Nasdaq Calypso

Scenario Analysis

Version 18

Revision 3.0

July 2024

Approved

Document History

Revision	Published	Summary of Changes
1.0	February 2024	First revision for version 18.
2.0	April 2024	Updates for version 18 monthly release - Pre-process pricer measure must be changed to INSTRUMENT_SPREAD for performance swaps.
3.0	July 2024	Updates for version 18 monthly release - Support Min & Max Levels on Zero Curve Shifts in Scenario Analysis

The Scenario analysis provides advanced configuration features, and it is recommended to use the Sensitivity analysis or the Simulation analysis instead.

Should you decide to use the Scenario Analysis, it is strongly recommended that you contact your Calypso representative for configuration advice.

Table of Contents

1. Scenario Analysis Overview

The Scenario analysis allows users to define different market data scenarios (using any type of perturbation) to be applied to a set of trades, and calculates risk measures for those scenarios. Scenarios are specified using the Scenario Editor.

The Scenario analysis can be run using the following methods:

- Using the scheduled task RISK_ANALYSIS to save results to the database and/or to a file - Saved results can be viewed in the Calypso Workstation using the risk servers.
- In real-time using the risk servers - The results are displayed in the Calypso Workstation.

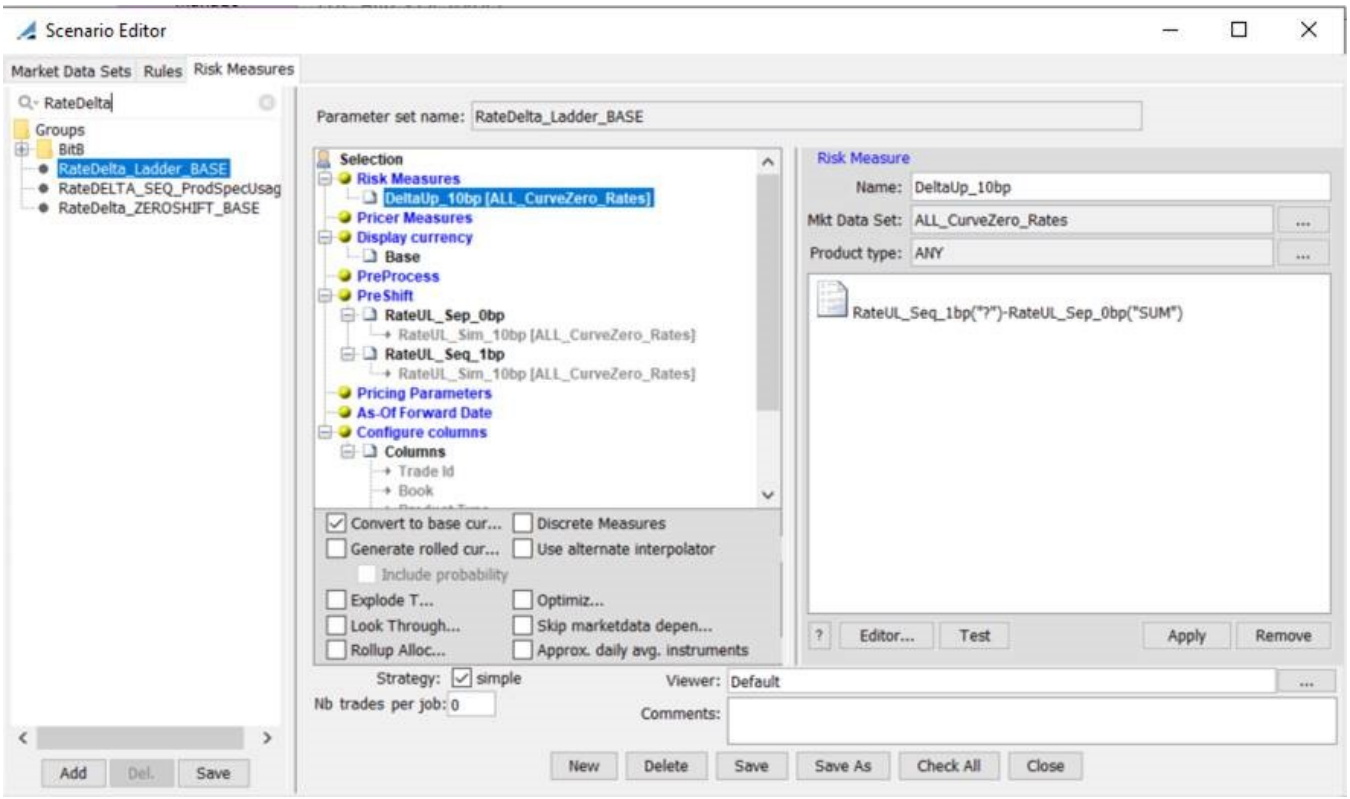
▶ Refer to Calypso Workstation documentation for details.

Scenario Editor

Scenario Editor allows defining scenarios for perturbing market data and applying the perturbations.

A scenario is comprised of a set of market data to be perturbed, a set of perturbation rules, and a set of risk measures that compute the results of perturbing the market data.

From the Calypso Navigator, navigate to **Configuration > Reporting & Risk > Scenario Editor** (menu action `risk.ScenarioParamViewer`) to invoke the Scenario Editor window as shown below. The Risk Measure panel is selected by default.



- Select the Market Data Sets panel for defining market data sets that will be perturbed.
  - See Defining Market Data Sets for details.
- Select the Rules panel for defining perturbations rules.
  - See Defining Perturbation Rules for details.
- Select the Risk Measures panels for defining risk measures.
  - See Defining Risk Measures for details.

Executing Scenarios

See Sample Scenario Outputs to learn more about viewing results.

Pricer Measures in Base Currency

All conversions happen in a cross-asset fashion, regardless of the pricer or product which produced the measures that are being converted. The pricing parameters and triangulation rules used for the conversion are taken for product type “ANY”: ADJUST_FX_RATE, INSTANCE_TYPE, CURVE_USAGE, QuoteUsage. If not specified for product type “ANY”, the default values are: ADJUST_FX_RATE = false, INSTANCE_TYPE = Last, CURVE_USAGE = MID, QuoteUsage = MID.

The pricing parameter FX_POINTS is always considered false.

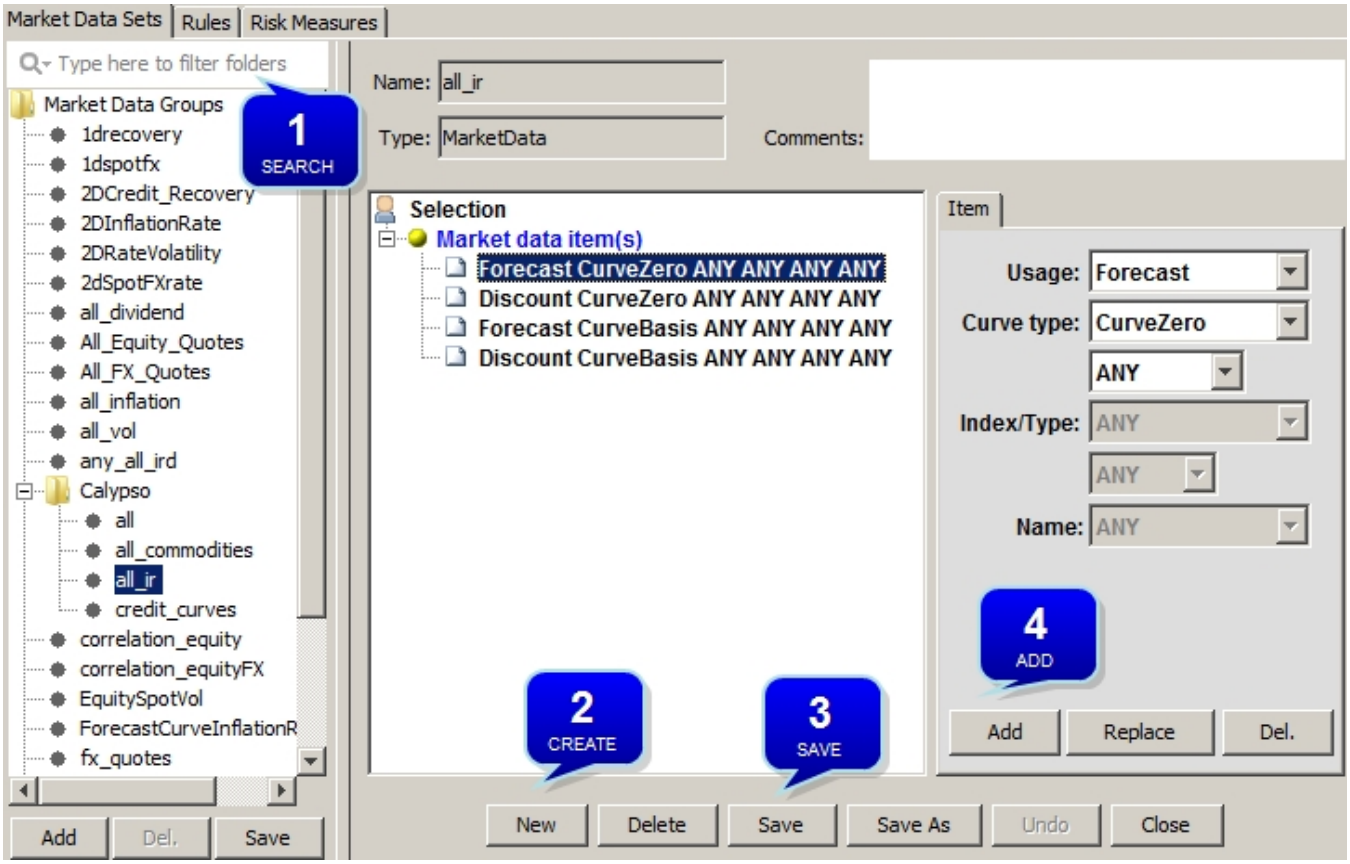
2. Scenario - Market Data Sets

A Market Data Set is essentially a filter which specifies a subset of market data item instances that will be perturbed, such as USD - CurveZero - 3M - LIBOR used for Discounting, or a particular market data item.

ⓘ [NOTE: The actual market data items will be retrieved from your Pricing Environment when the Scenario Analysis is executed. So if you define a Market Data Set with a specific curve, and that curve is not part of your Pricing Environment, it will not be perturbed]

Multiple market data sets can be collected in a market data set group.

The Market Data Sets panel will appear as shown below.



Sample Market Data Set

You have the option to create a market data group by clicking **Add** under Market Data Groups. You will be prompted to enter a group name. Click **Save** under Market Data Groups to save the group.

Step 1 - Click this box to filter on a folder of market data. Click the magnifying glass icon to set search parameters or enter text in the box to search for a specific folder.

Step 2 - Select the "Market Data Groups" label, or select an existing market data group, and click **New** to create a new market data set. This will clear the Market Data Sets panel.

Step 3 - Click **Save** when the market data set is defined. You will be prompted to enter a name. If a group is selected when you create a new market data set, the new market data set will be added to that group. Otherwise, it will be created on its own.

Note the type is set to MarketData, and you can enter a comment in the Comments field.

Step 4 - Select the type of market data item from the Item panel, and click **Add** to add it to the market data set. The various types of market data items are described below.

2.1 Commodity Usage

To select commodity curves.

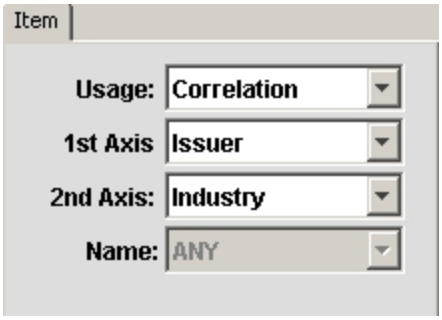
- Enter the fields described below.
- Then click **Add** to add the market data item to the market data set.

Fields	Description
Usage	Commodity.
Currency	Choose a currency or ANY.
Commodity	Click ... to select a commodity product, or double-click the Commodity label for ANY product.

Fields	Description
Name	Choose a curve name or ANY. This selection box will be filled with the appropriate curves from your Pricing Environment, based upon the selections above in the Item panel. [NOTE: This feature does not support names that include spaces]

2.2 Correlation Usage

To select correlation matrices.



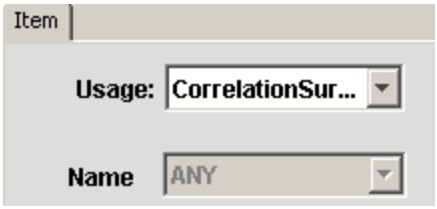
» Enter the fields as described below.

» Then click **Add** to add the market data item to the market data set.

Fields	Description
Usage	Correlation.
1st Axis	Select a first axis.
2nd Axis	Select a second axis.
Name	Defaults to ANY. [NOTE: This feature does not support names that include spaces]

2.3 Correlation Surface Usage

To select basket correlation surfaces.



» Select CorrelationSurface from the Usage field. The Name field defaults to ANY.

ⓘ [NOTE: This feature does not support names that include spaces]

» Then click **Add** to add the market data item to the market data set.

2.4 Credit Usage

To select credit curves.

» Enter the fields as described below.

You can click Advance Filter to specify additional criteria.

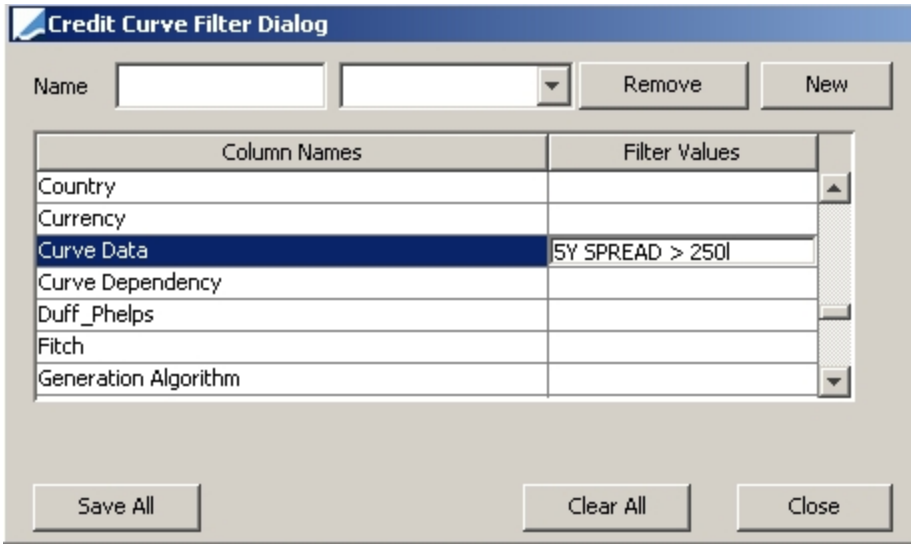
▶See Advanced Filter details.

» Then click **Add** to add the market data item to the market data set.

Fields	Description
Usage	Credit.
Curve Type	Choose Risky/Proba., Recovery, or Basis Adjustment. When BasisAdjustment is selected, Industry, Issuer, and Seniority are disabled.
Currency	Choose a currency or ANY.
Industry	Choose an industry or ANY.
Issuer	Choose an issuer or ANY.
Seniority	Choose a seniority or ANY.
Name	Choose a curve name or ANY.

Fields	Description
	[NOTE: This feature does not support names that include spaces]

Advanced Filter



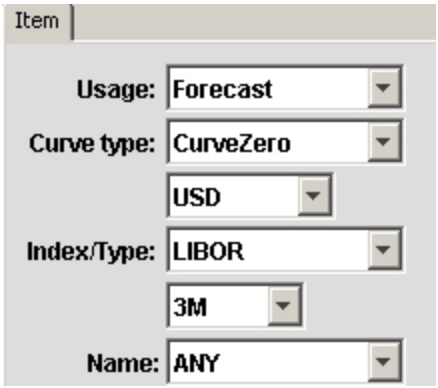
» Double-click a Filter Values cell to enter a value for a search criteria.

For the Curve Data criteria, you can use an expression of the form "5Y_SPREAD > 250" to test against the underlying spreads of a probability curve. If there is no 5Y underlying in the curve then the filter does nothing. You can also use the form "5Y_POINT <= 100" to test against an interpolated probability value.

» Click **Save All** when you are done.

2.5 Discount and Forecast Usage

To select discount curves and forecast curves.

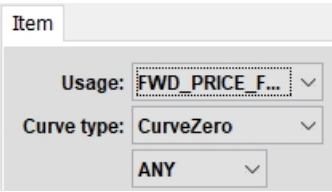


» Enter the fields as described below.

» Then click **Add** to add the market data item to the market data set.

You can also select interest rate curves configured in the Product Specific tab, provided you add their usage to the domain “ScenarioMarketDataSet.Rates”. The usage will appear in the Usage field and you can select the corresponding curves.

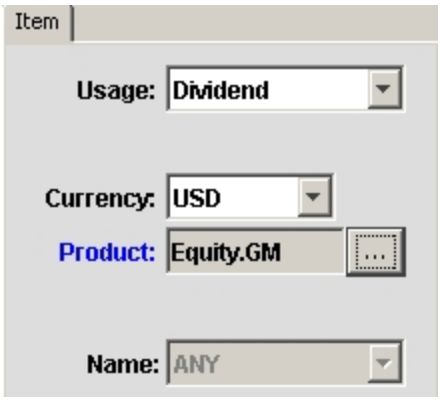
Example: FWD_PRICE_FOR



Fields	Description
Usage	Discount or Forecast. ⓘ [NOTE: This selection is used to find curves in the Pricer Config – It does not make any assumption on the usage that the pricers are making of the curves. For example, if a curve is used for discount on one product and forecast on another, then running a Scenario on this curve will impact both, even if the Market Data Set says discount only]
Curve Type	Choose the curve type. Available options include CurveZero, CurveBasis, CurveInflation, and CurveZeroPreciousMetal.
Currency	Choose a currency or ANY.
Index/Type	Choose an index or ANY.
Tenor	Choose a tenor or ANY.
Name	Choose a curve name or ANY. This selection box will be filled with the appropriate curves from your Pricing Environment, based upon the selections above in the Item panel. ⓘ [NOTE: This feature does not support names that include spaces]

2.6 Dividend Usage

To select dividend curves.



- Enter the fields as described below.
- Then click **Add** to add the market data item to the market data set.

Fields	Description
Usage	Dividend.
Primary	Choose the currency.
Product	Choose the product.
Name	Defaults to ANY. [NOTE: This feature does not support names that include spaces]

2.7 FX Usage

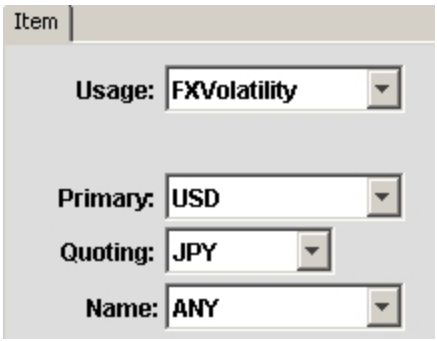
To select FX curves.

- Enter the fields as described below.
- Then click **Add** to add the market data item to the market data set.

Fields	Description
Usage	FX.
Primary	Choose the primary currency.
Quoting	Choose the quoting currency.
Name	Choose a curve name or ANY. ⓘ [NOTE: This feature does not support names that include spaces]

2.8 FX Volatility Usage

To select FX volatility surfaces.



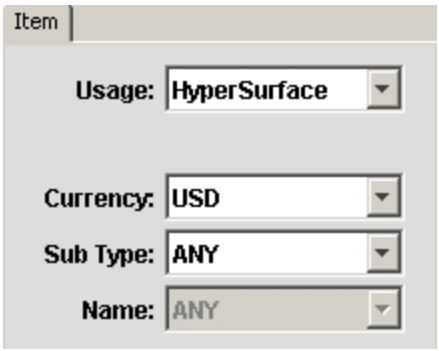
» Enter the fields as described below.

» Then click **Add** to add the market data item to the market data set.

Fields	Description
Usage	FXVolatility.
Primary	Choose the primary currency.
Quoting	Choose the quoting currency.
Name	Choose a curve name or ANY. ⓘ [NOTE: This feature does not support names that include spaces]

2.9 Hypersurface Usage

To select hypersurfaces.



- Enter the fields as described below.
- Then click **Add** to add the market data item to the market data set.

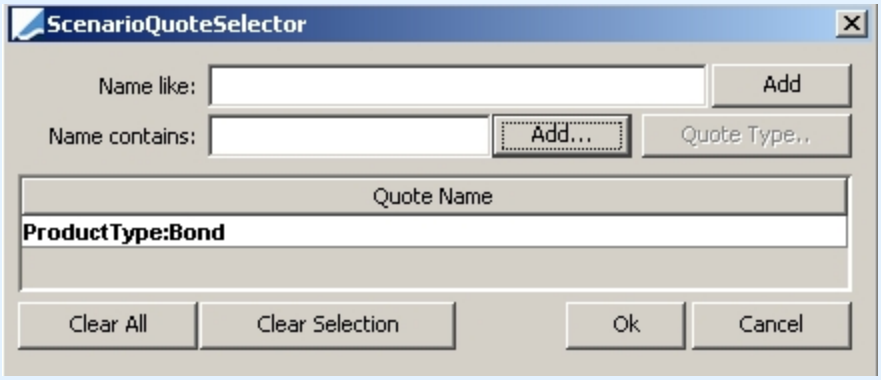
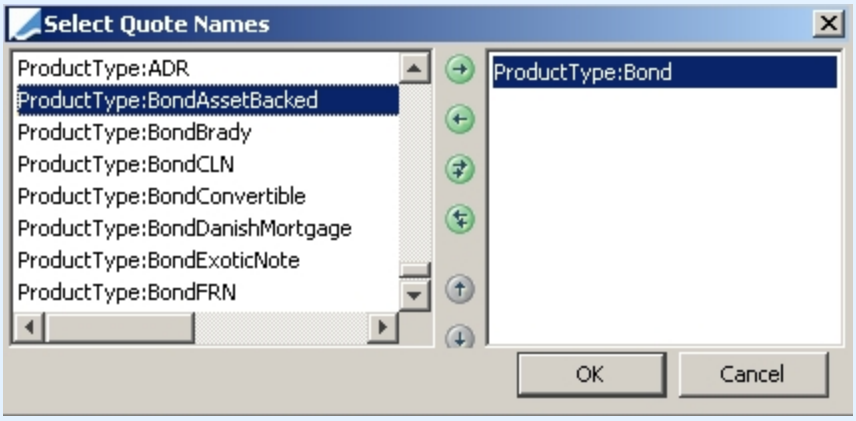
Fields	Description
Usage	HyperSurface.
Currency	Select a currency or ANY.
Sub Type	Select a subtype or ANY.
Name	Choose a surface name or ANY. ⓘ [NOTE: This feature does not support names that include spaces]

2.10 Quotes Usage

To select quotes. You can select quotes to be perturbed, as well as reference quotes for Beta perturbations.

