Scenario Analysis User Guide

Version 11.1 Patch 04

Fifth Edition — October 2010

This user guide describes the Calypso Scenario analysis functionality.

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 Scenario Editor and executed using Risk Analysis.

After the calculation is completed, a "basic" results viewer will be presented to the user. Within this viewer, the user will have drill-down capability, the ability to sort and aggregate results based on user-defined attributes (trade ID, counterparty, currency, etc.), and the ability to define report templates.

It is also possible to specify custom viewers. Refer to the *Calypso Developer's Guide* for information on implementing a custom viewer.

Revision date	Edition number	Comment
June 2009	First edition	First edition for version 11.0
August 2009	Second edition	Added information about volatility rules.
January 2010	Third edition	Third edition for release 11.1.
August 2010	Fourth edition	Updated distributed mode information.
October 2010	Fifth edition	Fifth edition for release 11.1 Patch 04.

Contents

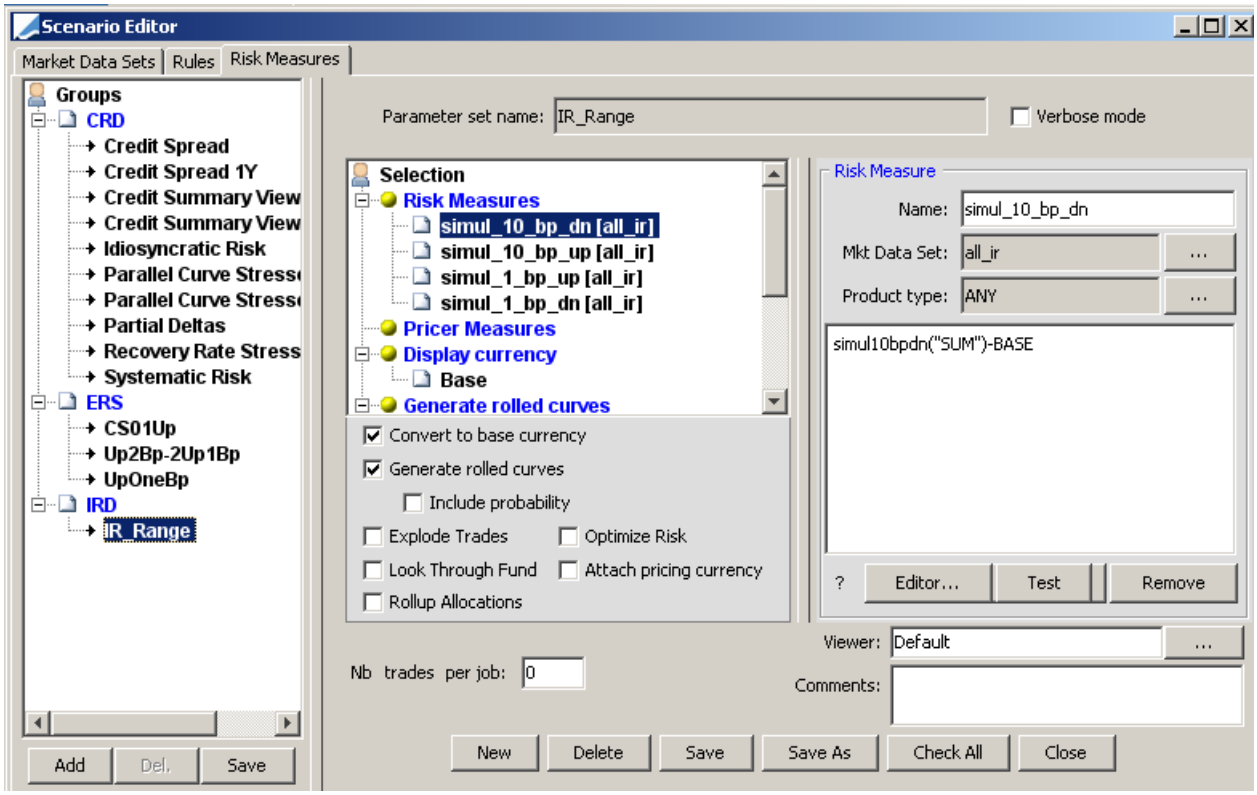
Section 1. Scenario Editor

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

It comes with a set of predefined scenarios that you can install when installing demonstration data. Refer to the *Calypso System Guide* for information on installing demonstration data.

A scenario is comprised of a set of market data, a set of perturbation rules and a set of risk measures to which the perturbations are applied.

Choose Main Entry > 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.
- Select the Rules panel for defining perturbations rules.
- Select the Risk Measures panels for defining risk measures.

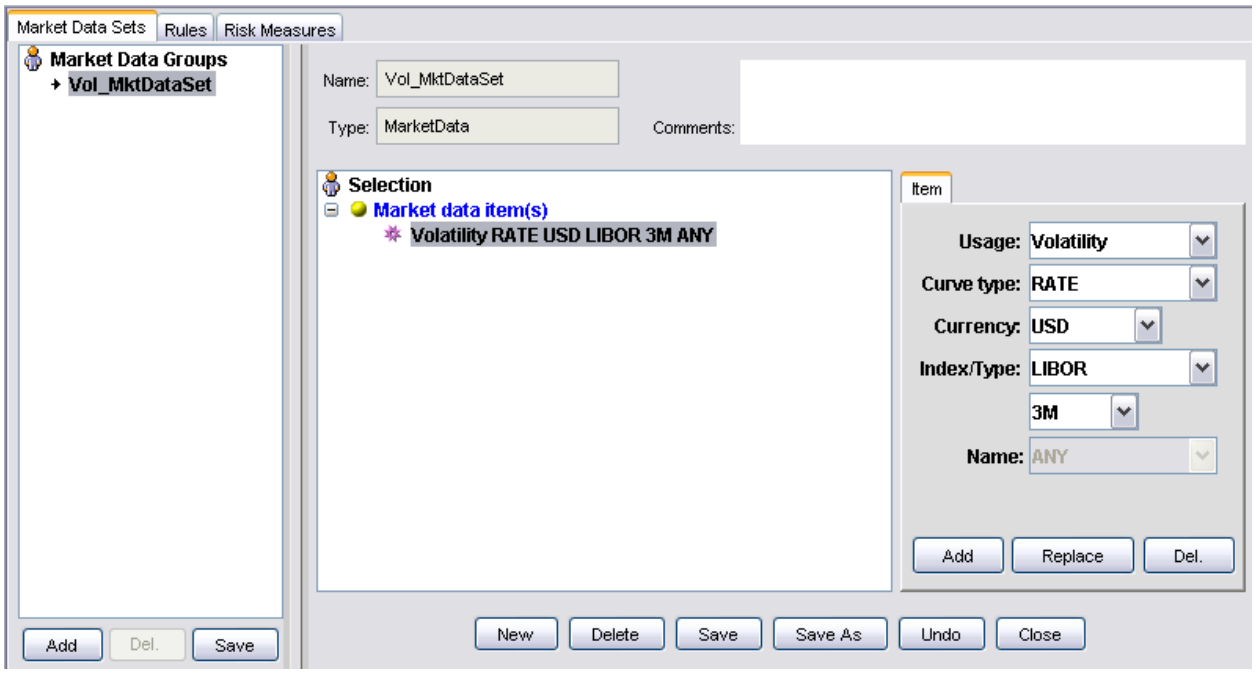
1.1 Defining Market Data Sets

A Market Data Set is essentially a filter which specifies a subset of market data item instances that will be perturbed, such as “all 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.



- Click **Add** under Market Data Groups to create a new group. You will be prompted to enter a group name. Then click **Save** under Market Data Groups to save the group.
- Click **New** to create a new market data set. This will clear the Market Data Sets panel.

  You can add market data items to the market data set using the Item panel.

  Select the type of market data item from the Usage field. Based on the selected usage, the market data item descriptor will be different, as described below.
- 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 that the type is set to MarketData, and that you can enter a comment in the Comments field.

1.1.1 Commodity Usage

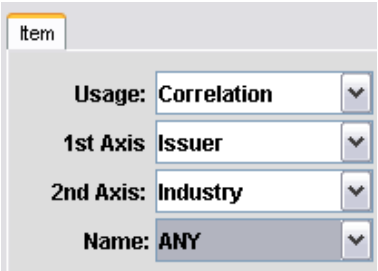
To select commodity curves.

- Enter the fields as 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.
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.

1.1.2 Correlation Usage

To select correlation matrices.

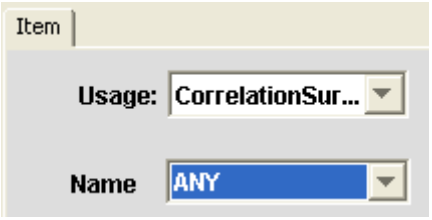


- Enter the fields as described below.
- Then click **Add** to add the market data item to the market data set.

Fields	Description
Usage	Correlation.
1st Axis	Select a first axis or ANY.
2nd Axis	Select a second axis or ANY.
Name	Defaults to ANY.

1.1.3 Correlation Surface Usage

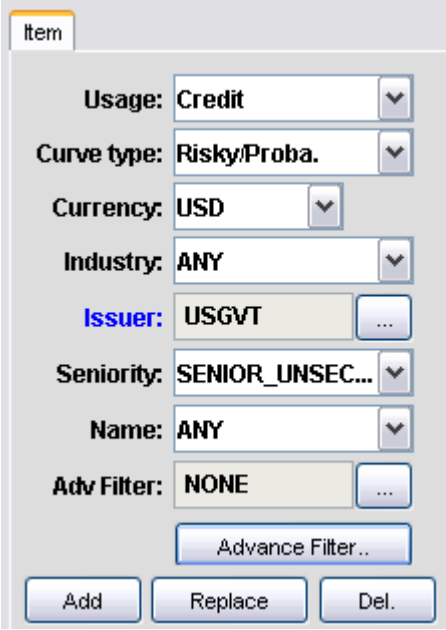
To select basket correlation surfaces.



- Select CorrelationSurface from the Usage field.
- Select a correlation surface from the Name field, or ANY, and click **Add** to add the market data item to the market data set.

1.1.4 Credit Usage

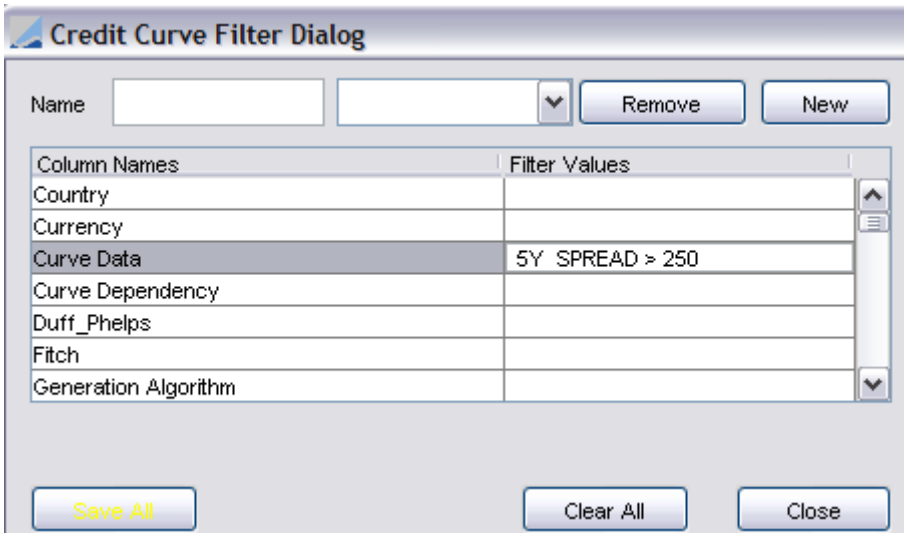
To select credit curves.



- Enter the fields as described below.
- You can click Advance Filter to specify additional criteria. See Advanced Filter for details.
- Then click **Add** to add the market data item to the market data set.

Fields	Description
Usage	Credit.
Curve Type	Choose Risky/Prob, Recovery, or Basis Adjustment. When BasisAdjustment is selected, Industry, Issuer, Seniority and Advanced Filter 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. This selection box will be filled with the appropriate curves from your Pricing Environment, based upon the selections above in the Item panel.

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.

1.1.5 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.

Fields	Description
Usage	Discount or Forecast.
Currency	Choose a currency or ANY.
Index/Type	Choose an index or ANY.

Fields	Description
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.

1.1.6 Dividend Usage

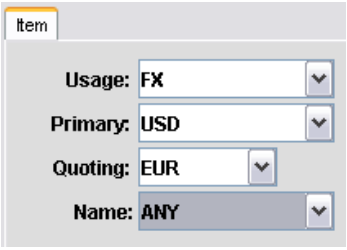
To select dividend curves.

- 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.

1.1.7 FX Usage

To select FX curves.

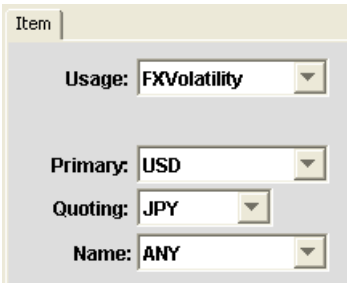


- Enter the fields as described below.
- Then click **Add** to add the market data item to the market data set.

Fields	Description
Usage	FX.
Primary	Choose the primary currency.
Quoting	Choose the quoting currency.
Name	Choose a curve name or ANY. This selection box will be filled with the appropriate curves from your Pricing Environment, based upon the selections above in the Item panel.

1.1.8 FX Volatility Usage

To select FX volatility surfaces.

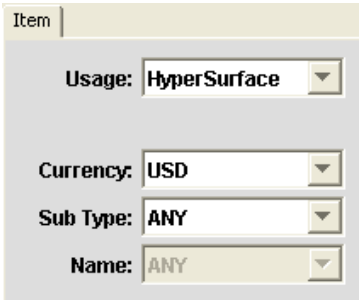


- » Enter the fields as described below.
- » Then click **Add** to add the market data item to the market data set.

Fields	Description
Usage	FXVolatility.
Primary	Choose the primary currency
Quoting	Choose the quoting currency
Name	Choose a surface name or ANY. This selection box will be filled with the appropriate surfaces from your Pricing Environment, based upon the selections above in the Item panel.

1.1.9 Hypersurface Usage

To select hypersurfaces.



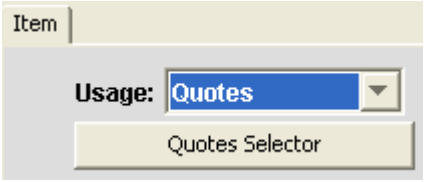
» Enter the fields as described below.

» 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. This selection box will be filled with the appropriate hypersurfaces from your Pricing Environment, based upon the selections above in the Item panel.

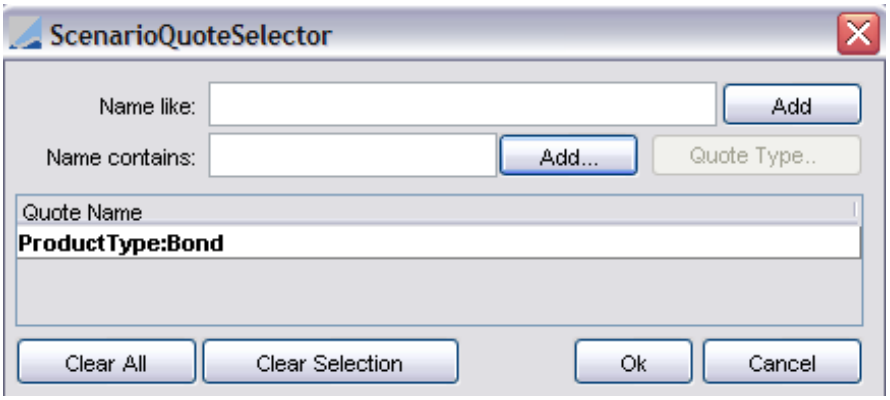
1.1.10 Quotes Usage

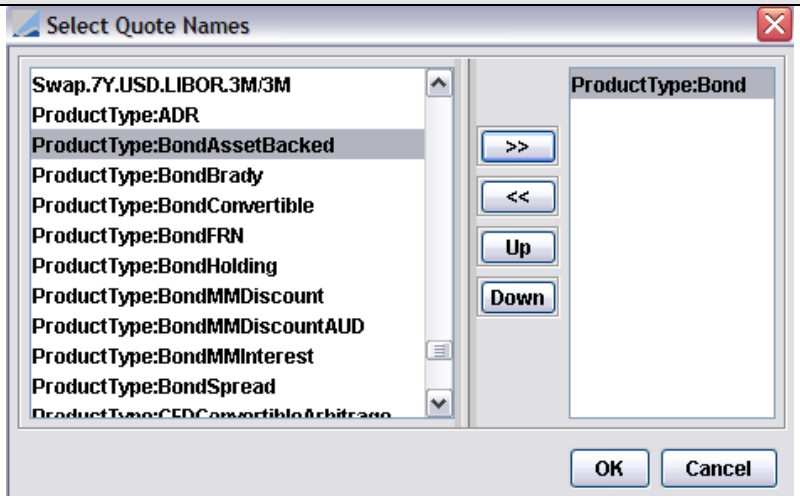
To select quotes. You can use the Quotes usage to select quotes to be perturbed, as well as reference quotes for Beta perturbations.



» 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 **Quotes Selector** to invoke the Quotes Selector window as shown below.  » 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.

Fields	Description
	

1.1.11 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.

1.1.12 Volatility Usage

To select volatility curves and 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	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. This selection box will be filled with the appropriate surfaces from your Pricing Environment, based upon the selections above in the Item panel.

1.1.13 Sample Market Data Set

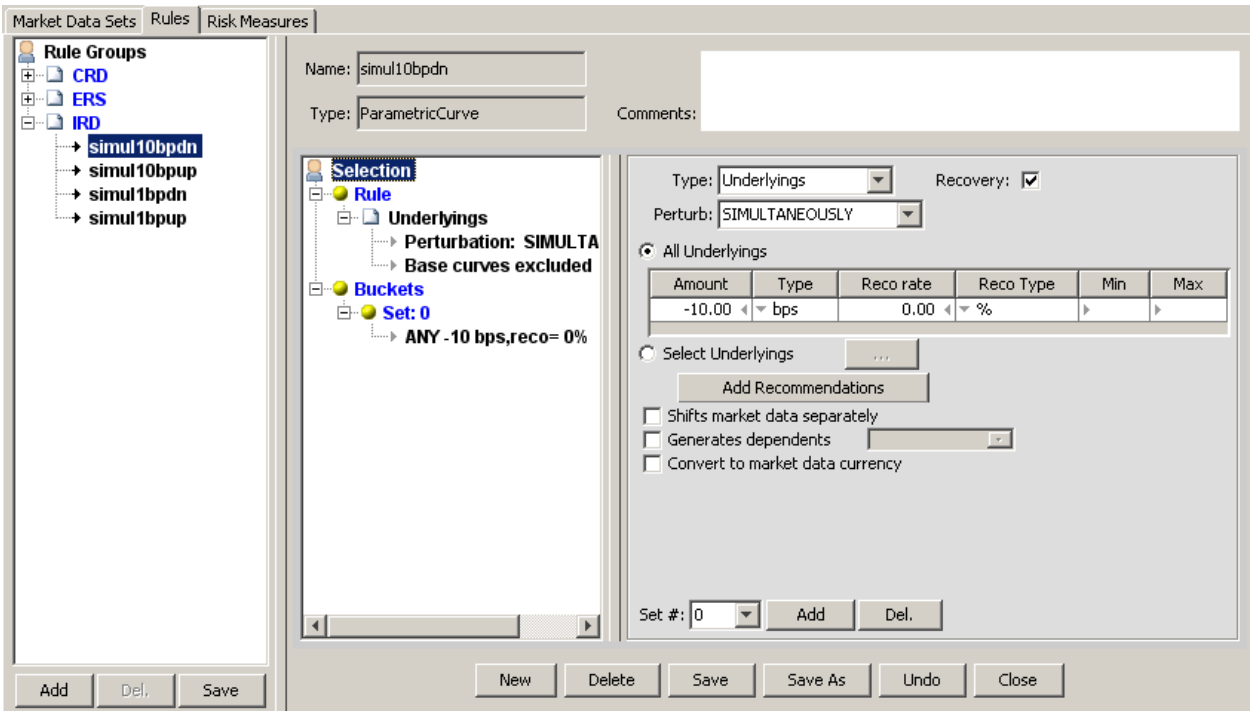
Market Data Item = All USD Forecast and Discount Curves, and All Rate Volatility Surfaces.

1.2 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.



» Click **Add** under Rule Groups to create a new group. You will be prompted to enter a group name. Then click **Save** under Rule Groups to save the group.

» Click **New** to create a new rule. You will be prompted to select a rule type.

The following types of perturbation rules are available: Curve (formerly Interest), Volatility, Quotes, Date, Composite and Matrix. 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:

- 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 interest rates.
- Date perturbation rules allow the simulation of a change in the valuation date.
- HyperSurface perturbation rules allow the perturbation of hyper surfaces.
- Matrix perturbation rules, similar to Composite, allow the specification of up to three basic rules, each along an axis, and a “matrix” of perturbations in three dimensional space is produced.
- Quotes perturbation rules allow the perturbation of individual quote values as well as Beta values.
- QuotesFromDataSet perturbation rules allow the perturbation of all quotes in a given market data set of Quotes usage.
- 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.

» 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.

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* and *forward* are output points (such as generated zero curve points, forward curve points, etc.). 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 perturbation1 to 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.

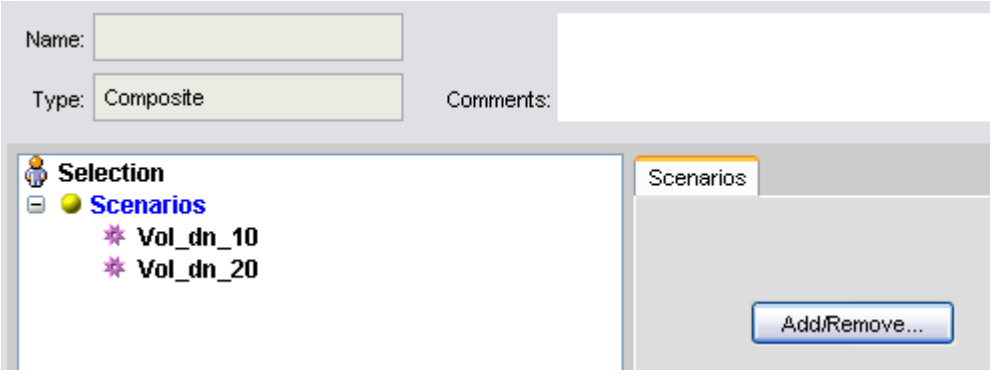
An amount and unit of perturbation may be defined for each perturbation. For zero perturbations, the amount of perturbation is added to each curve zero point within the specified interval. The specified compound frequency and daycount is used to extract the zero rate at each point from the discount factor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

For forward perturbations, a series of forward rates of the tenor specified are created. These forwards can be thought of as “synthetic” FRAs. Perturbation amounts can be specified for each forward and a new curve will be generated. For example, for a 10 year maturity interest rate curve, with specified forward tenor of 3 months, and time intervals of 6 months, we would create 20 3-month forwards.

