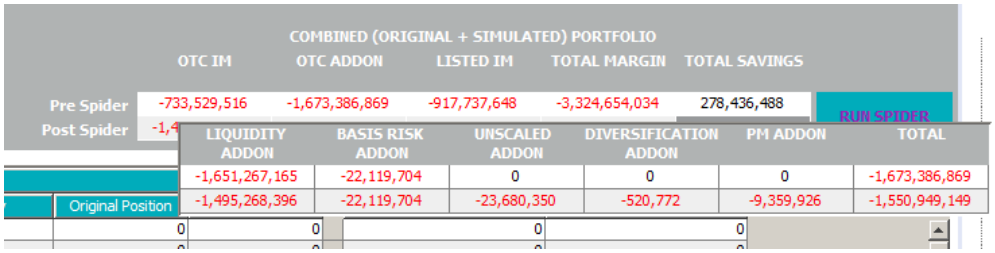
### 4.2.1 Summary Panel IM Estimate

The summary panel shows the estimated IM and Add On values in a table to the right of the control data.


The “Pre Spider” row shows the Initial Margin and IM Add Ons prior to portfolio margining (baseline IM).

The “Post Spider” row shows the Initial Margin and IM Add Ons post portfolio margining.

The “OTC AddOn” column shows the total sum of OTC IM Add Ons across: Liquidity Add On, Basis Risk Add On, Unscaled Add On, Diversification Add On and PM Add On as explained throughout this guide and below. Hovering over the OTC Add On column will show the breakdown of each Add On to the total OTC Add On figure.




- Liquidity Add On – this Add On is charged for concentrated risk positions
- Basis Risk Add On –this Add On is computed based on tenor basis exposures. Further details are available on the "Basis Risk Detail" tab and in the related document, "Basis Risk Addon_TIP_v2.2.pdf."
- Un-Scaled Add On -- this Add On is required when an VaR figure run with unscaled scenarios is more negative than the traditional PAIRS base initial margin calculation. In Smart 6. This add-on will take into account STIR scenarios for margined futures trades in Swapclear account. Please also see "Addendum To PAIRS_V1.0.pdf."
- Diversification Add On -- Diversification benefit between futures and minor currency swaps (ρ23) will be limited via an Add On.
- PM Add On -- applied to margin savings due to Portfolio Balancing. The charge is a percentage of the savings in basic Initial Margin. This Add on is applied only if listed positions are balanced to Swapclear accounts.

The "Total Margin" column is the sum of IM across both OTC and Listed and applicable Add Ons.

All Initial Margin and IM Add Ons in the Summary Panel are based off of the combined portfolio containing the base portfolios in Listed and OTC, and any manually input trades and sensitivities in the SwapClear IM, Listed IM, and Portfolio SMART Spider views.

The "Total Saving" column shows the total amount of change to Initial Margin as a result of portfolio margining, that is, the difference between the Prebalancing and Postbalancing total margin.

### 4.2.2 Run Spider

In the Summary Panel there is an "Run Balancer" button – this can be used at any time to recalculate the "Total Saving" column. Normally SMART will automatically recalculate Initial Margin as trades are added. If an update has been made to simulated positions, the text on the "Run Balancer button will turn purple (as shown below) and the user must manually invoke the "Run Balancer" button to update the results.


## 4.3 Adding Simulation Trades and Sensitivities

The user has several options for adding simulated trades to the portfolio.

### 4.3.1 SwapClear IM View

Any simulation trades or sensitivities added in the SwapClear IM View will be inherited over for consideration in the Portfolio Balancer view. Please refer to Section 3.3 and 3.5 for related functionality.

### 4.3.2 Listed IM View

Any simulated positions added in the Listed IM View will be inherited over for consideration in the Portfolio Balancer view. Please refer to section 5.3 for related functionality.

### 4.3.3 SMART Spider View

To add simulated positions (only STIRS and Bond Futures) in the SMART Spider view, users can simply click the cell under the "Simulated" column related to the contract they are looking to update in the view and update it with the position accordingly. To update the portfolio margining results, simply click the "Run Balancer" button.

## 4.4 Middle Area

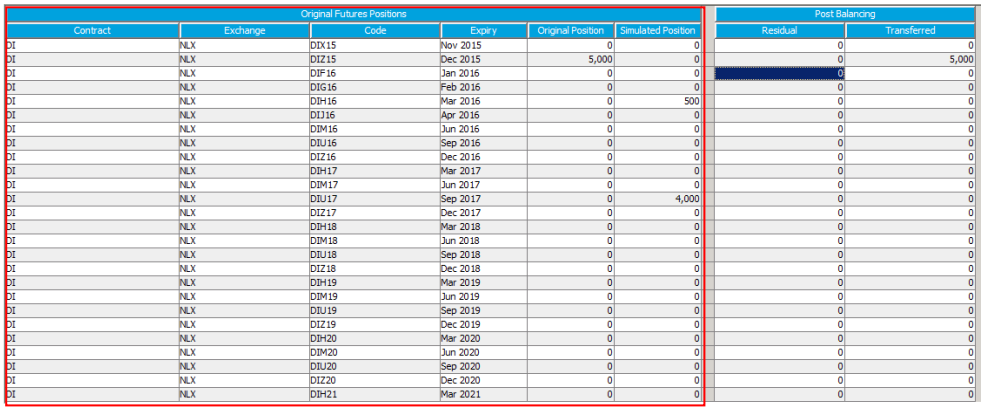
The middle area displays all of the original futures positions imported into the SMART tool and any simulated positions manually input in the SMART Spider view or Listed IM view. It further shows the post portfolio margining results.

### 4.4.1 Futures Positions

The futures positions shown in the middle area represent those initial contracts imported into the tool via the Position Statement Report. Columns will report back:

- Relevant economic information such as the contract's exchange, code and expiry
- "Original Position" will show the original position as reflected in the Listed Position Statement Report
- "Simulated Position" will show any position that has been manually input by the user in the SMART Spider view or the Listed IM view (will carry over from the Listed IM view and display in the Portfolio Balancer". To change this value simply select the text and overwrite it