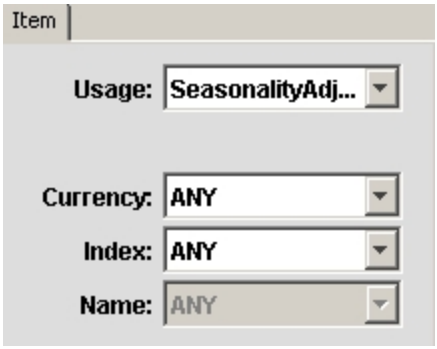
- Enter the fields as described below.
- Then click **Add** to add the market data item to the market data set.

Fields	Description
Usage	Quotes.
Quotes Selector	Click to **Quote Selector** to invoke the Quotes Selector window as shown below.

Fields	Description
	 » Click **Add** to invoke the Select Quote Names dialog. You can select quote names, and at the end of the list, you can select product types as shown below.  ⓘ [NOTE: This feature does not support names that include spaces]

2.11 Seasonality Adjustment Usage

To select seasonality curves.



» Enter the fields as described below.

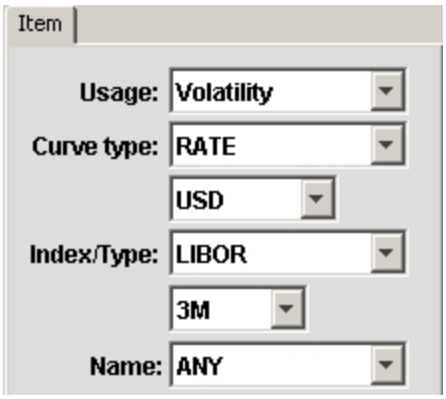
» Then click **Add** to add the market data item to the market data set.

Fields	Description
Usage	SeasonalityAdjustment.
Currency	Choose a currency or ANY.
Index	Choose an inflation index or ANY.
Name	Defaults to ANY. [NOTE: This feature does not support names that include spaces]

2.12 Volatility Usage

To select volatility surfaces.

For volatility surfaces with a Curve Type of RATE or MMFUTURE.

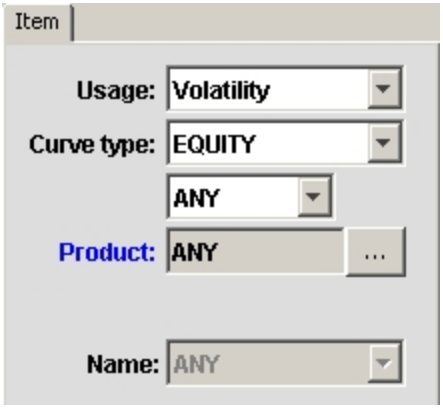


» Enter the fields as described below.

» Then click **Add** to add the market data item to the market data set.

Fields	Description
Usage	Volatility.
Curve Type	Choose a volatility surface type.
Currency	Choose a currency or ANY.
Index/Type	Choose an index or ANY.
Tenor	Choose a tenor or ANY.
Name	Choose a surface name or ANY. [NOTE: This feature does not support names that include spaces]

For volatility surfaces with a Curve Type of BOND, BONDFUTURE, or EQUITY.

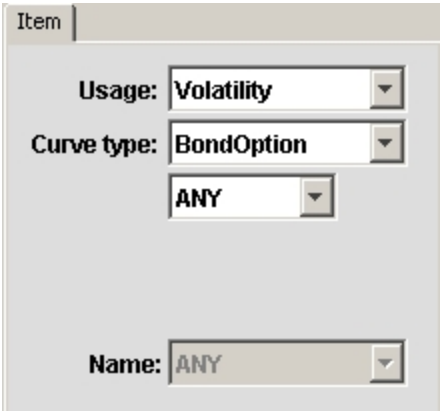


» Enter the fields as described below.

» Then click **Add** to add the market data item to the market data set.

Fields	Description
Usage	Volatility.
Curve Type	Choose a volatility surface type.
Currency	Choose a currency or ANY.
Product	Choose an index or ANY.
Name	Choose a surface name or ANY. ⓘ [NOTE: This feature does not support names that include spaces]

For volatility surfaces with a Curve Type of Basket, BondOption, Commodity, or Credit.



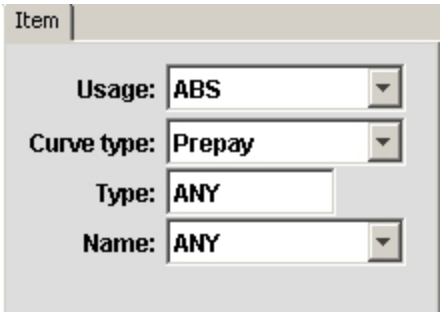
» Enter the fields as described below.

» Then click **Add** to add the market data item to the market data set.

Fields	Description
Usage	Volatility.
Curve Type	Choose a volatility surface type.
Currency	Choose a currency or ANY.
Name	Choose a surface name or ANY. ⓘ [NOTE: This feature does not support names that include spaces]

2.13 ABS Usage

To select ABS curves.



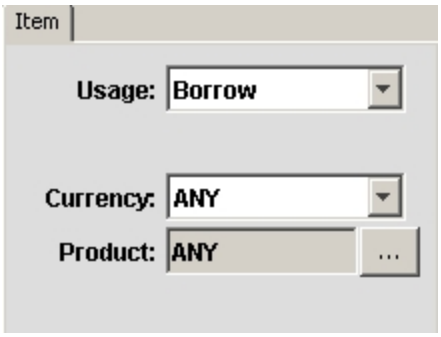
» Enter the fields as described below.

» Then click **Add** to add the market data item to the market data set.

Fields	Description
Usage	ABS.
Curve Type	Choose Prepay or Default.
Type	Choose a type.
Name	Defaults to ANY. ⓘ [NOTE: This feature does not support names that include spaces]

2.14 Borrow Usage

To select borrow curves.

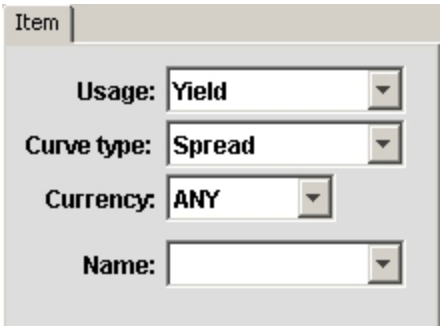


- Enter the fields as described below.
- Then click **Add** to add the market data item to the market data set.

Fields	Description
Usage	Borrow.
Currency	Choose a currency or ANY.
Product	Choose a Product.

2.15 Yield Usage

To select Yield curves.



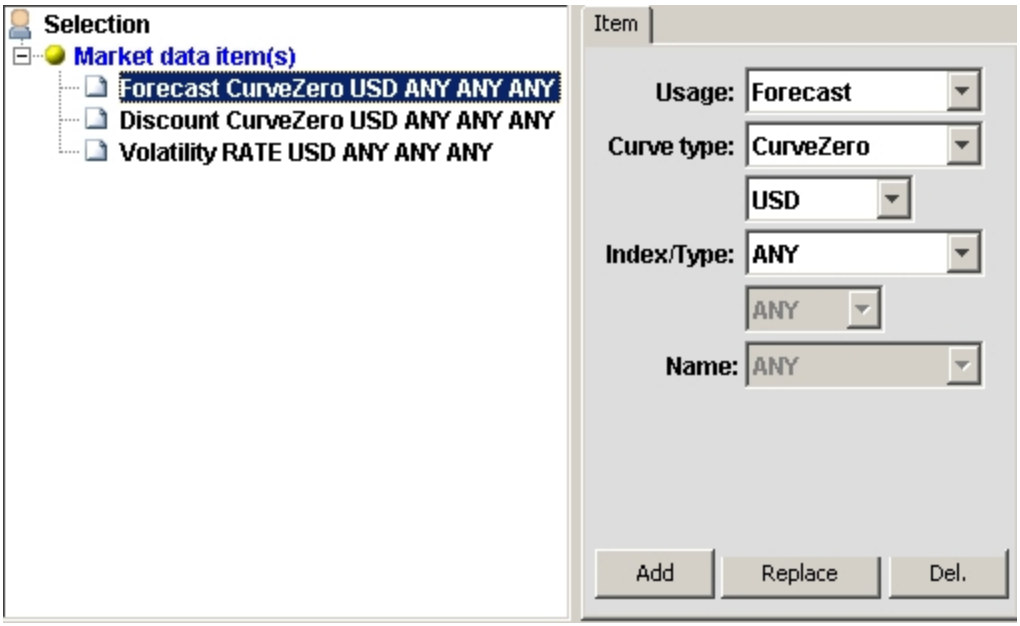
- Enter the fields as described below.
- Then click **Add** to add the market data item to the market data set.

Fields	Description
Usage	Yield.
Curve Type	Choose Benchmark or Spread.
Currency	Choose a currency or ANY.
Name	Choose a Name.

Fields	Description
	[NOTE: This feature does not support names that include spaces]

2.16 Sample Market Data Set

Market Data Item = All USD Forecast and Discount Curves, and All Rate Volatility Surfaces.

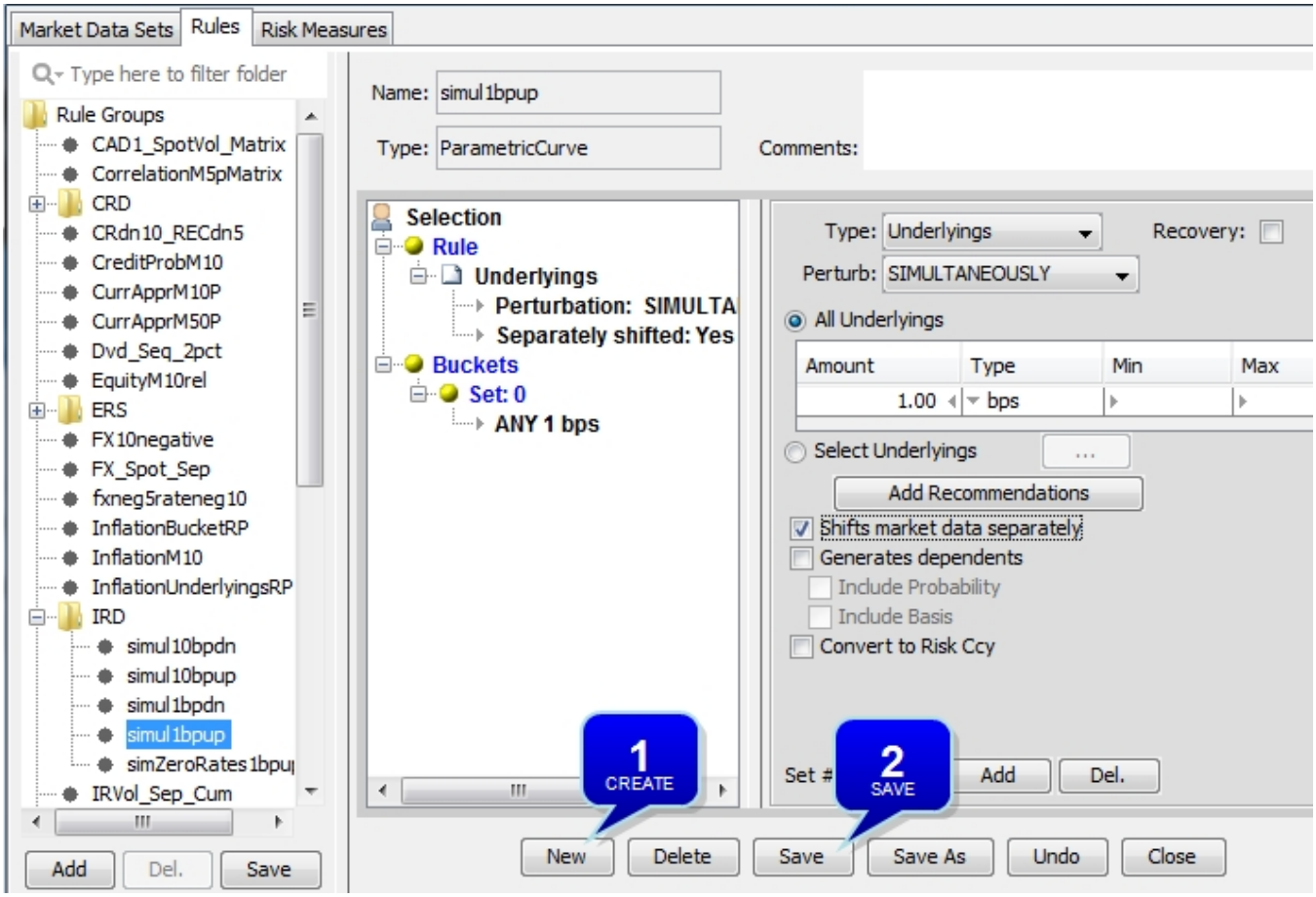


3. Scenario - Defining Perturbation Rules

A perturbation rule defines the perturbation of a particular market data item. It can affect a set of market data items or individual instances (for example, Discount USD LIBOR 6M USD_LIBOR_Curve).

Multiple perturbation rules can be collected in a rule group.

The Rules panel will appear as shown below.



Sample Perturbation Rule

Step 1 - Select the "Rules" label, and click **New** to create a new rule. You will be prompted to select a rule type.

The user may define different rules for the same market data item. In general, one rule will be applied to a particular market data item at a time:

The following types of perturbation rules are available:

- Composite perturbation rules allow the simultaneous application of one or more basic rules.
- CorrelationMatrix perturbation rules allow the perturbation of correlation matrices.
- CorrelationSurface perturbation rules allow the perturbation of correlation surfaces.
- Curve perturbation rules allow the perturbation of all the curves: rate, credit, dividend, inflation, etc.

- Date perturbation rules allow the simulation of a change in the valuation date.
- Matrix perturbation rules, similar to Composite, allow the specification of up to three basic rules, each along an axis. A "matrix" of perturbations in three dimensional space is produced.
- Quotes perturbation rules allow the perturbation of individual quote values and Beta values.
- Reset Risk Rules allow the perturbation of values related to trades involving reset dates.
- SeasonalityAdjustment perturbation rules allow the perturbation of seasonality curves.
- Volatility perturbation rules allow the perturbation of volatility surfaces along any of their axes.

Based on the rule type, the rule definition will be different, as described below.

Step 2 - Click **Save** when the rule is defined. You will be prompted to enter a name. If a group is selected when you create a new rule, the new rule will be added to that group. Otherwise, it will be created on its own.
Note that you can enter a comment in the Comments field.

You have the option to create a Rules Group by clicking **Add** under Rules Groups. You will be prompted to enter a group name. Click **Save** under Rule Groups to save the group.

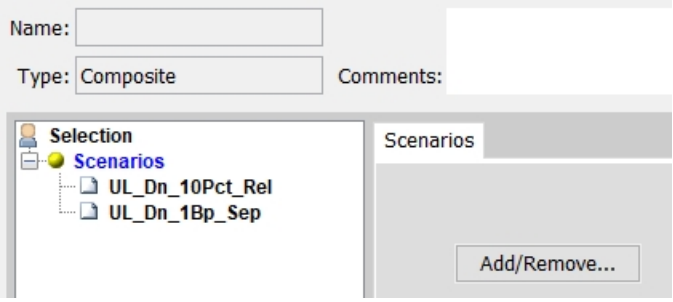
Perturbations are performed on either "input" or "output" points. For instance, *underlyings* (such as curve underlying instruments that generate zero curves) are input points, while *zero* is an output point (such as a generated zero curve point). All perturbations may be performed either on a point by point basis or by time intervals. For input point perturbations, the rule may also be defined to apply perturbations to different types of input points (e.g. apply perturbation1to money market instruments, perturbation2 to futures, perturbation3 to swaps, etc.). For time interval perturbations, the rule may apply perturbations to one or more time intervals, as defined by a set of tenors.

An amount and unit of perturbation may be defined for each perturbation. For zero perturbations, the amount of perturbation is added to each curve zero point within the specified interval. The specified compound frequency and daycount is used to extract the zero rate at each point from the discount factor curve.

For perturbations of underlying instruments, the amount of perturbation is added to each underlying instrument's quote (whether price, yield, etc.) prior to regeneration.

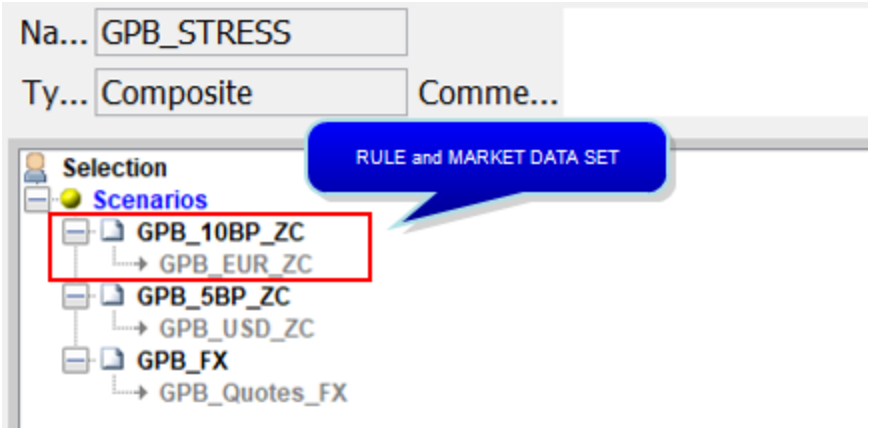
3.1 Composite Rules

Composite perturbation rules allow the simultaneous application of one or more basic rules.



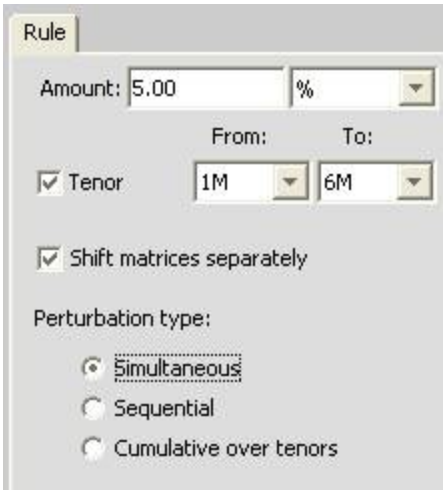
» Click **Add/Remove** to select scenario rules.

Each individual rule can be applied to its own market data set. Once you have added a rule, you can right-click it and choose Sub-Filter. You will be prompted to select a market data set.



3.2 Correlation Matrix Rules

CorrelationMatrix perturbation rules allow the perturbation of correlation matrices. Any Correlation Matrix with more than 3 axes is not supported.



- Enter the Shift Amount and unit
- You can check Tenor to enter a range of tenors, otherwise all of the tenors in the correlation matrix are shifted.
- If you check "Shift matrices separately", each selected matrix is shifted separately. Multiple scenarios will be generated.
- Perturbation type:

  Simultaneous - All the tenors (or the tenors within the selected range) are shifted all at once => result is one scenario.

  [NOTE: The perturbation type is simultaneous by default.]

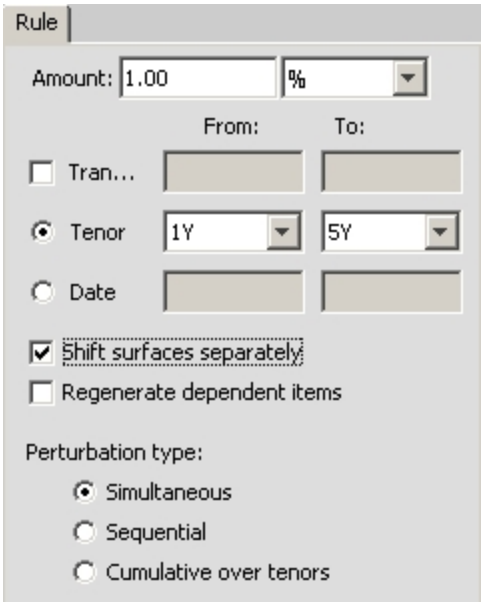
  If you check "Shift matrices separately", you can also select the following perturbation types:

  - Sequential - All the tenors (or the tenors within the selected range) are shifted sequentially.

    For each point axis1/axis2, shift the correlation at each tenor for that point in order (consider that for each point there is a curve of correlations by tenor) => result is one scenario per selected tenor per point.
  - Cumulative over tenors - The shift is cumulative along all tenors (or tenors in the selected range) => result is one scenario per selected tenor per point, and sequential across the points.

3.3 Correlation Surface Rules

CorrelationSurface perturbation rules allow the perturbation of correlation surfaces.



- Enter an amount in the Amount field and select percentage or relative percentage from the adjacent field.
- Click the Tranche checkbox if needed, and enter tranche amounts in the From and To fields.
- Select Tenor or Date to specify tenors or maturity dates.

- If you check "Shift surfaces separately", each selected surface is shifted separately. Multiple scenarios will be generated.
- Check "Regenerate dependent items" if necessary.
- Perturbation type:

  Simultaneous - All the tenors (or the tenors within the selected range) are shifted all at once => result is one scenario.

  [NOTE: The perturbation type is simultaneous by default.]