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

1.2.1 Composite Rules

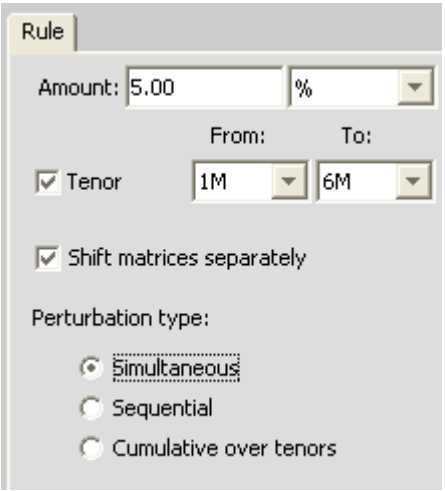
Composite perturbation rules allow the simultaneous application of one or more basic rules.



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

1.2.2 Correlation Matrix Rules

CorrelationMatrix perturbation rules allow the perturbation of correlation matrices.



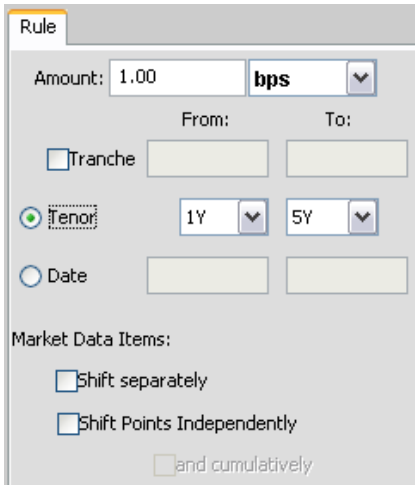
Select one of the following shift types:

- Simultaneous
  - Select range of tenors - shift each tenor plane within selected range all at once => result is one scenario.
  - Don't select tenors - shift all tenor planes all at once => result is one scenario.
- Sequential
  - Select range of tenors - 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.
  - Don't select tenors, except use all tenors on the matrix => result is one scenario per tenor per point.
- Cumulative over tenors
  - Select range of tenors - shift is cumulative along tenors => result is one scenario per selected tenor per point, and sequential across the points.
  - Don't select tenors - shift is sequential across the points.

If you check “Shift matrices separately”, each selected matrix is shifted separately. Multiple scenarios will be generated.

1.2.3 Correlation Surface Rules

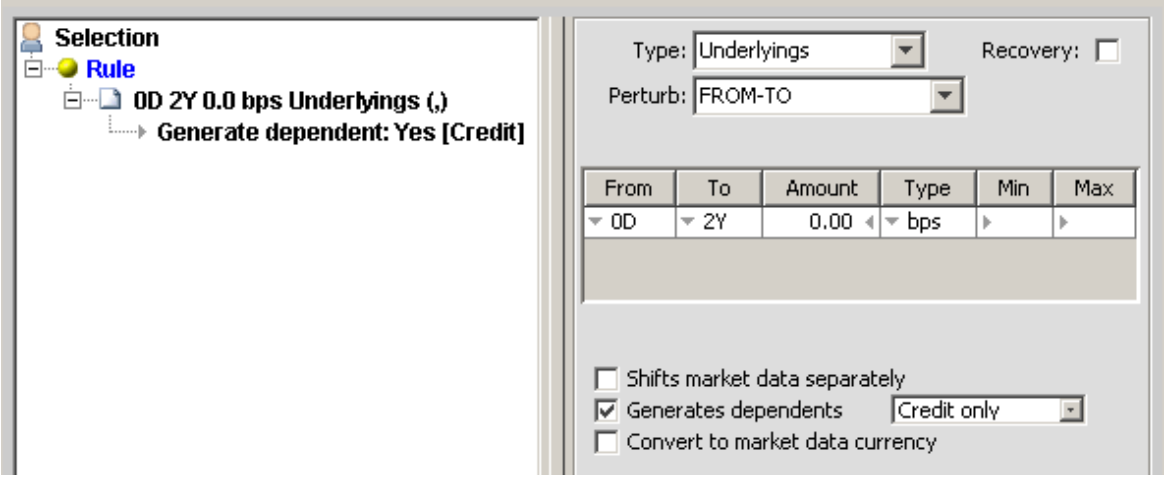
CorrelationSurface perturbation rules allow the perturbation of correlation surfaces.



- » Enter an amount in the Amount field and select the type of amount 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.
- » Check “Shifts 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.
- » When you check “Shift Points Independently”, you can also check “and cumulatively” to perform cumulative shifts.

1.2.4 Curve and ParametricCurve Rules

Curve perturbation rules allow the perturbation of interest rates.



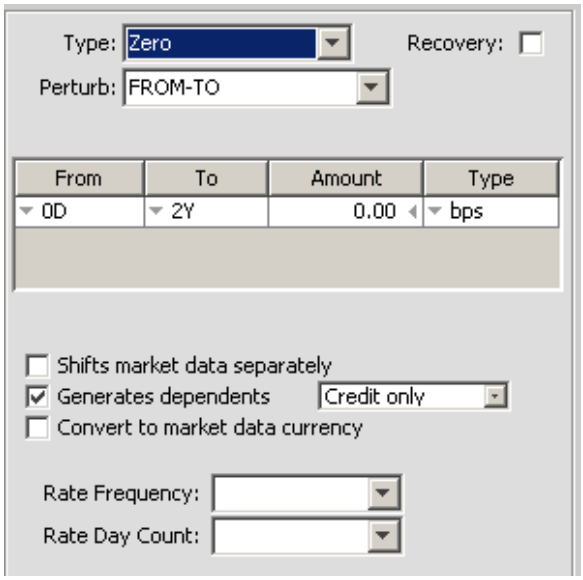
» Select the type of perturbation from the Type field and select the perturbation from the Perturb field. Then enter the fields described below, based on the selection.

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.

Note that the checkbox next to the Type field is not currently enabled.

Zero and Forward — FROM-TO Perturbation



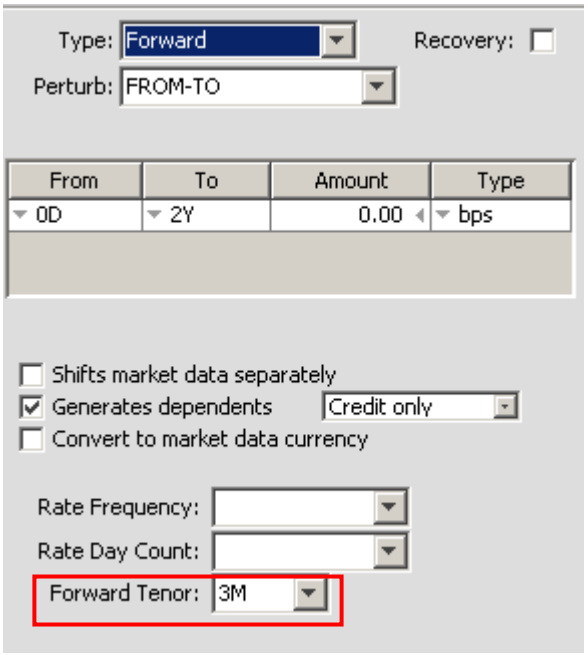
» Select a From and To tenors to perturb. The From tenor is added to ValDate for Start Date of perturbation, To tenor is added to Start Date for End Date of perturbation.

» Enter the perturbation amount, and choose bps, %, or %(rel) from the Type field.

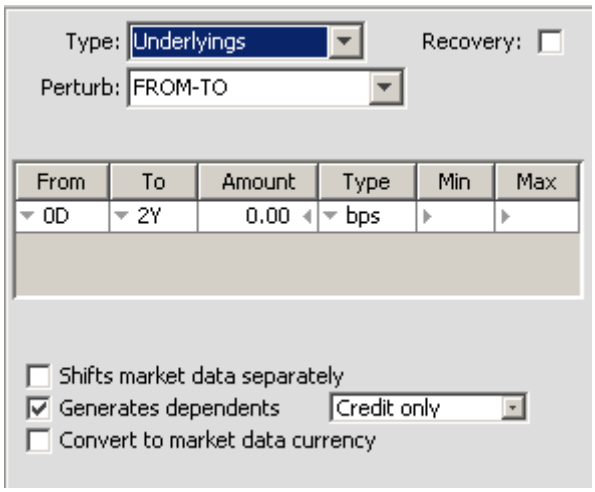
You can also specify a recovery rate perturbation. See Specifying a Recovery Rate Perturbation for details.

» 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 select for which types of curves you want to generate dependent curves.
- For curves defined with “Convert to market data currency” checked, the ratio of the numbers to the base currency numbers is equal to the FX rate.
- Select the compound frequency of the rate.
- Select the daycount convention of the rate.
- For the Forward perturbation type you can also select a forward tenor:



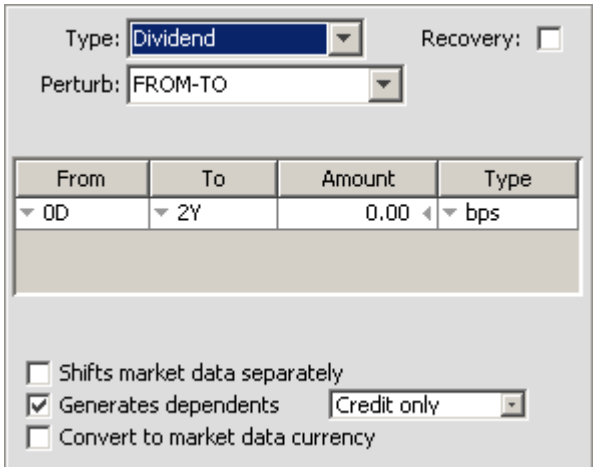
Underlyings — FROM-TO Perturbation



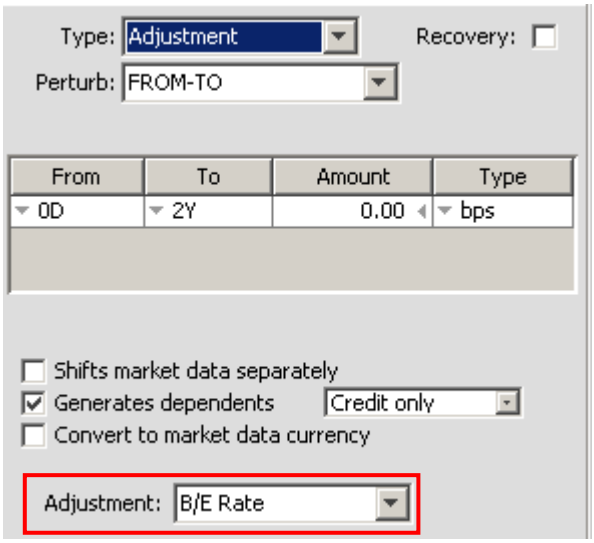
- Select a From and To tenors to perturb. The From tenor is added to ValDate for Start Date of perturbation, To tenor is added to Start Date for End Date of perturbation.
- Enter the perturbation amount, and choose bps, %, or %(rel) from the Type field.

  You can also specify a recovery rate perturbation. See Specifying a Recovery Rate Perturbation for details.

Dividend and Adjustment — FROM-TO Perturbation



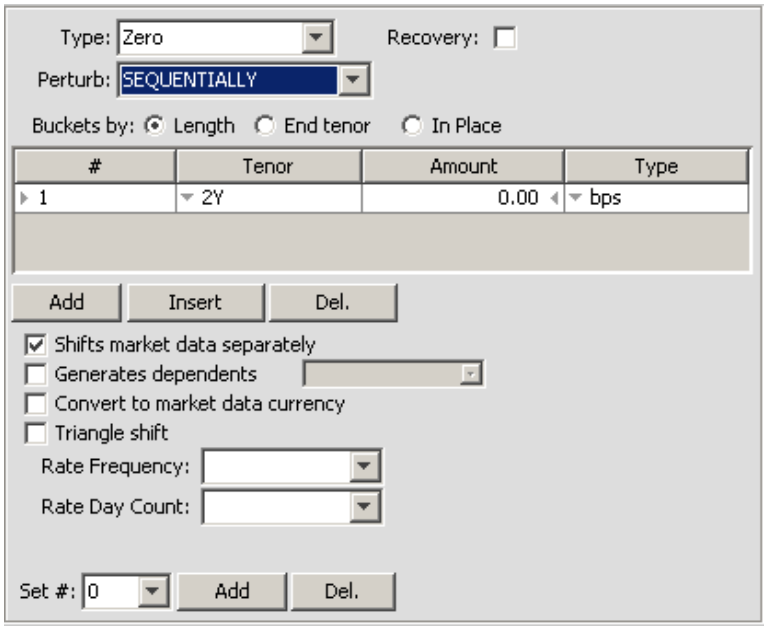
- Select a From and To tenors to perturb. The From tenor is added to ValDate for Start Date of perturbation, To tenor is added to Start Date for End Date of perturbation.
- Enter the perturbation amount, and choose bps, %, or %(rel) from the Type field.
- For the Adjustment perturbation type you can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



You can also specify a recovery rate perturbation. See Specifying a Recovery Rate Perturbation for details.

Zero and Forward — 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.

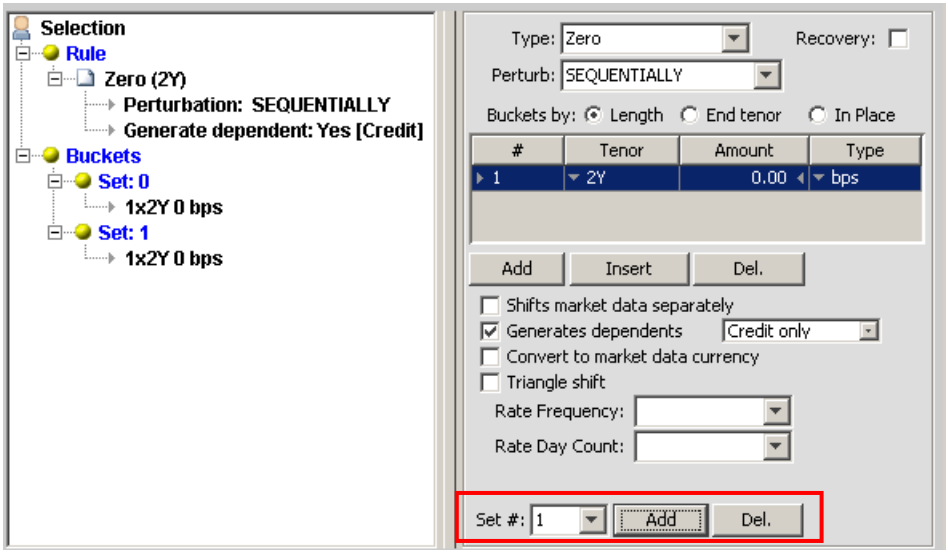


» Click **Add** or **Insert** under the bucket table to add another bucket.

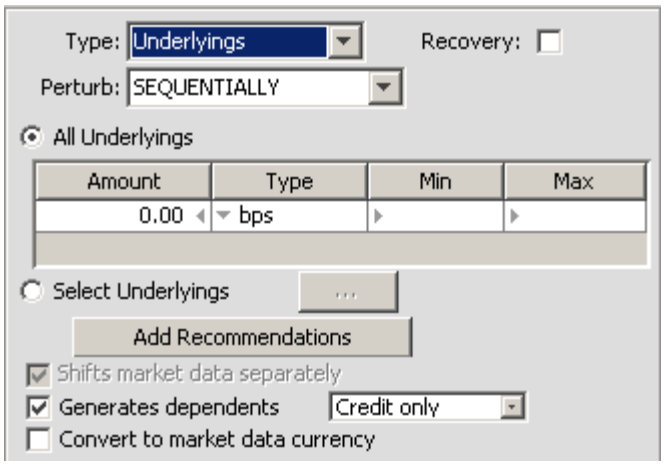
You can specify buckets in length, end tenor, or in place (it allows bumping the zero rate sequentially for each point on the curve).

» 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.

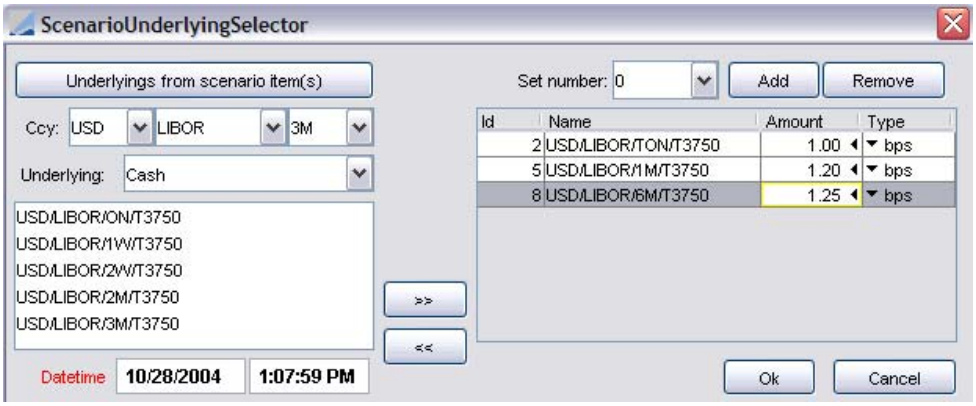
Here is an example for multiple sets of buckets.



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.

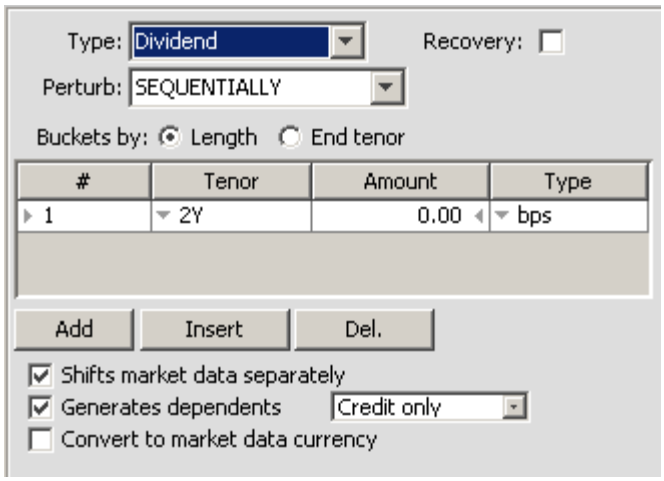


To select underlying instruments, you can click **Underlings from scenario item(s)** to load the underlying instruments of a given market data set. You can also select a reference index and a type of underlying to load the corresponding underlying instruments. Then select underlying instruments as applicable 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

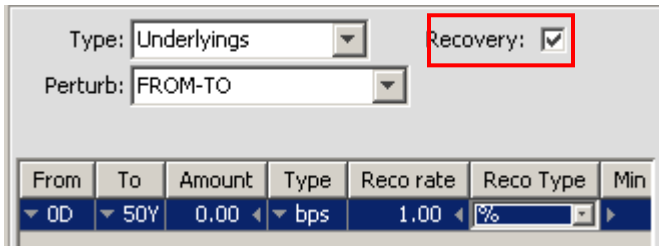
When you select SEQUENTIALLY, SIMULTANEOUSLY, or CUMULATIVE, the setup is the same as Dividend and Adjustment — FROM-TO Perturbation, except that you can specify multiple buckets.



» 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.



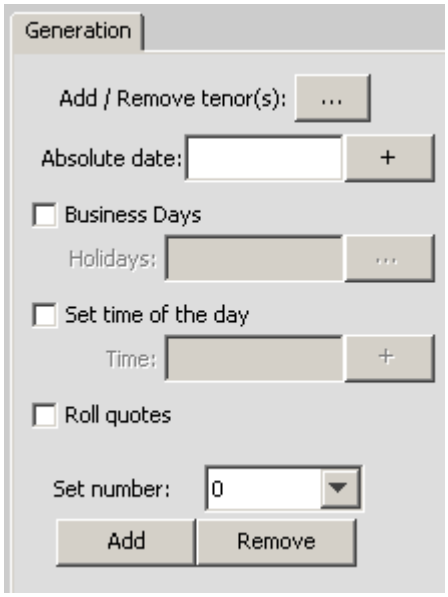
» Select the recovery type and enter the recovery rate. The recovery type can be specified as % for additive, or %(rel) for relative.

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).

1.2.5 Date Rules

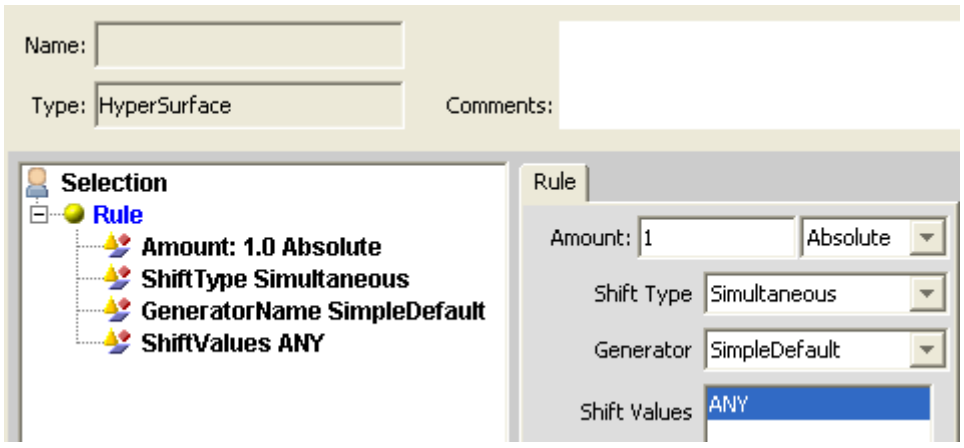
Date perturbation rules allow the simulation of a change in the valuation date.



- 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.

1.2.6 Hypersurface Rules

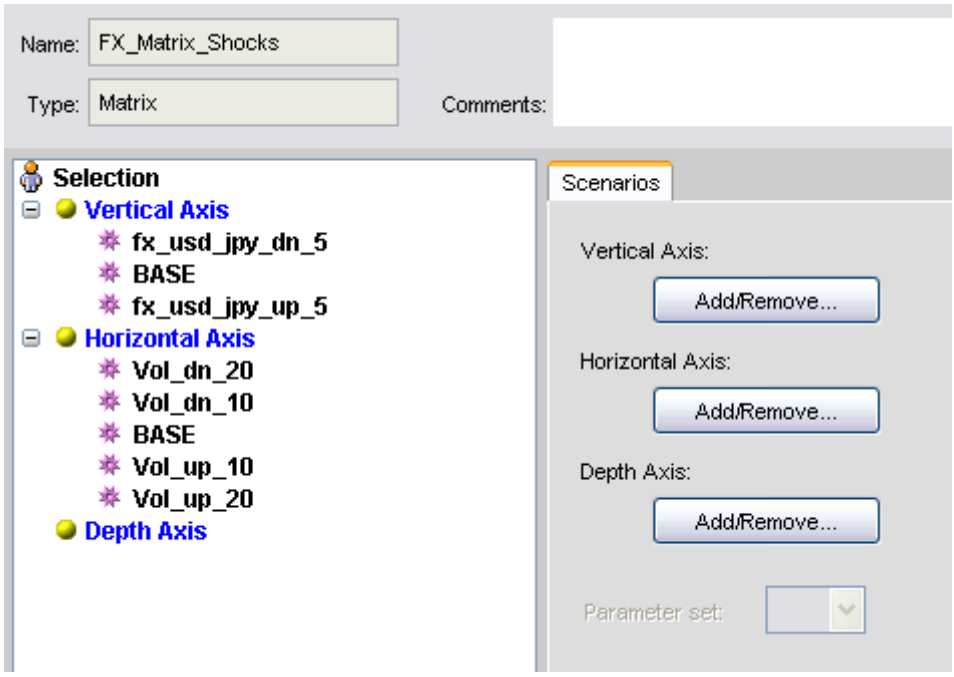
HyperSurface perturbation rules allow the perturbation of hypersurfaces.