Reference the below screenshot with the futures positions highlighted in red:



| Original Futures Positions | | | | | | Post Balancing | |
|---|---|---|---|---|---|---|---|
| Contract | Exchange | Code | Expiry | Original Position | Simulated Position | Residual | Transferred |
| DI | NLX | DIX15 | Nov 2015 | 0 | 0 | 0 | 0 |
| DI | NLX | DIZ15 | Dec 2015 | 5,000 | 0 | 0 | 5,000 |
| DI | NLX | DIF16 | Jan 2016 | 0 | 0 | 0 | 0 |
| DI | NLX | DIG16 | Feb 2016 | 0 | 0 | 0 | 0 |
| DI | NLX | DIH16 | Mar 2016 | 0 | 500 | 0 | 0 |
| DI | NLX | DIJ16 | Apr 2016 | 0 | 0 | 0 | 0 |
| DI | NLX | DIM16 | Jun 2016 | 0 | 0 | 0 | 0 |
| DI | NLX | DIU16 | Sep 2016 | 0 | 0 | 0 | 0 |
| DI | NLX | DIZ16 | Dec 2016 | 0 | 0 | 0 | 0 |
| DI | NLX | DIH17 | Mar 2017 | 0 | 0 | 0 | 0 |
| DI | NLX | DIM17 | Jun 2017 | 0 | 0 | 0 | 0 |
| DI | NLX | DIU17 | Sep 2017 | 0 | 4,000 | 0 | 0 |
| DI | NLX | DIZ17 | Dec 2017 | 0 | 0 | 0 | 0 |
| DI | NLX | DIH18 | Mar 2018 | 0 | 0 | 0 | 0 |
| DI | NLX | DIM18 | Jun 2018 | 0 | 0 | 0 | 0 |
| DI | NLX | DIU18 | Sep 2018 | 0 | 0 | 0 | 0 |
| DI | NLX | DIZ18 | Dec 2018 | 0 | 0 | 0 | 0 |
| DI | NLX | DIH19 | Mar 2019 | 0 | 0 | 0 | 0 |
| DI | NLX | DIM19 | Jun 2019 | 0 | 0 | 0 | 0 |
| DI | NLX | DIU19 | Sep 2019 | 0 | 0 | 0 | 0 |
| DI | NLX | DIZ19 | Dec 2019 | 0 | 0 | 0 | 0 |
| DI | NLX | DIH20 | Mar 2020 | 0 | 0 | 0 | 0 |
| DI | NLX | DIM20 | Jun 2020 | 0 | 0 | 0 | 0 |
| DI | NLX | DIU20 | Sep 2020 | 0 | 0 | 0 | 0 |
| DI | NLX | DIZ20 | Dec 2020 | 0 | 0 | 0 | 0 |
| DI | NLX | DIH21 | Mar 2021 | 0 | 0 | 0 | 0 |

### 4.4.2 Post Spider

The post spider section seeks to show the resulting movement of trades post portfolio margining. This is represented through two columns:

- "Residual" which represents positions which remain in Listed post portfolio margining
- "Transferred" which represent positions which are transferred to SwapClear post portfolio margining

Values in these fields cannot be edited.

Please refer to the below screenshot where Post Spider results are highlighted in red:

| Original Futures Positions | | | | | | Post Balancing | |
|---|---|---|---|---|---|---|---|
| Contract | Exchange | Code | Expiry | Original Position | Simulated Position | Residual | Transferred |
| DI | NLX | DIX15 | Nov 2015 | 0 | 0 | 0 | 0 |
| DI | NLX | DIZ15 | Dec 2015 | 5,000 | 0 | 0 | 5,000 |
| DI | NLX | DIF16 | Jan 2016 | 0 | 0 | 0 | 0 |
| DI | NLX | DIG16 | Feb 2016 | 0 | 0 | 0 | 0 |
| DI | NLX | DIH16 | Mar 2016 | 0 | 500 | 0 | 0 |
| DI | NLX | DIJ16 | Apr 2016 | 0 | 0 | 0 | 0 |
| DI | NLX | DIM16 | Jun 2016 | 0 | 0 | 0 | 0 |
| DI | NLX | DIU16 | Sep 2016 | 0 | 0 | 0 | 0 |
| DI | NLX | DIZ16 | Dec 2016 | 0 | 0 | 0 | 0 |
| DI | NLX | DIH17 | Mar 2017 | 0 | 0 | 0 | 0 |
| DI | NLX | DIM17 | Jun 2017 | 0 | 0 | 0 | 0 |
| DI | NLX | DIU17 | Sep 2017 | 0 | 4,000 | 0 | 0 |
| DI | NLX | DIZ17 | Dec 2017 | 0 | 0 | 0 | 0 |
| DI | NLX | DIH18 | Mar 2018 | 0 | 0 | 0 | 0 |
| DI | NLX | DIM18 | Jun 2018 | 0 | 0 | 0 | 0 |
| DI | NLX | DIU18 | Sep 2018 | 0 | 0 | 0 | 0 |
| DI | NLX | DIZ18 | Dec 2018 | 0 | 0 | 0 | 0 |
| DI | NLX | DIH19 | Mar 2019 | 0 | 0 | 0 | 0 |
| DI | NLX | DIM19 | Jun 2019 | 0 | 0 | 0 | 0 |
| DI | NLX | DIU19 | Sep 2019 | 0 | 0 | 0 | 0 |
| DI | NLX | DIZ19 | Dec 2019 | 0 | 0 | 0 | 0 |
| DI | NLX | DIH20 | Mar 2020 | 0 | 0 | 0 | 0 |
| DI | NLX | DIM20 | Jun 2020 | 0 | 0 | 0 | 0 |
| DI | NLX | DIU20 | Sep 2020 | 0 | 0 | 0 | 0 |
| DI | NLX | DIZ20 | Dec 2020 | 0 | 0 | 0 | 0 |
| DI | NLX | DIH21 | Mar 2021 | 0 | 0 | 0 | 0 |

## 4.5 Lower Area – Sensitivities

The lower area purely shows the combined sensitivities of the base portfolio (original) and any trades and sensitivities which may have been manually input across the SMART views.

**Combined Sensitivities (Original + Simulated)**

| | 1D | 1M | 2M | 3M | 6M | 9M | 12M | 18M | 2Y | 27M | 30M | 33M | 3Y | 39M | 42M | 4Y | 5Y | 6Y | 7Y | 8Y | 9Y | 10Y |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EUR EONIA | | | | | | | | | | | | | | | | | | | | | | |
| EUR EURIBOR | | 42,085 | 63,127 | | | -3,234 | -3,850 | -3,465 | -14,289 | | | | -23,830 | | | -30,817 | -39,640 | -47,143 | -53,541 | -59,650 | -64,575 | -112, |
| EUR STIR-FUT | | 779,810 | 7,018,292 | -7,565,076 | -12,682,627 | | | | | 41,873,628 | 86,499,139 | -9,436,232 | -10,132,352 | -66,346,518 | -90,764,813 | | | | | | | |
| GBP LIBOR | | | | | | | | | | | | | | | | | | | | | | |
| GBP SONIA | 27 | | | | | | | | | | | | | | | | | | | | | |
| GBP STIR-FUT | | | | | | | | | | | | | | | | | | | | | | |