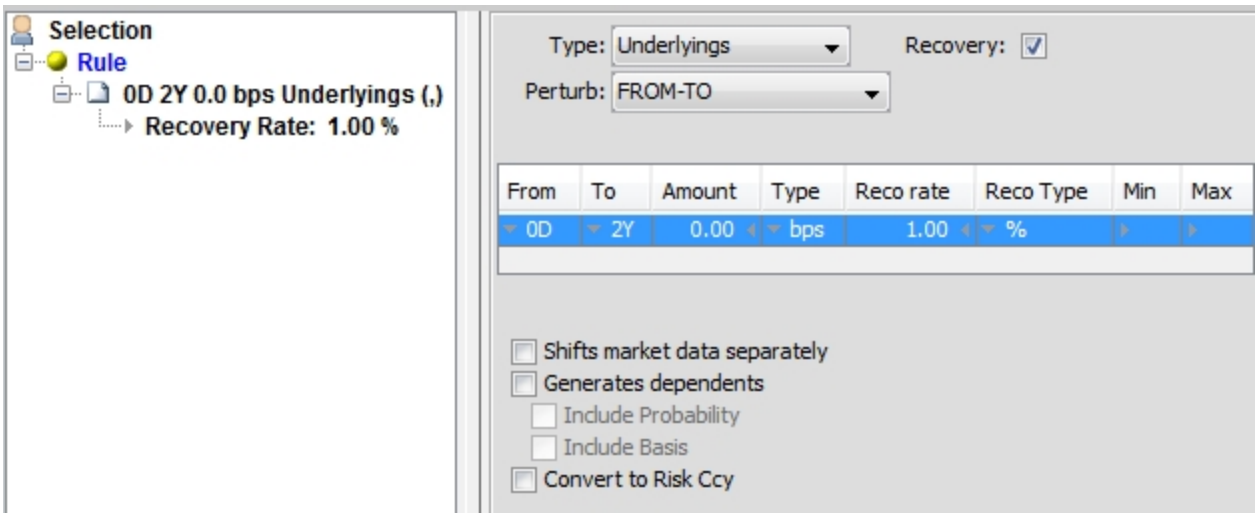
  If you check "Shift surfaces separately", you can also select the following perturbation types:

  - Sequential - All the tenors (or the tenors within the selected range) are shifted sequentially.

    For each point axis1/axis2, shift the correlation at each tenor for that point in order (consider that for each point there is a curve of correlations by tenor) => result is one scenario per selected tenor per point.
  - Cumulative over tenors - The shift is cumulative along all tenors (or tenors in the selected range) => result is one scenario per selected tenor per point, and sequential across the points.

3.4 Curve and ParametricCurve Rules

Curve perturbation rules allow the perturbation of interest rates.



- Select the type of perturbation from the Type field and select the perturbation from the Perturb field. Then enter the fields described below, based on the selection.

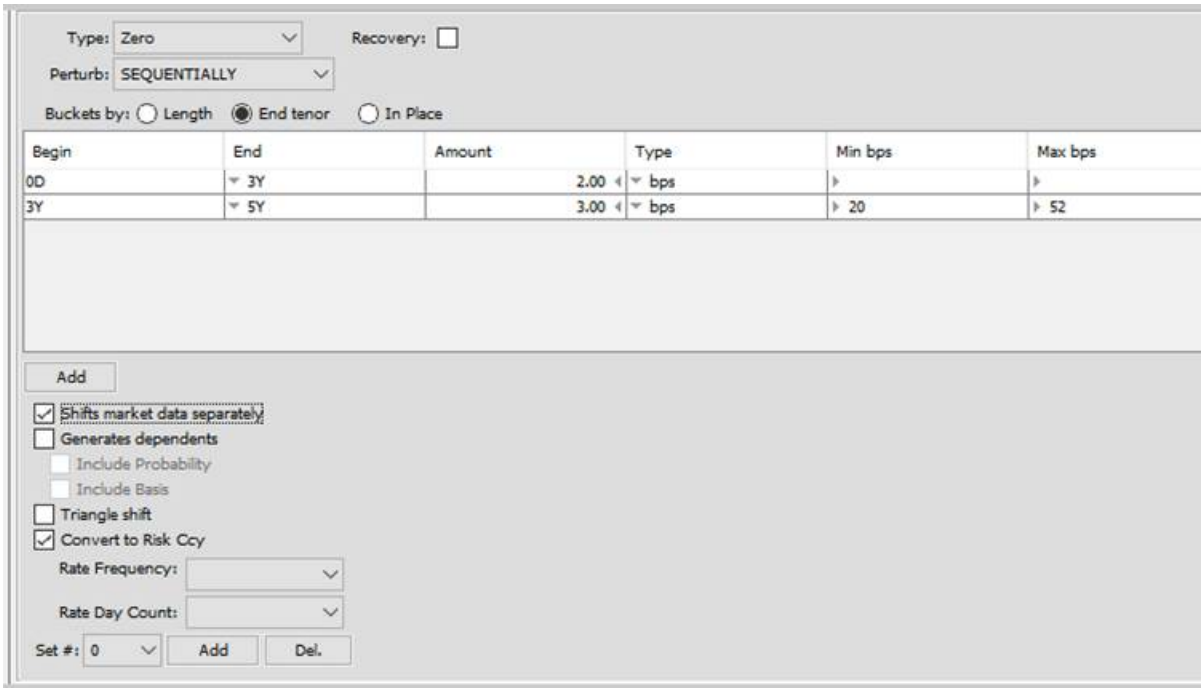
  Note that the rule type will be set to ParametricCurve for the following perturbations: SEQUENTIALLY, SIMULTANEOUSLY, and CUMULATIVE, therefore identifying bucketed perturbation rules within the perturbation range:

  - SEQUENTIALLY indicates that each bucket will be perturbed in turn.
  - SIMULTANEOUSLY indicates that all buckets will be perturbed at once.

– CUMULATIVE indicates that each bucket will be perturbed in turn but will also contain the previous bucket.

The relative shifts are meant to be applied on the “equivalent rate”. As such they are supported only for outright instruments (MoneyMarket, FutureMM, Swap, Bond, FRA, CDS, etc). They are typically NOT supported for spread or basis instruments (FX FWD, Basis Swap, Spread, etc). The same limitation applies to the min and max features.

Zero Perturbation



Min and Max Limits on Zero Curve Perturbation

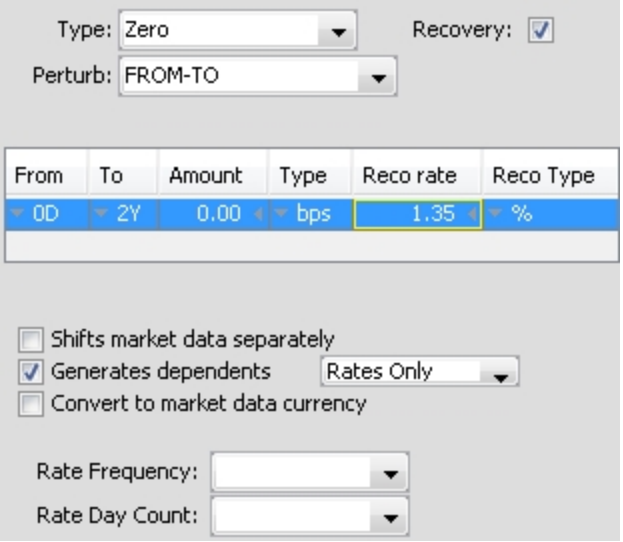
Users have the option to specify minimum and maximum levels on perturbed curve (in bps)

When the zero type is selected, the Min and Max columns are available for the following perturbations:

- FROM-TO
- SEQUENTIALLY
- SIMULTANEOUSLY
- CUMULATIVE

ⓘ Note: since min/max are enforced within the specified bucket, a non-local interpolator could cause rates to fall outside this range. Hence to apply the min/max functionality reliably, local interpolators should be chosen, using the alternate interpolator route if necessary.

Zero -- FROM-TO Perturbation

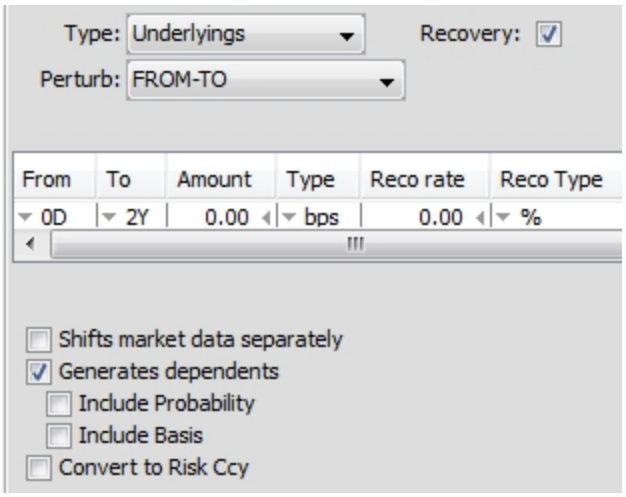


- Select From and To tenors to perturb. The From tenor is added to ValDate for Start Date of perturbation. The To tenor is added to Start Date for End Date of perturbation.
- Enter the perturbation amount, and choose bps, %, or %(rel) from the Type field.

  You can also specify a recovery rate perturbation.

  ▶ See Specifying a Recovery Rate Perturbation for details.
- Check "Shifts market data separately" to calculate a price for each market data being individually shifted (the other market data remaining static), otherwise all market data will be shifted simultaneously and a single price will be calculated.
- Check "Generates dependents" to generate dependent curves. You can include probability curves and basis curves.
- Check "Convert to Risk Ccy" to convert to risk currency.
- Select the compound frequency of the rate.
- Select the daycount convention of the rate.

Underlyings -- FROM-TO Perturbation

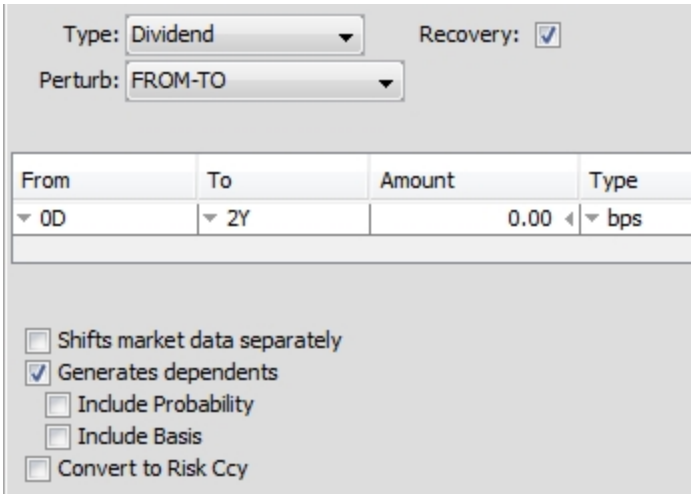


- Define the range of underlyings to perturb by selecting the first tenor (FROM), and the last tenor (END). For tenor based instruments (MoneyMarket, Swap, CDS, etc.), the tenor buckets apply to the tenor of the instrument, regardless of the actual calendar dates of the instrument. For fixed dates instruments (FutureMM, etc.) the tenor buckets apply to the actual calendar dates of the instruments.
- Enter the perturbation amount, and choose bps, %, or %(rel) from the Type field.

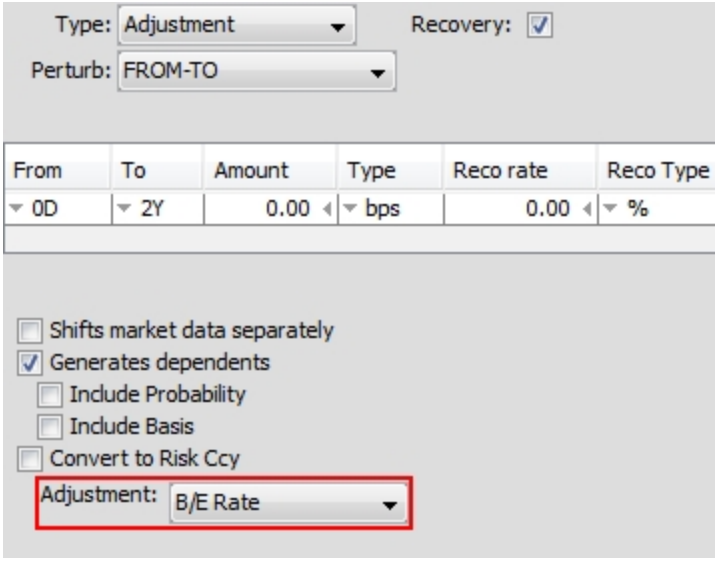
  You can also specify a recovery rate perturbation.

  ▶ See Specifying a Recovery Rate Perturbation for details.

Dividend and Adjustment -- FROM-TO Perturbation



- Select From and To tenors to perturb. The From tenor is added to ValDate for Start Date of perturbation, To tenor is added to Start Date for End Date of perturbation.
- Enter the perturbation amount, and choose bps, %, or %(rel) from the Type field.
- For the Adjustment perturbation type you can select a convexity adjustment:

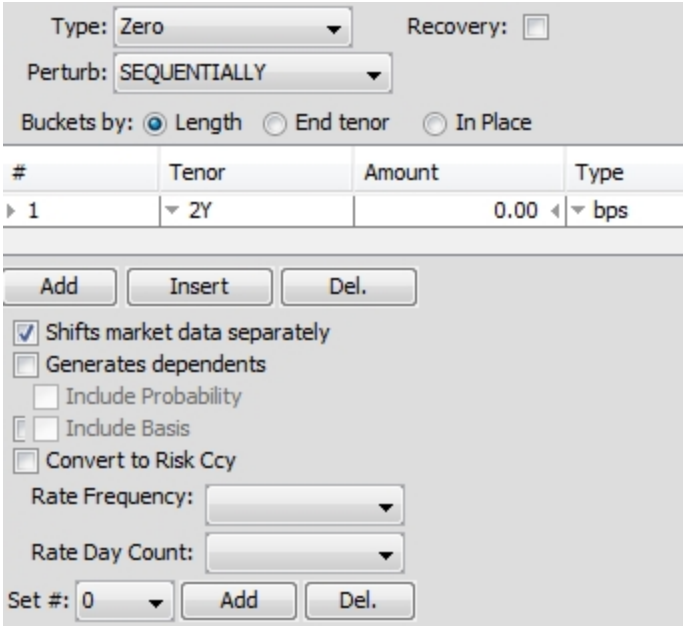


You can also specify a recovery rate perturbation.

▶ See Specifying a Recovery Rate Perturbation for details.

Zero -- Bucketed Perturbation

When you select SEQUENTIALLY, SIMULTANEOUSLY, or CUMULATIVE, the setup is the same as Zero -- FROM-TO Perturbation, except that you can specify multiple buckets.

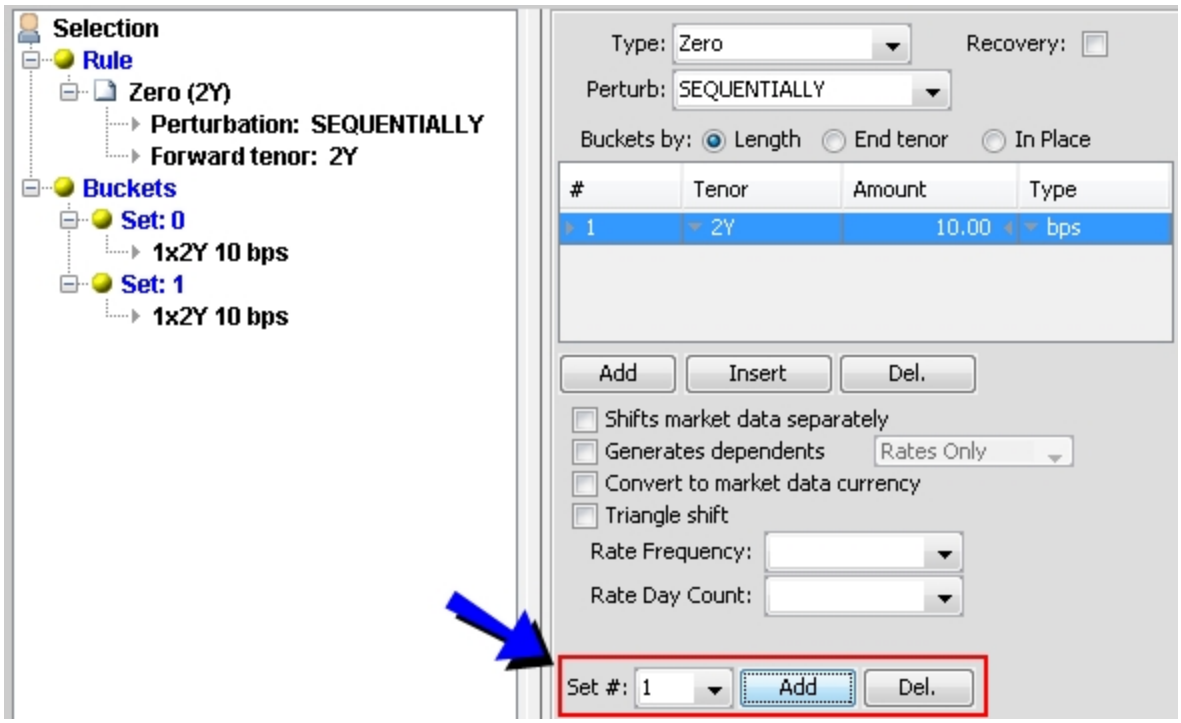


» Click **Add** or **Insert** under the bucket table to add another bucket.

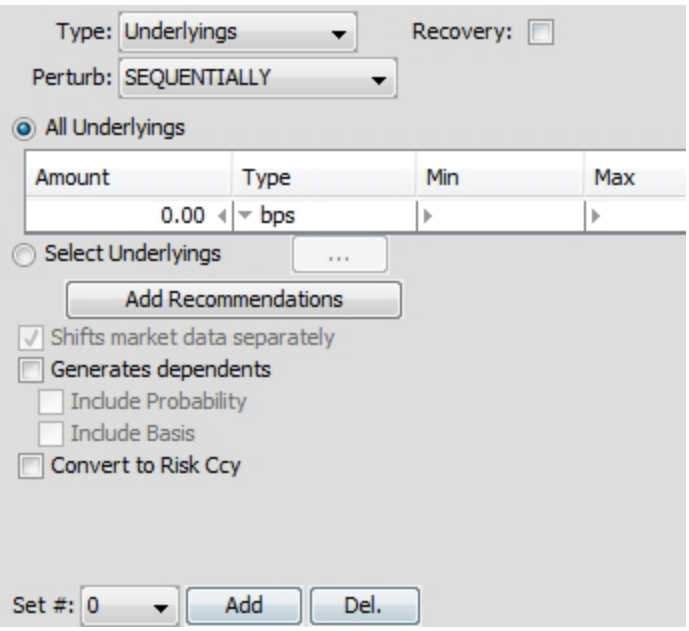
You can specify buckets in length, end tenor, or in place (it allows bumping the zero rate sequentially for each point on the curve).

» You can also specify multiple sets of buckets. To do this, click **Add** next to the Set # field. Then for each set, you can modify the tenors and the shift amounts as applicable. You can select the set number from the Set # field, and the corresponding buckets will be displayed in the bucket table.

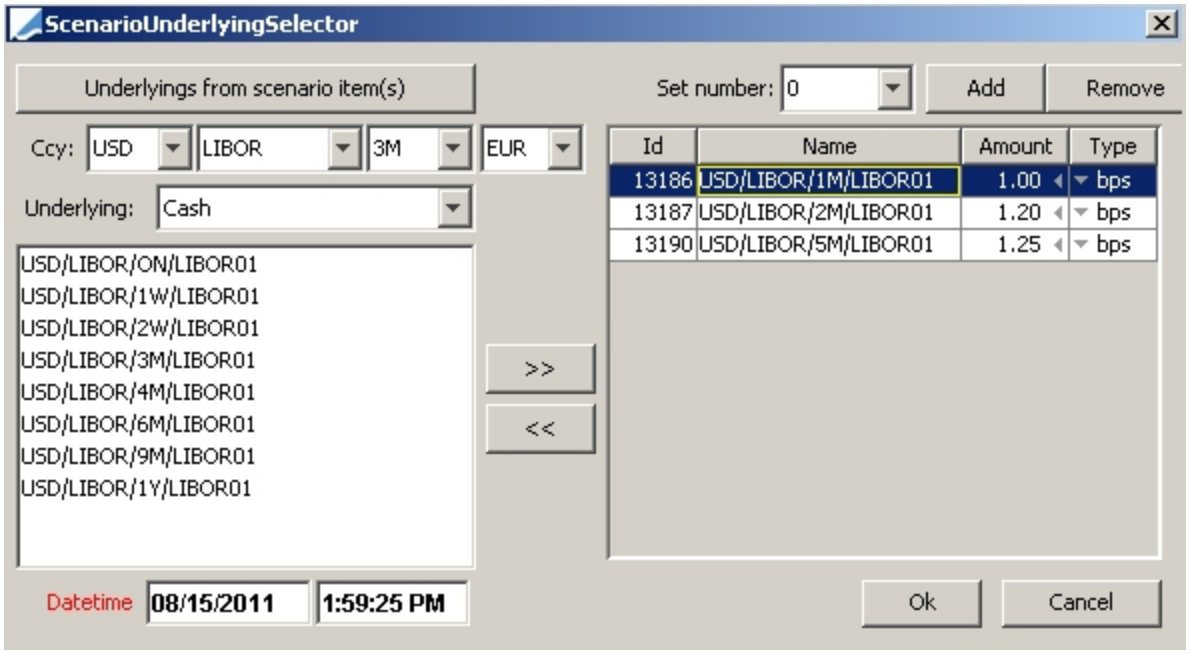
Here is an example for multiple sets of buckets.



Underlyings -- Bucketed Perturbation



» Click the "All Underlyings" radio button to select all underlying instruments and specify a single shift amount, or click the "Select Underlyings" radio button. In the latter case, click ... to select underlying instruments and specify individual shift amounts as shown below.