- Enter a shift amount, and select from the adjacent field whether the amount is absolute or relative.
- Select the shift type, currently only Simultaneous is available.
- Select the hyper surface generator, and the values to be shifted.
- All values will be shifted for the same amount.

1.2.7 Matrix Rules

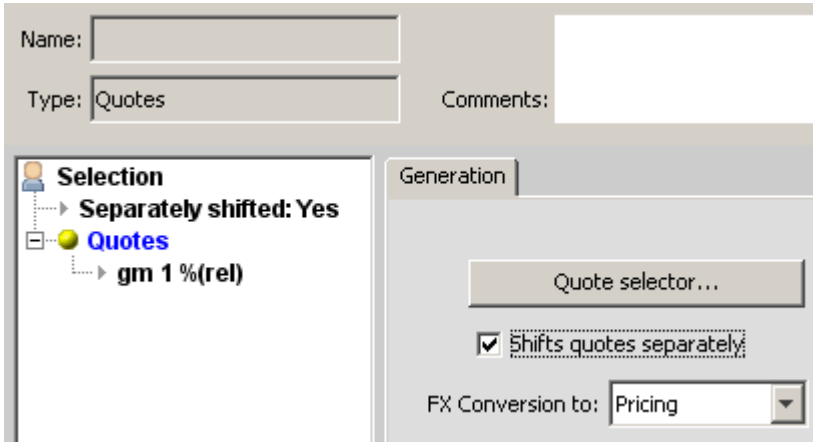
Matrix perturbation rules, similar to Composite, allow the specification of up to three basic rules, each along an axis, and a "matrix" of perturbations in three dimensional space is produced.



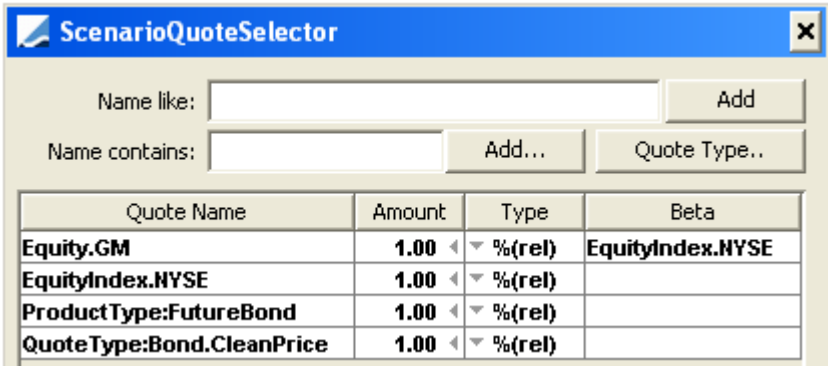
- » Click **Add/Remove** under the Vertical Axis label to select rules for the vertical axis.
- » Click **Add/Remove** under the Horizontal Axis label to select rules for the horizontal axis.
- » Click **Add/Remove** under the Depth Axis label to select rules for the depth axis.

1.2.8 Quotes Rules

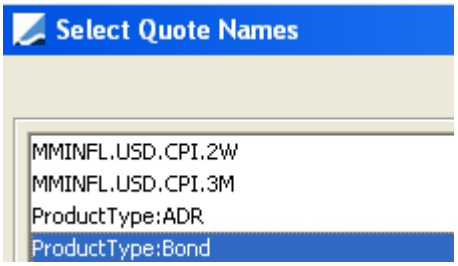
Quotes perturbation rules allow the perturbation of individual quote values, quotes per product type, as well as Beta values.



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



Click **Add** to add individual quotes as applicable, and enter the shift amount and type, or to add 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.

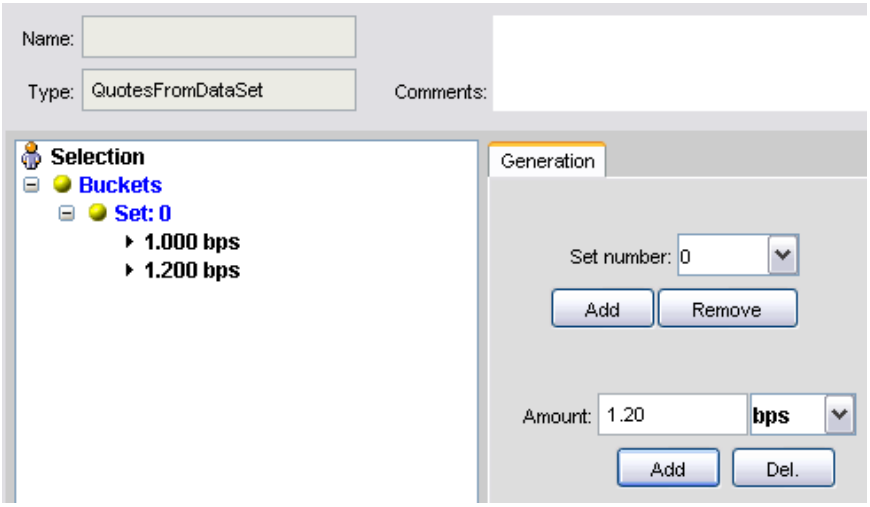
To shift Beta values for a given quote, right-click the Beta field and choose “Add Beta” from the popup menu. It allows selecting the corresponding asset for which you have defined Beta values.

» 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.

1.2.9 Quotes From Data Set Rules

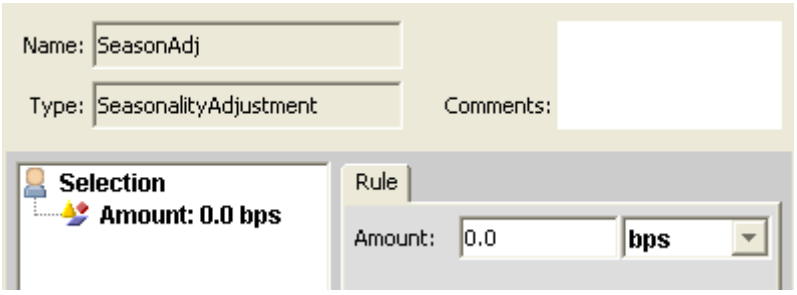
QuotesFromDataSet perturbation rules allow the perturbation of all quotes in a given market data set of Quotes usage.



- Enter a shift amount and select an amount type as applicable.
- You can click Add under the Amount field to add more shift amounts.
- You can also create multiple sets of shift amounts. To do this, click **Add** below the Set number field. Then for each set, you can modify the shift amounts as applicable. You can select the set number from the Set number field.

1.2.10 Seasonality Adjustment Rules

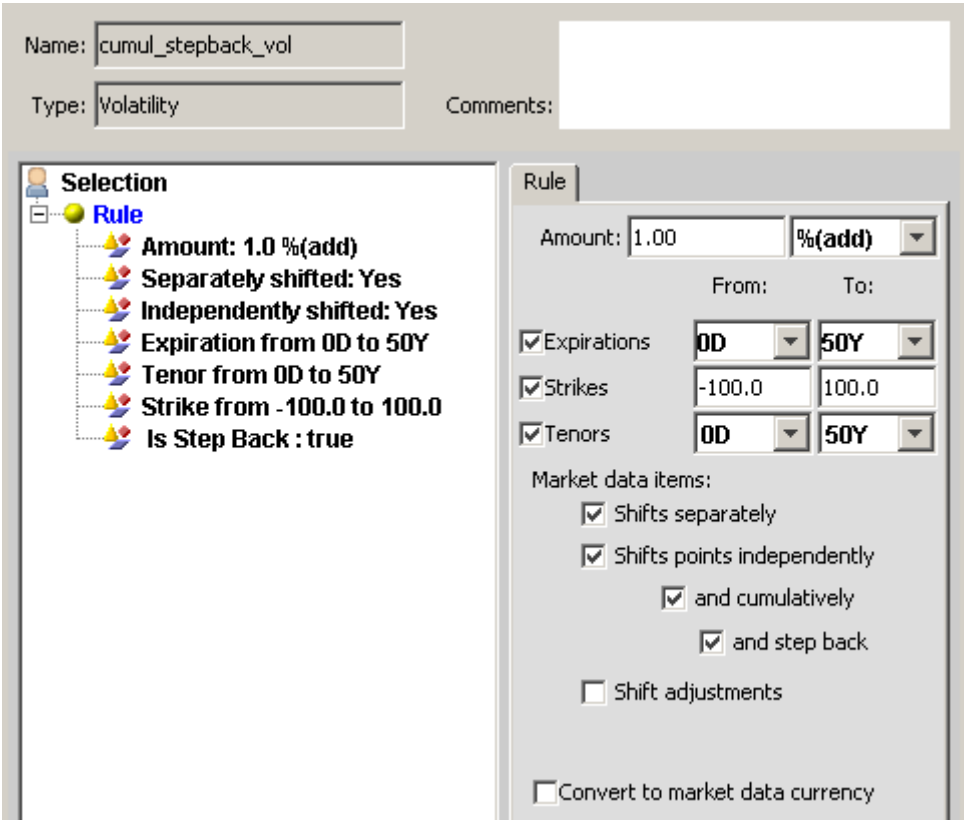
SeasonalityAdjustment perturbation rules allow the perturbation of seasonality curves.



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

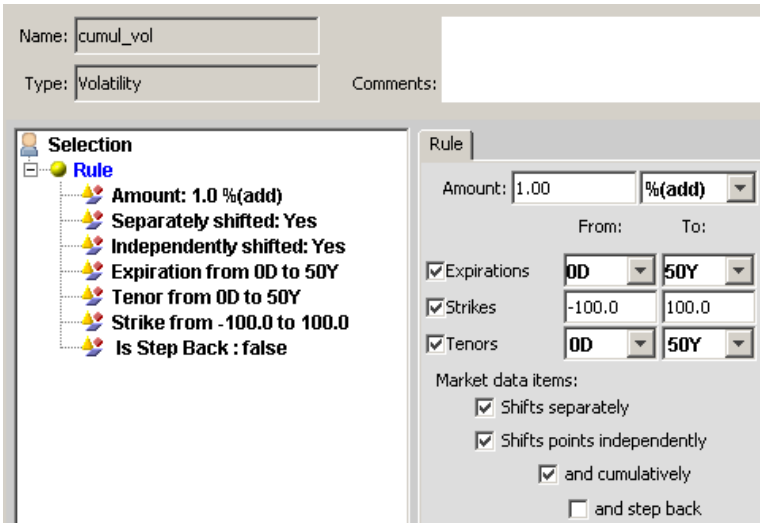
1.2.11 Volatility Rules

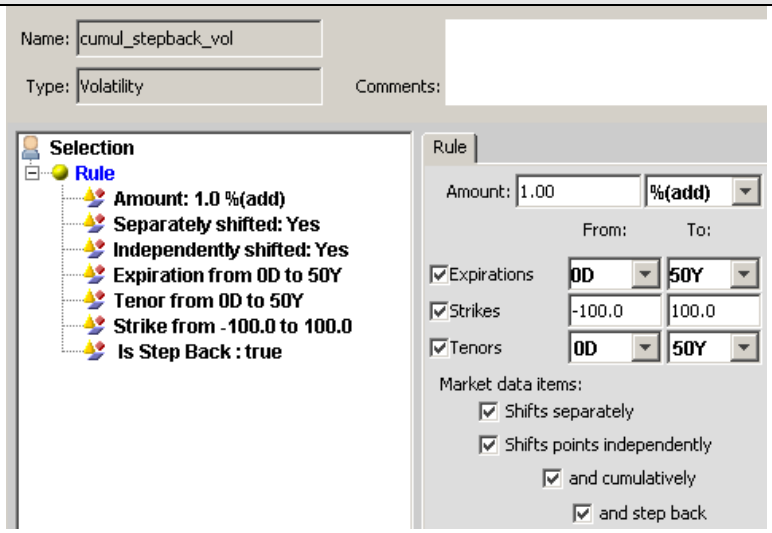
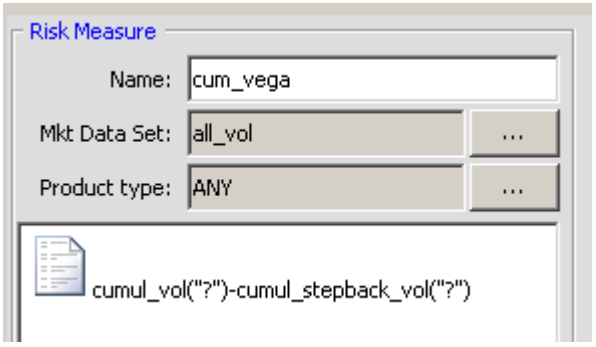
Volatility perturbation rules allow the perturbation of volatility surfaces along any of their axes.



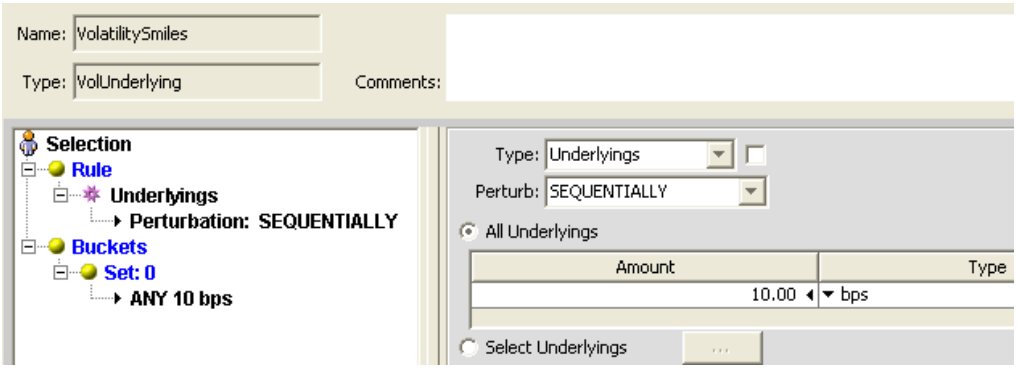
- Enter the shift amount in %.
- Select From and To expiration tenors as applicable.

- Enter From and To strike prices in % as applicable.
- Select From and To tenors as applicable.
- Check the boxes corresponding to the type of shift you wish to perform.

Checkbox Options	Description
Shifts separately	To shift each market data separately.
Shifts points independently	To shift each point independtly. ***Cumulative Shifts*** You can also check “and cumulatively” to perform cumulative shifts. 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 etc. Strikes, Expiries and Tenors are shifted from lowest to highest. ***Step Back*** You can also check “and 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 “and step back” checked

Checkbox Options	Description
	 The risk measure will be defined as: 
Shift adjustments	To shift associated adjustments. When you check "Shift adjustments", you will be prompted to select the type of adjustment to be shifted. 

1.2.12 Volatility Underlying Rules



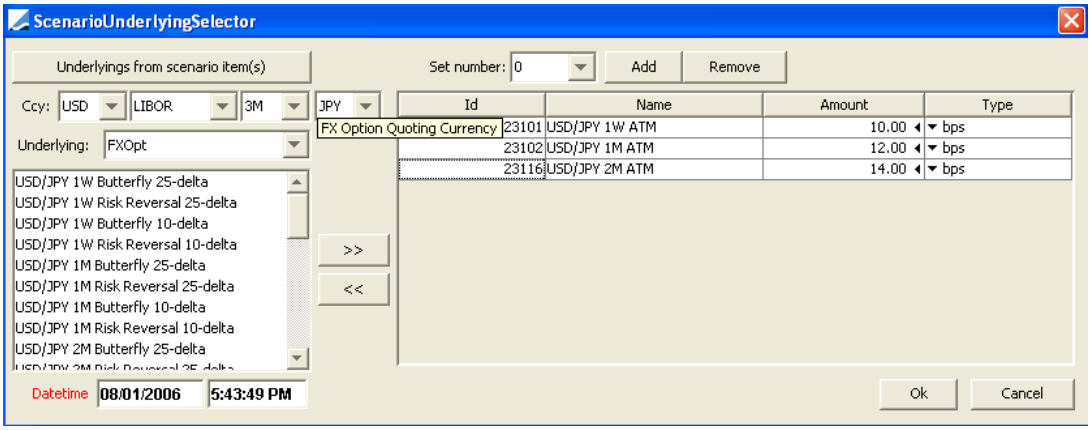
» Select the type of perturbation “Underlyings” from the Type field and select the perturbation from the Perturb field.

Select one of the following perturbation types:

- 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.

» Note that the checkbox next to the Type field is not currently enabled.

» 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.



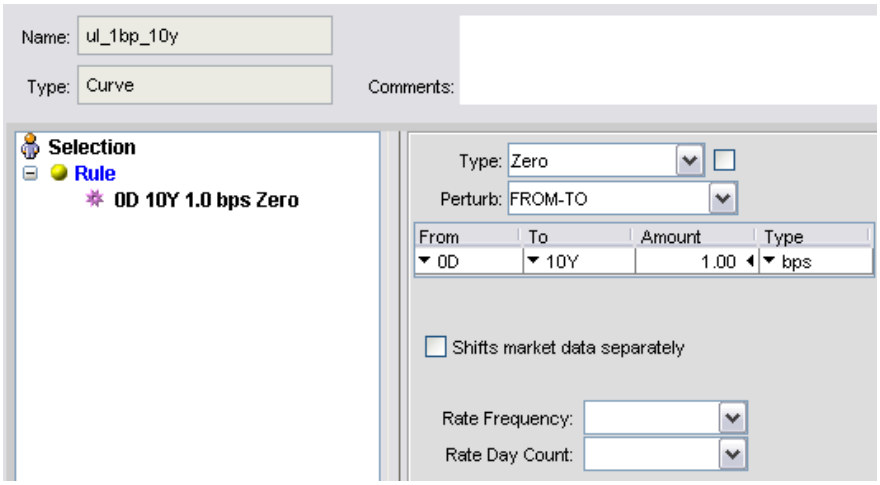
To select underlying instruments, you can click **Underlyings from scenario item(s)** to load the underlying instruments of a given market data set. You can also select a reference index and a type of underlying to load the corresponding underlying instruments. Then select underlying instruments as applicable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

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

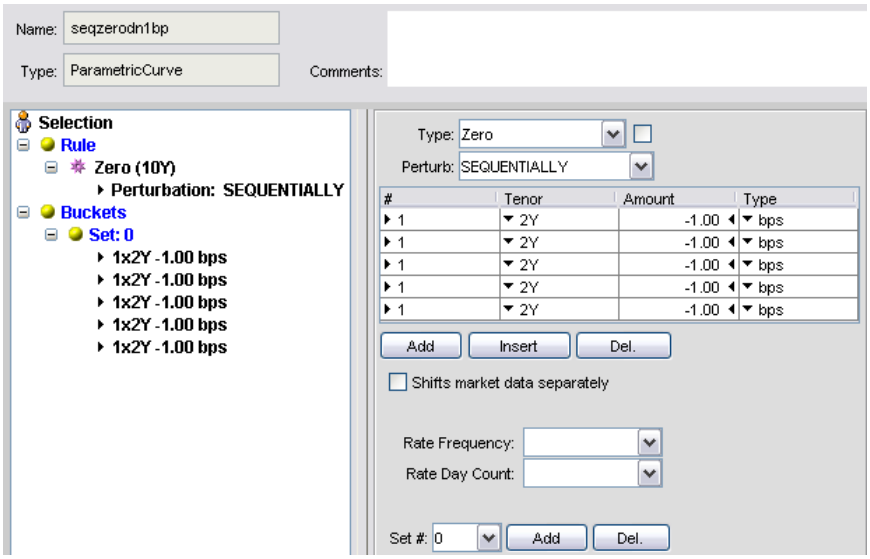
1.2.13 Sample Perturbation Rules

Curve Perturbation Rules

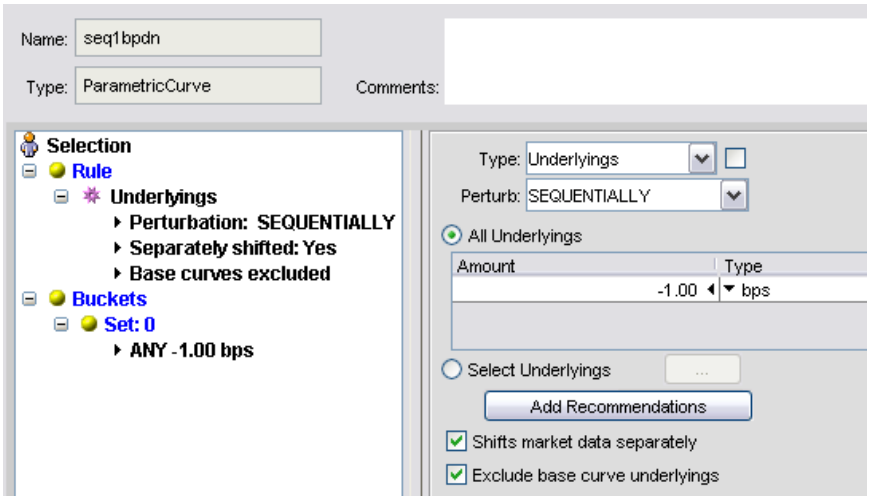
- Curve Perturbation Rule = Parallel shift all zero rates from valuation date to 10 years up by 1 bp.



- Curve Perturbation Rule = Sequentially shift the 2Y zero rates from valuation date to 10 years down by 1 bp.

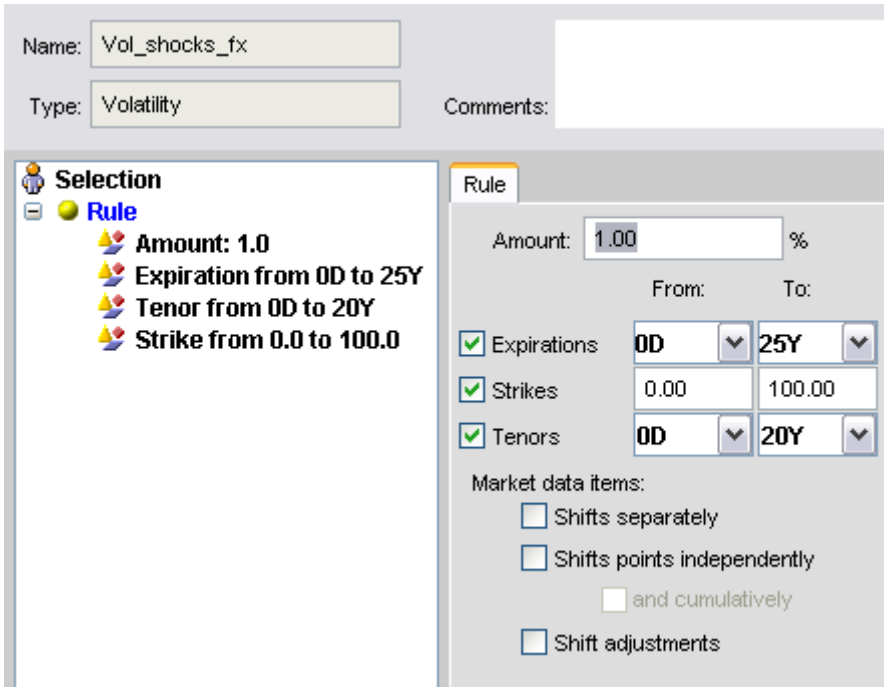


- Curve Perturbation Rule = Sequentially shift the yield/price of the all underlyings up by 1 bp.