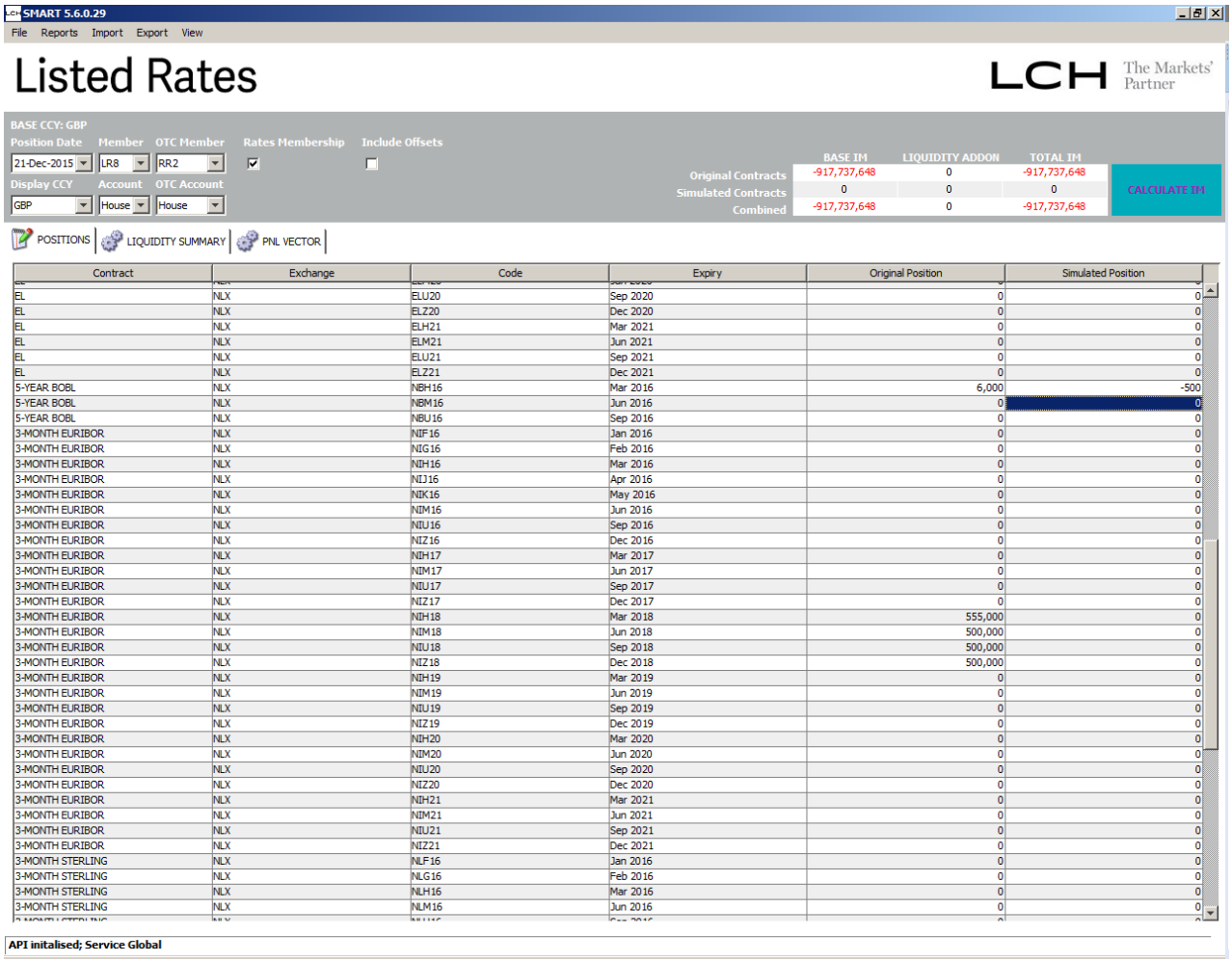
## 4.6 Export to Excel & Copy/Paste

By choosing "EXPORT TO EXCEL" from the Export menu at the top left corner of the SMART Desktop, the user can save the results of portfolio margining to an Excel document.

Further, any data in the SMART Spider view can be copied (select and Ctrl C) and pasted (Ctrl V) into excel.

# 5 Listed IM View

## 5.1 Overview




### 5.1.1 Top Area

The top area is made up of the Summary Panel. This panel allows the user to make changes to the IM estimation, such as change the account for which an IM estimate is desired, position date, etc.

Also displayed is a summary of the IM calculation.

Please take note of the “Rates Membership” and “Include Offsets” checkboxes. The following logic will apply:

- Rates Membership: once clicked Liquidity margin will be calculated across both OTC and Listed as it is calculated in the Rates Membership. As such, once checked, both positions in the selected Listed member and the selected SwapClear member will be taken into consideration in the Liquidity Add-On calculation. If left unchecked SwapClear positions will not be taken into consideration in the Liquidity Add On.

- Include Offsets: once clicked, any margin offsets as a result of portfolio margining will be reflected in the margin calculations. This includes any relevant updates to the Base IM and Liquidity Add On.

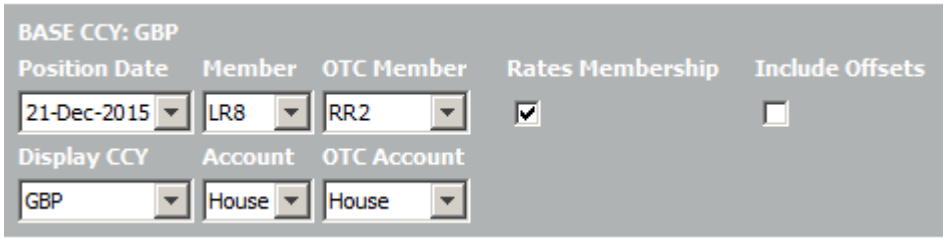
### 5.1.2 Lower area

The lower area contains the futures positions included in the IM estimation. The user can also add positions into this area via the "Simulated Position" column. This is further described in section 5.3.

Two additional tabs are also shown to provide additional detail into the Liquidity Add On and PnL Vectors.

## 5.2 Top Area – Summary Panel

The top left section of the summary panel contains the global settings that affect the IM estimation.




The "BASE CCY" field identifies the currency used for IM calculation.

The "OTC Member" field displays the member mnemonic from report 102/102c and the "Member" field represents the member mnemonic from the Listed Rates Position file. If these reports are not available, these fields will be blank.