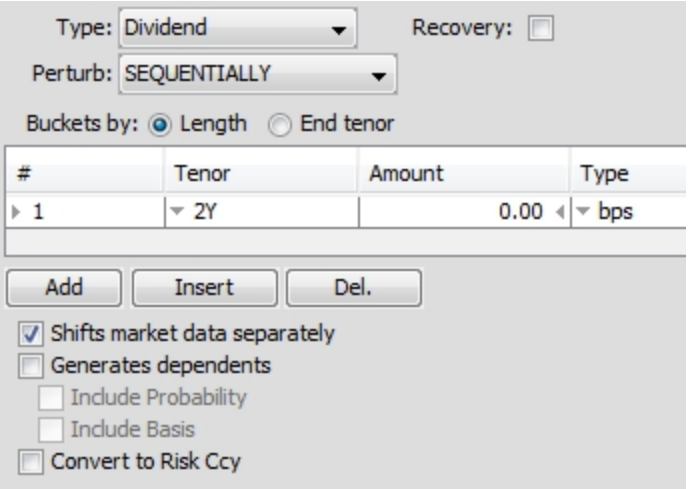


To select underlying instruments, you can click **Underling from scenario item(s)** to load the underlying instruments of a given market data set. You can also select a reference index and a type of underlying to load the corresponding underlying instruments. Then select underlying instruments as applicable and click **>>**. In the underlying table, specify the shift amount and its type.

Click **Add Recommendations** to select instruments for hedge recommendation.

Dividend and Adjustment -- Bucketed Perturbation

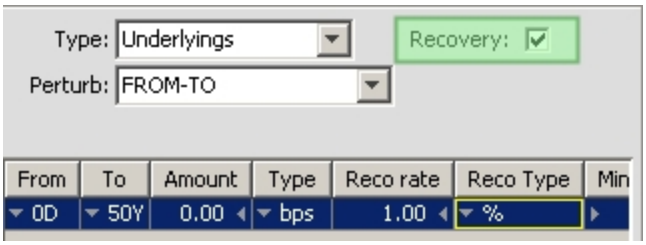
When you select SEQUENTIALLY, SIMULTANEOUSLY, or CUMULATIVE, the setup is the same as Dividend and Adjustment -- FROM-To Perturbation, except that you can specify multiple buckets.



» Click **Add** or **Insert** under the bucket table to add another bucket.

Specifying a Recovery Rate Perturbation

To specify a recovery rate perturbation, check the Recovery checkbox next to the Type field as shown below.



» Select the recovery type and enter the recovery rate. The recovery type can be specified as % for additive, or % (rel) for relative.

Example: if you specify a perturbation of 10%, a recovery rate of 40% will move to 50%, and if you specify 10%(rel), a recovery rate of 40% will move to 44%.

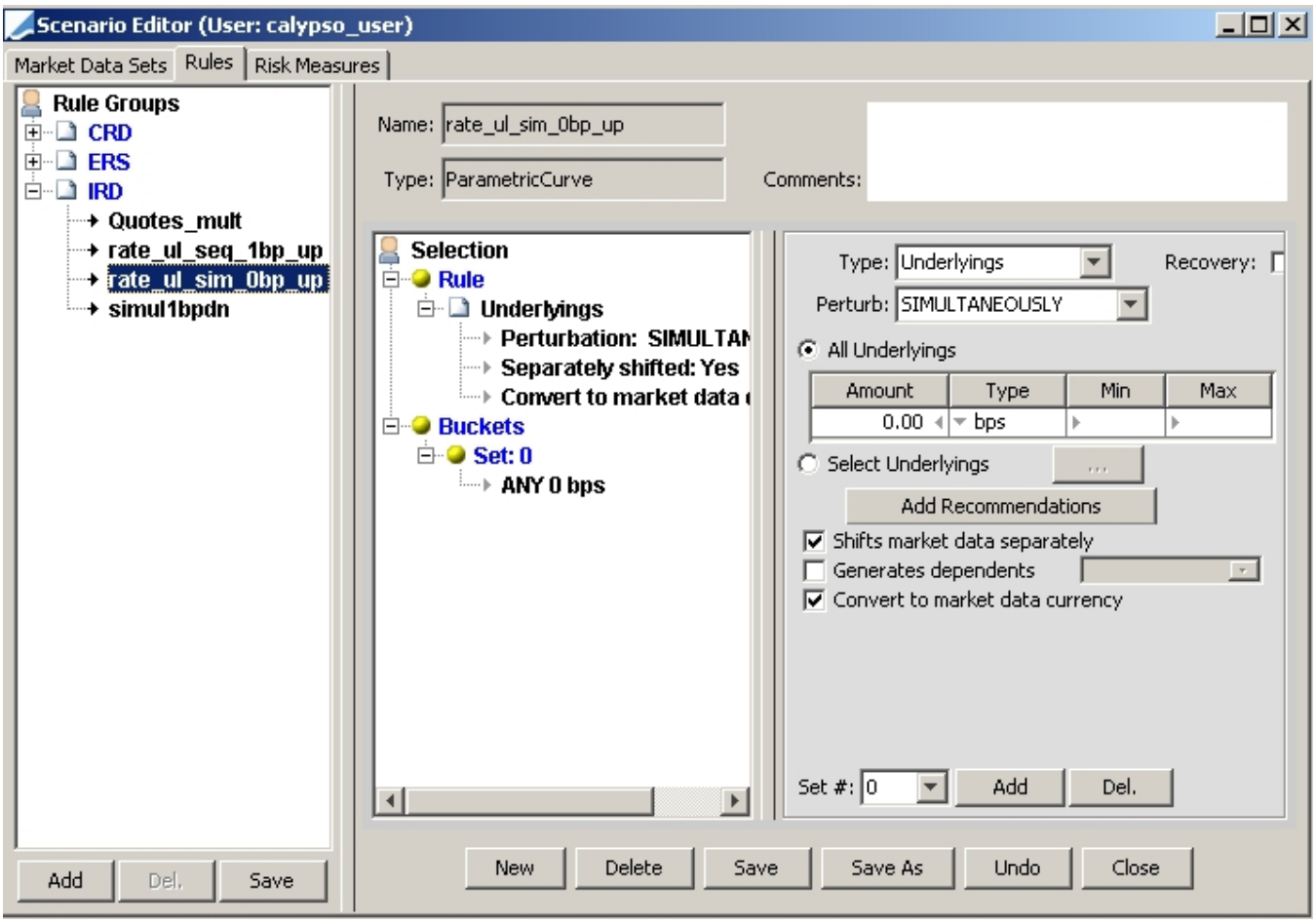
To specify a recovery rate perturbation of 0%, use -100%(rel).

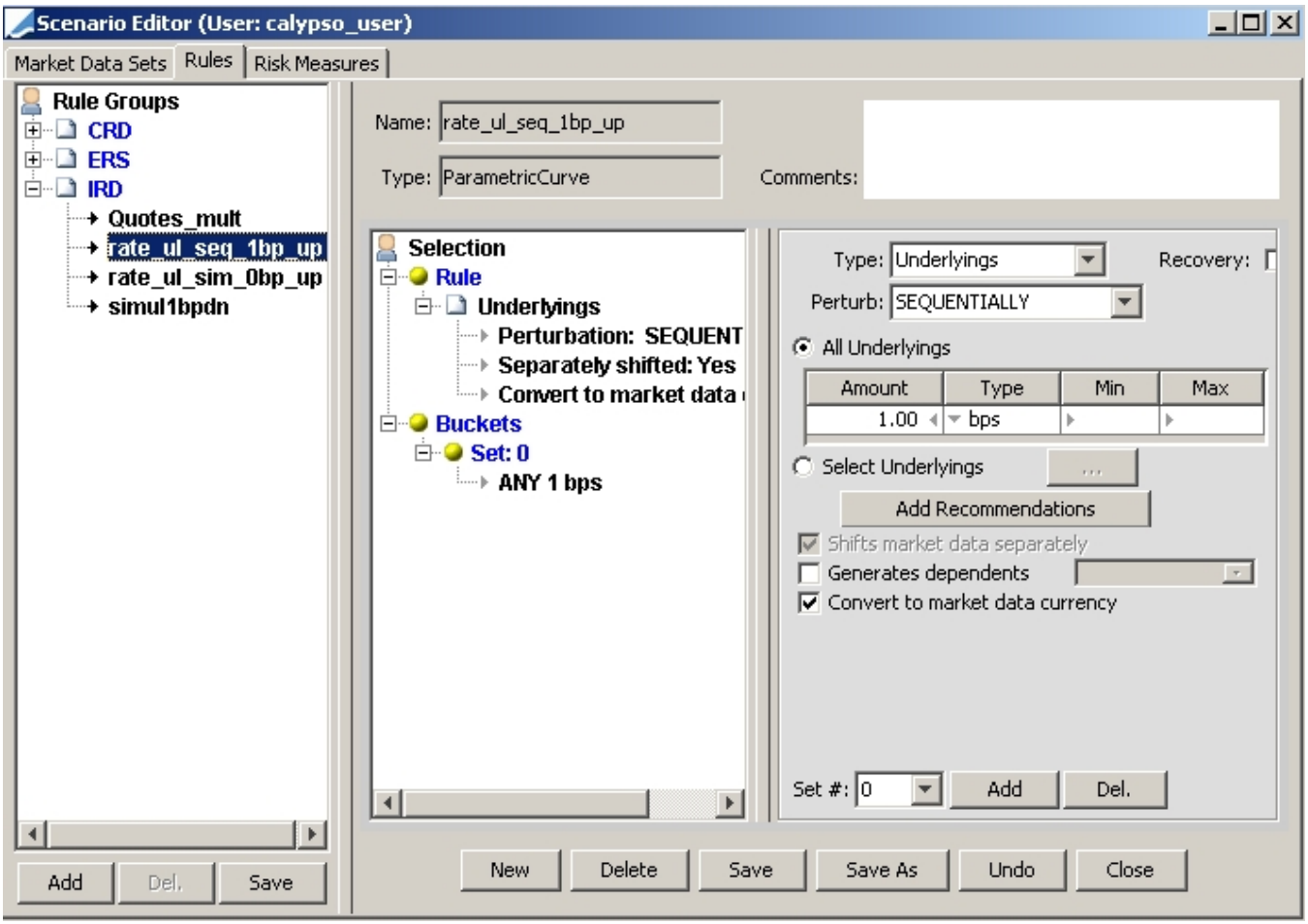
Example

Below are two parametric curve perturbation rules in the IRD rule group.

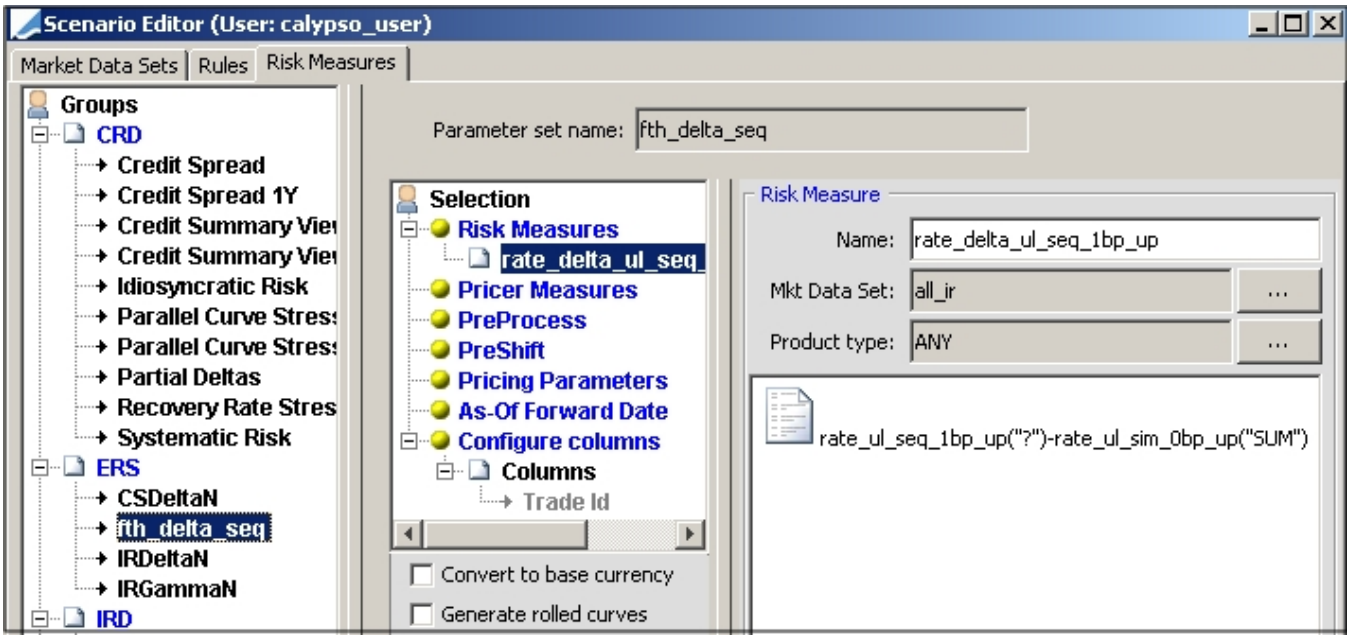
Scenario delegates the actual shifting of the quote to the curve underlying itself, as well as min and max bounds. Some curve underlyings leverage this and convert the shift amount before applying it:

- A shift of +1bp on a FutureMM quote of 98 will result in a quote of 97.99 (+1bp is converted to -0.01);
- A shift of +1bp on a spread-quoted Basis Swap will actually apply a -1bp shift to the quote;
- Other examples include FX and FX Forward curve underlyings (Contango in particular).





A risk measure can be created that incorporates the perturbation rules.



3.5 Date Rules

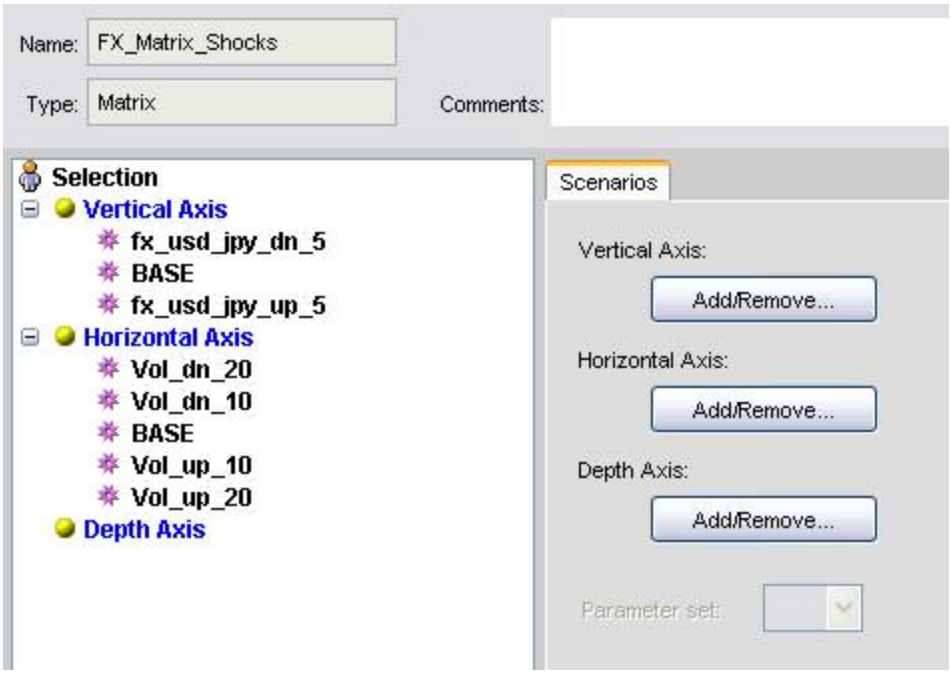
Date perturbation rules allow the simulation of a change in the valuation date.

- Click ... next to the Add /Remove tenor(s) field to add tenors.
- You can also specify multiple sets of tenors. To do this, click **Add** below the Set number field. Then for each set, you can modify the tenors as applicable. You can select the set number from the Set number field.
- You can enter specific dates. Enter a date in the "Absolute date" field, and click **Add**.

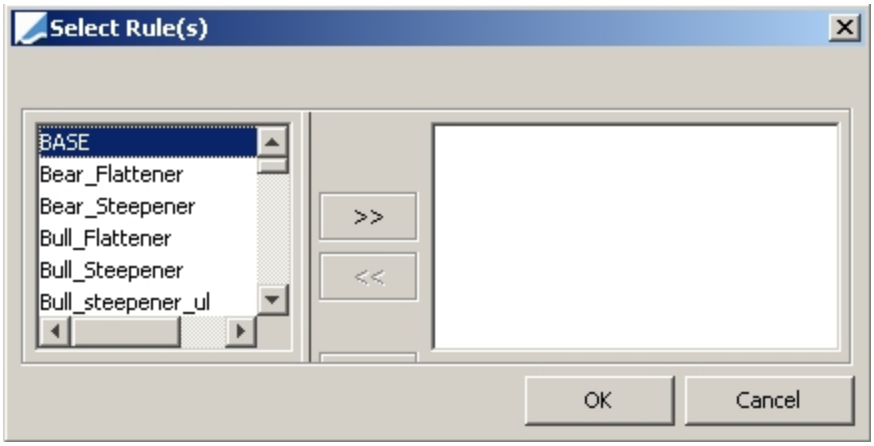
- You can check "Business Days" to only generate business dates. In that case, you can select a holiday calendar.
- You can also set the time of the day.
- Select "Roll quotes" to roll the quotes forward for all tenors specified in the date rule.

3.6 Matrix Rules

Matrix perturbation rules, similar to Composite, allow the specification of up to three basic rules, each along an axis. A "matrix" of perturbations in three dimensional space is produced.



- Click **Add/Remove** under the Vertical Axis label to select rules for the vertical axis. The Select Rules screen will appear as below.

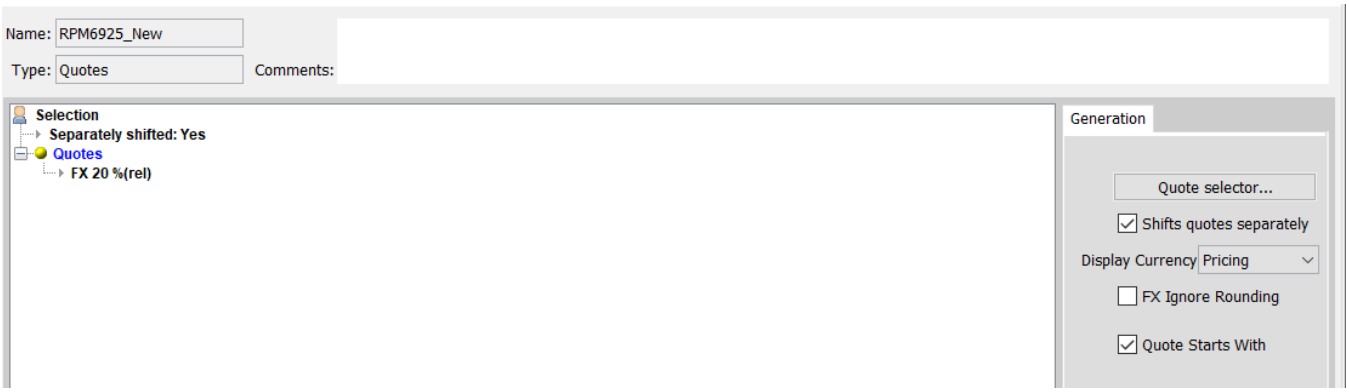


- Click **Add/Remove** under the Horizontal Axis label to select rules for the horizontal axis.

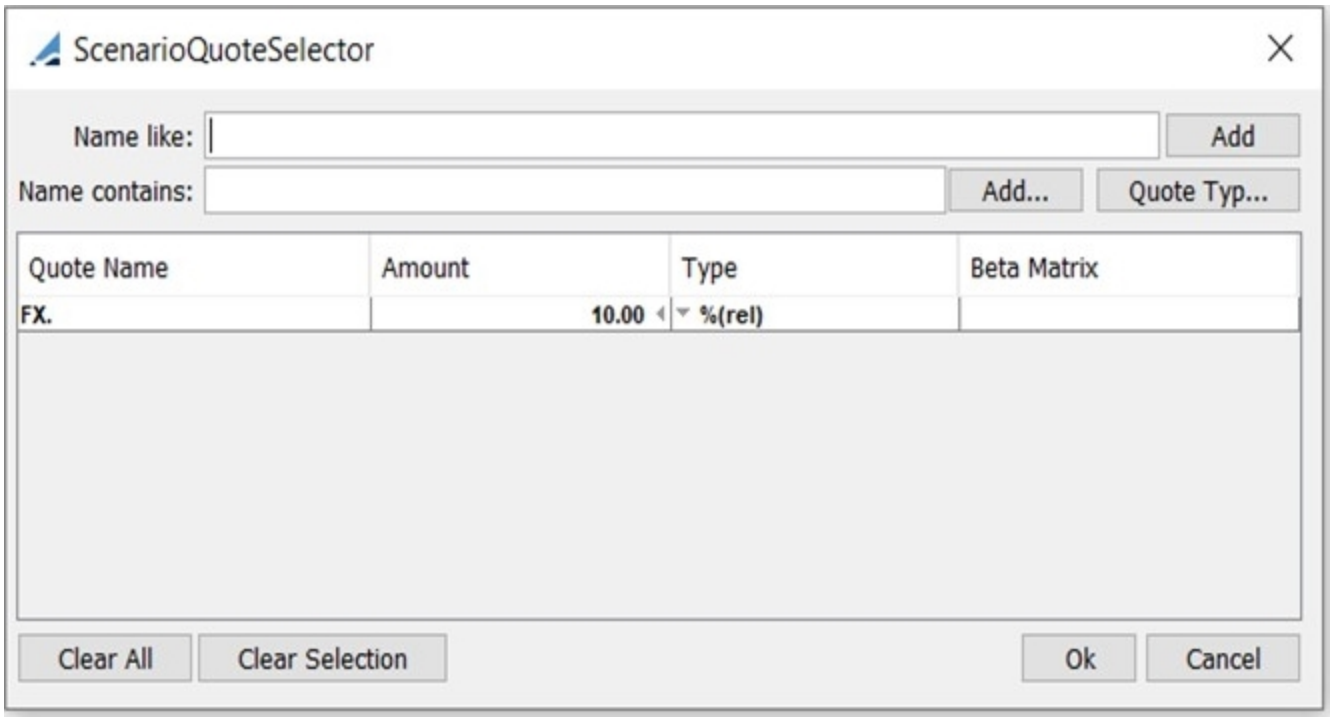
» Click **Add/Remove** under the Depth Axis label to select rules for the depth axis.