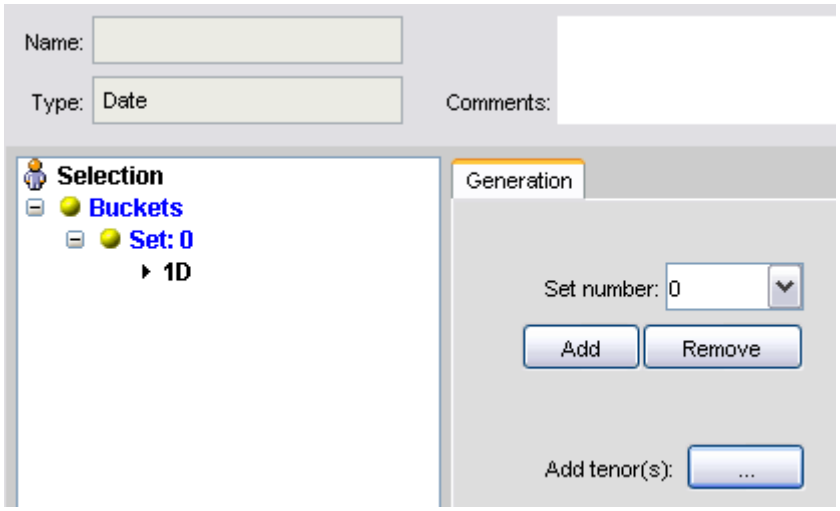
Volatility Perturbation Rule

Volatility Perturbation Rule = Sequentially shift the volatility at the expiration dates from valuation date to 25 years for each tenor up to 20 years, for each strike up to 100%.



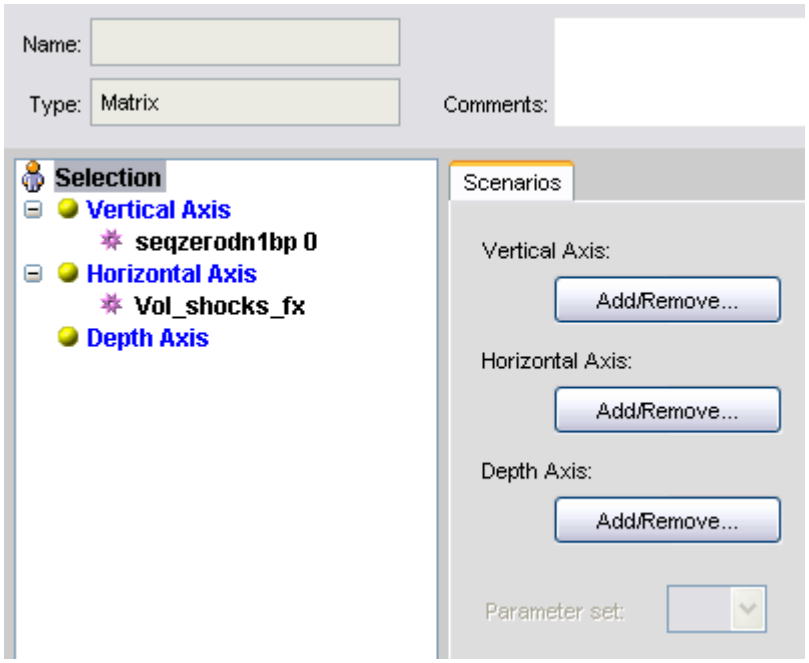
Date Perturbation Rule

Date Perturbation Rule = Shift the valuation date forward by one day.



Matrix Perturbation Rule

Matrix Perturbation Rule = Sequentially shift the 2Y zero rates from valuation date to 10 years down by 1 bp, and each volatility at the expiration dates from valuation date to 25 years for each tenor up to 20 years, for each strike up to 100%.

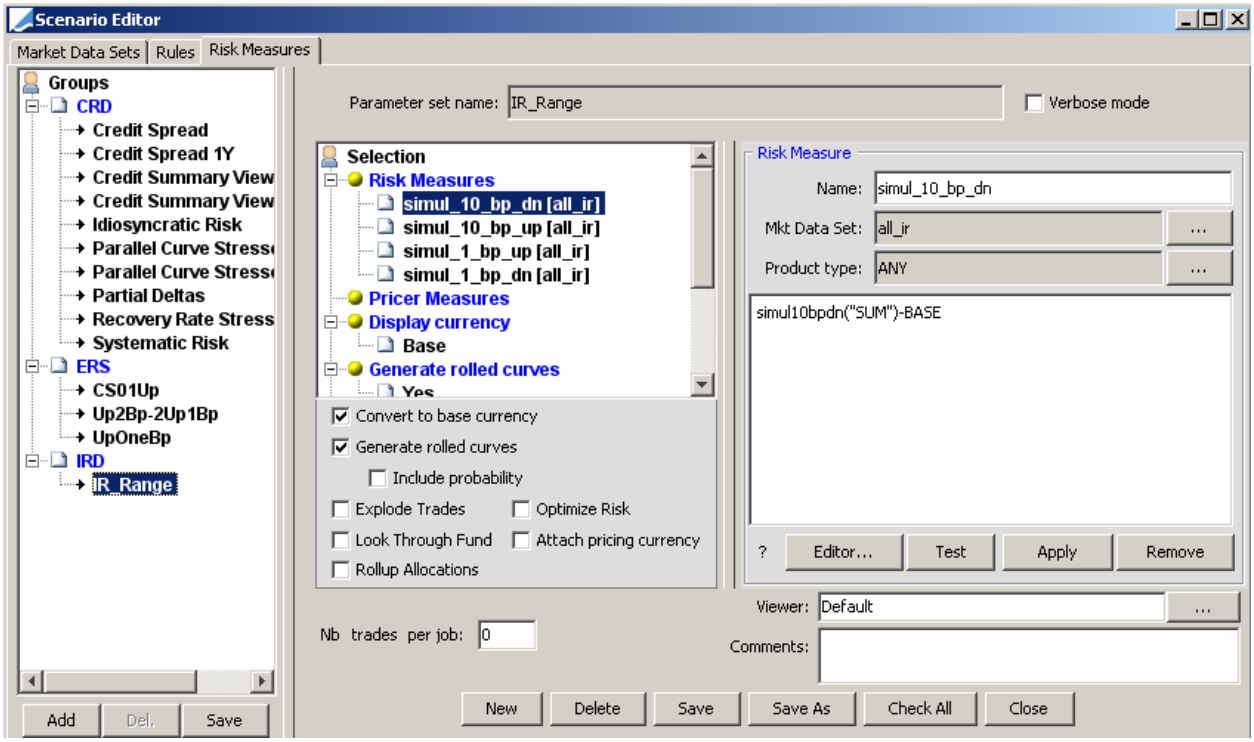


1.3 Defining Risk Measures

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

Multiple sets of risk measures can be collected in a group.

The Risk Measures panel will appear as shown below.

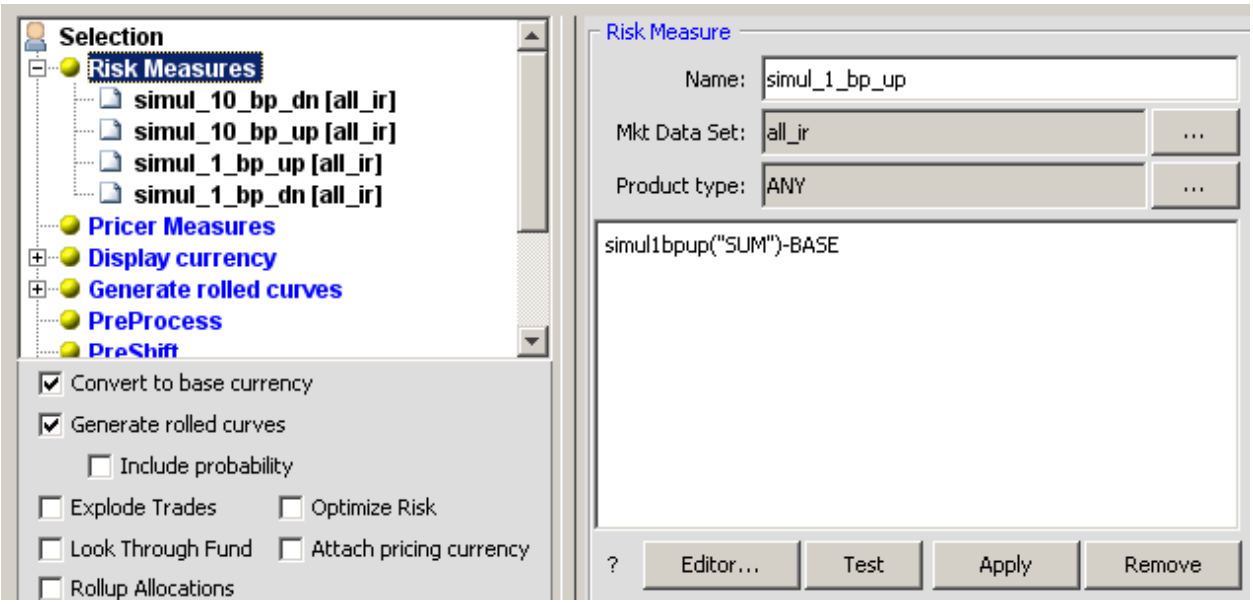


- Click **Add** under Groups to create a new group. You will be prompted to enter a group name. Then click **Save** under Groups to save the group.
- Click **New** to create a new set of risk measures. This will clear the Risk Measures panel.

  You can add risk measures to the risk measure set using Selection > Risk Measure, or using Selection > Pricer Measures, as described below.
- Click **Save** when the risk measure set is defined. You will be prompted to enter a name. If a group is selected when you create a new risk measure set, the new risk measure set will be added to that group. Otherwise, it will be created on its own.

1.3.1 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 ScenarioCalculator dialog that allows you to specify the calculation formula. See ScenarioCalculator 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.

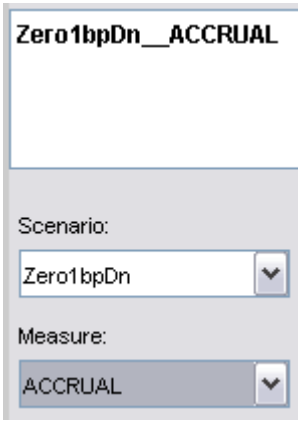
ScenarioCalculator

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

» Select BASE (pricer measure without perturbation) or a perturbation rule from the Scenario field. Then click **Insert Scenario**.

By default, BASE or the perturbation rule are 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.

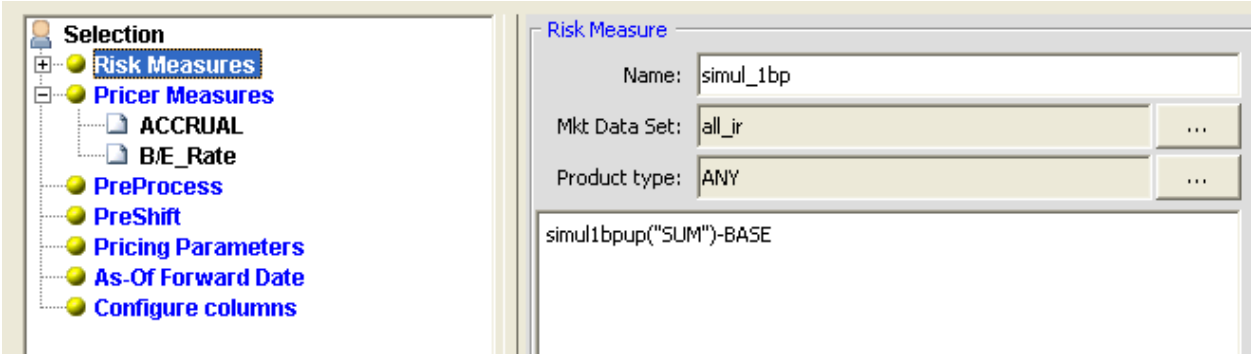
Whether a perturbation rule uses Sequential or Simultaneous generation also has implications for the risk analysis output. For the sequential case there will be *n* columns per risk measure instead of one, or *n* columns per perturbation scenario (per pricer measure) instead of one.

» You can then add operators and constant values to the calculation formula using the keypad, and more perturbation rules as applicable.

» Click **OK** when you are done.

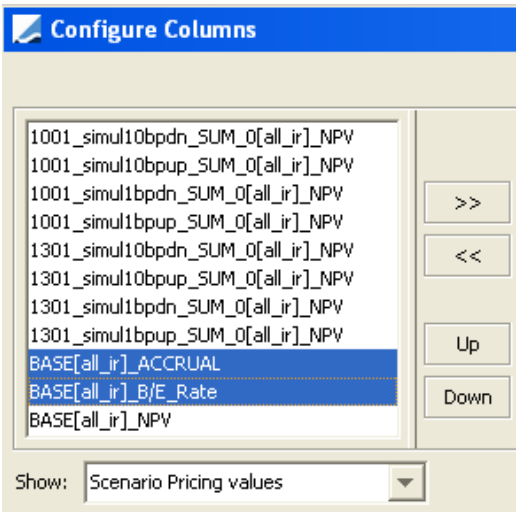
1.3.2 Selection > Pricer Measures

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.



» Click **Add Pricing Measures** to add out-of-the-box pricer measures to the scenario output. You will be prompted to select pricer measures.

These pricer measures are not added to the output by default – You need to add them using Utilities > Configure Columns.

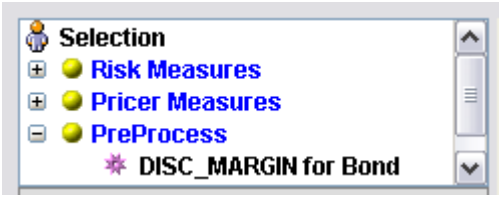


» Make sure to select “Scenario Pricing Values” from the Show field to view only output columns. In this example, ACCRUAL and B/E_Rate for the market data set “all_ir” appear as “BASE[all_ir]_ACCRUAL” and “BASE[all_ir]_B/E_Rate”.

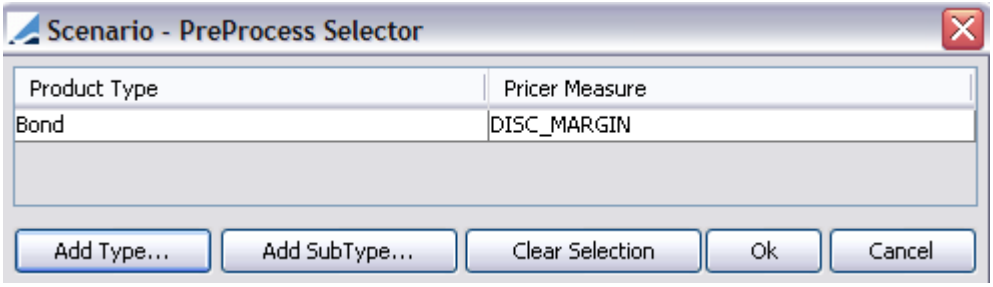
BASE[all_ir]_ACCRUAL	BASE[all_ir]_B/E_Rate
(7,138.89)	0.02
(9,666.67)	0.02

1.3.3 Selection > PreProcess

Allows you to specify a preprocessing logic.



» Right-click the PreProcess label and choose PreProcess from the popup menu. You can define the preprocessing by product type or by product subtype.



Click **Add Type** to define the preprocess by product type. You will be prompted to select a product type and a driver such as Z_SPREAD, DISC_MARGIN, INSTRUMENT_SPREAD.

Click **Add SubType** to define the preprocess by product subtype. You will be prompted to select a product subtype and a driver.

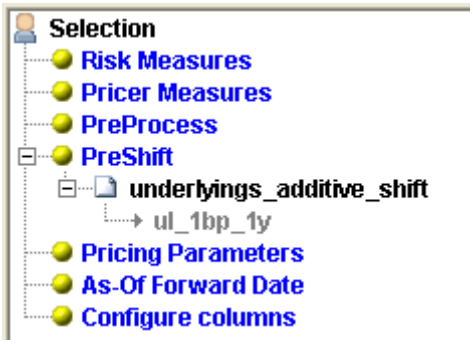
The driver values will be calculated and used as quotes to price the products.

Note that this logic applies to futures only if FUTURE_FROM_QUOTE = true, and to bonds only if BOND_FROM_QUOTE = true.

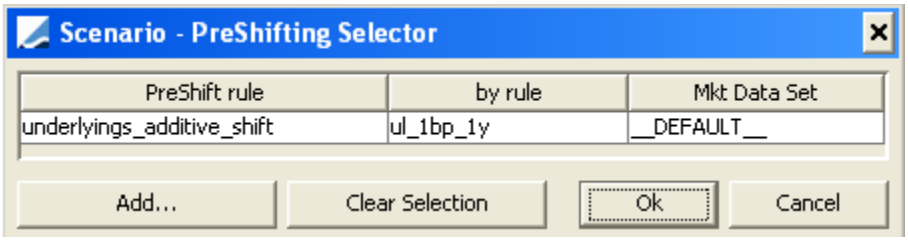
Then click **OK**.

1.3.4 Selection > PreShift

You can specify pre-shift rules in the case where you have to apply multiple shifts to the market data (Gamma calculation for example).



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

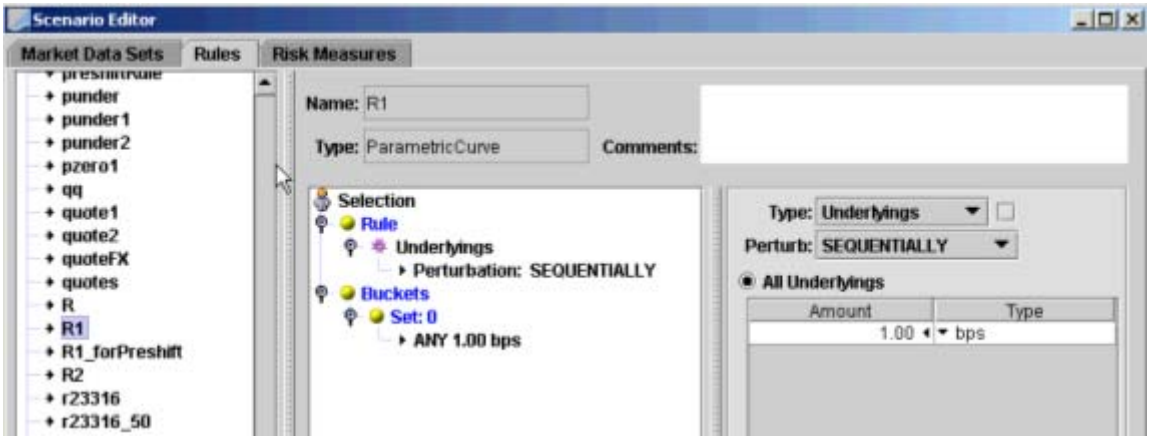


Click **Add**. You will be prompted to select a rule and its preshift rule. You can also select a different market data set for the preshift rule, or __DEFAULT__ to use the same market data set as the rule.

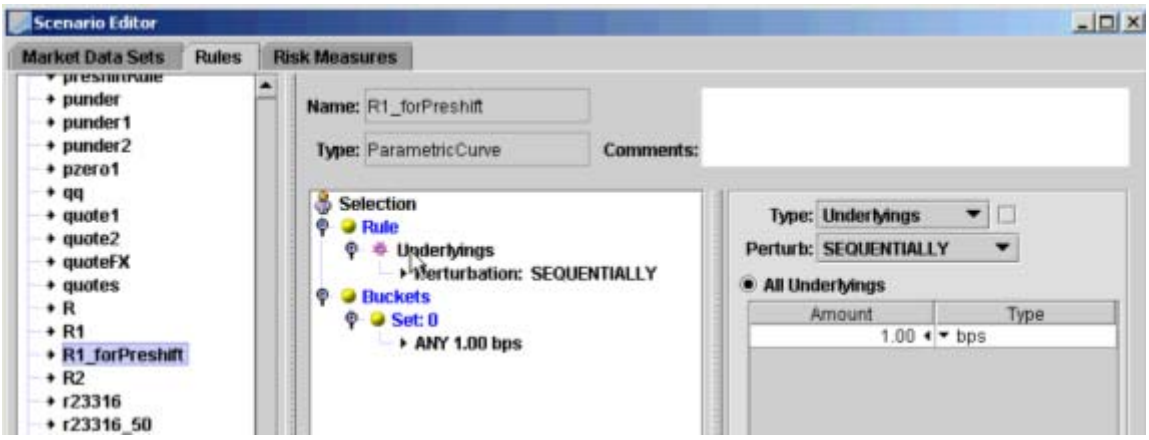
Then click **OK**.

Example

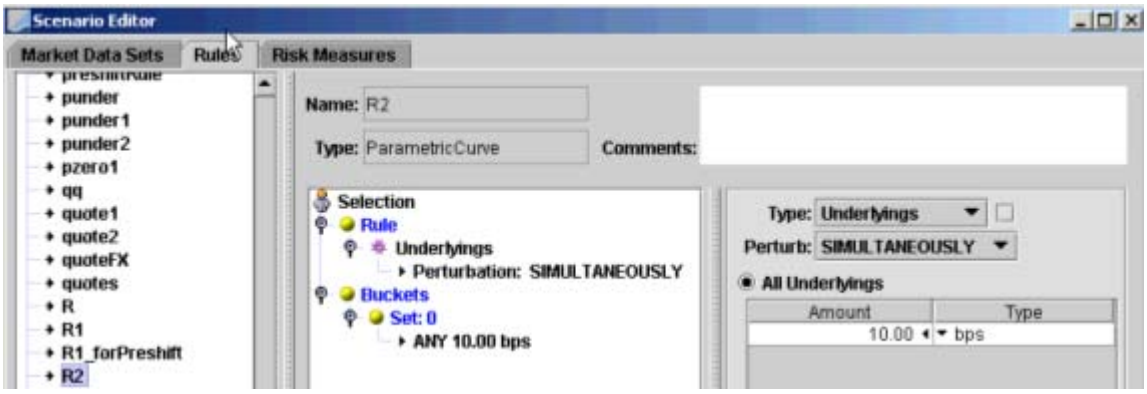
Create a rule for Sequential 1 bp shift of the underlyings (say R1).