The "Display Currency" field shows the currency in which the user wants to see the results of the IM estimation. The spot FX rate obtained from reports 16a, 16c or 18 is used to convert the values into the desired currency. The IM calculations are always done in BASE CCY – the Display Currency is used to convert the Initial Margin to the desired currency after the IM Calculations are completed.

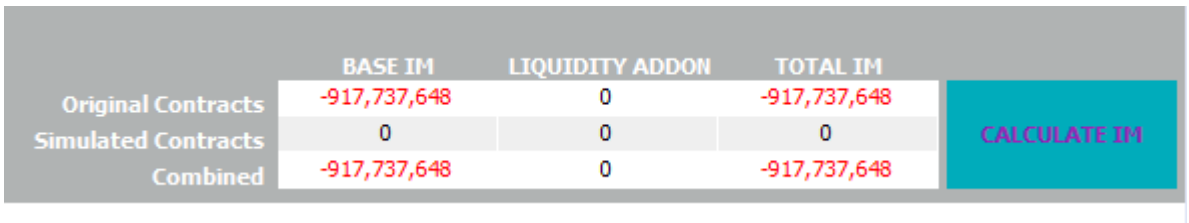
The "Account" and "OTC Account" fields show the list of accounts available. This is further described below.

| Reports Availability | Behaviour |
|---|---|
| Both 102 and 102c present | The House, Client and individual client accounts are displayed.<br><br>If House account is used when calculating IM, the IM will be as per member mode.<br><br>If Client account is used, the result will be in IM in Client mode but |

| | |
|---|---|
| | without a base portfolio.<br><br>If an individual client account is used when calculating IM, the IM will be in Client mode – base portfolio data is included. |
| Only 102 is present | The House and Client accounts are displayed.<br><br>Using House account in IM calculation will trigger member mode IM - base portfolio in report 102 will be included.<br><br>Choosing Client account in IM calculation will trigger Client mode IM - base portfolio will not be available. |
| Only 102c is present | The Client and individual client accounts are displayed.<br><br>The IM will be in Client mode when any of the accounts is used.<br><br>If the Client account is used when calculating IM, it will mean Client mode IM without base portfolio. This option is meant to be used for new/unknown clients. |
| Neither 102 nor 102c present | The Client and House accounts are displayed.<br><br>There will not be a base portfolio for either account.<br><br>If Client account is used in the IM calculation then the IM will be in Client mode – no base portfolio.<br><br>If House account is used in the IM calculation then the IM will be in house mode – no base portfolio. |
| Listed Position Statement Report is present | All Listed accounts are displayed (includes all relevant House and Client accounts) |
| Listed Position Statement Report is not present | No Listed accounts will be displayed or be used in the Liquidity Add On calculation |

### 5.2.1 Summary Panel IM Estimate

The summary panel shows the estimated IM values in a table to the right of the control data.



The “Original Contracts” row shows the Initial Margin and IM Addons for the base portfolio provided in the Listed Positions report.

The “Simulated Contracts” row shows the Initial Margin and IM Addons for the manually inputted positions.

The “Combined” row shows the Initial Margin estimate for the combined portfolio containing the base portfolio and the manually inputted positions.

The “Total IM” column shows the total IM, or sum of the Base IM and Add Ons for the respective contracts -- Original, Simulated or Combined.

The user can copy the values in the table to the Clipboard by selecting the data using the cursor or mouse and then pressing **Ctrl+C**. The data can be pasted into Excel. Note that the headings are not copied.

### 5.2.2 Calculate IM

In the Summary Panel there is a “Calculate IM” button – this can be used at any time to recalculate the Initial Margin. Where additional simulated positions have been added, the user must manually invoke the Calculate IM button to update the Initial Margin – the text on the button turns purple (as shown below) when the Initial Margin estimate is deemed to be stale and should be refreshed.


## 5.3 Adding Simulation Positions

To add simulation trades in the Listed IM view, users can simply click the cell under the “Simulated Position” column related to the contract they are looking to update in the view and update it with the position accordingly. To update the portfolio margining results, simply click the “Calculate IM” button.

Please reference the below screenshot where a simulated position of 200 has been added to the DIX15 contract (highlighted by the blue line).

| Contract | Exchange | Code | Expiry | Original Position | Simulated Position |
|---|---|---|---|---|---|
| DI | NLX | DIX15 | Nov 2015 | 0 | 200 |
| DI | NLX | DIZ15 | Dec 2015 | 5,000 | 0 |
| DI | NLX | DIF16 | Jan 2016 | 0 | 0 |
| DI | NLX | DIG16 | Feb 2016 | 0 | 0 |
| DI | NLX | DIH16 | Mar 2016 | 0 | 500 |
| DI | NLX | DIJ16 | Apr 2016 | 0 | 0 |
| DI | NLX | DIM16 | Jun 2016 | 0 | 0 |

## 5.4 Lower Area

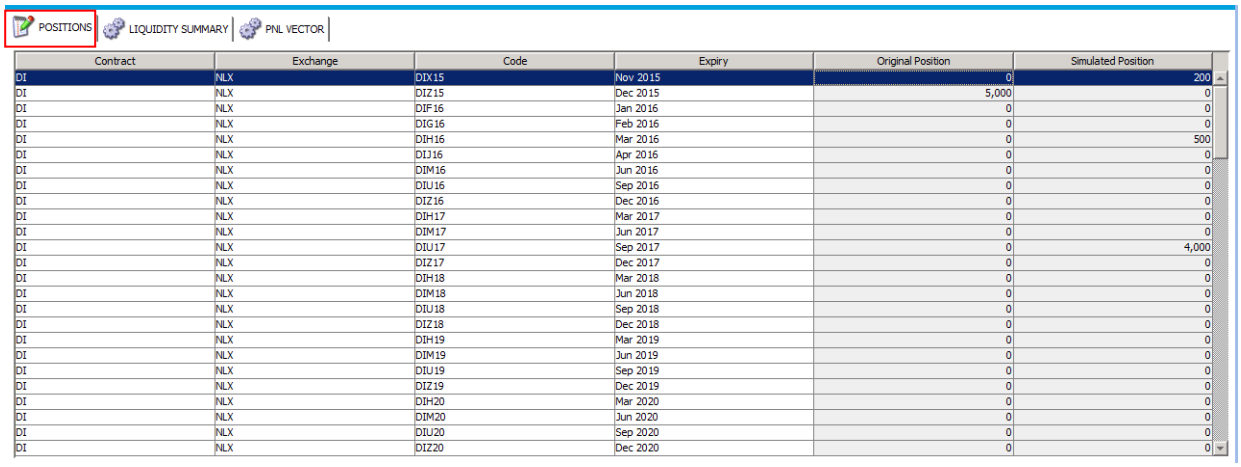
The lower area displays all of the original futures positions imported into the SMART tool (via the Listed Position Statement report) and any simulated positions manually input in the Listed IM view. It further shows tabs representing the Liquidity Add On and PNL Vectors