3.7 Quotes Rules

Quotes perturbation rules allow the perturbation of individual quote values, quotes per product type, and Beta values.

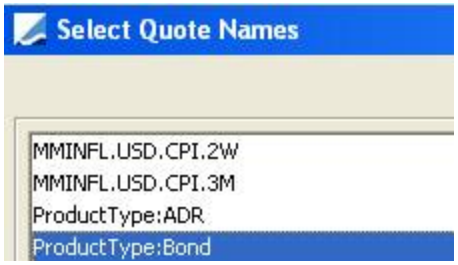


» Click **Quote selector** to select the quotes that you wish to shift.



Under Type, you can choose bps, pips, %, or %(rel).

Click **Add** to add individual quotes and/or product types (product types are at the end of the list).



You can also create rules to perturb the quotes based on product type and quote type. For example, you can perturb CDS indices quoted in spread and CDS indices quoted in price using different perturbation rules. Click **Quote Type** to select a product type and a quote type.

To shift Beta values for a given quote, right-click the Beta field and choose "Add Beta" from the popup menu. It allows selecting the corresponding asset for which you have defined Beta values.

» Check "Shifts quotes separately" to calculate a price for each quote being individually shifted (the other quotes remaining static), otherwise all quotes will be shifted simultaneously and a single price will be calculated.

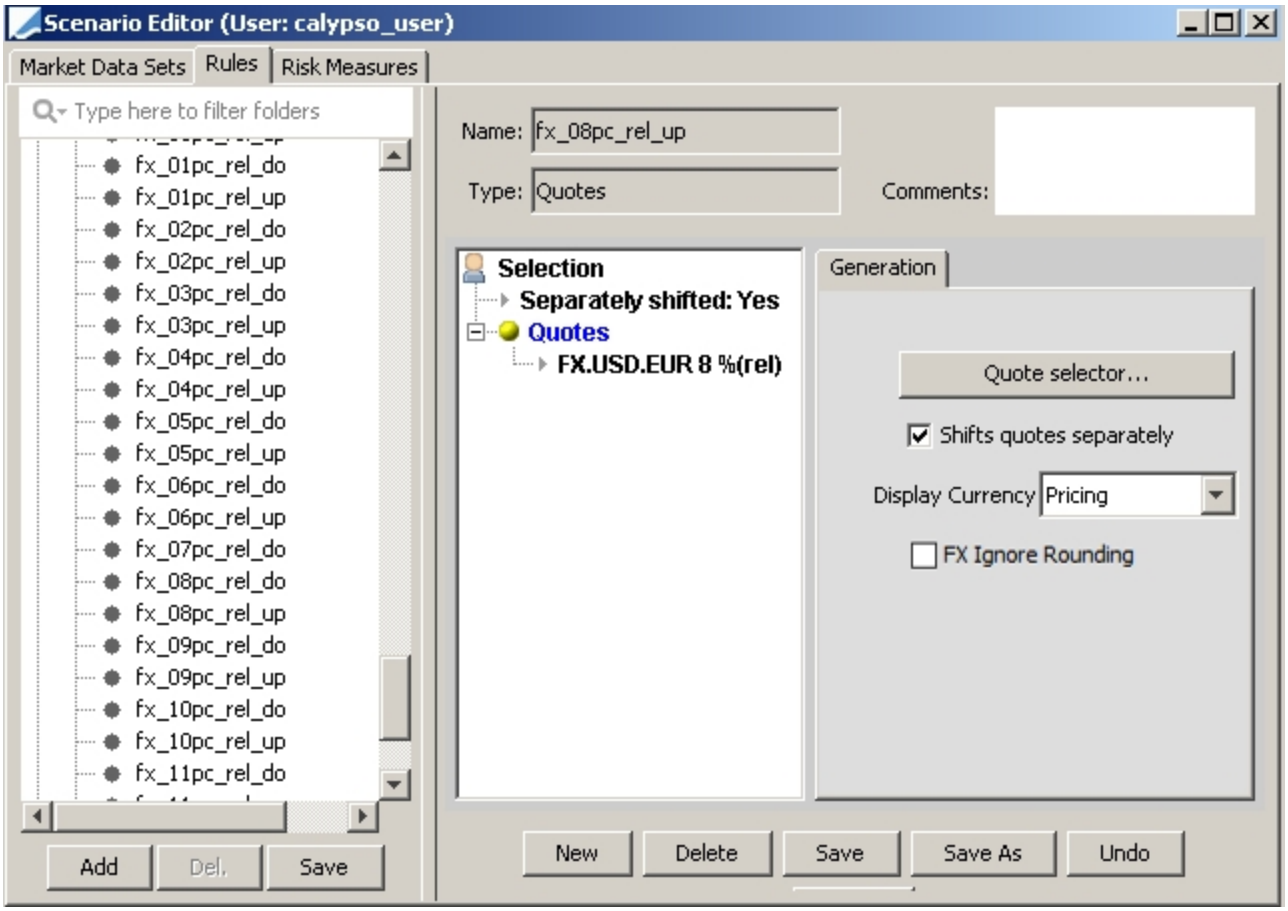
You can select the FX conversion target: The shifted and base pricer measure will be converted to the selected currency (CC1, CC2, PL Display ccy etc) of the shifted ccy pair.

» Check "FX Ignore Rounding" to not round the quote obtained after shifting FX quotes. The shifted quote might not be consistent with the market standard as defined in the currency pair definitions, and this is accepted as this shifted quote is a theoretical value.

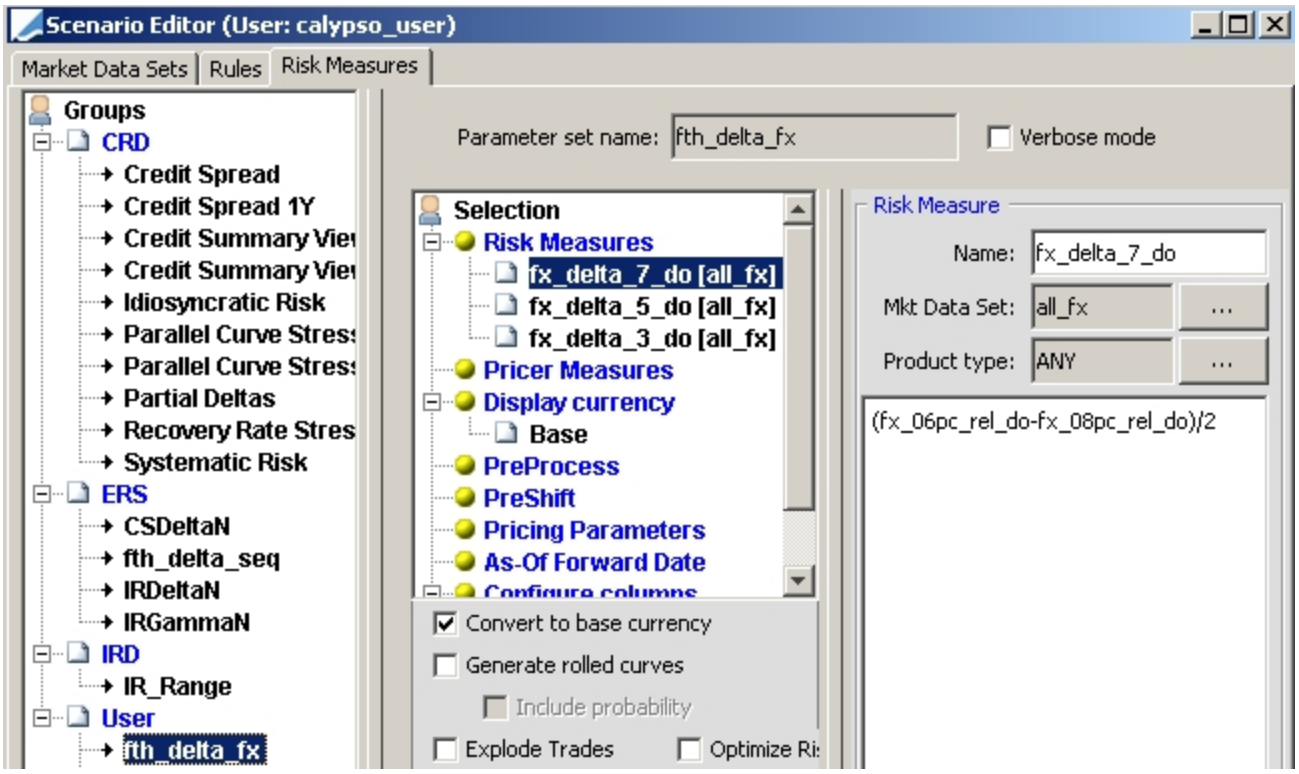
» Check "Quote Starts With" to remove the wildcard character at the start of the SQL search statement, thereby improving performance. This is for all quotes, and not controllable at the individual quote level.

Example

Below is a collection of quotes perturbation rules.



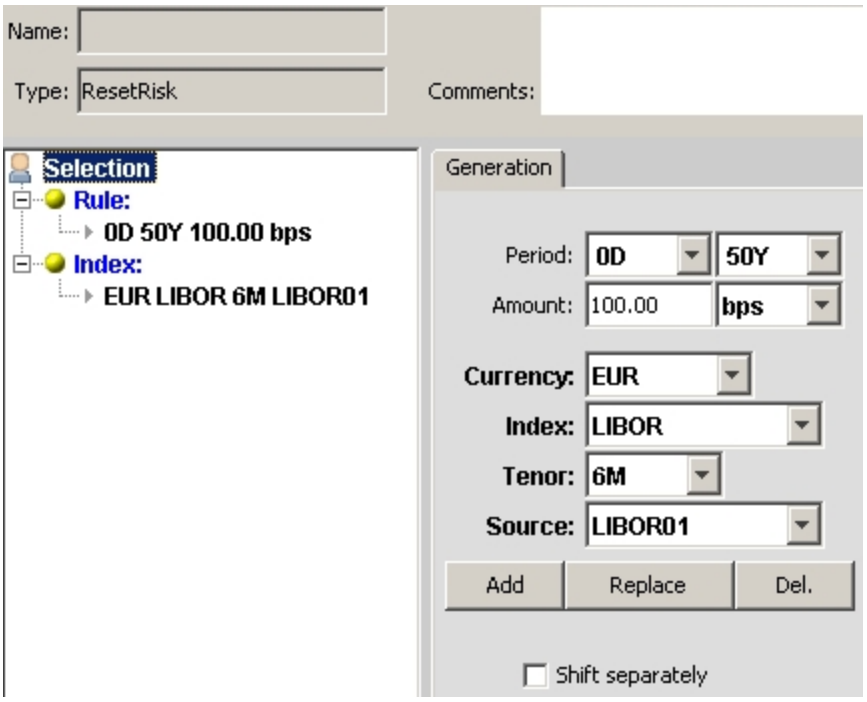
The quotes perturbation rules can be used to create sets of risk measures.



3.8 Reset Risk Rules

Reset risk perturbation rules allow the perturbation of values related to trades involving resets.

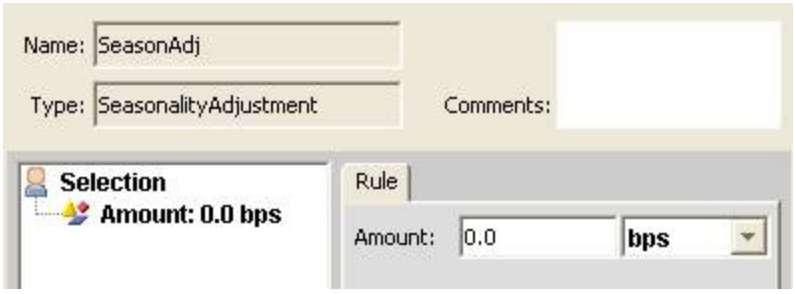
ⓘ [NOTE: This perturbation type is limited to the following products: EquityLinkedSwap, SimpleMM, and Swap (vanilla only, no optionality)]



- Select the starting and ending periods. The second period must be greater than or equal to the first period.
- Enter the shift amount in basis points, percentages, or relative percentages.
- Select the currency.
- Depending on the selected currency, you may have the option to select a reference index.
- Depending on the selected currency and index, you may have the option to select a tenor.
- Depending on the selected currency, index, and tenor, you may have the option to select a source.
- If you check "Shift separately", multiple scenarios will be generated.

3.9 Seasonality Adjustment Rules

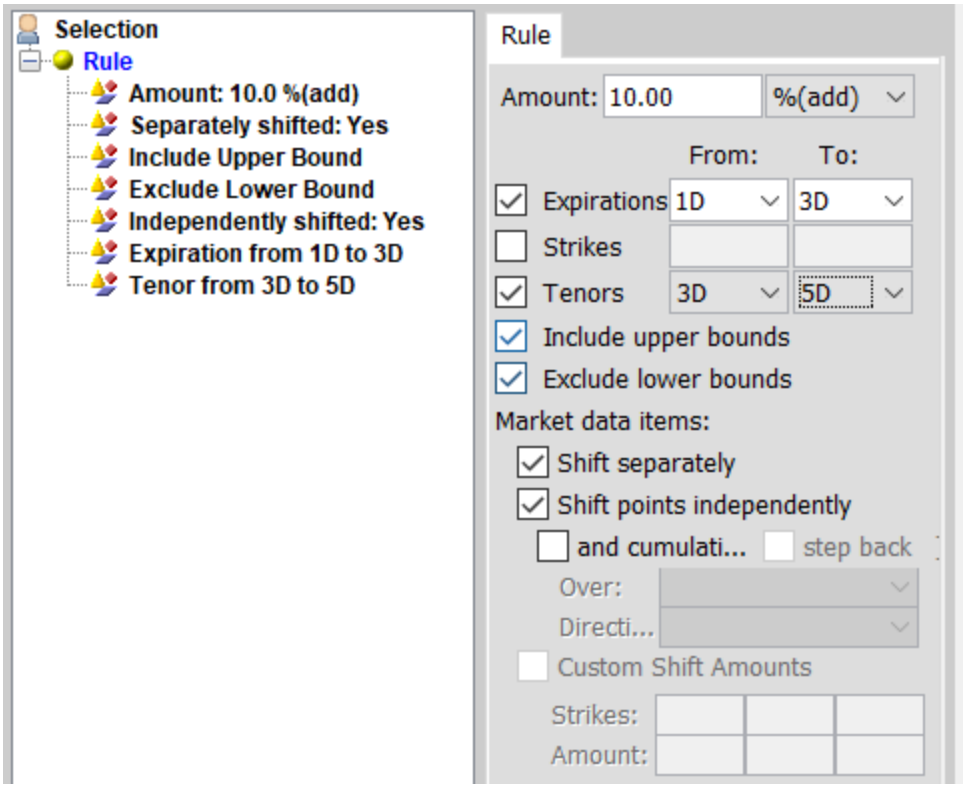
Seasonality Adjustment perturbation rules allow the perturbation of seasonality curves.



- Enter the shift amount in basis points or relative percentages.

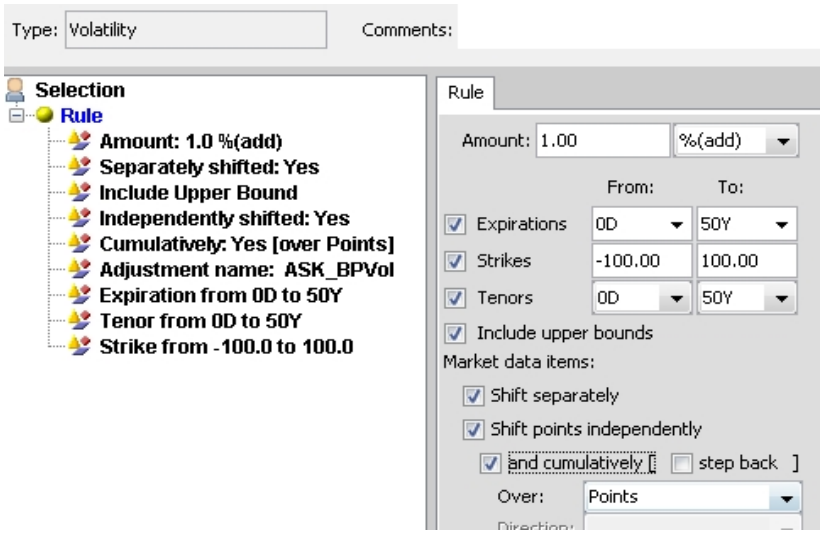
3.10 Volatility Rules

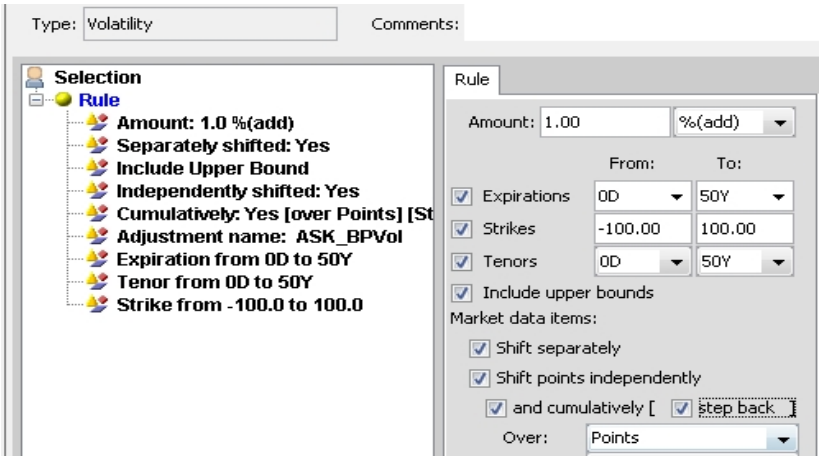
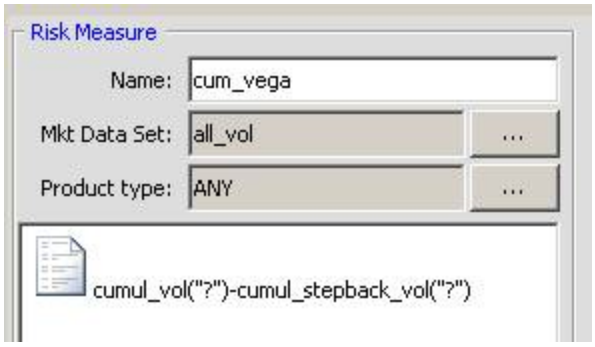
Volatility perturbation rules allow the perturbation of volatility surfaces along any of their axes.



- Enter the shift amount in %(add), %(mult), or %(rel).
- Select From (included) and To (excluded) expiration tenors, if applicable.
- Enter From (included) and To (excluded) strike prices in %, if applicable.
- Select From (included) and To (excluded) tenors, if applicable.
- Check the boxes corresponding to the type of shift you wish to perform.

Checkbox Options	Description
Exclude lower bounds	If checked, the lower bounds for expiration, tenor and strike are included.
Shifts separately	To shift each market data separately.
Shifts points independently	To shift each point independently. *Cumulative Shifts* You can also check "and cumulatively" to perform cumulative shifts.

Checkbox Options	Description
	The perturbation order used in the cumulative volatility rule is Strikes, Expiries, and Tenors. It means that the system starts by shifting cumulatively all Strikes of the same Expiry and Tenor. Then the Strikes of the second Expiry are shifted cumulatively. When all Strikes of all Expiries of the first Tenor are shifted, the system does the same on the second Tenor. The shifts continue in a similar fashion until all of the necessary cumulative shifts have been performed. Strikes, Expiries, and Tenors are shifted from lowest to highest. For Expiries, you can choose a Forward or Backward direction for the shift. *Step Back* You can also check "step back" to calculate the shifted NPV for the "previous point" of the Volatility Surface. This scenario rule is then used in a risk measure formula to calculate a "step back" cumulative sensitivity as shifted NPV - previous shifted NPV. To do this, two cumulative Volatility rules must be created: • One with "and cumulatively" checked and "and step back" unchecked.  • One with both "and cumulatively" and "step back" checked.

Checkbox Options	Description
	 The risk measure will be defined as: 
Custom Shift Amounts	If not shifting points independently, you can designate custom shift amounts. You can specify three strikes and their corresponding amounts.
Shift adjustments	To shift associated adjustments. When you check "Shift adjustments", you will be prompted to select the type of adjustment to be shifted. 
Convert to Risk Ccy	Check box to convert to risk currency.

3.11 ModelCalibration Rules

ModelCalibration perturbation rules alow the perturbation of ModelCalibration parameter values, such as the correlations used to calibrate the Libor Market Model (menu action `marketdata.ModelCalibrationWindow`).

The prerequisite to use a ModelCalibration Scenario Rule is the configuration of a calibrated LMM used in pricing relevant trades.

▶ For details, please refer to LMM Model Calibration in the XVA and Monte Carlo PEE documentation.

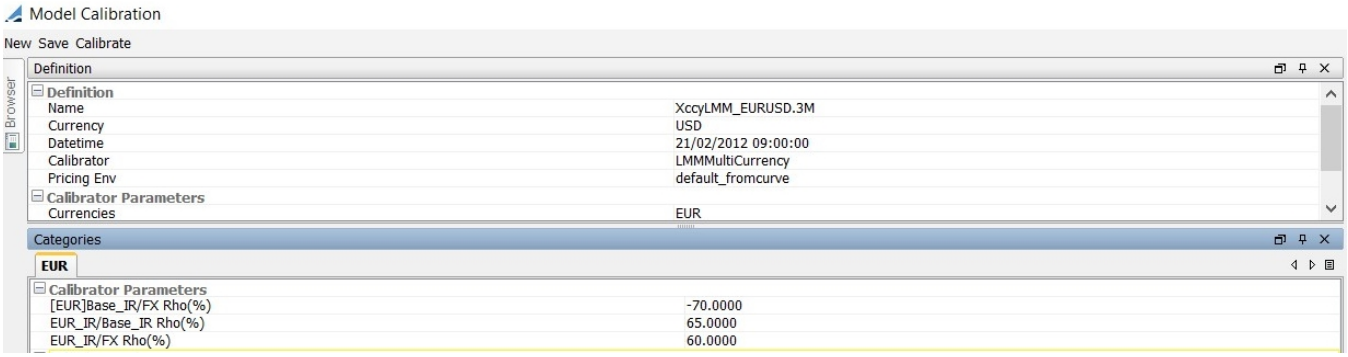


Figure 1: The Model Calibration Window. (The Model Parameter values in the lower view correspond to the Category and Name dropdown menus in figure 2.)