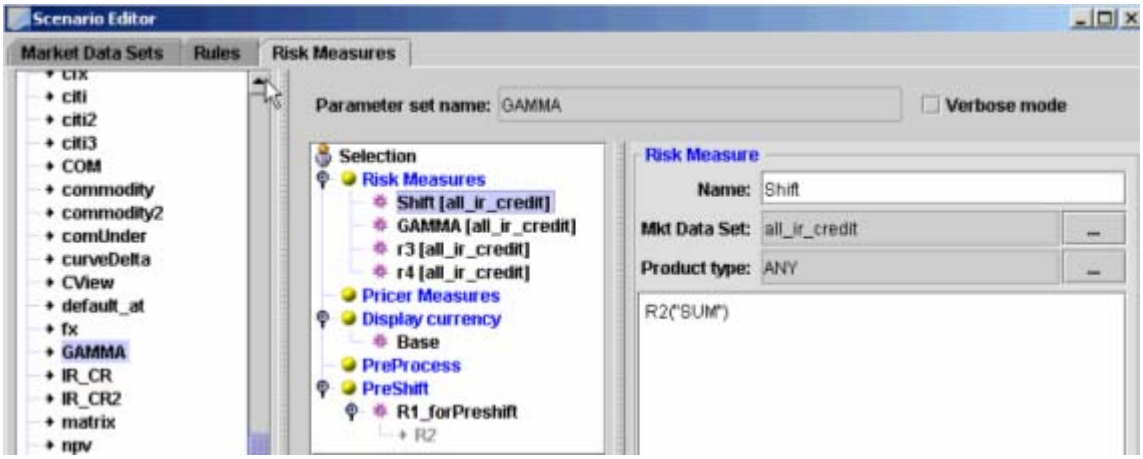
Create a rule for Sequential 1 bp shift of the underlyings (same as R1) but that will be used to pre-shift underlyings in the risk measure formula (say R1_forPreshift)



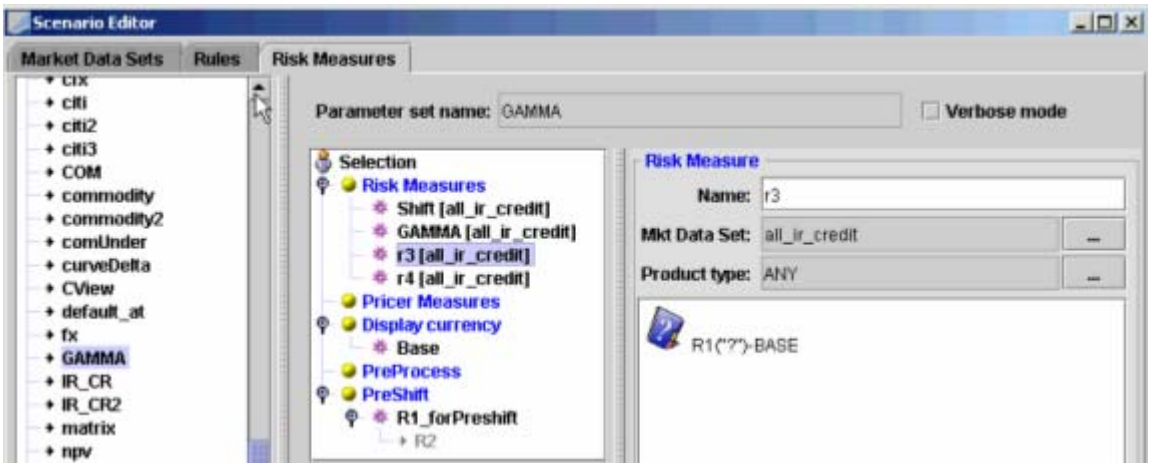
Create a rule for simultaneous-shift of 10 bps of all underlyings (say R2)



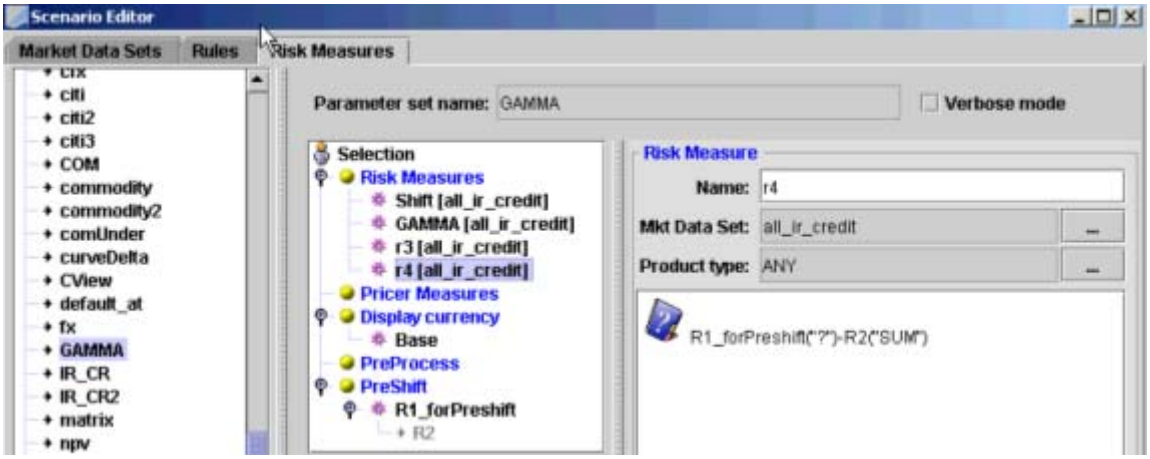
Create a risk measure to display parallel shift amount (Shift = R2)



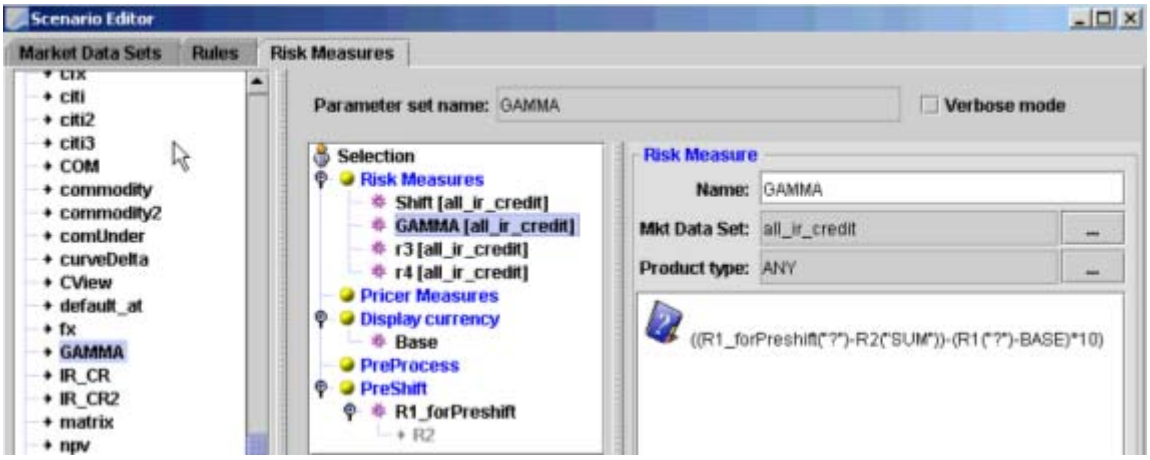
Create a risk measure to display parallel shift by 1bp (r3 = R1-BASE)



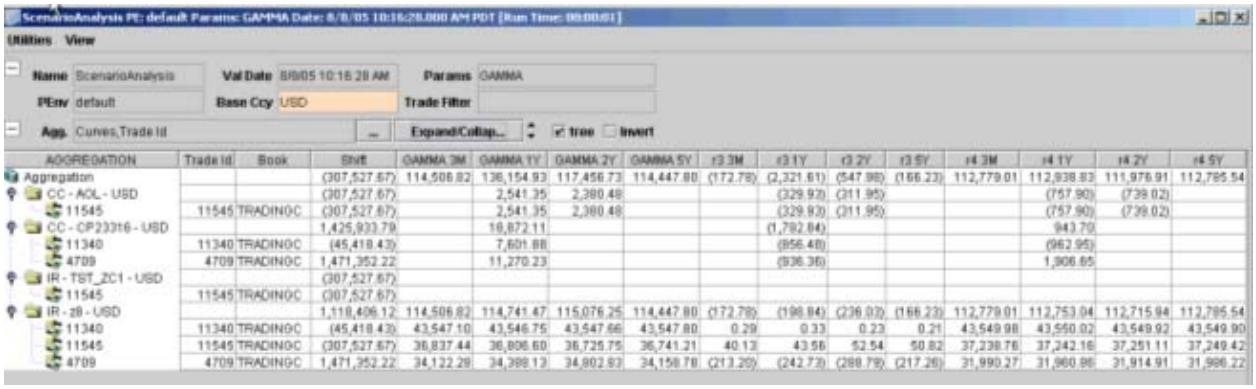
Create a risk measure to display parallel shift by 1bp pre-shifted by 10 bps (r4 = R1_preshifted_by_R2 – R2)



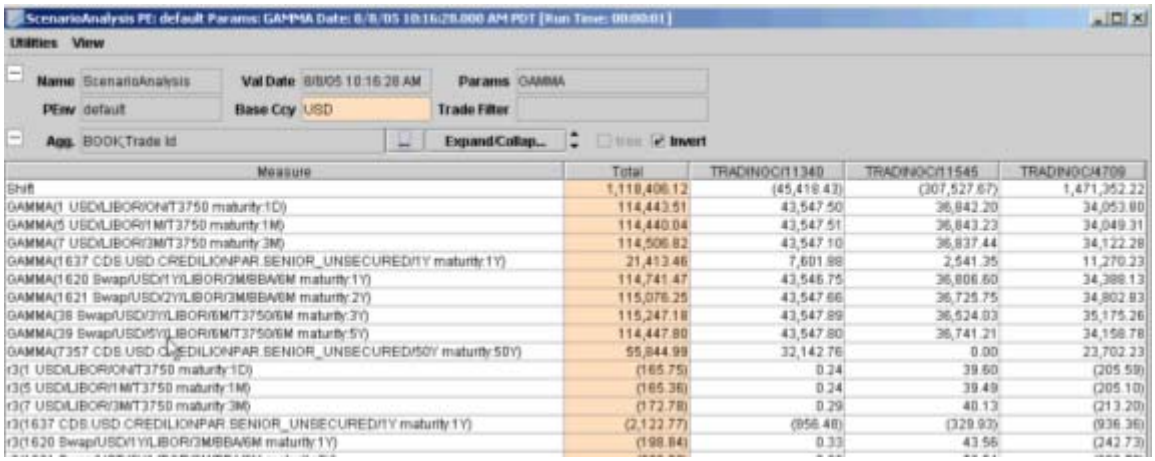
Create a risk measure for GAMMA = ((R1_forPreshift – R2) - (R1 - BASE) * 10) [i.e. (r4 – r3)*10]



Sample output using ScenarioCurveViewer that shows TradeId, Book, Parallel-Shift-amount, Gamma, r3 and r4 values, Curve names (aggregation).

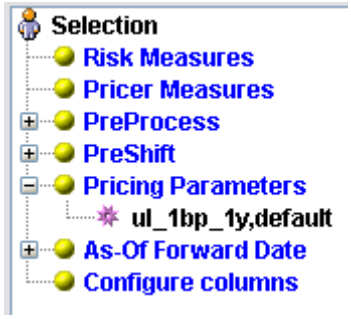


Sample output using the default scenario viewer:

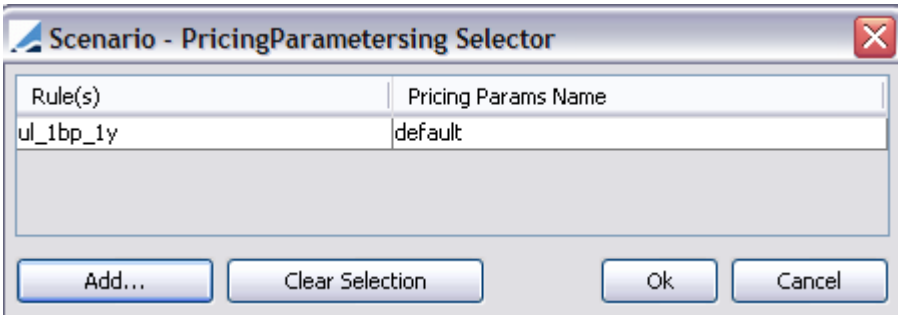


1.3.5 Selection > Pricing Parameters

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



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

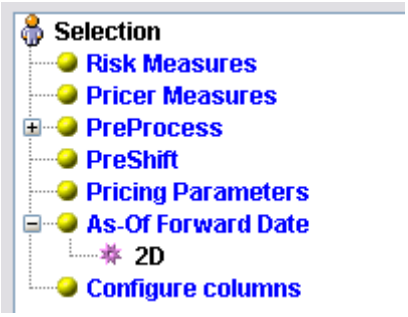


Click **Add**. You will be prompted to select a rule and a pricing parameter set.

Then click **OK**.

1.3.6 Selection > As-Of Forward Date

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

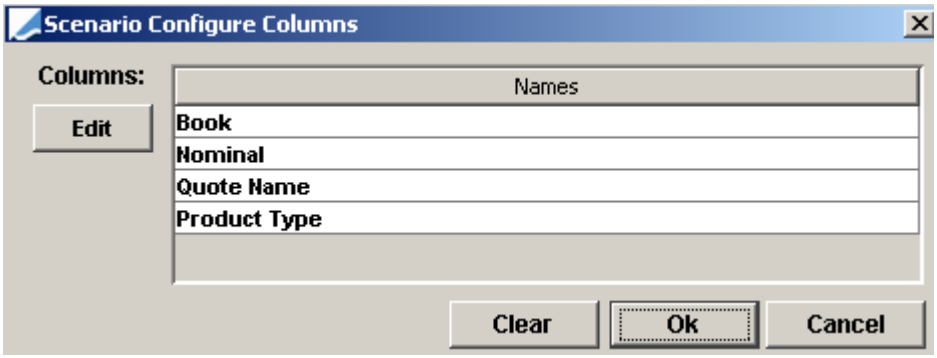


» Right-click the As-Of Forward Date label and choose Set Tenors. You will be prompted to select a tenor.

1.3.7 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.



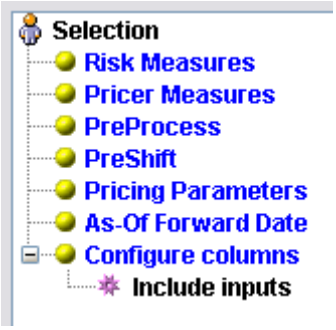
Click **Edit** under Columns to add columns. You will be prompted to select columns. Note that the columns here only correspond to trade-related columns. When the environment property SCENARIO_ALL_COLUMN_NAMES is False, no column will be available for selection here. You will only be able to see SCENARIO_MEASURES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

1.3.8 Selection > Configure Columns > Include/Exclude Inputs

You can display information about how the perturbation rules have been applied to each pricer measure.



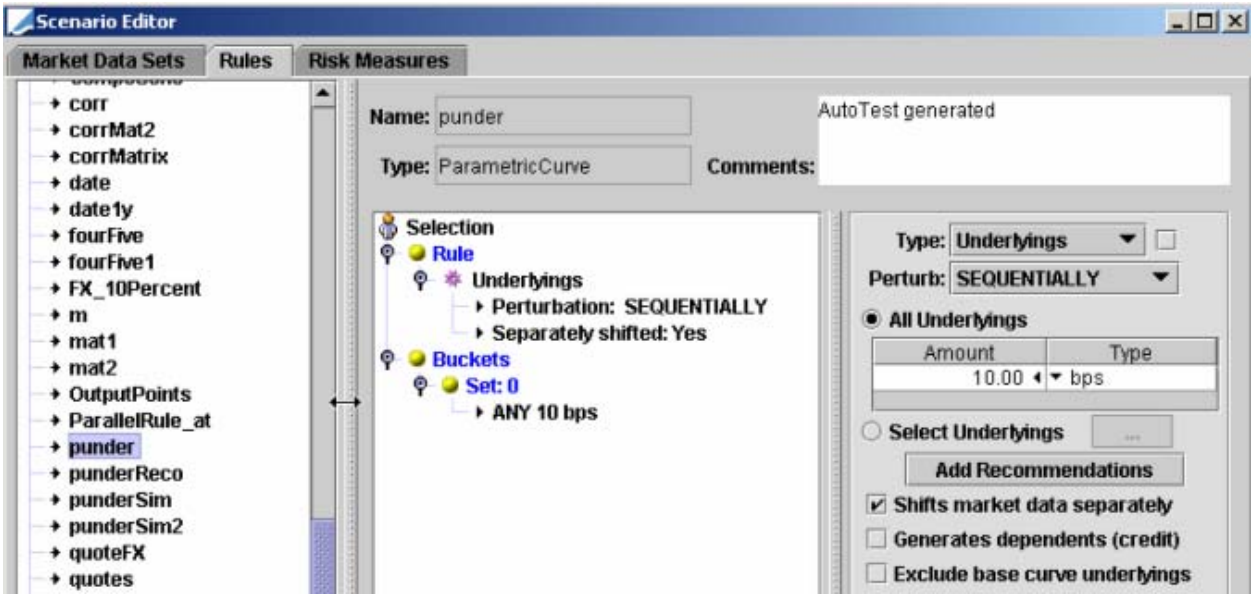
» Right-click Configure Columns label and choose Include/Exclude Inputs.

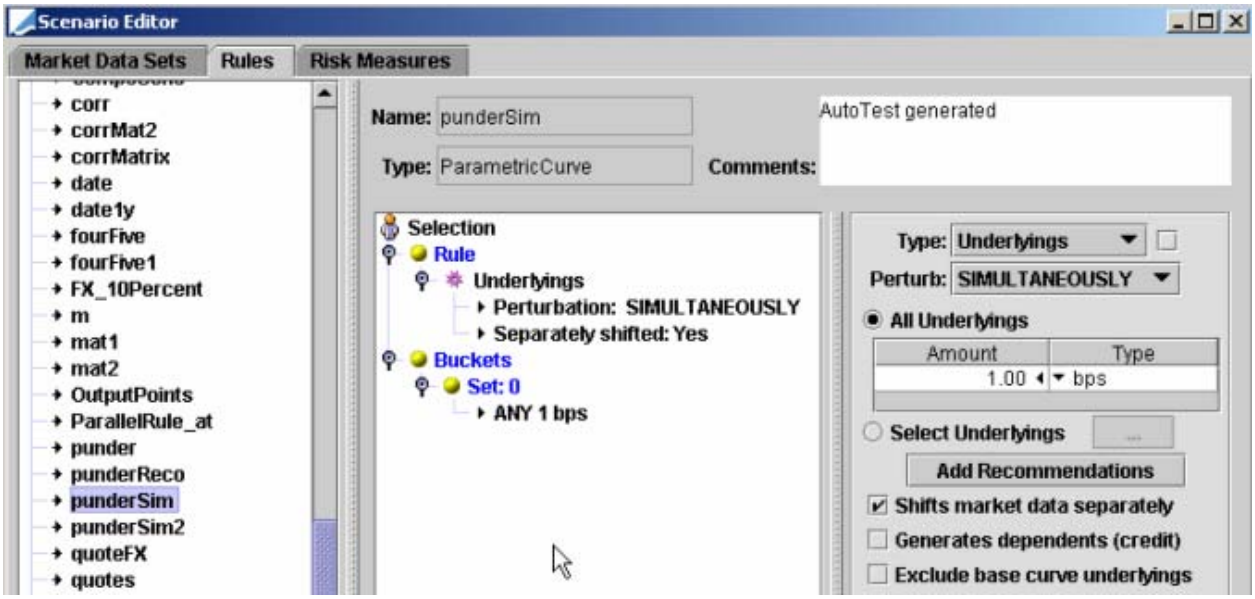
Note that in order to display this type of information, you need to use one of the following viewers: `com.calypso.apps.risk.ScenarioInputParametersViewer` or `calypsox.apps.risk.ScenarioInputViewer`. These two viewers are identical, the one available under calypsox is provided for extension. They should be registered in the ScenarioViewerClassNames domain.

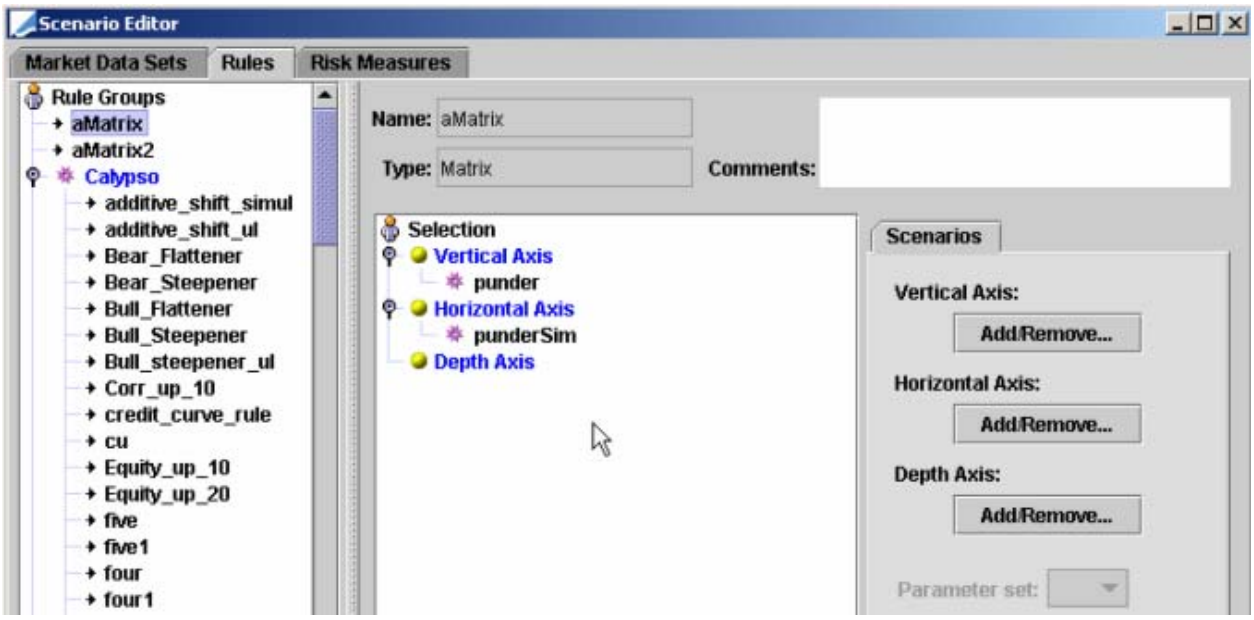
Example 1

Rules Definition

rm = aMatrix("?")-BASE where aMatrix = matrix of (punder, punderSim)


Scenario Editor
Market Data Sets
Rules
Risk Measures
corr
corrMat2
corrMatrix
date
date1y
fourFive
fourFive1
FX_10Percent
m
mat1
mat2
OutputPoints
ParallelRule_at
punder
punderReco
punderSim
punderSim2
quoteFX
quotes
Name: punder
Type: ParametricCurve
Comments:
AutoTest generated
Selection
Rule
Underlyings
Perturbation: SEQUENTIALLY
Separately shifted: Yes
Buckets
Set: 0
ANY 10 bps
Type: Underlyings
Perturb: SEQUENTIALLY
All Underlyings
Amount
Type
10.00
bps
Select Underlyings
Add Recommendations
Shifts market data separately
Generates dependents (credit)
Exclude base curve underlyings