### 5.4.1 Futures Positions – Positions Tab

The futures positions shown in the lower area represent those initial contracts imported into the tool via the Listed Positions Report and any simulated positions. Columns will report back:

- Relevant economic information such as the contract's exchange, code and expiry
- "Original Position" will show the original position as reflected in the Listed Position Statement Report
- "Simulated Position" will show any position that has been manually input by the user in the Spider view or the Listed IM view (will carry over from the SMART Spider view and display in the Listed IM view. To change this value simply select the text and overwrite it

Reference the below screenshot with the positions tab highlighted in red, and the subsequent data:




| Contract | Exchange | Code | Expiry | Original Position | Simulated Position |
|---|---|---|---|---|---|
| DI | NLX | DIX15 | Nov 2015 | 0 | 200 |
| DI | NLX | DIZ15 | Dec 2015 | 5,000 | 0 |
| DI | NLX | DIF16 | Jan 2016 | 0 | 0 |
| DI | NLX | DIG16 | Feb 2016 | 0 | 0 |
| DI | NLX | DIH16 | Mar 2016 | 0 | 500 |
| DI | NLX | DIJ16 | Apr 2016 | 0 | 0 |
| DI | NLX | DIM16 | Jun 2016 | 0 | 0 |
| DI | NLX | DIU16 | Sep 2016 | 0 | 0 |
| DI | NLX | DIZ16 | Dec 2016 | 0 | 0 |
| DI | NLX | DIH17 | Mar 2017 | 0 | 0 |
| DI | NLX | DIM17 | Jun 2017 | 0 | 0 |
| DI | NLX | DIU17 | Sep 2017 | 0 | 4,000 |
| DI | NLX | DIZ17 | Dec 2017 | 0 | 0 |
| DI | NLX | DIH18 | Mar 2018 | 0 | 0 |
| DI | NLX | DIM18 | Jun 2018 | 0 | 0 |
| DI | NLX | DIU18 | Sep 2018 | 0 | 0 |
| DI | NLX | DIZ18 | Dec 2018 | 0 | 0 |
| DI | NLX | DIH19 | Mar 2019 | 0 | 0 |
| DI | NLX | DIM19 | Jun 2019 | 0 | 0 |
| DI | NLX | DIU19 | Sep 2019 | 0 | 0 |
| DI | NLX | DIZ19 | Dec 2019 | 0 | 0 |
| DI | NLX | DIH20 | Mar 2020 | 0 | 0 |
| DI | NLX | DIM20 | Jun 2020 | 0 | 0 |
| DI | NLX | DIU20 | Sep 2020 | 0 | 0 |
| DI | NLX | DIZ20 | Dec 2020 | 0 | 0 |

### 5.4.2 Liquidity Summary Tab

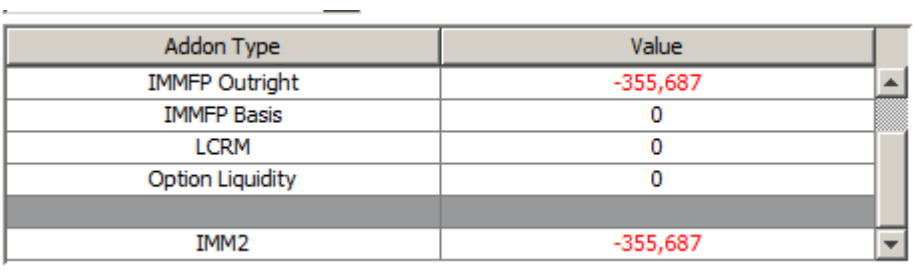
The liquidity summary tab provides detail into the breakdown of IMM2 – outright interest rate risk, swap vs futures basis risk and LCRM.

IMM2 : Captures the concentration risk for listed and OTC trades

- Outright interest rate risk: The existing SwapClear IMM FP methodology will be used to capture concentrated outright directional risks across the combined listed/OTC rates service.
- Swap vs futures basis risk: An additional component of IMM FP will be introduced to cater for futures vs swap basis risk.
- LCRM: Captures the concentration risk for all ineligible products for margining (Bond futures).
- Options Liquidty : Additional component of IMM to capture the concentration of Listed Options.

IMM2 will be set to zero when Listed account is mapped to a SwapClear one as in this case, the IMMFP add-on is charged on SwapClear side.

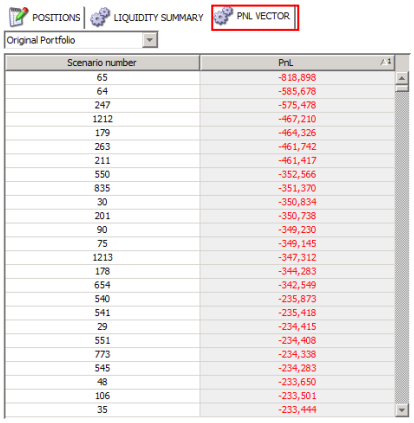
Please refer to the below screenshot in the Listed IM View:



| Addon Type | Value |
|---|---|
| IMMFP Outright | -355,687 |
| IMMFP Basis | 0 |
| LCRM | 0 |
| Option Liquidity | 0 |
| | |
| IMM2 | -355,687 |

### 5.4.3 PnL Vector Tab

This tab generates the PnL Vectors as driven by the Listed Unit P&L Vectors report in the SMART001.dat file, and the Listed Position Statement report. The absence of one or both of these files will result in missing PnL Vectors.




The PnL vectors are based on the PAIRS process of calculating an expected shortfall on the 4 worst scenarios. The PAIRS uses 2 days holding period and 1250 scenarios (5 years lookback period)

# 6 Theoretical Background

## 6.1 Delta Gamma Approximation

Taylor series is an efficient way of obtaining an approximation of a function by a power series. A function of x, such as f(x), will in a neighbourhood around 'a' be approximated by a the sum of a constant term, a linear term, a quadratic term and a cubic term, higher order terms are truncated:

$$f(x+a) \cong f(x) + \frac{f'(x)}{1!}a + \frac{f''(x)}{2!}a^2 + \frac{f'''(x)}{3!}a^3 + \ldots$$

In the Delta Gamma approximation for SwapClear, the function in scope is the NPV of a Swap with respect to the Zero Rates in all Knot Points on the curve:

$$NPV(z_1, z_2, z_3, \ldots, z_N) = x$$

The Delta Gamma approximation dealing with changes of the NPV includes the first and second order terms of the Taylor Expansion. The change of NPV due to a movement of a particular Knot Point *i* by an amount *a* can be expressed as:

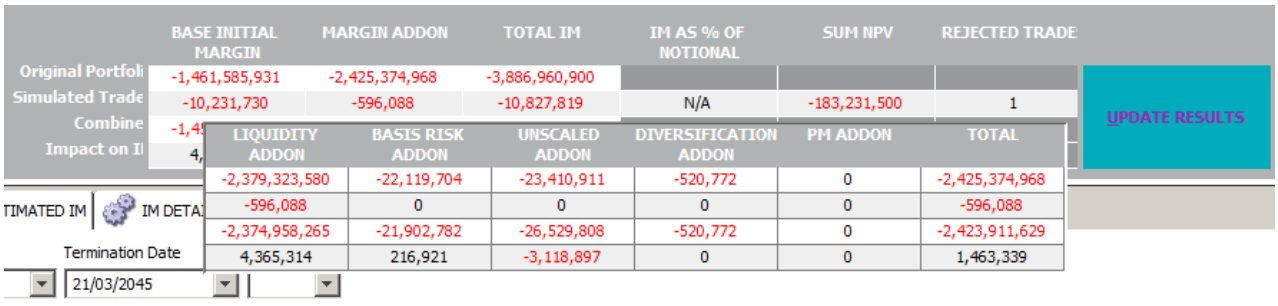
$$NPV(z_1, \ldots, z_i + a_i, \ldots, z_N) - NPV(z_1, \ldots, z_i, \ldots, z_N) \cong$$
$$\frac{\partial NPV(z_1, \ldots, z_i, \ldots, z_N)}{\partial z_i}(a_i) + \frac{1}{2}\frac{\partial^2 NPV(z_1, \ldots, z_i, \ldots, z_N)}{\partial z_i^2}(a_i)^2$$

For a complete description of SwapClear Valuation and Sensitivity methodology please see the document "SwapClear Risk Analytics".

## 6.2 IM Addons

In addition to the calculation of the base Initial Margin (IM), the Desktop Simulation Tool has the functionality to estimate Initial Margin Add On requirements. These results can be found in the "Liquidity Summary" tab, and also in the main screen of the SwapClear IM View next to the IM estimation

The SwapClear IM summary view displays an estimation of all add-ons used for the portfolio margining decision. :



| | BASE INITIAL MARGIN | MARGIN ADDON | TOTAL IM | IM AS % OF NOTIONAL | SUM NPV | REJECTED TRADE |
|---|---|---|---|---|---|---|
| Original Portfoli | -1,461,585,931 | -2,425,374,968 | -3,886,960,900 | | | |
| Simulated Trade | -10,231,730 | -596,088 | -10,827,819 | N/A | -183,231,500 | 1 |
| Combine | -1,4 | | | | | |
| Impact on I | 4, | | | | | |

UPDATE RESULTS

| LIQUIDITY ADDON | BASIS RISK ADDON | UNSCALED ADDON | DIVERSIFICATION ADDON | PM ADDON | TOTAL |
|---|---|---|---|---|---|
| -2,379,323,580 | -22,119,704 | -23,410,911 | -520,772 | 0 | -2,425,374,968 |
| -596,088 | 0 | 0 | 0 | 0 | -596,088 |
| -2,374,958,265 | -21,902,782 | -26,529,808 | -520,772 | 0 | -2,423,911,629 |
| 4,365,314 | 216,921 | -3,118,897 | 0 | 0 | 1,463,339 |

TIMATED IM | IM DETA

Termination Date

21/03/2045

IM add-ons include:

- Diversification Add On - Diversification benefit between futures and minor currency swaps will be limited via an add-on.
- PM Add On - applied to margin savings as result of the Portfolio margining. The charge is a percentage of the savings in basic Initial Margin. This Add On is applied only if listed positions are balanced to Swapclear accounts.
- Liquidity Add On – this Add On is charged for concentrated risk positions. This is calculated based on 2 quantities:
    - IMM1 : Captures the total IM breaching the liquidity thresholds. When members are margining listed accounts, the IMM1 will be calculated on total IM of listed and OTC accounts.
    - IMM2 : Captures the concentration risk for listed and OTC trades
        - Outright interest rate risk: The existing SwapClear IMM FP methodology will be used to capture concentrated outright directional risks across the combined listed/OTC rates service.
        - Swap vs futures basis risk: An additional component of IMM FP will be introduced to cater for futures vs swap basis risk.
        - LCRM: Captures the concentration risk for all ineligible products for margining (Bond futures).

    Where a member has the possibility to incur both types of IMM it is typically the larger of the two that will be charged.
    Further details of the individual curve concentration charge can be found on the “Liquidity Summary” tab. For a complete description of SwapClear Liquidity Add On methodology please see the document “Liquidity Margin!” that can be found on the LCH secure website.
- Basis Risk Add On –this Add On is computed based on tenor basis exposures. Further details are available on the “Basis Risk Detail” tab and in the related document, “Basis Risk Addon_TIP_v2.2.pdf.”
- Unscaled Add On – this Add On is required when an VaR figure run with unscaled scenarios is more negative than the traditional PAIRS base initial margin calculation. The 5.6.0 version will load STIRS scenarios for margined STIRS trades in SwapClear account. Please also see “AddendumToPAIRS_V1.0.pdf.”

# 7 SMART Tool Frequently Asked Questions

**1. What is the purpose of the tool?**

SMART is used to approximate the Initial Margin for a portfolio of swaps margined at SwapClear. Initial Margin (IM) is the returnable deposit required when opening new positions at the clearing house. It is held in case of default in which LCH would inherit the defaulting positions, and therefore would have the potential to incur losses while transferring the defaulting portfolio.

By using SMART it is possible to assess the IM requirement of a SwapClear portfolio. SMART can calculate IM requirements for any combination of Portfolio (Original, Simulated Trades, Combined (Original plus Simulated)).

**2. How to use SMART for what-if calculations?**

What-if calculation can be done by turning individual trades on and off on the true/false toggle next to each trade on the summary page, also inputted sensitivity profiles can be turned on and off using the "include Profile" flag on the "Sensitivity" tab. Trades and profiles that are set to true will be included in the simulated trade category when calculating Initial Margin and Initial Margin Multiplier.

**3. How is the Initial Margin calculated in SwapClear?**

SwapClear uses PAIRS (Portfolio Approach to Interest Rate Scenarios) to calculate the required IM to be paid on a portfolio. PAIRS calculates the Expected Shortfall of the largest six losses over a 5 business day holding period based on volatility filtered historical simulation of a rolling 10 year history of rate data. This is designed to give the clearing house a 5 day period to neutralise the risk of a members positions if they were to default. In calculating IM for client positions the scenarios that SwapClear holds for a 5 day holding period are scaled by $\sqrt{(7/5)}$ to take into account an additional two day holding period to allow for the expected time taken to transfer the client to a surviving clearing member.