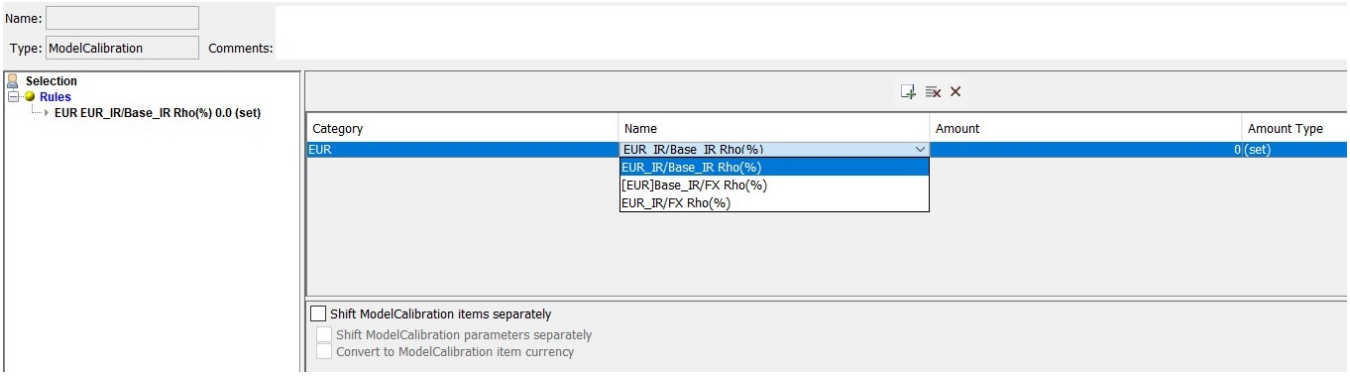


Figure 2: The ModelCalibration Rule shown in Scenario Editor.

Category: options driven by Model Calibration configuration.

- "Default" - This corresponds to Parameters that are currently agnostic and apply to the overall calibration of the model. Such examples include "Beta", "Initial A", and "Initial B".
- "ANY" - This will drive a selectable list of all available Parameter selections which will apply to all currencies.
- [Currency Code] - This swill drive a selectable list of all available Parameter selections that will apply to the selected currency.

Name: Available list of parameters used in Model Calibration. This is driven by the selection in the “Category” field. The list under “Name” corresponds with Calibrator Parameters defined in the ModelCalibration window.

Amount: Shift amount entered by the user, up to 2 decimals.

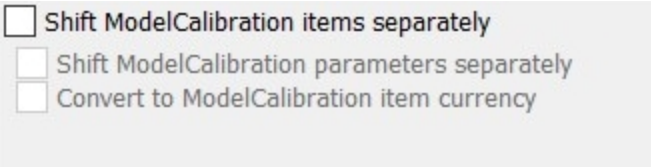
Amount Type: (abs), (%rel), (set)

- "abs" is the sum of Start Parameter Value and Shift Amount
- "%rel" is a relative increase of the Start Parameter Value by the defined Shift Amount.
- "set" Amount Type overrides the specified Calibrator Parameter with the defined Shift Amount.

  Where **P** is the Final Parameter Value, **p** is Start Parameter Value, **S** is Shift Amount, and **T** is Amount Type:

  - If **T** = "abs" then **P** = **p** + **S**.
  - If **T** = "%rel" then **P** = **p** * (1+**S**/100).
  - If **T** = "set" then **P** = **S**.

Shift Settings

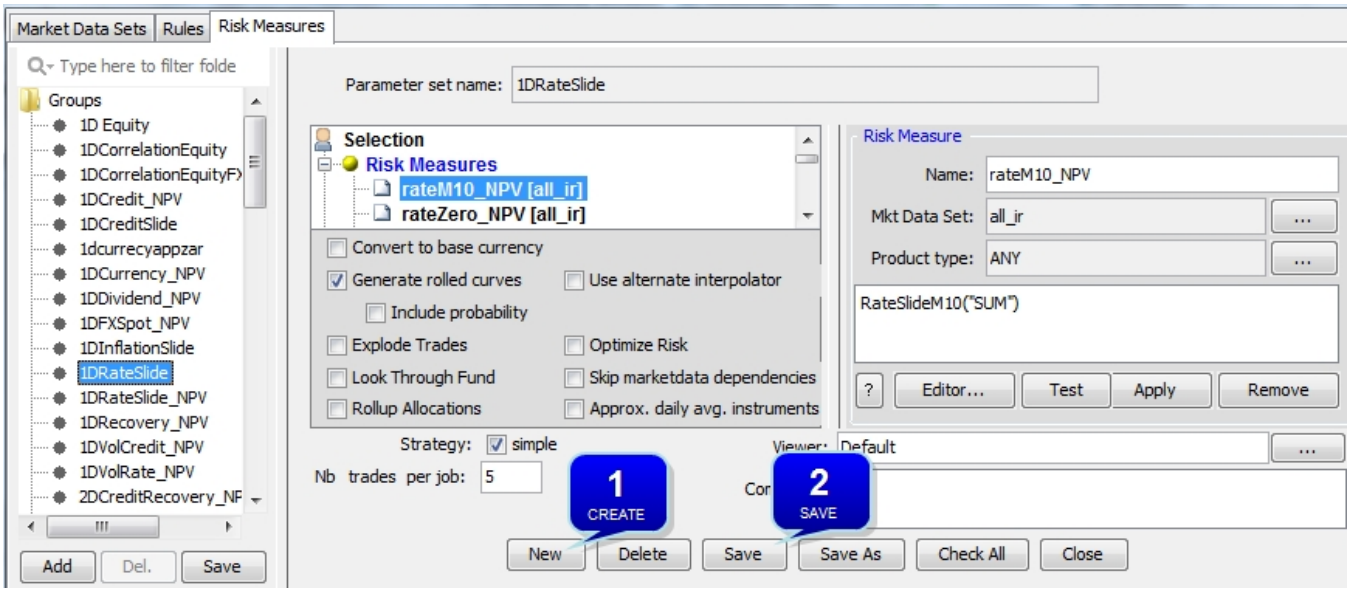


Shift Settings	Description
Shift ModelCalibration items separately	When the market data set contains more than one ModelCalibration item, this will control whether they should be shifted separately or not. Default value is unchecked.
Shift ModelCalibration parameters separately	Only available when shifting ModelCalibration items separately. When more than one parameter to be shifted is defined, this will control whether all parameters will be shifted at simultaneously, or one by one. Default value is unchecked.
Convert to ModelCalibration item currency	Unchecked and locked if “shift ModelCalibration items separately” is unchecked. Available for checking if “shift ModelCalibration items separately” is checked. Default value is unchecked. If “Convert to ModelCalibration item currency” is checked, the Pricer Measure produced will be the same as the currency of the ModelCalibration item that is shifted.

4. Scenario - Risk Measures

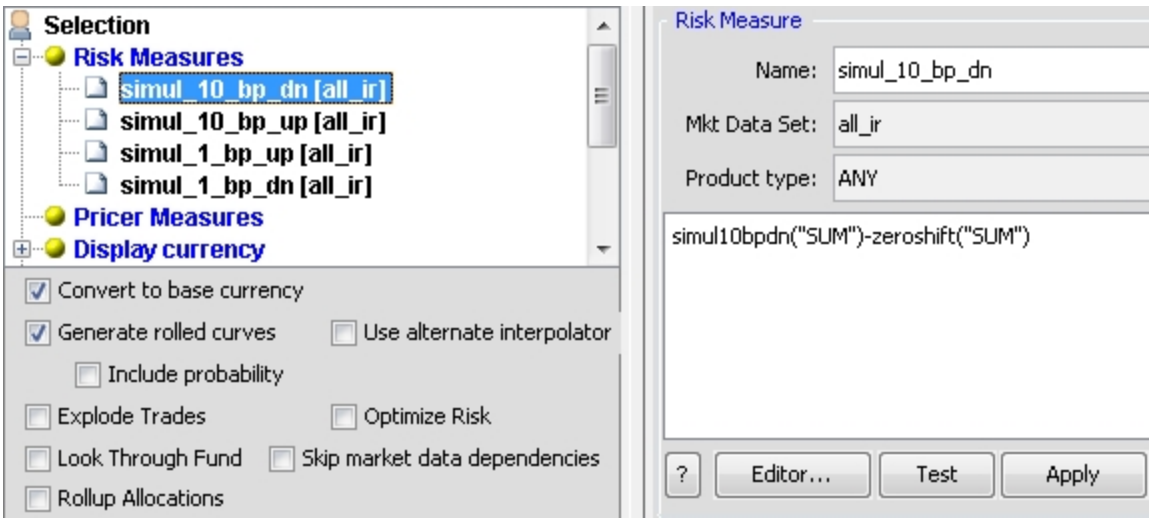
A set of risk measures (parameter set) is a collection of risk measures, associated with perturbation rules and a market data set.

The Risk Measures panel will appear as shown below.



4.1 Selection > Risk Measures

Displays custom risk measures defined in the Risk Measure panel.

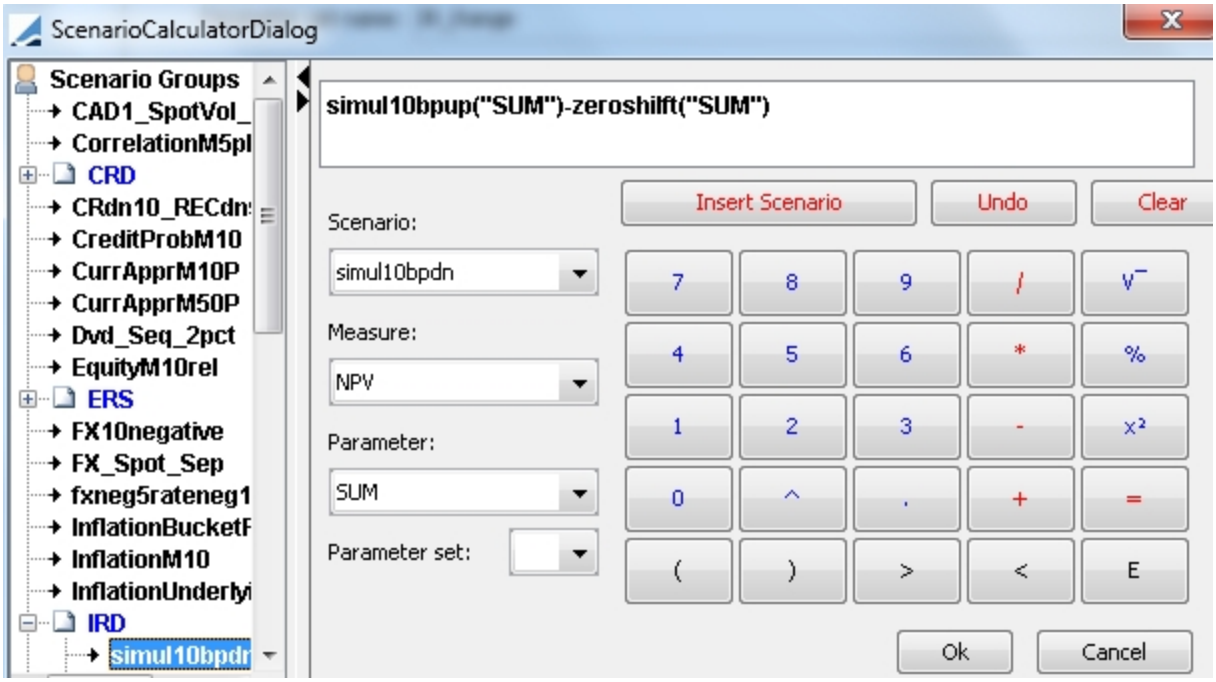


- Enter a risk measure name in the Name field.
- Select a market data set from the Mkt Data Set field.

- Select a list of product types from the Product type field, or ANY for all product types.
- Click **Editor** to display the Scenario Calculator dialog that allows you to specify the calculation formula. See below for details.
- Click **Test** to parse the calculation formula to check if it is valid.
- Click **Apply** to add the risk measure to the risk measure set. The risk measure will appear under **Selection > Risk Measures**.

Scenario Calculator

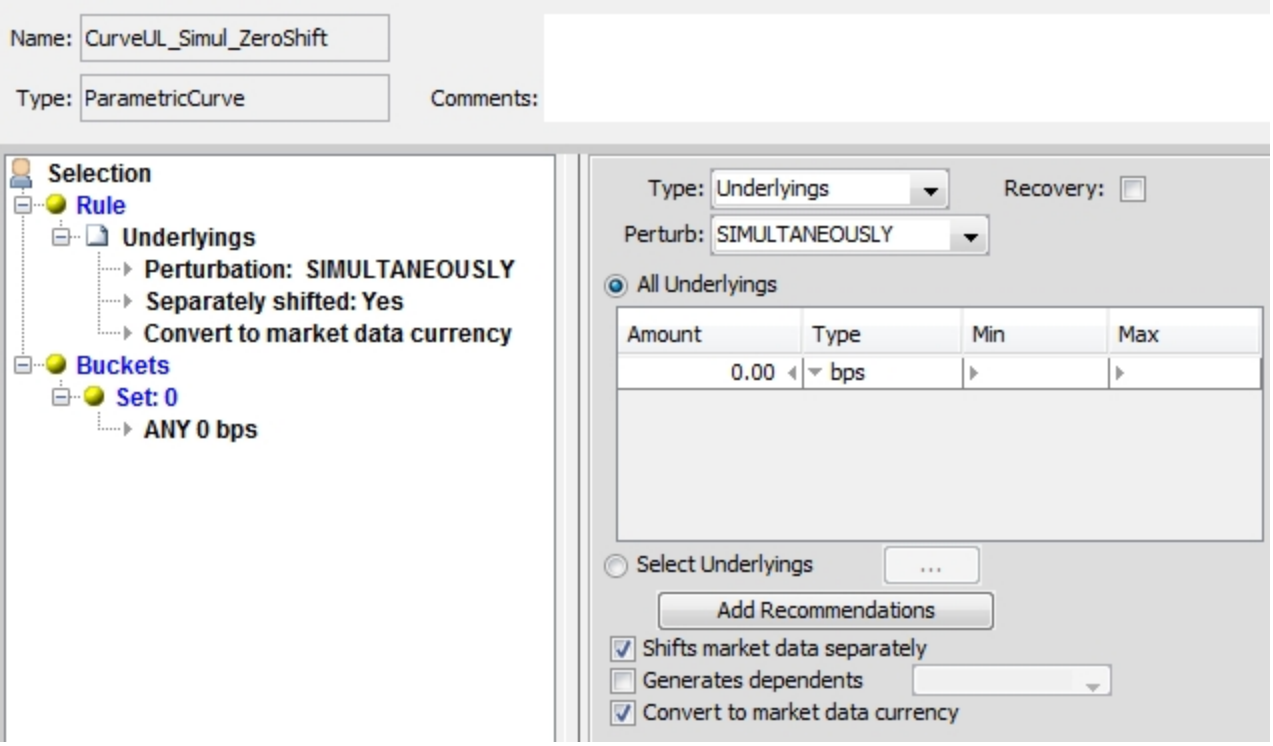
The calculation formula of a risk measure is a simple linear combination of perturbation rules.



- Select a perturbation rule from the Scenario field. Then click **Insert Scenario**.
- You can then add operators and constant values to the calculation formula using the keypad, and more perturbation rules as applicable. See below for details.
- Click **OK** when you are done.

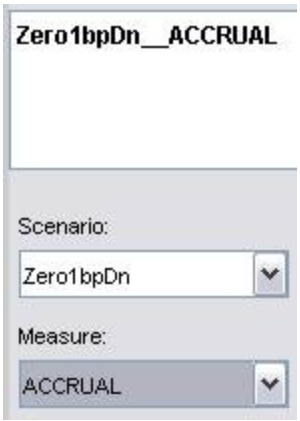
ⓘ [NOTE: Although the BASE measure is an option, it is highly recommended to manually create and use a "zero shift" rule instead. This is to get rid of any market data inconsistencies that could pollute the results]

Sample Zero Shift



By default, the perturbation rule is applied to the NPV pricer measure, but you can select another pricer measure from the Measure field as applicable.

For example, if you want to apply a perturbation rule to the ACCRUAL measure, it will appear as shown below.



Whether a perturbation rule uses Sequential or Simultaneous, generation has implications on the risk measure definition. An operation like PR1_NPV - PR1_NPV returns a scalar for the simultaneous case. For the sequential case, the operation is in vector rather than in scalar space. In other words, the risk measure (Vector [PR1_NPV] - Vector [PR2_NPV]) will calculate the difference in NPVs element-wise between PR1 and PR2. Any operation would be applied on an element-by-element basis (*, /, log, etc.). The output would be a risk measure with the same dimensionality as

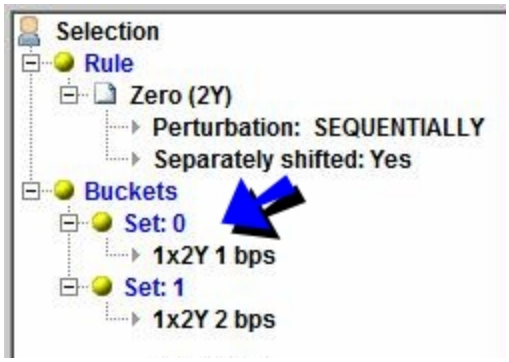
the perturbation scenario NPV vectors. If the scenario NPV vectors don't have the same dimensionality, it is considered an error condition.

Whether a perturbation rule uses Sequential or Simultaneous generation also has implications for the risk analysis output. For the sequential case, there will be *n* columns per risk measure, instead of one, or *n* columns per perturbation scenario (per pricer measure).

The following fields only apply to curve perturbation rules and date perturbation rules, and depend on how the perturbation rule is defined.

- "**Parameter**" specifies how the rule should be applied:
  - "?": Sequentially - You will get 1 risk value for each shifted point.
  - "SUM": Simultaneously - All points will be shifted simultaneously to produce 1 risk value.
- "**Parameter Set**" specifies which set of perturbations you want to use in case you have defined multiple sets in the perturbation rule.

  Sample sequential rule with multiple sets:

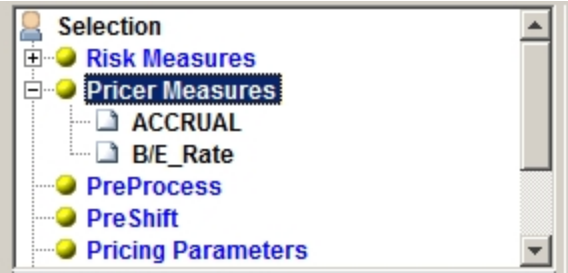


  "Set: 0" will shift the market data by 1bps, and "Set: 1" will shift the market data by 2bps.

ⓘ [NOTE: To define a Delta risk measure for a Cumulative curve perturbation, you must utilize both the aforementioned "Parameter" and "Parameter Set" fields. In this case, you must specify the current shift ("?",0) minus the previous shift ("?",1). Example: CurveUL_1bp("?",0)-CurveUL_1bp("?",1)]

4.2 Selection > Pricer Measures

Allows you to add standard pricer measures to the output. For example, pricer measures that are used in the computation of the risk measures to view the intermediary results.



» Right-click the "Pricer Measures" label, and choose "Pricer Measures" from the popup menu to add out-of-the-box pricer measures to the scenario output. You will be prompted to select pricer measures.

Custom Pricer Measures

NOTE: Custom Pricer Measures which require market data in addition to what is already managed by the Pricer are not supported (e.g. ACCURAL_BO_BASE, VEGA_BASE). Any “Base” conversions can be configured to occur at report level.

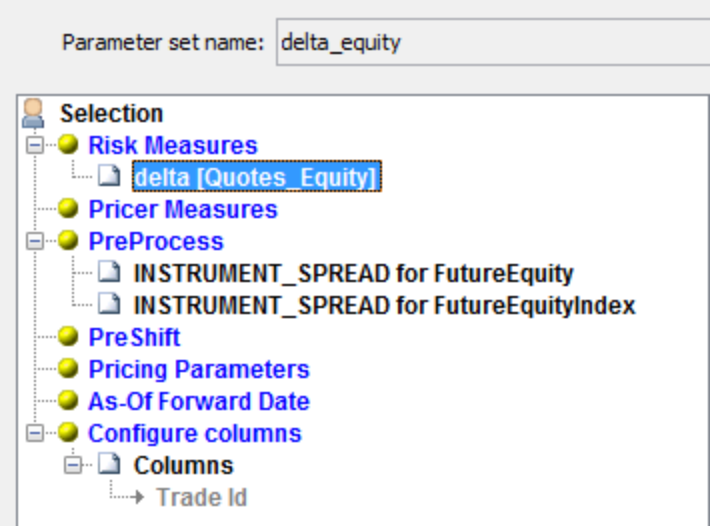
4.3 Selection > PreProcess

Listed products (example Future Money Market – Calypso product FutureMM) are priced typically from market quotes. However, there is a need to compute risk on these products versus the same market data as OTC trades, in order to aggregate the risk, verify the hedge, or explain the P&L. For example, with a book of IR Swaps hedged with Futures, it is important that the risk of the Futures is computed on the same curve as the Swaps so that the hedge can be verified.

The listed products can be priced either from the direct quotes or theoretically (i.e. price FutureMM from swap curve). In the context of risk, one could price them theoretically and therefore produce the needed risk. However, that approach leads to prices that are inconsistent with the market (direct quotes).