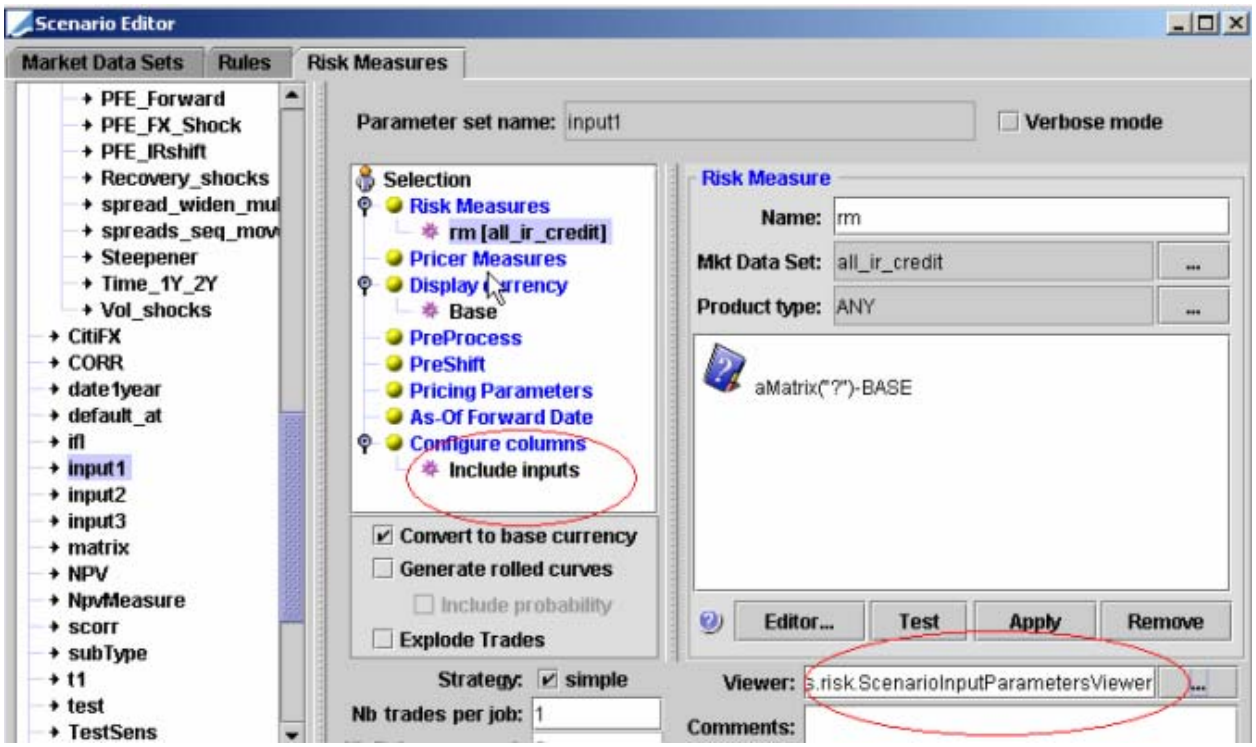

Scenario Editor
Market Data Sets
Rules
Risk Measures
corr
corrMat2
corrMatrix
date
date1y
fourFive
fourFive1
FX_10Percent
m
mat1
mat2
OutputPoints
ParallelRule_at
punder
punderReco
punderSim
punderSim2
quoteFX
quotes
Name: punderSim
Type: ParametricCurve
Comments:
AutoTest generated
Selection
Rule
Underlyings
Perturbation: SIMULTANEOUSLY
Separately shifted: Yes
Buckets
Set: 0
ANY 1 bps
Type: Underlyings
Perturb: SIMULTANEOUSLY
All Underlyings
Amount
Type
1.00
bps
Select Underlyings
Add Recommendations
Shifts market data separately
Generates dependents (credit)
Exclude base curve underlyings



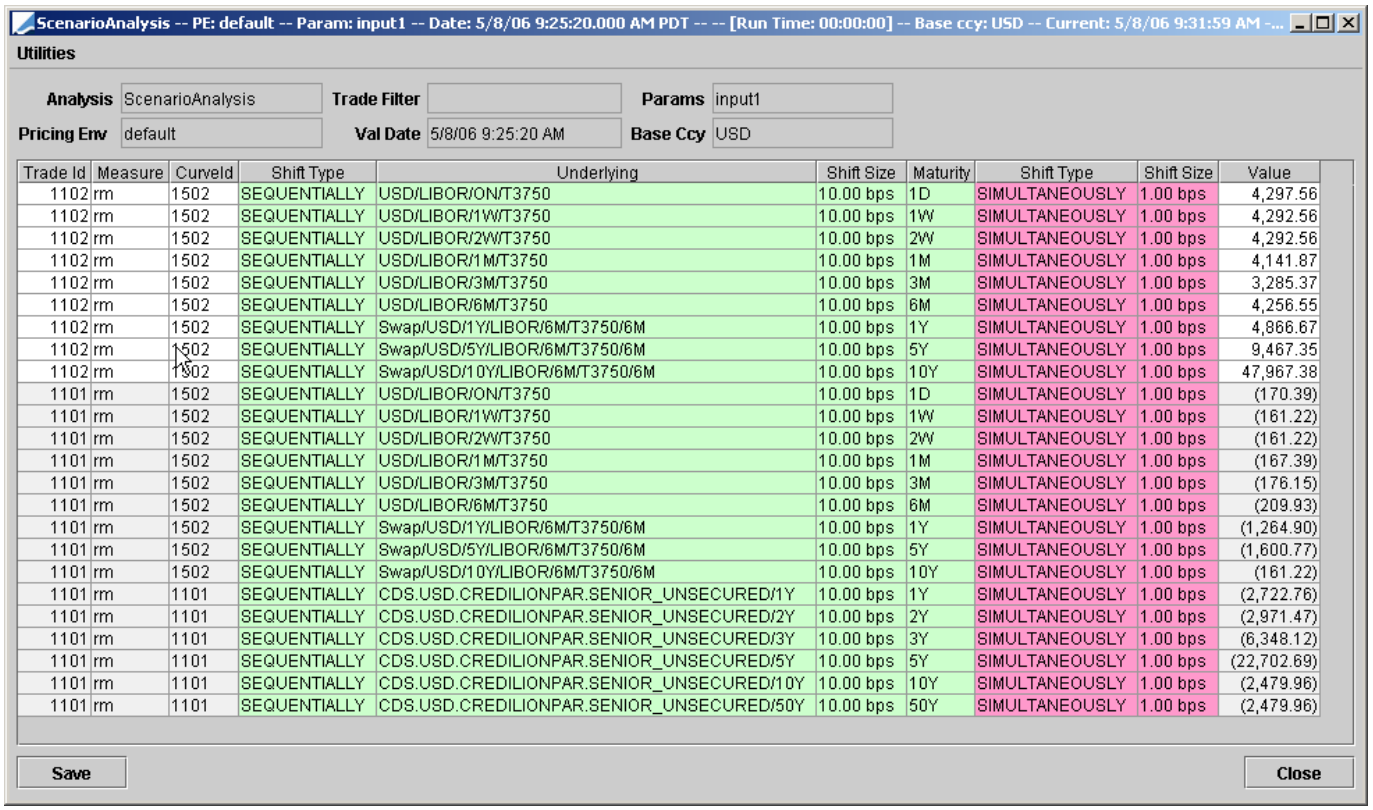
Risk Measure Definition

Right-click on the “Configure columns” label and choose “Include/Exclude Inputs”.

Set the viewer to `apps.risk.ScenarioInputParametersViewer`.

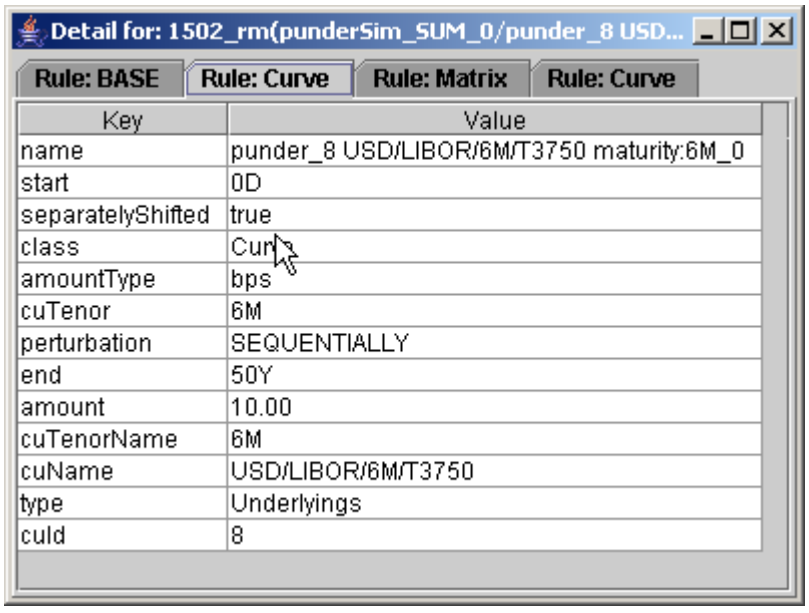


The scenario analysis will look like t his:



Trade Id	Measure	CurveId	Shift Type	Underlying	Shift Size	Maturity	Shift Type	Shift Size	Value
1102	rm	1502	SEQUENTIALLY	USD/LIBOR/ON/T3750	10.00 bps	1D	SIMULTANEOUSLY	1.00 bps	4,297.56
1102	rm	1502	SEQUENTIALLY	USD/LIBOR/1W/T3750	10.00 bps	1W	SIMULTANEOUSLY	1.00 bps	4,292.56
1102	rm	1502	SEQUENTIALLY	USD/LIBOR/2W/T3750	10.00 bps	2W	SIMULTANEOUSLY	1.00 bps	4,292.56
1102	rm	1502	SEQUENTIALLY	USD/LIBOR/1M/T3750	10.00 bps	1M	SIMULTANEOUSLY	1.00 bps	4,141.87
1102	rm	1502	SEQUENTIALLY	USD/LIBOR/3M/T3750	10.00 bps	3M	SIMULTANEOUSLY	1.00 bps	3,285.37
1102	rm	1502	SEQUENTIALLY	USD/LIBOR/6M/T3750	10.00 bps	6M	SIMULTANEOUSLY	1.00 bps	4,256.55
1102	rm	1502	SEQUENTIALLY	Swap/USD/1Y/LIBOR/6M/T3750/6M	10.00 bps	1Y	SIMULTANEOUSLY	1.00 bps	4,866.67
1102	rm	1502	SEQUENTIALLY	Swap/USD/5Y/LIBOR/6M/T3750/6M	10.00 bps	5Y	SIMULTANEOUSLY	1.00 bps	9,467.35
1102	rm	1502	SEQUENTIALLY	Swap/USD/10Y/LIBOR/6M/T3750/6M	10.00 bps	10Y	SIMULTANEOUSLY	1.00 bps	47,967.38
1101	rm	1502	SEQUENTIALLY	USD/LIBOR/ON/T3750	10.00 bps	1D	SIMULTANEOUSLY	1.00 bps	(170.39)
1101	rm	1502	SEQUENTIALLY	USD/LIBOR/1W/T3750	10.00 bps	1W	SIMULTANEOUSLY	1.00 bps	(161.22)
1101	rm	1502	SEQUENTIALLY	USD/LIBOR/2W/T3750	10.00 bps	2W	SIMULTANEOUSLY	1.00 bps	(161.22)
1101	rm	1502	SEQUENTIALLY	USD/LIBOR/1M/T3750	10.00 bps	1M	SIMULTANEOUSLY	1.00 bps	(167.39)
1101	rm	1502	SEQUENTIALLY	USD/LIBOR/3M/T3750	10.00 bps	3M	SIMULTANEOUSLY	1.00 bps	(176.15)
1101	rm	1502	SEQUENTIALLY	USD/LIBOR/6M/T3750	10.00 bps	6M	SIMULTANEOUSLY	1.00 bps	(209.93)
1101	rm	1502	SEQUENTIALLY	Swap/USD/1Y/LIBOR/6M/T3750/6M	10.00 bps	1Y	SIMULTANEOUSLY	1.00 bps	(1,264.90)
1101	rm	1502	SEQUENTIALLY	Swap/USD/5Y/LIBOR/6M/T3750/6M	10.00 bps	5Y	SIMULTANEOUSLY	1.00 bps	(1,600.77)
1101	rm	1502	SEQUENTIALLY	Swap/USD/10Y/LIBOR/6M/T3750/6M	10.00 bps	10Y	SIMULTANEOUSLY	1.00 bps	(161.22)
1101	rm	1101	SEQUENTIALLY	CDS.USD.CREDILIONPAR.SENIOR_UNSECURED/1Y	10.00 bps	1Y	SIMULTANEOUSLY	1.00 bps	(2,722.76)
1101	rm	1101	SEQUENTIALLY	CDS.USD.CREDILIONPAR.SENIOR_UNSECURED/2Y	10.00 bps	2Y	SIMULTANEOUSLY	1.00 bps	(2,971.47)
1101	rm	1101	SEQUENTIALLY	CDS.USD.CREDILIONPAR.SENIOR_UNSECURED/3Y	10.00 bps	3Y	SIMULTANEOUSLY	1.00 bps	(6,348.12)
1101	rm	1101	SEQUENTIALLY	CDS.USD.CREDILIONPAR.SENIOR_UNSECURED/5Y	10.00 bps	5Y	SIMULTANEOUSLY	1.00 bps	(22,702.69)
1101	rm	1101	SEQUENTIALLY	CDS.USD.CREDILIONPAR.SENIOR_UNSECURED/10Y	10.00 bps	10Y	SIMULTANEOUSLY	1.00 bps	(2,479.96)
1101	rm	1101	SEQUENTIALLY	CDS.USD.CREDILIONPAR.SENIOR_UNSECURED/50Y	10.00 bps	50Y	SIMULTANEOUSLY	1.00 bps	(2,479.96)

By double-clicking on any rows, the detail of how the risk measure has been computed will be exposed.

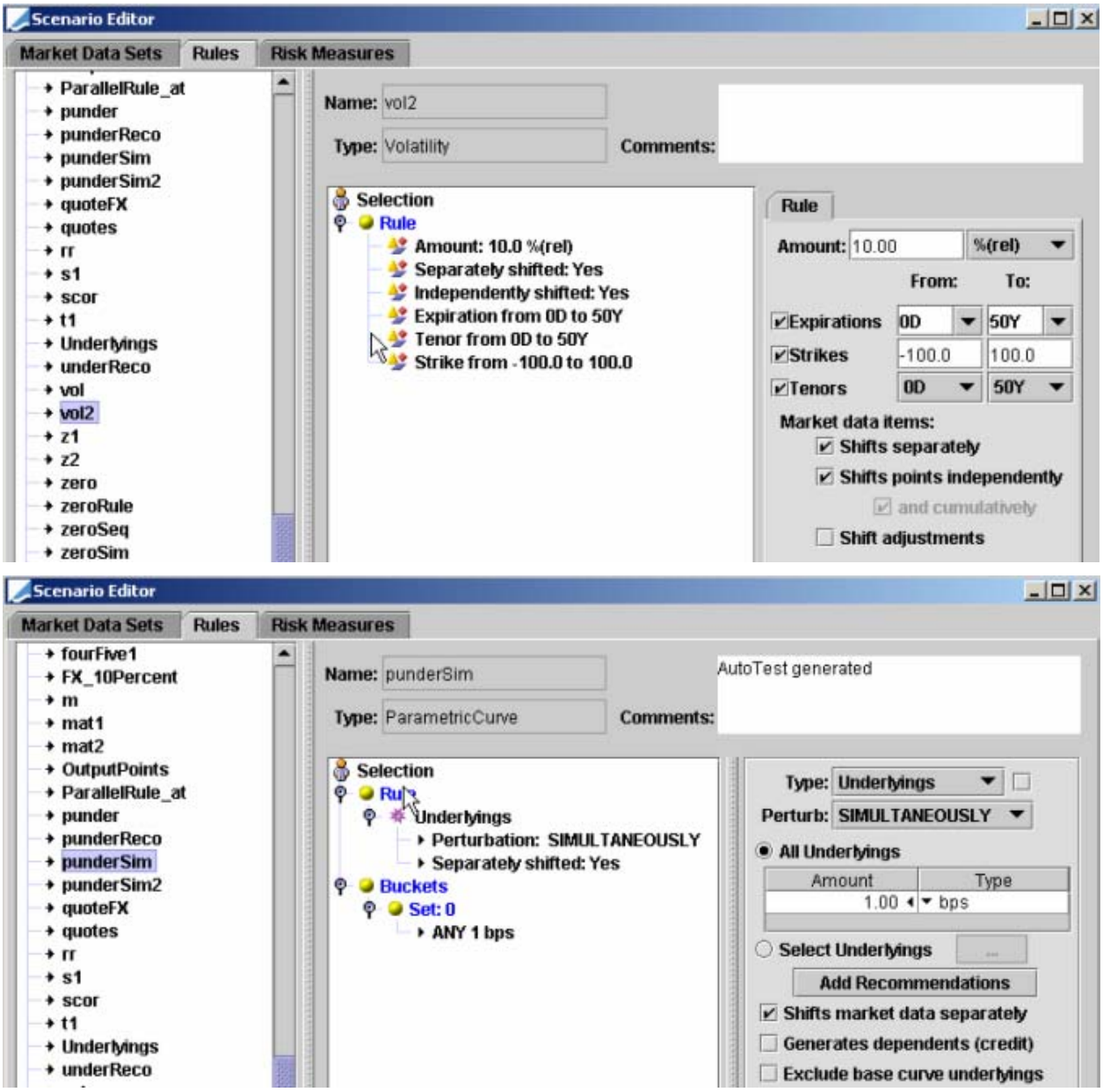


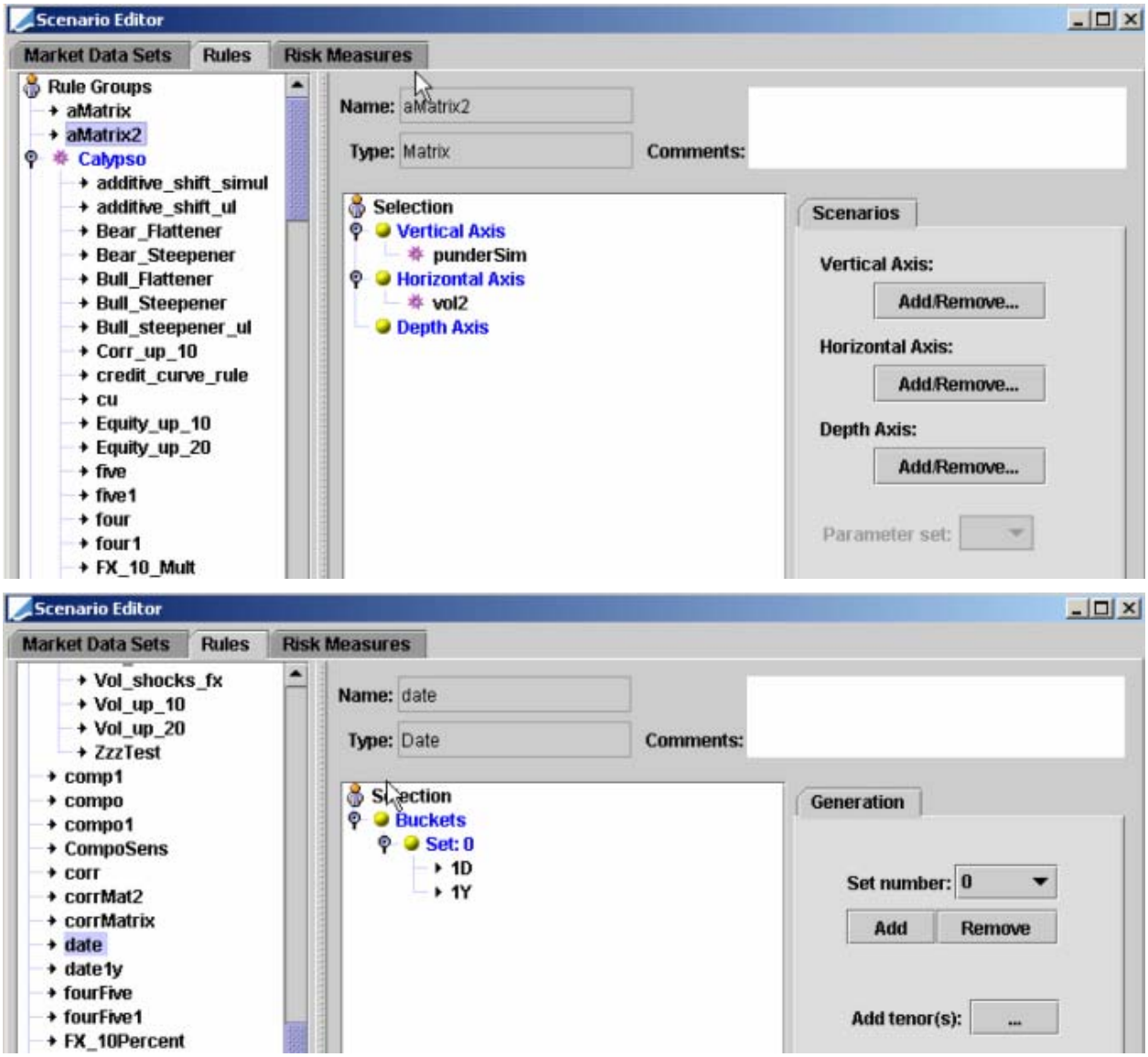
Key	Value
name	punder_8 USD/LIBOR/6M/T3750 maturity:6M_0
start	0D
separatelyShifted	true
class	Cur
amountType	bps
cuTenor	6M
perturbation	SEQUENTIALLY
end	50Y
amount	10.00
cuTenorName	6M
cuName	USD/LIBOR/6M/T3750
type	Underlyings
cuId	8