For a complete description of PAIRS methodology please see the document "PAIRS TIP V4" that can be found on the LCH secure web site.

**4. How does SMART calculate Initial Margin?**

SwapClear performs a full cash flow revaluation for all trades margined at the clearing house. SMART provides a tool that approximates the estimated IM based on a Delta Gamma approximation. The main drivers of tool for the IM calculation are Zero sensitivities in local currency.

**5. How are Sensitivities calculated for trades?**

SwapClear calculates Delta and Gamma sensitivities analytically. There is no bucketing or apportionment of the sensitivities as SwapClear calculates the exact P&L attribution at each knot point on the curve that is being shifted.

For a complete description of SwapClear Valuation and Sensitivity methodology please see the document "SwapClear Risk Analytics" that can be found on the LCH. secure web site.

**6. How can the user input sensitivities of trades?**

To model trades in SMART the users have three options: They can input trade details on a trade ticket launched from the Summary Tab, they can cut and paste trades into the excel summary tab, or alternatively they can input sensitivity profiles (Delta and Gamma sensitivities). In this way users can access the IM requirement of the portfolio and by including / excluding using the true false toggle what-if scenarios can be explored. As the user sensitivities are input against the standard (IM) curves, the basis risk add-on is not computed.

**7. What are Liquidity Multipliers?**

Liquidity multipliers are additional margin that can be called due to concentrated risk positions, termed Initial Margin Multipliers (IMM).

SwapClear asks all members to participate in a currency liquidity review, at least once a year, to assess the maximum amount of each currency the market can absorb given a normal trading day. Using the feedback SwapClear determines a set of thresholds based on the liquidity of the currencies. The thresholds are applied to the currency WCL balance and where the threshold is breached additional margin is called based on this balance.

**8. What is the Basis Risk add-on?**

Unlike the VM model, Swapclear IM model uses a single curve methodology where trades with different fixing periodicity ( e.g. 1M Libor, 3M Libor or 6M Libor) are all priced using the STD Libor curve.(Please see the document "*SwapClear Zero Coupon Rate Curve Configuration"* to see the details of STD curve construction.)

Because market provides different quotes for each of these trades with the different fixing periodicity (which is reflected in the construction of the tenor curves in the VM valuation), the consequence of the single curve valuation is that IM does not incorporates potential risks (called tenor basis risk) coming from different price between these trades.

Additionally, the single curve IM model uses one standard curve for calculating both the forward rates and discount factors. This means that all cash flows in the IM calculation are discounted with the rates from the Libor STD curves for the Libor indexed trades and not the OIS rates. As the current market standard is to use OIS curves for discount factors (which SwapClear has also implemented in the VM model), there is therefore a potential risk exposure to Libor-OIS spread that is not taken into account in the IM model.

Swapclear developed and implemented a methodology to calculate Basis risk add-on that should sufficiently covers both the tenor basis risk and OIS discounting basis risk. The detailed methodology is described in the documents *Basis Risk Add On TIP* and *LCH Risk Monitoring of Basis Risk Inc OIS* stored in the SwapClear Secure area.

**9. What dates do the scenario numbers denote?**

Scenarios are numbered in reverse chronological order, with scenario 1 being the most recent one, and scenario 2500 the oldest one.

**10. How accurate is the tool relative to official portfolio valuation by SwapClear?**

While SMART uses a Taylor Delta Gamma approximation SwapClear uses a full revaluation of each trade, this will produce a small difference. The size of the difference is typically around 2%,

and dependent on several factors such as the portfolio composition and scenarios. It should be remembered at all times that this tool is just for estimation purposes only and in no way should be relied on as definitive or predictive of what the actual Initial margin will be.

**11. What is the Unscaled VAR add-on?**

The details and purpose of this add-on is described in the documents *AddendumToPAIRS_V1.0* stored in the SwapClear Secure area.

**12. Why are there two sets of sensitivities and IM contributions for a single inflation trade?**

The SMART Taylor IM estimation for inflation swaps account for separate forward inflation curve and OIS discount risk for all inflation trades, as well as cross effects. Therefore single inflation trades will create sensitivities to two separate curves. The OIS discount sensitivity from inflation trades will be aggregated with any OIS risk resulting from OIS swaps.

## SMART Spider FAQ

**1. Can I reduce my total IM liabilities by perfectly hedging my OTC portfolio with listed products?**

Although a prefect hedge is not achievable between OTC and Listed, a great level of IM reduction can be achieved.

For example a single OTC swap resetting on STIRS futures dates can be hedged with an equivalent strip of STIR futures providing a large total IM reduction.

In reality OTC portfolios are usually very diversified with a lower level of direct offset achievable. The resulting total final IM is also affected by additional add-ons that can further decrease the offset effect.

**2. I have my largest OTC risk on the mid-long end of the swap curves ie.10Y+, can I still benefit by cross margin using STIRS futures up to 3Y or 5Y?**

Yes, there should be some cross margining benefit, because the IM optimization works on IM scenario rather than deltas, it takes in account the portfolio margining characteristics across all products, risk factors and currencies.

**3. I have added some simulated positions to my OTC and/or Listed portfolio and my resulting transferred listed portfolio is now very different from before, is that normal?**

Many different solutions can be close to the optimal solution, the addition of few trades or moving into a new business day can cause the transfer positions to be very different, however this should not be of concern as the Total final IM is not expected to change substantially unless the risk added is substantial.

**4. Is there a way to identify the listed positions that reduces my total IM the most?**

A starting listed positions set is always required. Users can simulate listed trade positions, use original position or a mix of simulated and original ones.

To exclude an original position just book an opposite sign simulated position.

Once the desired starting positions have been defined, run the balancer, the transferred positions will provide a good indication of the most efficient position, the process can be repeated by using transferred starting position as original position.

**5. What are the Add On affecting my final total IM numbers?**

The IM optimization process works with OTC base IM and Listed base IM only (no Add on).