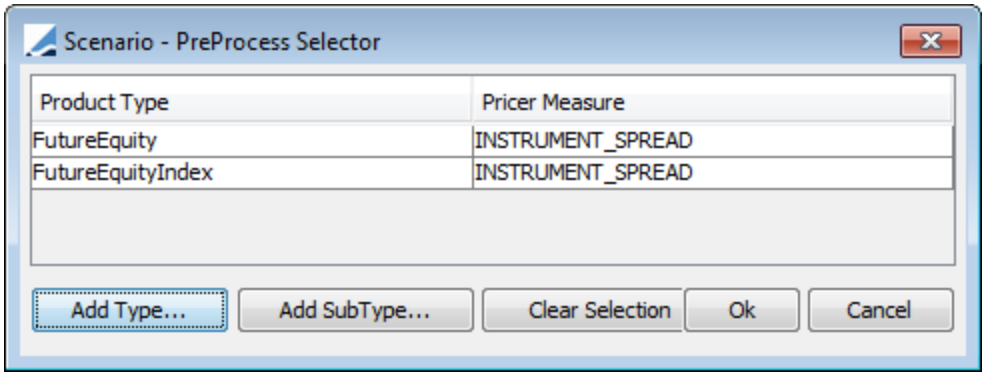
The preferred approach in Calypso is to compute a Pricer Measure that captures the gap between the market price and the theoretical price. This measure is stored and then used as an additional input when pricing theoretically during the risk process. In case of no shift (i.e. 0bp on rates), one can find the market price again.

This approach is called Pre Processing. It must be defined manually in Scenario Editor.



To define a PreProcessing for Product and Pricer combinations in Scenario Editor:

» Right-click the "PreProcess" label and choose "PreProcess" from the popup menu. You can define the Pricer Measure by Product Type or by product SubType.



Click **Add Type** to define the Pricer Measure by Product Type. You will be prompted to select a Product Type and a Pricer Measure.

Click **Add SubType** to define the Pricer Measure by product SubType. You will be prompted to select a product SubType and a Pricer Measure.

The Pricer Measures will be calculated and used as additional inputs to price the products, therefore allowing the computation of various sensitivities for products priced from quotes.

Then click **OK**.

Recommended Settings

The pricing parameters listed below must be set to true in order for the pre-processing to take effect.

PRODUCT_NAME	PRICER_PARAMS	PRICER_MEASURE
Bond	BOND_FROM_QUOTE	INSTRUMENT_SPREAD
BondAssetBacked	BOND_FROM_QUOTE	INSTRUMENT_SPREAD
BondBrady	BOND_FROM_QUOTE	INSTRUMENT_SPREAD
BondFRN	BOND_FROM_QUOTE	INSTRUMENT_SPREAD
BondMMDiscount	MMKT_FROM_QUOTE	INSTRUMENT_SPREAD
BondMMDiscountAUD	MMKT_FROM_QUOTE	INSTRUMENT_SPREAD
BondMMInterest	MMKT_FROM_QUOTE	INSTRUMENT_SPREAD
BondOption	BOND_FROM_QUOTE	PLXG
ETOEquity	NPV_FROM_QUOTE	VOLATILITY_SPREAD
ETOEquityIndex	NPV_FROM_QUOTE	VOLATILITY_SPREAD
FutureBond	FUTURE_FROM_QUOTE	INSTRUMENT_SPREAD
FutureCommodity	FUTURE_FROM_QUOTE	INSTRUMENT_SPREAD
FutureDividend	FUTURE_FROM_QUOTE	INSTRUMENT_SPREAD
FutureEquity	FUTURE_FROM_QUOTE	INSTRUMENT_SPREAD
FutureEquityIndex	FUTURE_FROM_QUOTE	INSTRUMENT_SPREAD
FutureMM	FUTURE_FROM_QUOTE	INSTRUMENT_SPREAD
FutureOptionBond	NPV_FROM_QUOTE	VOLATILITY_SPREAD
FutureOptionDividend	NPV_FROM_QUOTE	IMPLIEDVOLATILITY
FutureOptionEquity	NPV_FROM_QUOTE	VOLATILITY_SPREAD
FutureOptionEquityIndex	NPV_FROM_QUOTE	VOLATILITY_SPREAD
FutureOptionMM	NPV_FROM_QUOTE	VOLATILITY_SPREAD
PerformanceSwap	BOND_FROM_QUOTE	INSTRUMENT_SPREAD
Warrant	NPV_FROM_QUOTE	VOLATILITY_SPREAD

4.4 Selection > PreShift

You can specify pre-shift rules in the case you have to apply multiple shifts to the market data (Vanna calculation for example). A pre-shift can be applied prior to the execution of another rule.

» Right-click the "PreShift" label and choose "PreShift". The PreShift Selector will appear as shown below.

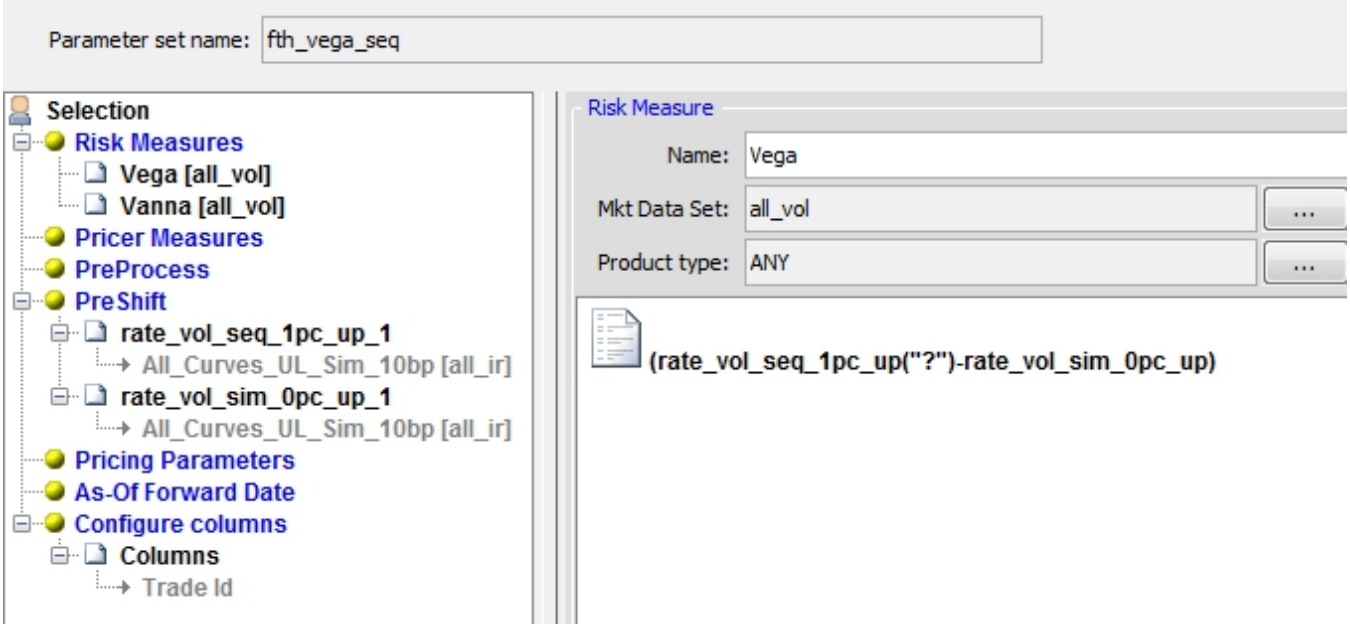
Click **Add**. You will be prompted to select a rule and its preshift rule. You can also select a different market data set for the preshift rule, or __DEFAULT__ to use the same market data set as the rule.

Then click **OK**.

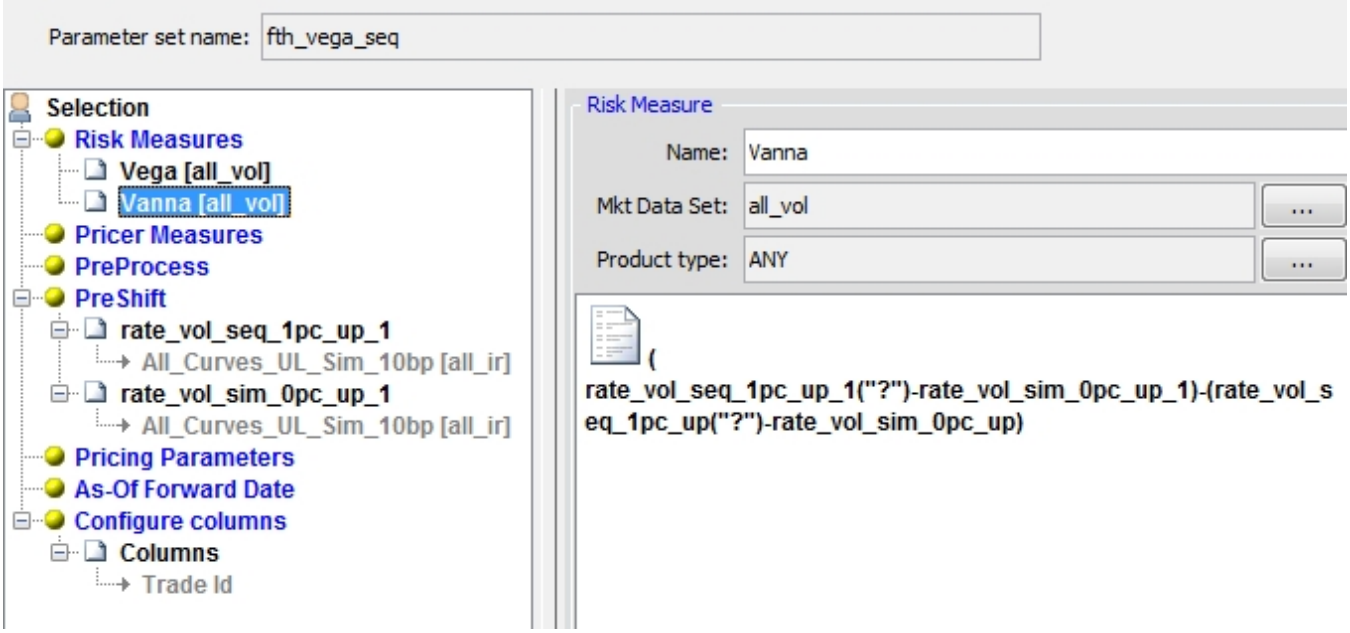
Example

Pre-shift is especially useful for computations involving second order cross sensitivity. In the example below, Vanna will be derived by calculating the change of Vega after a shift of curves.

Start with the risk measure Vega.



Then compute Vanna by calculating the difference between one Vega with preshift and one Vega without preshift.

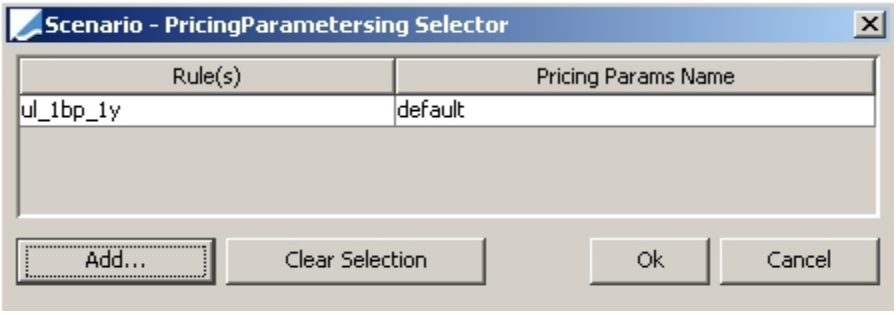


4.5 Selection > Pricing Parameters

You can add a set of pricing parameters for a given rule. Before pricing the rule, the attached parameter set will be merged with the current parameter set of the pricing environment used for pricing.

If there is any conflict, the pricing parameters of the attached parameter set override the pricing parameters of the pricing environment.

» Right-click the "Pricing Parameters" label and choose "Add Pricing Parameters". The Pricing Parameter Set Selector will appear as shown below.



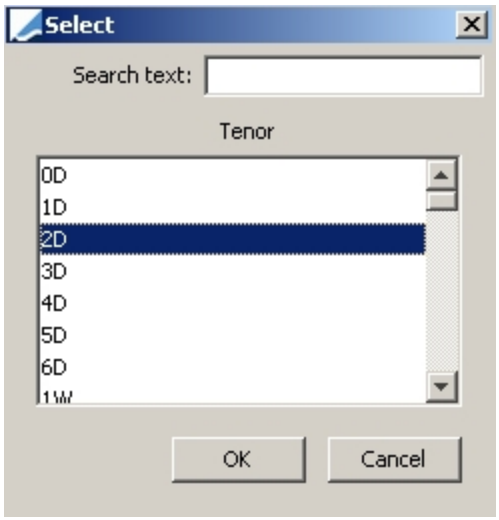
Click **Add**. You will be prompted to select a rule and a pricing parameter set.

Then click **OK**.

4.6 Selection > As-Of Forward Date

This can be used in conjunction with pre-shift rules only. The As-Of Forward component of Scenario will shift the val date for evaluating the pre-shift rule by the tenor specified. Therefore, the new val date for the analysis will be Val Date + Tenor in As-of Forward.

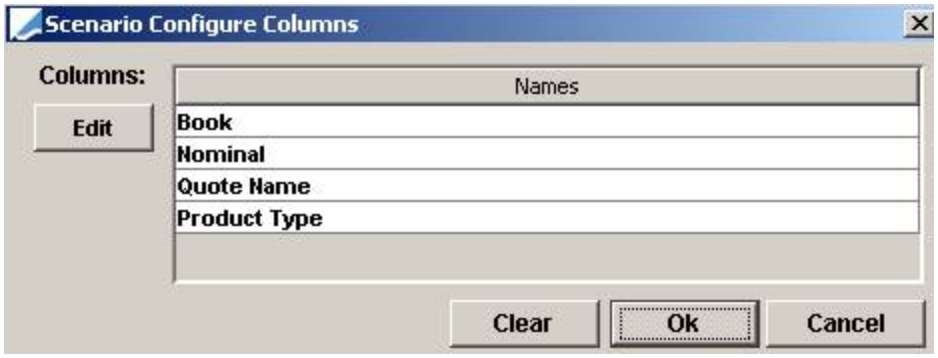
» Right-click the "As-Of Forward Date" label and choose "Set Tenor". You will be prompted to select a tenor.



4.7 Selection > Configure Columns > Set Columns

You can predefine which columns and aggregation levels you want to display.

» Right-click the "Configure Columns" label and choose "Set Columns". The Configure Columns dialog will appear as shown below.



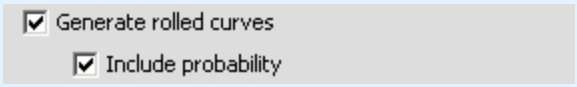
Click **Edit** under Columns to add columns. You will be prompted to select columns. Note that the columns here only correspond to trade-related columns. When the environment property SCENARIO_ALL_COLUMN_NAMES is False, no column will be available for selection here. You will only be able to see SCENARIO_MEASURES and RISK_MEASURES in the report.

Click **Edit** under Aggregation to add aggregation levels. You will be prompted to select aggregation levels.

Then click **OK**.

4.8 Additional Settings

You can specify the following settings on the risk measure set.

Fields	Description
Convert to base currency	Check this box to convert all the measures to the base currency.
Generate rolled curves	Check this box to generate rolled curves. When generating rolled curves, you have the option to include probability curves by checking the "Include probability" box. 
Use alternate inter-polator	If you are using spline interpolators for pricing (MonotoneConvex, Spline, LogSpline) that use the whole curve for interpolation, you can select linear interpolators for the risk computations to use only two consecutive points for interpolation. Check “Use alternate interpolator” to use the interpolator defined in domain “riskAlternateCurveInterpolator” for interpolation, typically InterpolatorLinear or InterpolatorLogLinear (default value).
Discrete Measures	Check this box to designate a Scenario Parameter as containing Discrete Measures to be used in Pricing Analysis. Please note, Discrete Measures can only be checked if: • "Shifts market data separately" is unchecked in Scenario Rules where applicable. • Each Risk Measure defined only produces a single output per trade or position. ⓘ [NOTE: It is recommended that no more than 10 Risk Measures be used in a Scenario Parameter Set. Performance should be assessed on a case-by-case basis as every Risk Measure has unique processing requirements.]
Explode Trades	Check this box to break down structured trades into their individual components. This feature is also customizable at the API level. ▶ Refer to the *Calypso Developer's Guide* for details.
Optimize Risk	Checking this will merge similar trades into one for processing the risk measures, then split again for display- therefore improving the processing time. This is customizable and extendable through API. Default core implementation includes CDS, CDSIndex, CDSIndexTranche.
Look Through Fund	Not used.
Skip market data dependencies	When checked, the scenario rule is only applied to market data that are needed for pricing. ⓘ [NOTE: It does not apply if “Generates dependents” is set, and should be unchecked in that case]

Fields	Description
Approx. daily avg. instruments	Check to use an approximation when generating curves with BasisGlobal that use daily average swap underlyings, in order to improve performance.
Rollup Allocations	Select this checkbox so that the results are displayed for block trades with rolled up notional (i.e. the original block size). Child trades are filtered out of the analysis.
Viewer	The default viewer is Default which corresponds to "`apps.risk.ScenarioRiskAnalysisViewer`". Note that this is the only viewer supported by the Calypso Workstation.
Comments	Free form comment.

ⓘ [NOTE: In order to avoid conflicts when using a set of trades using different rule types on the dispatcher, use SCENARIO_SKIP_RISK_ATTRIBUTES set to "true". The Scenario Viewer will not display rule-specific columns]

4.9 Distributed Processing Mode

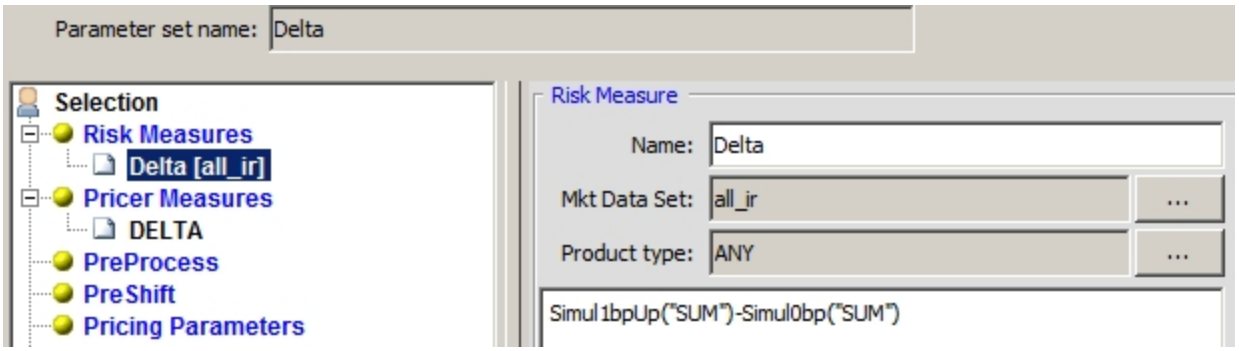
The following setting only applies when you are running the scenario analyses in distributed mode.

Fields	Description
Strategy / Nb trades per job	Parameter used for dispatching the analysis in distributed mode. ▶ Refer to the *Calypso System Guide* for information on running an analysis in distributed mode. We recommend testing with 300, and tune as applicable. When Strategy is clear, you can enter the number of rules per job instead of the number of trades per job. In this case, you must set the environment property SCENARIO_DISPATCH_PER_RULE_TRADES_LIMIT to limit the number of trades per rule - Default value is 100 (Cannot exceed 1000). ⓘ [NOTE: For volatility rules, you cannot use the number of rules per job - You can only use the number of trades per job. Default number of trades per job is 500.]

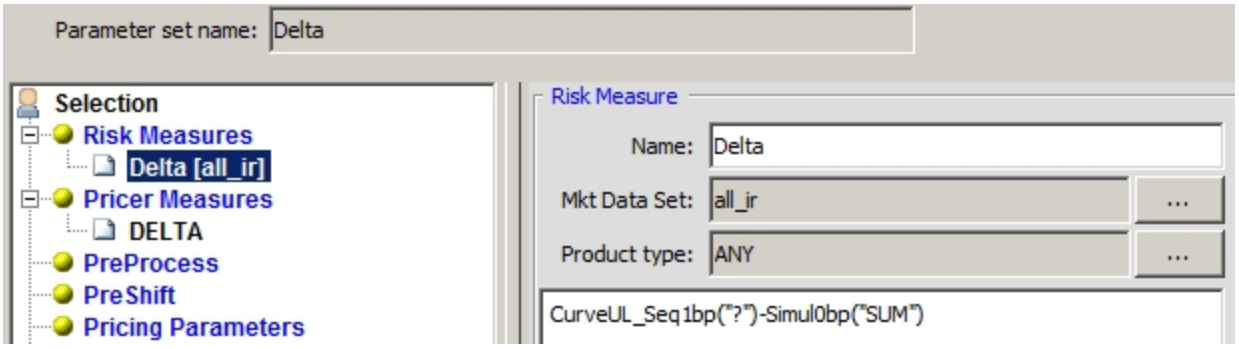
4.10 Sample Sets of Risk Measures

Using Scenarios, the following types of scenarios can be quickly set up.