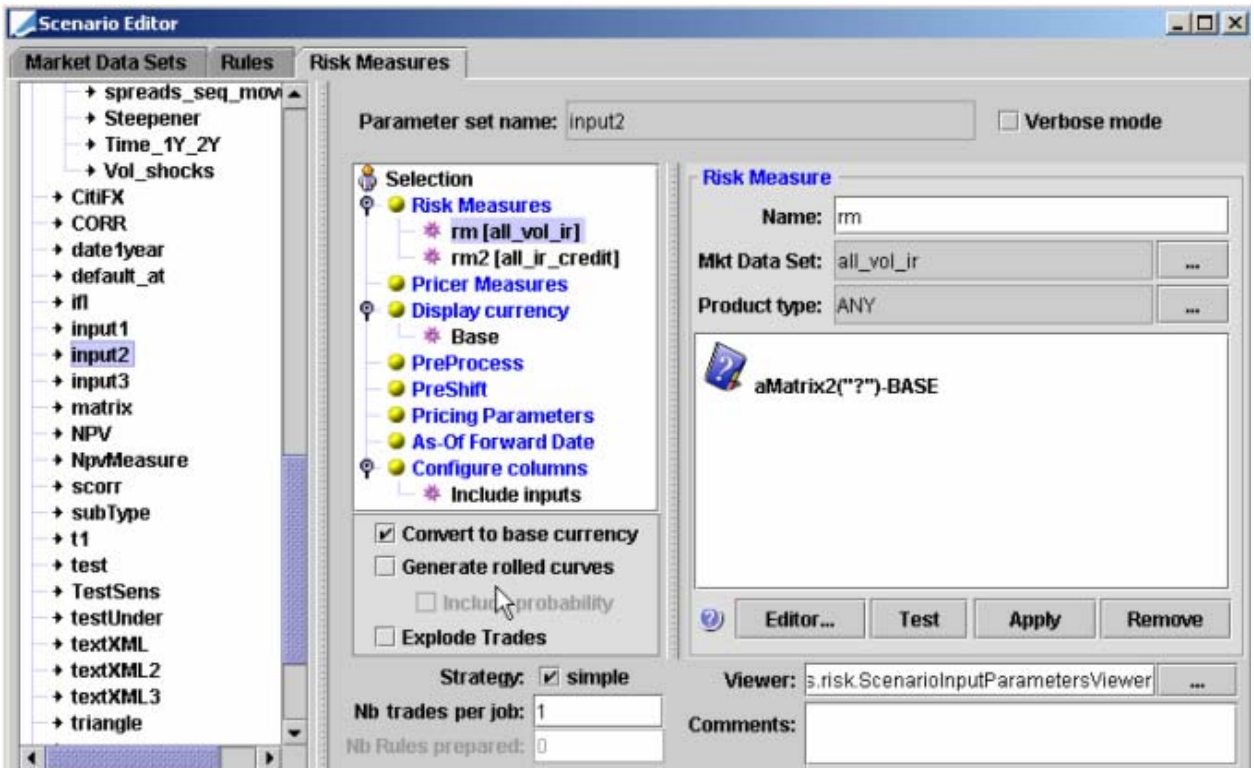
Example 2

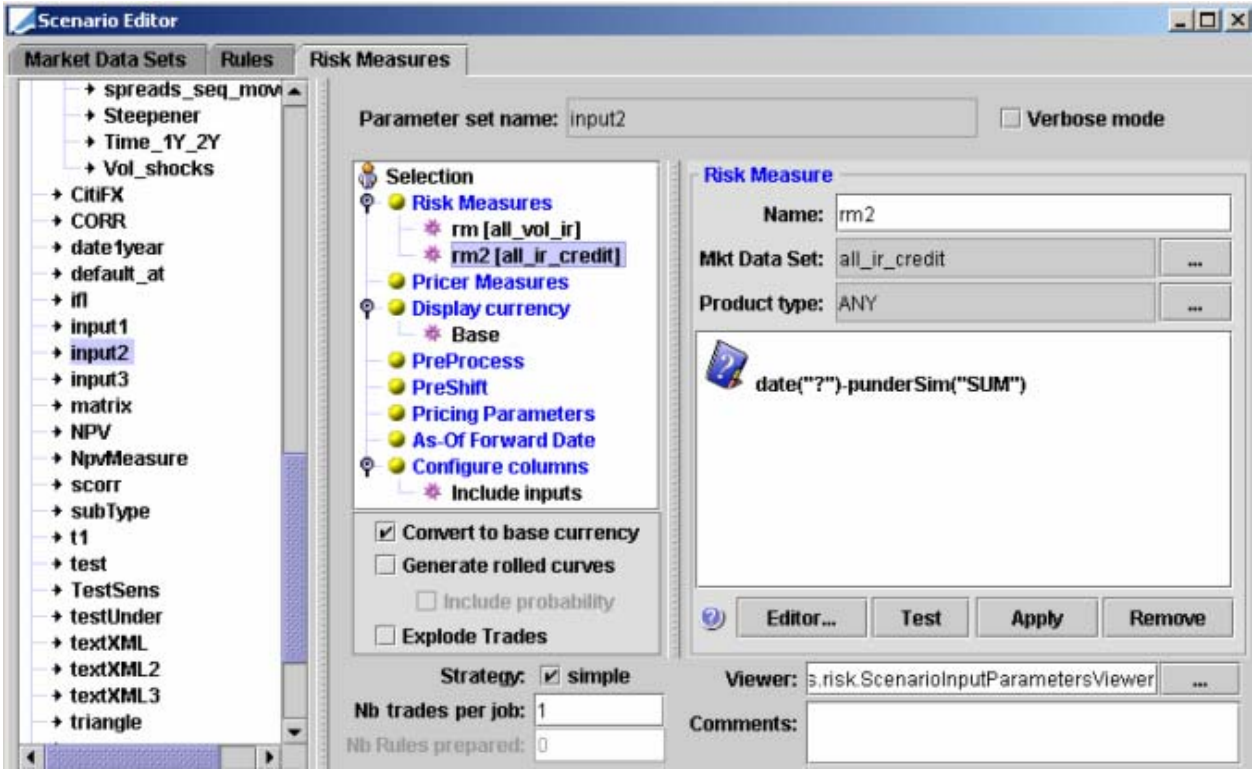
Rules Definition

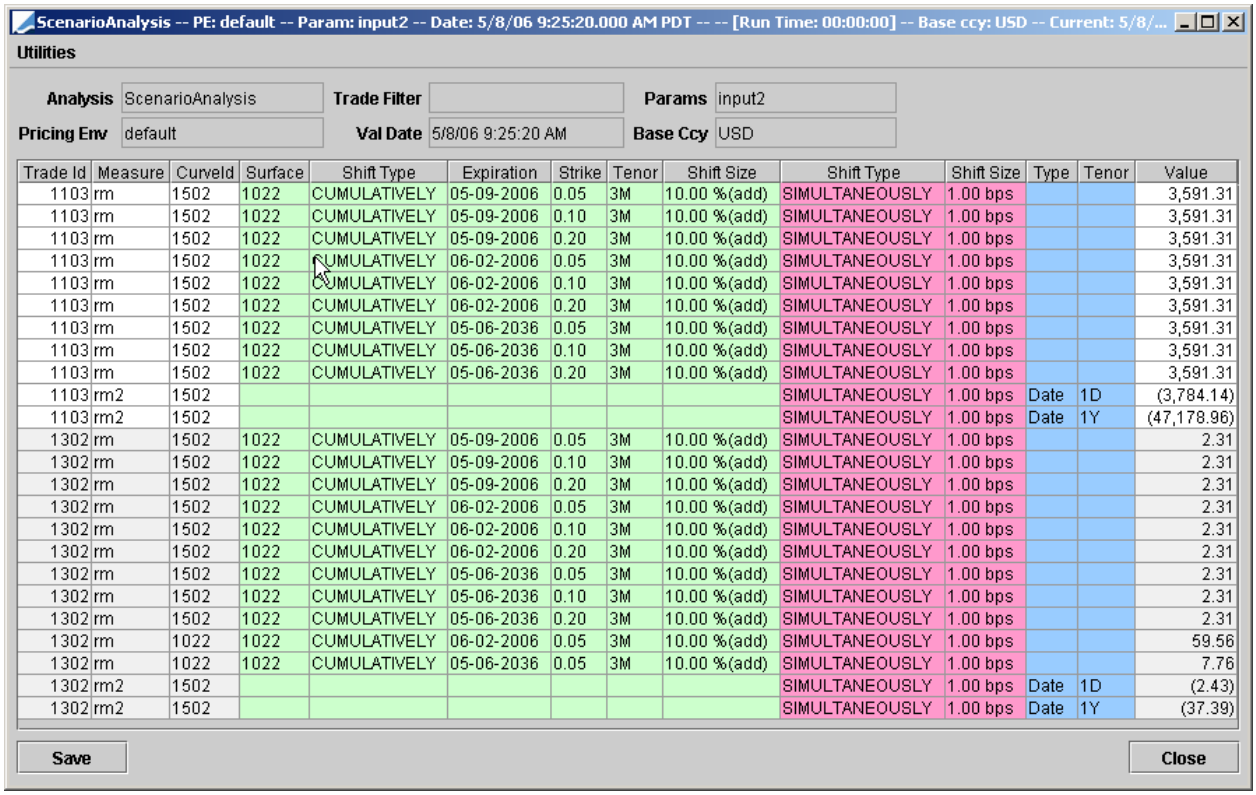
rm = aMatrix2("?")-BASE where aMatrix = matrix of (vol2, punderSim) and rm2 = date("?")-punderSim("SUM")




Scenario Editor
Market Data Sets
Rules
Risk Measures
Rule Groups
aMatrix
aMatrix2
Calypso
additive_shift_simul
additive_shift_ul
Bear_Flattener
Bear_Steepener
Bull_Flattener
Bull_Steepener
Bull_steepener_ul
Corr_up_10
credit_curve_rule
cu
Equity_up_10
Equity_up_20
five
five1
four
four1
FX_10_Mult
Name: aMatrix2
Type: Matrix
Comments:
Selection
Vertical Axis
punderSim
Horizontal Axis
vol2
Depth Axis
Scenarios
Vertical Axis:
Add/Remove...
Horizontal Axis:
Add/Remove...
Depth Axis:
Add/Remove...
Parameter set:
Scenario Editor
Market Data Sets
Rules
Risk Measures
Vol_shocks_fx
Vol_up_10
Vol_up_20
ZzzTest
comp1
compo
compo1
CompoSens
corr
corrMat2
corrMatrix
date
date1y
fourFive
fourFive1
FX_10Percent
Name: date
Type: Date
Comments:
Selection
Buckets
Set: 0
1D
1Y
Generation
Set number: 0
Add
Remove
Add tenor(s):
...







Trade Id	Measure	CurveId	Surface	Shift Type	Expiration	Strike	Tenor	Shift Size	Shift Type	Shift Size	Type	Tenor	Value
1103	rm	1502	1022	CUMULATIVELY	05-09-2006	0.05	3M	10.00 %(add)	SIMULTANEOUSLY	1.00 bps			3,591.31
1103	rm	1502	1022	CUMULATIVELY	05-09-2006	0.10	3M	10.00 %(add)	SIMULTANEOUSLY	1.00 bps			3,591.31
1103	rm	1502	1022	CUMULATIVELY	05-09-2006	0.20	3M	10.00 %(add)	SIMULTANEOUSLY	1.00 bps			3,591.31
1103	rm	1502	1022	CUMULATIVELY	06-02-2006	0.05	3M	10.00 %(add)	SIMULTANEOUSLY	1.00 bps			3,591.31
1103	rm	1502	1022	CUMULATIVELY	06-02-2006	0.10	3M	10.00 %(add)	SIMULTANEOUSLY	1.00 bps			3,591.31
1103	rm	1502	1022	CUMULATIVELY	06-02-2006	0.20	3M	10.00 %(add)	SIMULTANEOUSLY	1.00 bps			3,591.31
1103	rm	1502	1022	CUMULATIVELY	05-06-2036	0.05	3M	10.00 %(add)	SIMULTANEOUSLY	1.00 bps			3,591.31
1103	rm	1502	1022	CUMULATIVELY	05-06-2036	0.10	3M	10.00 %(add)	SIMULTANEOUSLY	1.00 bps			3,591.31
1103	rm	1502	1022	CUMULATIVELY	05-06-2036	0.20	3M	10.00 %(add)	SIMULTANEOUSLY	1.00 bps			3,591.31
1103	rm2	1502							SIMULTANEOUSLY	1.00 bps	Date	1D	(3,784.14)
1103	rm2	1502							SIMULTANEOUSLY	1.00 bps	Date	1Y	(47,178.96)
1302	rm	1502	1022	CUMULATIVELY	05-09-2006	0.05	3M	10.00 %(add)	SIMULTANEOUSLY	1.00 bps			2.31
1302	rm	1502	1022	CUMULATIVELY	05-09-2006	0.10	3M	10.00 %(add)	SIMULTANEOUSLY	1.00 bps			2.31
1302	rm	1502	1022	CUMULATIVELY	05-09-2006	0.20	3M	10.00 %(add)	SIMULTANEOUSLY	1.00 bps			2.31
1302	rm	1502	1022	CUMULATIVELY	06-02-2006	0.05	3M	10.00 %(add)	SIMULTANEOUSLY	1.00 bps			2.31
1302	rm	1502	1022	CUMULATIVELY	06-02-2006	0.10	3M	10.00 %(add)	SIMULTANEOUSLY	1.00 bps			2.31
1302	rm	1502	1022	CUMULATIVELY	06-02-2006	0.20	3M	10.00 %(add)	SIMULTANEOUSLY	1.00 bps			2.31
1302	rm	1502	1022	CUMULATIVELY	05-06-2036	0.05	3M	10.00 %(add)	SIMULTANEOUSLY	1.00 bps			2.31
1302	rm	1502	1022	CUMULATIVELY	05-06-2036	0.10	3M	10.00 %(add)	SIMULTANEOUSLY	1.00 bps			2.31
1302	rm	1502	1022	CUMULATIVELY	05-06-2036	0.20	3M	10.00 %(add)	SIMULTANEOUSLY	1.00 bps			2.31
1302	rm	1022	1022	CUMULATIVELY	06-02-2006	0.05	3M	10.00 %(add)	SIMULTANEOUSLY	1.00 bps			59.56
1302	rm	1022	1022	CUMULATIVELY	05-06-2036	0.05	3M	10.00 %(add)	SIMULTANEOUSLY	1.00 bps			7.76
1302	rm2	1502							SIMULTANEOUSLY	1.00 bps	Date	1D	(2.43)
1302	rm2	1502							SIMULTANEOUSLY	1.00 bps	Date	1Y	(37.39)

1.3.9 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.
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	If you check "Optimize Risk", CDSIndex and CDSIndexTranche notionals will be netted for processing the risk measures, then split again for display – Therefore improving the processing time.
Look Through Fund	Expand out the holdings of the underlying fund. Shows all the trades when one fund owns another fund. Refer to the *Asset Management User Guide* for information about the setup of funds.
Attach pricing currency	Select this checkbox to attach the name of the pricing currency to the risk measures. If multiple currencies are used in the pricing of the risk measure, then ANY is attached to the risk measure.
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.

Fields	Description
	Viewer: apps.risk.ScenarioCurveViewer ... » Click ... to select another viewer. The available viewers are defined in the domain ScenarioViewerClassNames (using their fully qualified name, for example `apps.risk.ScenarioCurveViewer`). You can also create a custom viewer and select the viewer here. Refer to the Calypso Developer's Guide for details. Note that custom viewers should be registered with the ScenarioViewerClassNames domain.
Comments	Free form comment.

1.3.10 Distributed Processing Mode

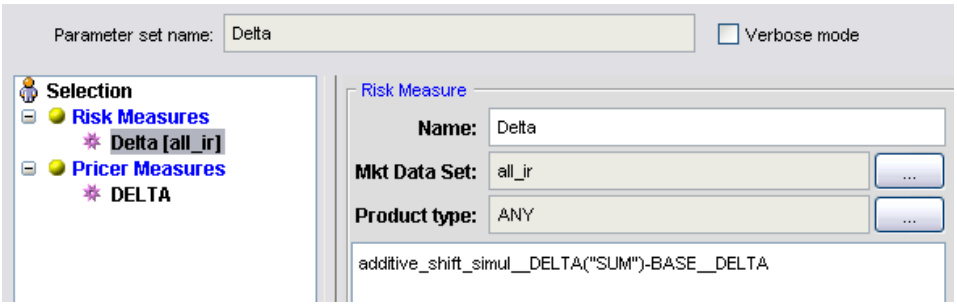
The following setting only applies when you are running the scenario analyses in distributed mode.

Fields	Description
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.

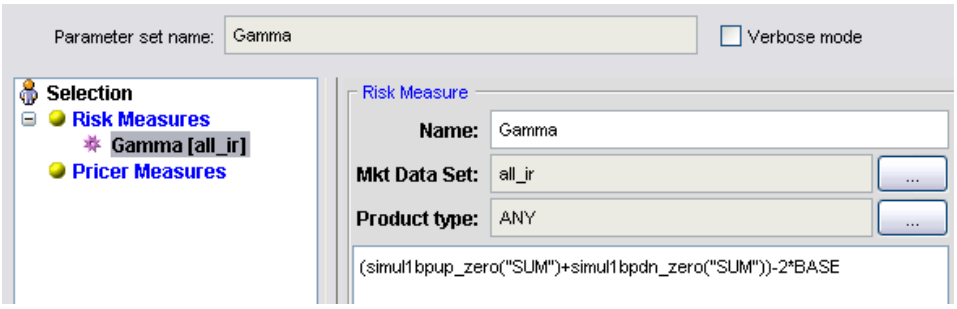
1.3.11 Sample Sets of Risk Measures

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

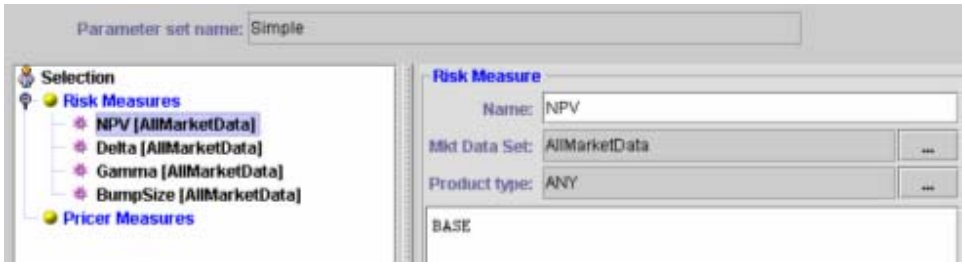
Delta Sensitivity



Gamma Sensitivity



Simple NPV


Parameter set name: Simple
Selection
Risk Measures
NPV [AllMarketData]
Delta [AllMarketData]
Gamma [AllMarketData]
BumpSize [AllMarketData]
Pricer Measures
Risk Measure
Name: NPV
Mkt Data Set: AllMarketData
Product type: ANY
BASE

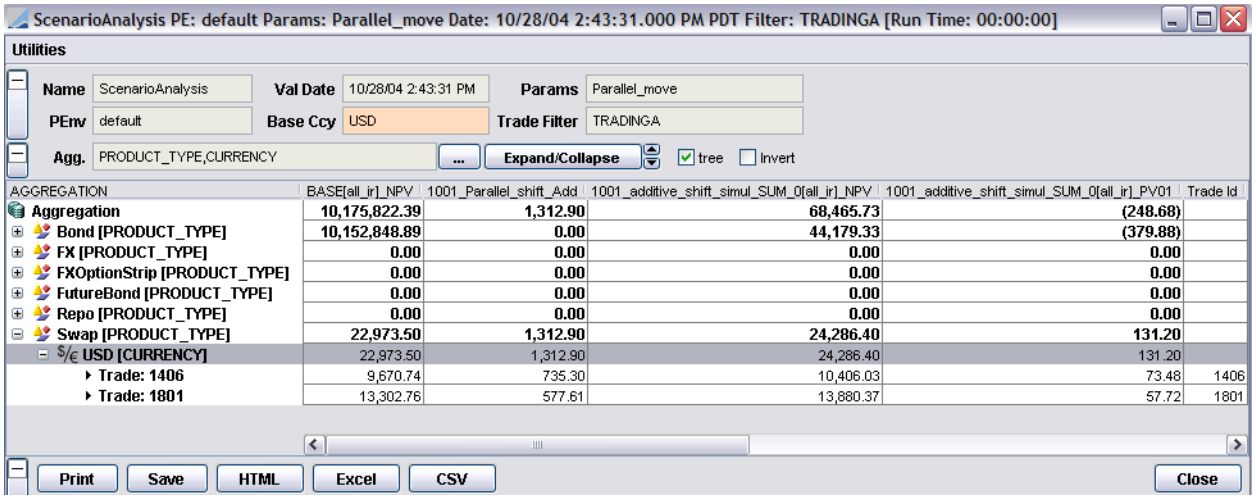
Section 2. Executing Scenario Analyses

Once scenarios are created using the Scenario Editor, they can be executed as a risk analysis of type Scenario. Refer to Calypso Risk Analyses documentation for details on executing risk analyses.

2.1 Report Results

[NOTE: The results are viewed in the Calypso Workstation. Refer to Calypso Workstation for details]

You can also **preview** the results in the Risk Analysis window. They will appear as shown below.



AGGREGATION	BASE[all_ir]_NPV	1001_Parallel_shift_Add	1001_additive_shift_simul_SUM_0[all_ir]_NPV	1001_additive_shift_simul_SUM_0[all_ir]_PV01	Trade Id
Aggregation	10,175,822.39	1,312.90	68,465.73	(248.68)	
Bond [PRODUCT_TYPE]	10,152,848.89	0.00	44,179.33	(379.88)	
FX [PRODUCT_TYPE]	0.00	0.00	0.00	0.00	
FXOptionStrip [PRODUCT_TYPE]	0.00	0.00	0.00	0.00	
FutureBond [PRODUCT_TYPE]	0.00	0.00	0.00	0.00	
Repo [PRODUCT_TYPE]	0.00	0.00	0.00	0.00	
Swap [PRODUCT_TYPE]	22,973.50	1,312.90	24,286.40	131.20	
$/€ USD [CURRENCY]	22,973.50	1,312.90	24,286.40	131.20	
Trade: 1406	9,670.74	735.30	10,406.03	73.48	1406
Trade: 1801	13,302.76	577.61	13,880.37	57.72	1801

The results are displayed using the viewer specified in Scenario Editor, and the Summary view. You can add more views to the Scenario Analysis window to display more information, and specify various aggregation levels. There will be a panel for each report view.

- Click ... next to the "Agg." field to specify aggregation levels. See Specifying Aggregation Levels for details.
- Check the Tree checkbox to display the trades in a tree view, based on the specified aggregation levels as shown below.

PRODUCT_TYPE	CURRENCY	Trade Id	BASE[all_ir]_NPV	1001_Parallel_shift_Add	1001_additive_shift_simul_SUM_0[all_ir]_NPV	1001_additive_shift_simul_SUM_0[all_ir]_PV01	Trade Id
Bond	USD	1103	44,179.33	0.00	44,179.33	(379.88)	1103
Bond	USD	1104	35,595.07	0.00	0.00	0.00	1104
Bond	USD	1105	(498.21)	0.00	0.00	0.00	1105
Bond	USD	1201	10,327.12	0.00	0.00	0.00	1201
Bond	USD	1401	9,916,021.37	0.00	0.00	0.00	1401
Bond	USD	1403	5,542.10	0.00	0.00	0.00	1403
Bond	USD	1404	(498.21)	0.00	0.00	0.00	1404

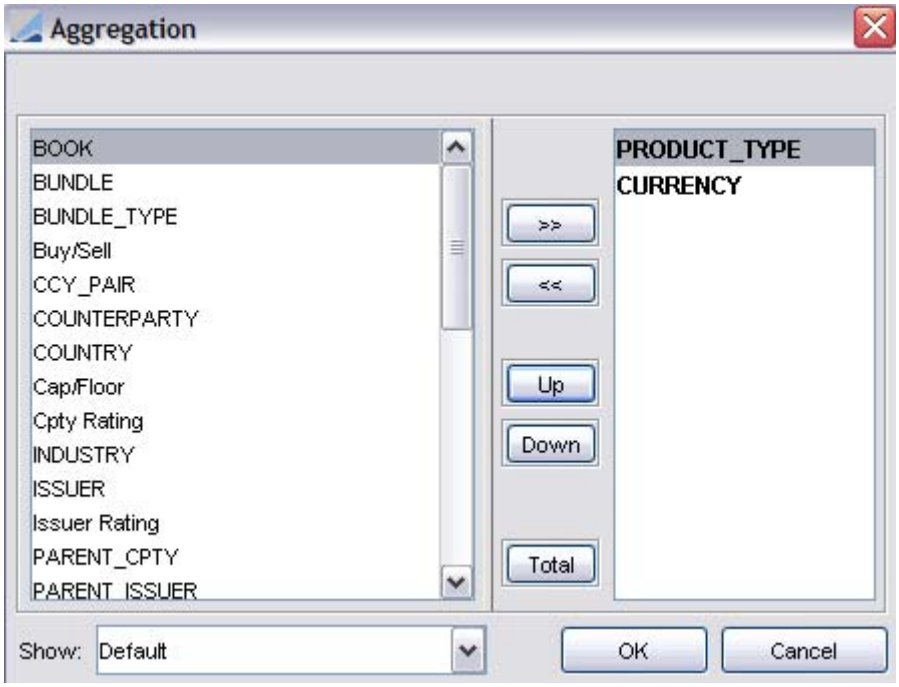
- Check the Invert checkbox to reverse the axes of the report as shown below.

Measure	Total	Bond/USD/1103	Bond/USD/1104	Bond/USD/1105
BASE[all_ir]_NPV	10,175,822.39	44,179.33	35,595.07	(498.21)
1001_Parallel_shift_Add	1,312.90	0.00	0.00	0.00
1001_additive_shift_simul_SUM_0[all_ir]_NPV	68,465.73	44,179.33	0.00	0.00
1001_additive_shift_simul_SUM_0[all_ir]_PV01	(248.68)	(379.88)	0.00	0.00
Trade Id		1103	1104	1105
Product Description		BondUST/10Y/11/15/2008/4.75%	BondUST/30Y/11/15/2028/5.25%	BondUST/30Y/11/15/2028/5.25%
Trade Date		Aug 26, 2004 11:37 AM	Aug 26, 2004 11:37 AM	Aug 26, 2004 12:25 PM
Settle Date		Aug 27,2004	Aug 27,2004	Aug 27,2004

2.1.1 Specifying Aggregation Levels

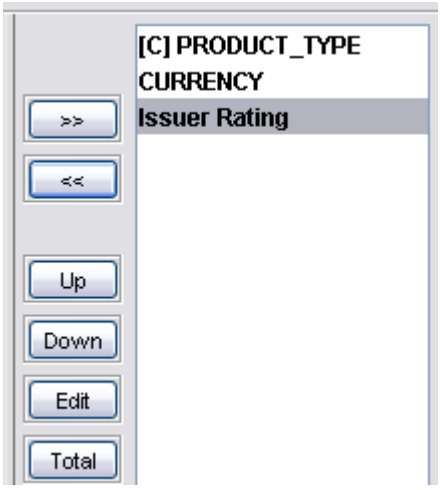
Note that if you have predefined aggregation level in the Risk Measures panel, under Configure Columns > Set Columns, only those levels will appear here for selection.