The following add on values are then added to calculate the total final IM:

IM add-ons include:

- Diversification Add On - Diversification benefit between futures and minor currency swaps will be limited via an Add On.
- PM Add On - applied to margin savings as result of the Portfolio margining. The charge is a percentage of the savings in basic Initial Margin. This Add On is applied only if listed positions are balanced to Swapclear accounts.
- Liquidity Add On – this Add On is charged for concentrated risk positions. This is calculated based on 2 quantities:
    - IMM1 : Captures the total IM breaching the liquidity thresholds. When members are margining listed accounts, the IMM1 will be calculated on total IM of listed and OTC accounts.
    - IMM2 : Captures the concentration risk for listed and OTC trades
        - Outright interest rate risk: The existing SwapClear IMM FP methodology will be used to capture concentrated outright directional risks across the combined listed/OTC rates service.
        - Swap vs futures basis risk: An additional component of IMM FP will be introduced to cater for futures vs swap basis risk.
        - LCRM: Captures the concentration risk for all ineligible products for margining (Bond futures).

  Where a member has the possibility to incur both types of IMM it is typically the larger of the two that will be charged.
  Further details of the individual curve concentration charge can be found on the “Liquidity Summary” tab. For a complete description of SwapClear Liquidity Add On methodology please see the document “Liquidity Margin!” that can be found on the LCH secure website.
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5.6.0 version will load STIRS scenarios  for margined STIRS trades in SwapClear account.  Please also see “AddendumToPAIRS_V1.0.pdf.”

# 8 User Support Contact

For prospective and existing participants, please direct all support queries to smartsupport@lch.com

# 9 Appendix

## 9.1 Required software and support files

### 9.1.1 Reports

Download of Reports from MemberLive is to be handled as a separate task outside of SMART tool. Members should have a process in place to download the reports required by SMART from the MemberLive website to a specific location in their organization's network. The files used in the calculation must be downloaded daily from LCH. Member Reporting and all saved on the same folder. The necessary files and their respective links are:

**YYYYMMDD_REP00003 - Historic Index Rates_ 1.TXT**

/Public/SwapClear/Trade

**YYYYMMDD_REP00006 - Calendar_ 1.TXT**

/Public/SwapClear/Trade

**YYYYMMDD_REP00016a - OTC Portfolio Cash Settlement (SCM)_ 1.txt**

/{member mnemonic}/SwapClear/YYYYMMDD

OR

**YYYYMMDD_REP00016c - OTC Portfolio Cash Settlement (Client)_ 1.txt**

/{member mnemonic}//SwapClear/YYYYMMDD

NOTE: Anyone of the two reports is needed to retrieve the FX rate. The reports contain information on house respective clients' positions

Alternatively

**REP00018 – Daily Exchange Rates_1.TXT**

/Public/Banking

NOTE: The report contains exchange rates from banking; please observe that the rates are slightly different from the rates in report 16.

**YYYYMMDD_REP00079 - IM Yield Curve - Zero Yield Day 0_ 1.TXT**

/Public/SwapClear/Risk/Yield Curves

**YYYYMMDD_REP00079Spread - IM Yield Curve - Zero Yield Day 0_ 1.TXT**

/Public/SwapClear/Risk/Yield Curves

**YYYYMMDD_REP00079Tenor - IM Yield Curve - Zero Yield Day 0_ 1.TXT**

/Public/SwapClear/Risk/Yield Curves

**YYYYMMDD_REP00090 - SwapClear Scenario Report_ 1.TXT**

/Public/SwapClear/Risk/Yield Curves

**YYYYMMDD_REP00090Spread - SwapClear Scenario Report_ 1.TXT**

/Public/SwapClear/Risk/Yield Curves

**YYYYMMDD_REP00090Tenor - SwapClear Scenario Report_ 1.TXT**

/Public/SwapClear/Risk/Yield Curves

**YYYYMMDD_REP00100 - Risk Yield Curve - Zero Rates Day 0_ 1.TXT**

/Public/SwapClear/Risk/Yield Curves

**YYYYMMDD_REP00101 - VM Yield Curve - Zero Rates Day 0_ 1.TXT**

/Public/SwapClear/Risk/Yield Curves

**YYYYMMDD_REP00133 - Inflation Seasonality_ 1.TXT**

/Public/SwapClear/Risk/Yield Curves

**YYYYMMDD_ REP00134 - IM Inflation Curve - Par Rates Day 0_ 1.TXT**

/Public/SwapClear/Risk/Yield Curves

**YYYYMMDD _REP00135 - VM Inflation Curve - Par Rates Day 0_ 1.TXT**

/Public/SwapClear/Risk/Yield Curves

**YYYYMMDD_REP00102 - IM Sensitivity Report (SCM)_ 1.TXT**

/{member mnemonic}/SwapClear/YYYYMMDD

**YYYYMMDD_REP00102c - IM Sensitivity Report (Client)_ 1.TXT**

/{member mnemonic}/SwapClear/YYYYMMDD

The equivalent report for clients would be called 102cl and for fund managers 102cf

**YYYYMMDD_REP00103 - Tenor Sensitivity Report (SCM)_ 1.TXT**

/{member mnemonic}/SwapClear/YYYYMMDD

**YYYYMMDD_REP00103c - Tenor Sensitivity Report (Client)_ 1.TXT**

/{member mnemonic}/SwapClear/YYYYMMDD

The equivalent report for clients would be called 103cl and for fund managers 103cf

**YYYYMMDD_ REP00138 - IM Cross Gamma Sensitivity Report_ 1.TXT**

/{member mnemonic}/SwapClear/YYYYMMDD

**YYYYMMDD_ REP00138c - IM Cross Gamma Sensitivity Report_ 1.TXT**

/{member mnemonic}/SwapClear/YYYYMMDD

The equivalent report for clients would be called 138cl and for fund managers 138cf

**LCH_Position_Statement_Report.xml**

/{member mnemonic}/NLX/YYYYMMDD

**YYYYMMDD_SMART0001.DAT**

/Public/SwapClear/Risk/SMART

**YYYYMMDD_SMART0002.TXT**

/{member mnemonic}/SwapClear/YYYYMMDD

An equivalent report for clients would be call 2c and 2f

**YYYYMMDD_SMART0003c/cf.TXT**

/{member mnemonic}/SwapClear/YYYYMMDD

Only for direct clients

## 9.2 Glossary of Terms

| | |
|---|---|
| OTC portfolio | A clearing member's Over-The-Counter portfolio applicable for margining by LCH. Ltd. For SwapClear this consists of Swaps and consideration amounts. |
| Total portfolio | The combination of a clearing member's OTC portfolio. |
| Scenario | A specific yield curve and FX shift. |
| Scenario Worst-Case Loss | The largest loss obtained resulting from the set of scenarios classed. |
| Yield Curve/Zero Coupon Yield Curve | A curve showing the relationship of non-interest bearing instruments' yields against maturity. |
| IMMES | Initial Margin Management Event Service |
| PAIRS | Portfolio Approach to Interest Rate Scenarios. |
| IM | Initial Margin |
| NPV | Net Present Value |