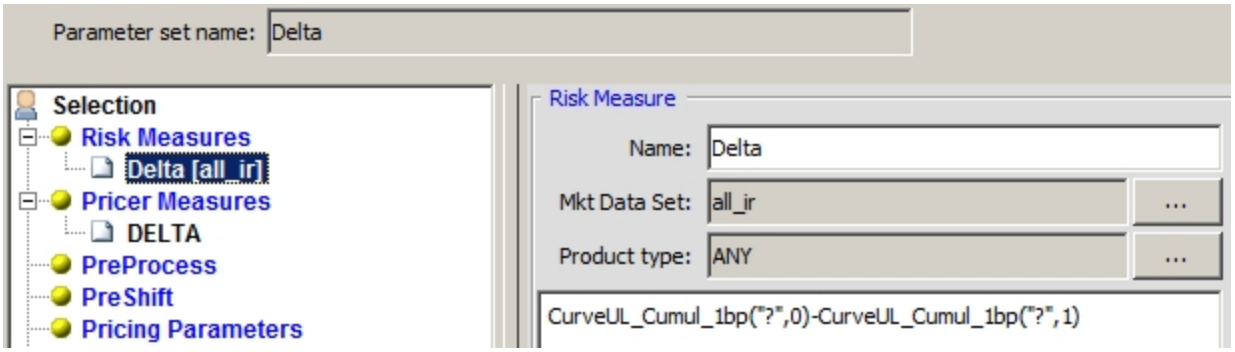
Delta Sensitivity - Simultaneous Shift



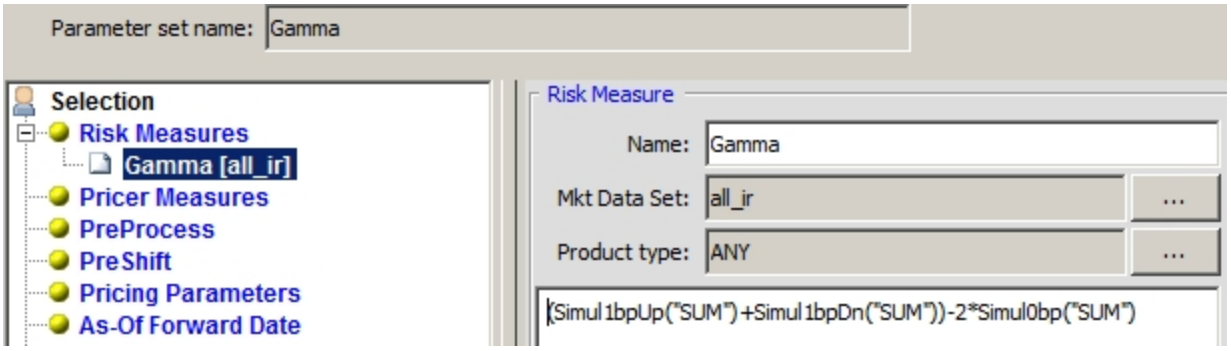
Delta Sensitivity - Sequential Shift



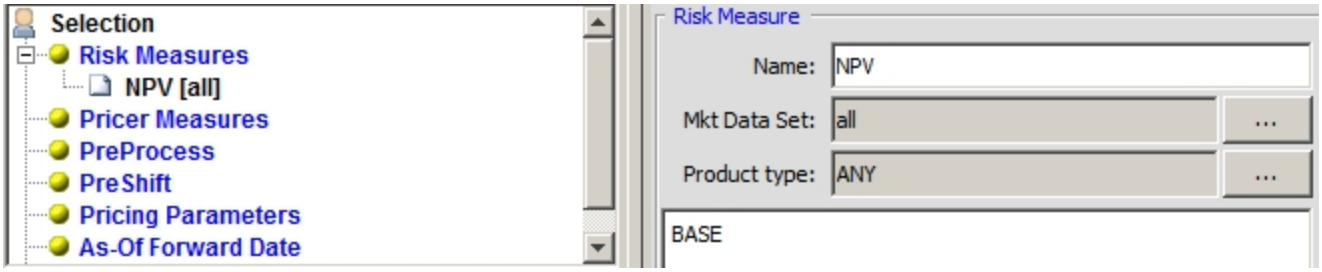
Delta Sensitivity - Cumulative Shift



Gamma Sensitivity



Simple NPV - For Simple NPV, you can use BASE - This is the only case where we recommend using it.



5. Sample Scenario Outputs

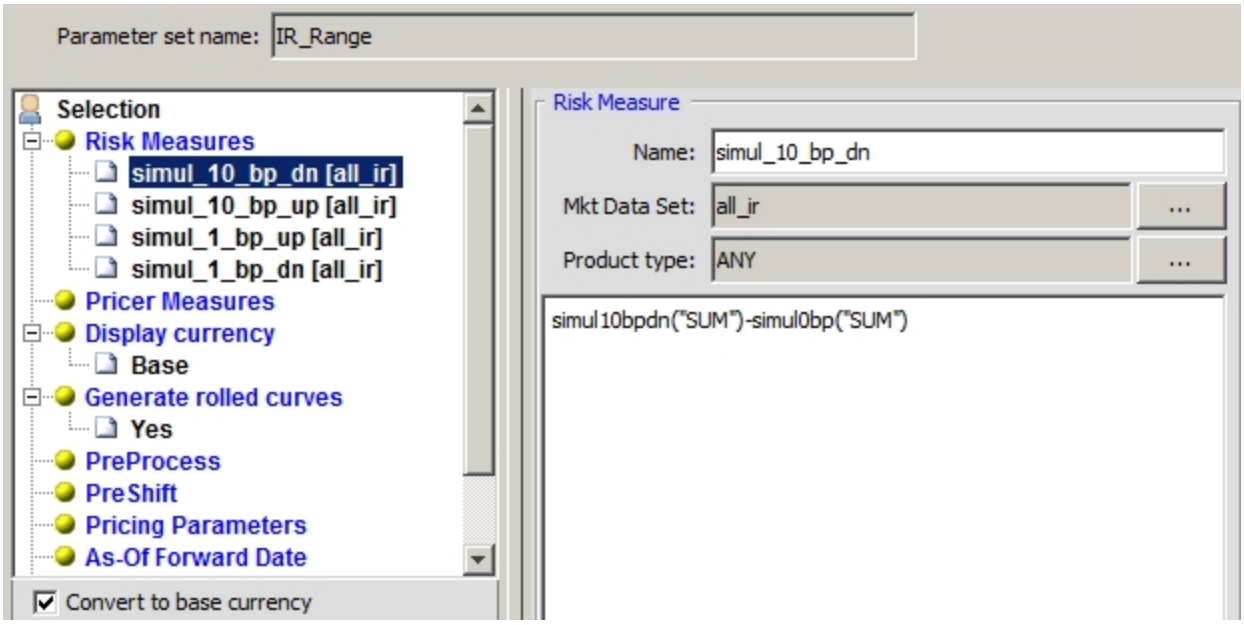
Scenario results can be viewed in the Calypso Workstation (CWS).

▶ Refer to the Calypso Workstation documentation for details.

ⓘ [NOTE: When sorting reports in CWS, the most important field should be sorted first. In the case of Rates, it is the tenor or bucket value. In the case of Rate Volatility, is it the Vol Expiry Tenor followed by the Vol Tenor]

5.1 Sample IR_Range Scenario for IRD Trades

5.1.1 IR_Range Risk Measures

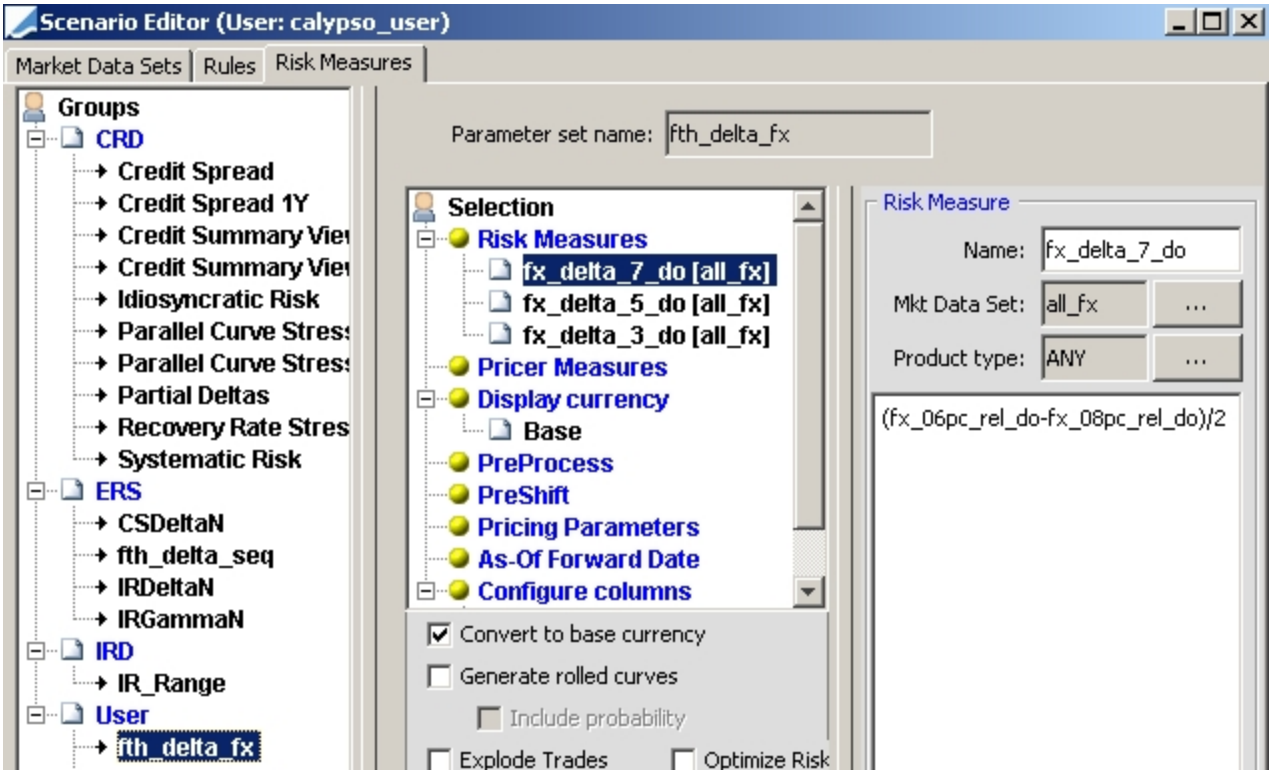


5.1.2 Output in Calypso Workstation

Trade Id	Risk Measure Name	Type	Underlier Currency	Underlier Market Data Name	Value
1236	simul_1_bp_dn	Curve	USD	ZC USD Libor-Deposit 3M/6M	1,682.22
1236	simul_1_bp_up	Curve	USD	ZC USD Libor-Deposit 3M/6M	-1,682.14
1236	simul_10_bp_dn	Curve	USD	ZC USD Libor-Deposit 3M/6M	16,825.85
1236	simul_10_bp_up	Curve	USD	ZC USD Libor-Deposit 3M/6M	-16,817.69
1237	simul_1_bp_dn	Curve	USD	ZC USD Libor-Deposit 3M/6M	-2,539.84
1237	simul_1_bp_up	Curve	USD	ZC USD Libor-Deposit 3M/6M	2,573.53
1237	simul_10_bp_dn	Curve	USD	ZC USD Libor-Deposit 3M/6M	-23,914.60
1237	simul_10_bp_up	Curve	USD	ZC USD Libor-Deposit 3M/6M	27,281.22
1230	simul_1_bp_dn	Curve	[JPY, USD]	[ZC USD Libor-Deposit 3M/6M, ZC JPY Libor-Deposit]	675.00
1230	simul_1_bp_up	Curve	[JPY, USD]	[ZC USD Libor-Deposit 3M/6M, ZC JPY Libor-Deposit]	-674.67
1230	simul_10_bp_dn	Curve	[JPY, USD]	[ZC USD Libor-Deposit 3M/6M, ZC JPY Libor-Deposit]	6,765.36
1230	simul_10_bp_up	Curve	[JPY, USD]	[ZC USD Libor-Deposit 3M/6M, ZC JPY Libor-Deposit]	-6,731.35
1240	simul_1_bp_dn	Curve	[JPY, USD]	[ZC USD Libor-Deposit 3M/6M, ZC JPY Libor-Deposit]	4,705
1240	simul_1_bp_up	Curve	[JPY, USD]	[ZC USD Libor-Deposit 3M/6M, ZC JPY Libor-Deposit]	-4,702
1240	simul_10_bp_dn	Curve	[JPY, USD]	[ZC USD Libor-Deposit 3M/6M, ZC JPY Libor-Deposit]	47,170
1240	simul_10_bp_up	Curve	[JPY, USD]	[ZC USD Libor-Deposit 3M/6M, ZC JPY Libor-Deposit]	-46,896

5.2 Sample FX Delta

5.2.1 Risk Measures

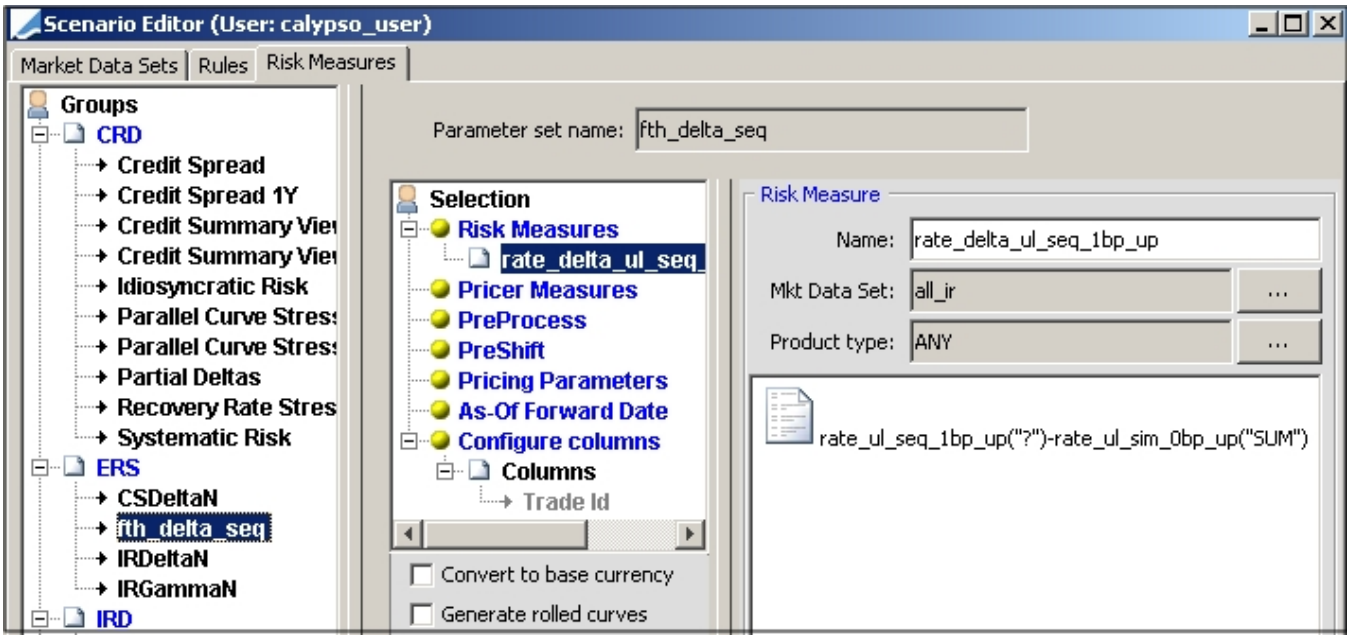


5.2.2 Output in Calypso Workstation

Risk Measure Full Name	Risk Measure Name	Trade Id	Type	Value	Value (base)
FX.EUR.USD_fx_delta_7_do	fx_delta_7_do	2931	Quotes	17,746.36	17,746.36
FX.EUR.USD_fx_delta_3_do	fx_delta_3_do	2931	Quotes	17,746.36	17,746.36
FX.EUR.USD_fx_delta_5_do	fx_delta_5_do	2931	Quotes	17,746.36	17,746.36
FX.EUR.USD_fx_delta_7_do	fx_delta_7_do	2930	Quotes	-973.33	-973.33
FX.EUR.USD_fx_delta_3_do	fx_delta_3_do	2930	Quotes	-973.33	-973.33
FX.EUR.USD_fx_delta_5_do	fx_delta_5_do	2930	Quotes	-973.33	-973.33
FX.EUR.USD_fx_delta_7_do	fx_delta_7_do	2932	Quotes	14,777.02	14,777.02
FX.EUR.USD_fx_delta_3_do	fx_delta_3_do	2932	Quotes	14,777.02	14,777.02
FX.EUR.USD_fx_delta_5_do	fx_delta_5_do	2932	Quotes	14,777.02	14,777.02
FX.USD.CAD_fx_delta_5_do	fx_delta_5_do	2933	Quotes	18,993.52	24,568.70
FX.USD.CAD_fx_delta_7_do	fx_delta_7_do	2933	Quotes	18,993.52	25,636.90
FX.USD.CAD_fx_delta_3_do	fx_delta_3_do	2933	Quotes	18,993.52	23,565.89

5.3 Sample Rate Delta Underlying

5.3.1 Risk Measures

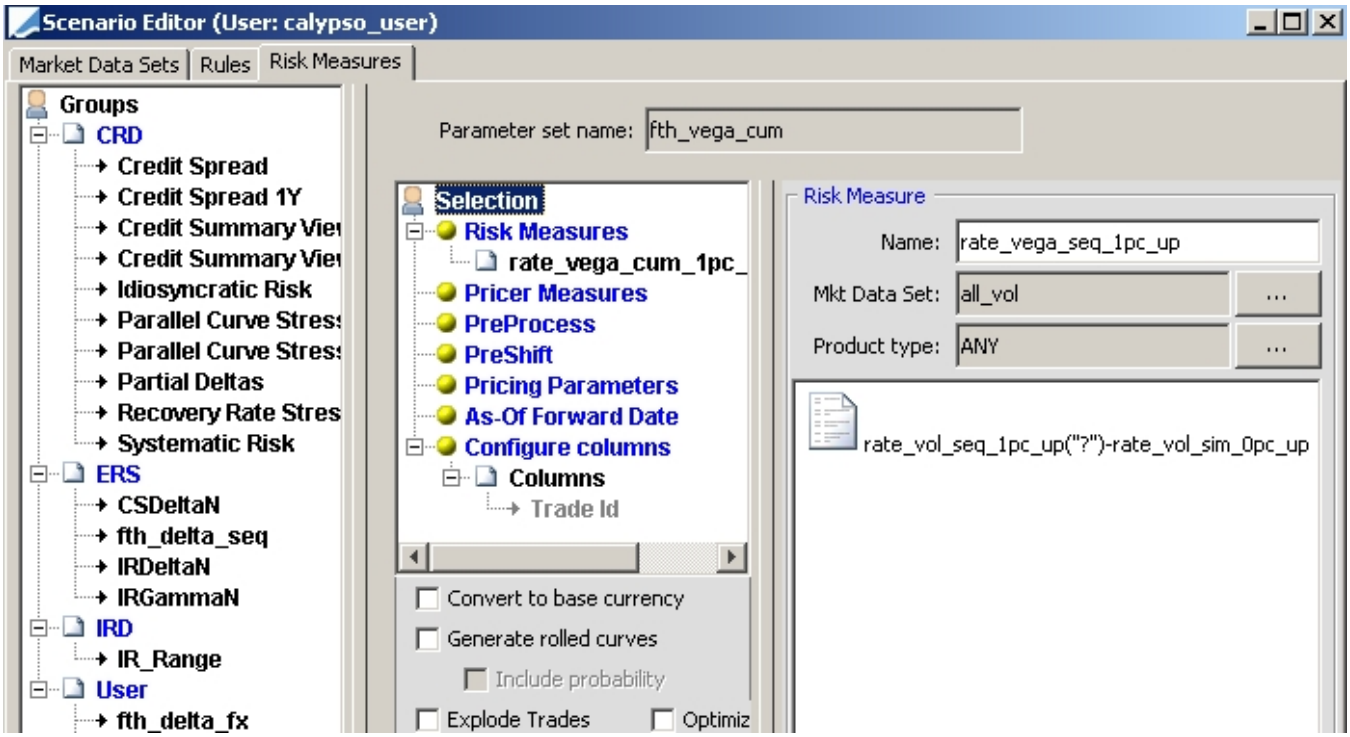


5.3.2 Output in Calypso Workstation

Trade Id	Risk Measure Name	Type	Underlier Currency	Underlier Market Data Name	Value
1236	rate_delta_ul_seq_1p_up	Curve	USD	ZC USD Libor-Deposit 3M/6M	-53.11
1236	rate_delta_ul_seq_1p_up	Curve	USD	ZC USD Libor-Deposit 3M/6M	-30.18
1236	rate_delta_ul_seq_1p_up	Curve	USD	ZC USD Libor-Deposit 3M/6M	-158.68
1236	rate_delta_ul_seq_1p_up	Curve	USD	ZC USD Libor-Deposit 3M/6M	9.28
1236	rate_delta_ul_seq_1p_up	Curve	USD	ZC USD Libor-Deposit 3M/6M	17.73
1236	rate_delta_ul_seq_1p_up	Curve	USD	ZC USD Libor-Deposit 3M/6M	-1,507.18
1236	rate_delta_ul_seq_1p_up	Curve	USD	ZC USD Libor-Deposit 3M/6M	2.32
1236	rate_delta_ul_seq_1p_up	Curve	USD	ZC USD Libor-Deposit 3M/6M	0.84
1236	rate_delta_ul_seq_1p_up	Curve	USD	ZC USD Libor-Deposit 3M/6M	35.90
1237	rate_delta_ul_seq_1p_up	Curve	USD	ZC USD Libor-Deposit 3M/6M	-0.00
1237	rate_delta_ul_seq_1p_up	Curve	USD	ZC USD Libor-Deposit 3M/6M	-0.20
1237	rate_delta_ul_seq_1p_up	Curve	USD	ZC USD Libor-Deposit 3M/6M	-3.70
1237	rate_delta_ul_seq_1p_up	Curve	USD	ZC USD Libor-Deposit 3M/6M	2,698.66
1237	rate_delta_ul_seq_1p_up	Curve	USD	ZC USD Libor-Deposit 3M/6M	336.32
1237	rate_delta_ul_seq_1p_up	Curve	USD	ZC USD Libor-Deposit 3M/6M	-64.36
1237	rate_delta_ul_seq_1p_up	Curve	USD	ZC USD Libor-Deposit 3M/6M	-2.88
1237	rate_delta_ul_seq_1p_up	Curve	USD	ZC USD Libor-Deposit 3M/6M	-3.55
1237	rate_delta_ul_seq_1p_up	Curve	USD	ZC USD Libor-Deposit 3M/6M	-3.41
1237	rate_delta_ul_seq_1p_up	Curve	USD	ZC USD Libor-Deposit 3M/6M	-524.88

5.4 Sample Rate Vega by Bucket

5.4.1 Risk Measures



5.4.2 Output in Calypso Workstation

Trade Id	Risk Measure Name	Type	Underlier Currency	Underlier Market Data Name	Value
1237	rate_vega_cum_1pc_up	Composite	USD	VOL SWAPTION USD LIBOR	12,221.11
1237	rate_vega_cum_1pc_up	Composite	USD	VOL SWAPTION USD LIBOR	1,473.70