Click ... next to the "Agg." field to select aggregation levels.



- From the Show field, you can select the type of aggregation levels that you want to display.
- Select an aggregation level from the left column and click >>.

  For an aggregation level that requires more information, the Edit button will appear. Select an aggregation level from the right column and click **Edit** to specify more information.

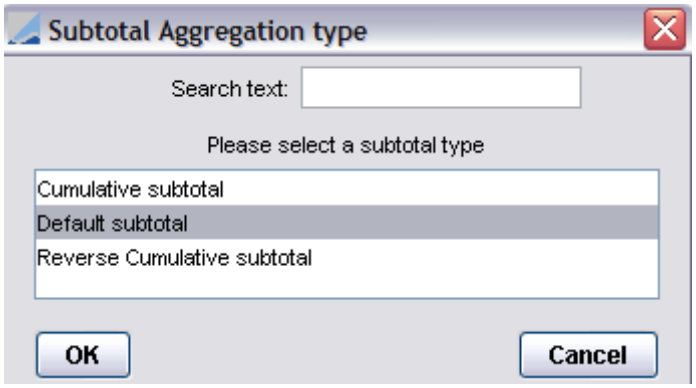


  For example, for the Issuer Rating, you can further select rating sources, and have a column for each rating source.

» Then click **OK** when you are done.

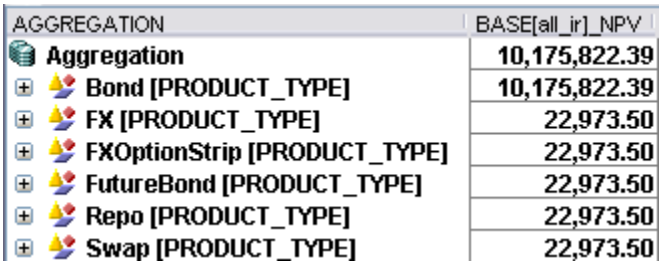
Totals

Once an aggregation level appears in the right column, you can select it and click **Total** to specify the type of total that you want to calculate.



The following types of total are available:

- Cumulative subtotal — The total of a given aggregation level is propagated upwards to the other aggregations levels.



- Default subtotal — The totals are shown by aggregation level.

AGGREGATION	BASE[all_ir]_NPV
Aggregation	10,175,822.39
Bond [PRODUCT_TYPE]	10,152,848.89
FX [PRODUCT_TYPE]	0.00
FXOptionStrip [PRODUCT_TYPE]	0.00
FutureBond [PRODUCT_TYPE]	0.00
Repo [PRODUCT_TYPE]	0.00
Swap [PRODUCT_TYPE]	22,973.50

- Reverse Cumulative subtotal — The total of a given aggregation level is propagated downwards to the other aggregations levels.

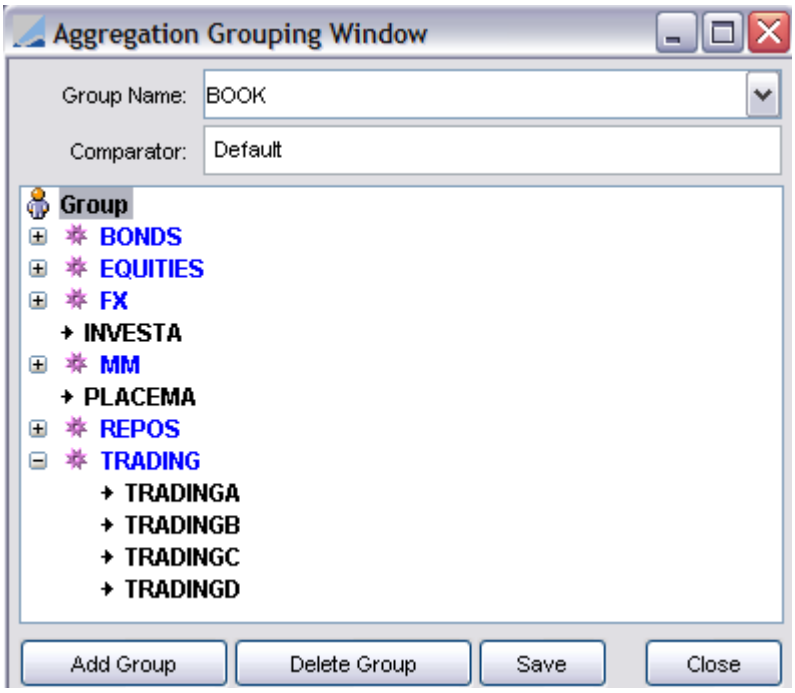
AGGREGATION	BASE[all_ir]_NPV
Aggregation	10,175,822.39
Bond [PRODUCT_TYPE]	10,152,848.89
FX [PRODUCT_TYPE]	10,152,848.89
FXOptionStrip [PRODUCT_TYPE]	10,152,848.89
FutureBond [PRODUCT_TYPE]	10,152,848.89
Repo [PRODUCT_TYPE]	10,152,848.89
Swap [PRODUCT_TYPE]	10,175,822.39

Aggregation Groups

Within an aggregation level, you can specify groups of data.

For example, for the BOOK aggregation level, you want to define groups of books, and aggregate trades by groups of books rather than individual books.

To specify aggregation group, you can choose Utilities > Aggregation grouping from the scenario analysis results, or you can choose Main Entry > Configuration > Reporting & Risk > Aggregation Grouping.

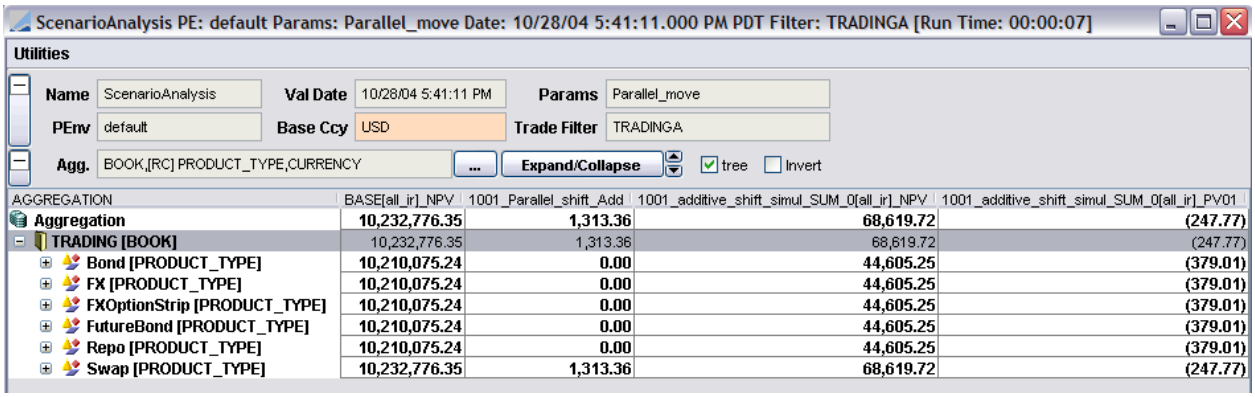


» Select an aggregation level from the Group Name field. All the data of that aggregation level will appear under the Group label. For example, for the BOOK aggregation level, all books will appear.

» Select the Group label or an existing group, and click Add Group to add a group of data. You will be prompted to enter a group name and to select the data that you wish to put in that group. The data will disappear from under the Group label and will appear under the group name.

» Then click **Save** to save the groups.

In the scenario analysis results, when you select an aggregation level that has groups, the trades will be aggregated by groups rather than individual data as shown below.



AGGREGATION	BASE[all_ir]_NPV	1001_Parallel_shift_Add	1001_additive_shift_simul_SUM_0[all_ir]_NPV	1001_additive_shift_simul_SUM_0[all_ir]_PV01
Aggregation	10,232,776.35	1,313.36	68,619.72	(247.77)
TRADING [BOOK]	10,232,776.35	1,313.36	68,619.72	(247.77)
Bond [PRODUCT_TYPE]	10,210,075.24	0.00	44,605.25	(379.01)
FX [PRODUCT_TYPE]	10,210,075.24	0.00	44,605.25	(379.01)
FXOptionStrip [PRODUCT_TYPE]	10,210,075.24	0.00	44,605.25	(379.01)
FutureBond [PRODUCT_TYPE]	10,210,075.24	0.00	44,605.25	(379.01)
Repo [PRODUCT_TYPE]	10,210,075.24	0.00	44,605.25	(379.01)
Swap [PRODUCT_TYPE]	10,232,776.35	1,313.36	68,619.72	(247.77)

Developer Tip

- You can create a custom comparator class to order the aggregation groups. Create a class named `tk.util.<class name>` that implements `java.util.Comparator`.

2.1.2 Importing External Results

The following files need to be compiled: calypsox.apps.risk.ScenarioOutputImporter and `samples/RiskAggregation`.

RiskAggregation takes an env, a user name and a password as input parameters. It is a sample program to convert a source file into a Calypso input file that can be imported by ScenarioOutputImporter. You will be prompted to select a source file, and a name for the converted file.

A sample source file is provided under `samples/RiskAggregation.txt`. Note that the trade keywords Ticker, Currency 1, Currency 2, and Currency 3 should be added to the tradeKeyword domain using Main Entry > Configuration > System > Domain Values.

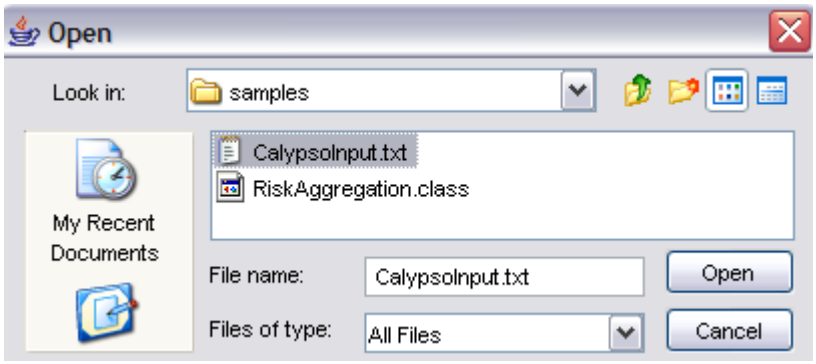
The format of the converted file is:

Converted File	Calypso System
Trade ID	Trade.getId()
Ticker	Trade keyword: Ticker
Rating	Product attribute: Issuer Rating.Moody
End Date	Product maturity date
Notional (MM)	Risk measure
Spread DV01 ($)	Risk measure
Domestic Yield DV01($)	Risk measure
Currency	Trade keyword: Currency 1
Foreign Yield DV01($)	Risk measure
Currency	Trade keyword: Currency 2
FX Risk ($)	Risk measure
Currency	Trade keyword: Currency 3

Converted File	Calypso System
Full Spread DV01 ($)	Risk measure
Full Notional (MM)	Risk measure

You can create your own RiskAggregation class to convert custom files.

Once you have a Calypso input file, choose Utilities > Import from file as shown below.



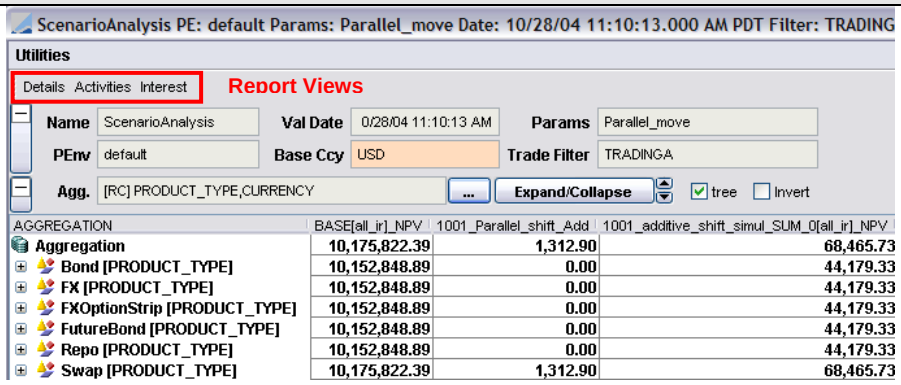
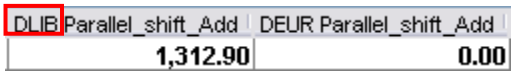
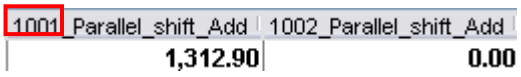
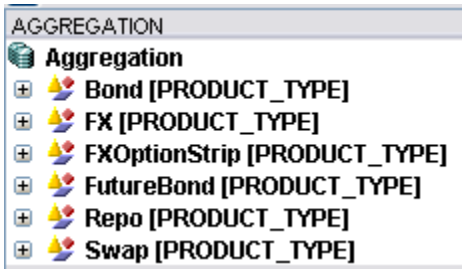
» Select an input file and click **Open**.

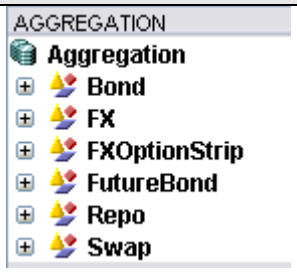
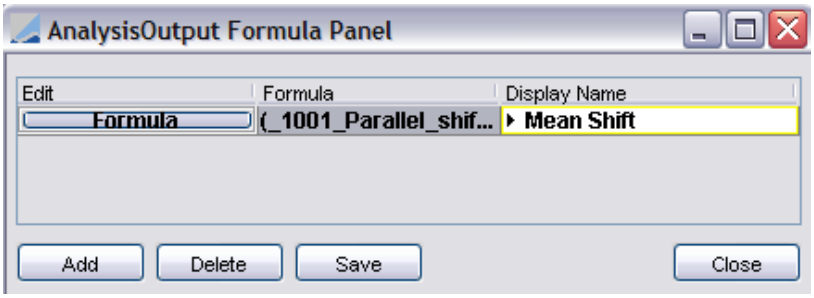
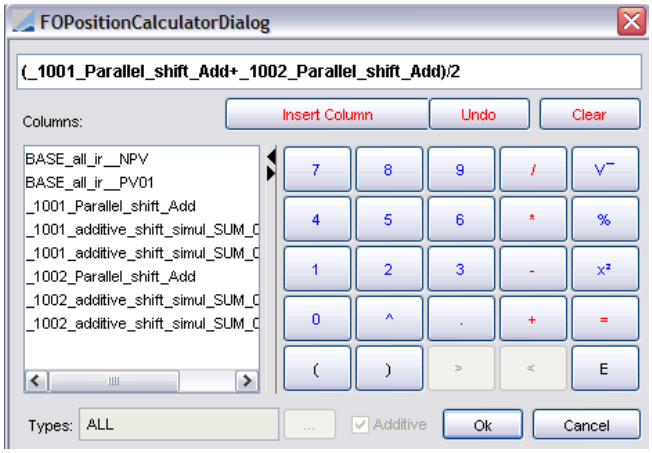
The new columns are added to the list of configurable columns. Choose Utilties > Configure Columns to add them to the results as applicable.

2.1.3 Utilities Menu

The Utilities menu offers the following functions.

Fields	Description
Configure Columns	You will be prompted to add or remove columns as applicable. When the environment property SCENARIO_ALL_COLUMN_NAMES is True, all available columns can be configured in addition to SCENARIO_MEASURES and RISK_MEASURES. Note that if you have specified columns in the Risk Measures panel under Configure Columns > Set Columns, only those columns will be available for selection here (in addition to SCENARIO_MEASURES and RISK_MEASURES). When SCENARIO_ALL_COLUMN_NAMES is False, only SCENARIO_MEASURES and RISK_MEASURES can be configured.
Show Log Progress	Displays the log of the Scenario analysis execution.
Show Scenario Trade Details	Displays the details of a selected trade.
Add View	You will be prompted to select a view type and a report view to be added. Multiple views can be added to the Scenario Analysis window to display more information, and to offer different levels of aggregation as in the example shown below. There is a panel for each report view.

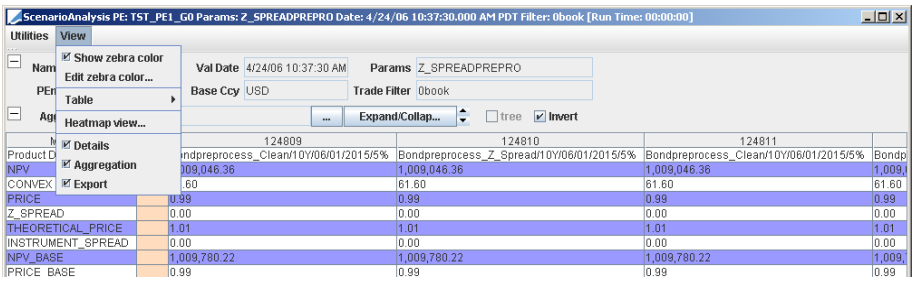
Fields	Description
	 » Click a report view to display it. You can also group these views into a template that you can run on saved reports.
Remove View	You will be prompted to select a report view to be removed.
View Editor	Invokes the View Report window. See Defining a Report View for details.
Merge with	Merges the results with the results of a saved report. You will be prompted to select a saved report.
Saved frame editor	Not currently used.
Show curve names	This menu item operates as a checkbox. When you have selected to shift market data separately, results will be displayed for each curve. Check “Show curve names” to display the results by curve name as shown below.  Otherwise, the results will be displayed by curve id as shown below. 
Show aggregation type	This menu item operates as a checkbox. Check “Show aggregation type” to display the aggregation level as sown in the example below.  Otherwise, the aggregation levels will appear as:

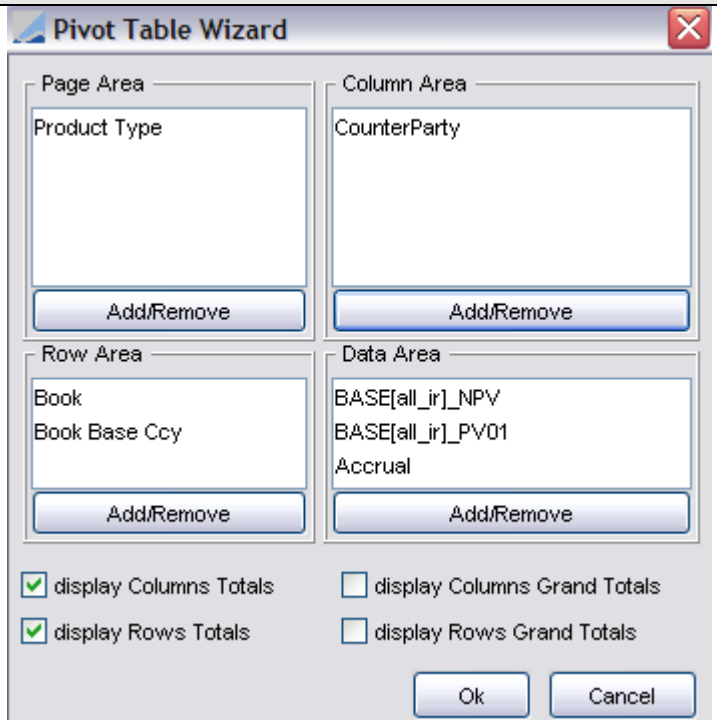
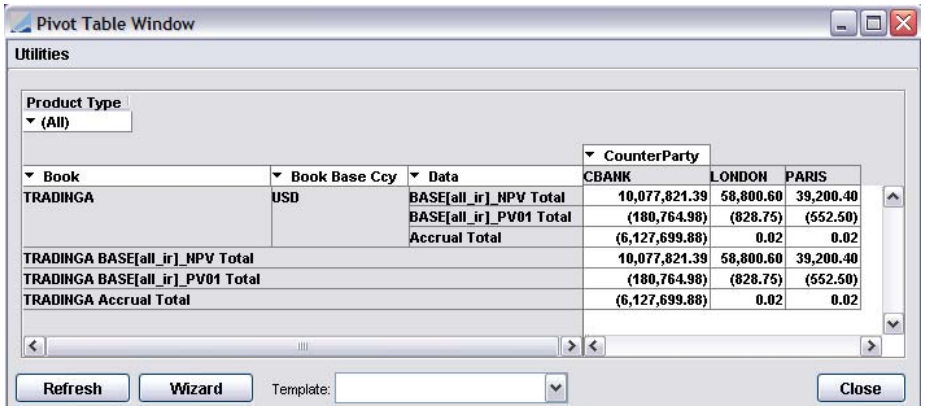
Fields	Description
	
Show in base currency	Select to show totals at the aggregation level. This option is available when you select “Convert to base currency” in the scenario parameters. It is disabled otherwise.
Display as percentage	Select to display the aggregated results in percentage. The aggregation level displays 100% while the individual rows display a percentage of that.
Aggregation grouping	See Aggregation Groups for details.
Create columns	To create custom columns using existing columns and formulae.  » Click **Add** to add a column. » Click **Formula** to specify the column formula.  You can select a column, click **Insert Column** to insert the column in the formula, then add operators and more columns as applicable. Then click **OK** when you are done. » Enter the name of the column in the Display Name field, and click **Save** to save the column. Note that once the column is created, you need to choose Utilities > Refresh to refresh the list of configurable columns, and you need to choose Utilities > Configure Columns to add the column to the results as applicable.

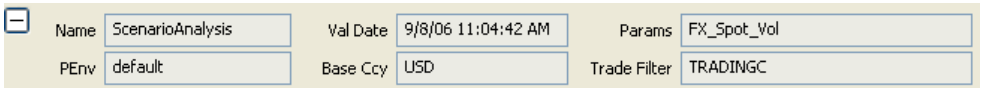
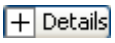
Fields	Description
Refresh	To refresh the list of configurable columns if you have created custom columns.
Curve Viewer	To display all the curves used by each trade. 
New Trade	Select to capture a new trade.
Close	Closes the window.

2.1.4 View Menu

The View menu offers the following functions.

Menu Item	Description
Show zebra color	Select to display zebra striping in the report output. 
Edit zebra color	Select a background color for the zebra striping.
Table	Select the type of table to display in the report. ***Simple Table*** Data is displayed across rows and columns. ***Pivot Table / Pivot Table in new window*** Specify aggregations across rows and columns. If a pivot table template exists, you will be prompted to select a template. Otherwise, the Pivot Table Wizard will appear as shown below.

Menu Item	Description
	 » Click **Add/Remove** in the Page Area to specify selection criteria. » Click **Add/Remove** in the Column Area to specify column aggregation criteria. » Click **Add/Remove** in the Row Area to specify row aggregation criteria. » Click **Add/Remove** in the Data Area to specify what data should be aggregated according to the selected aggregation criteria. » Check “display Columns Totals” to show totals per column. » Check “display Columns Grand Totals” to show totals across all columns. » Check “display Rows Totals” to show totals per row. » Check “display Rows Grand Totals” to show totals across all rows. A sample pivot table for the criteria specified above is shown below.  You can choose Utilities > Save As Template to save the pivot table configuration as a template.
Heatmap view	Select to group trades according to whether the exposure is long or short, and color the positions to indicate the daily P&L of the position.

Menu Item	Description
Details	Select to display the Details panel in the Scenario Analysis report.  Alternatively, click  to hide the panel and click  to display the panel.
Aggregation	Select to display the Aggregation panel in the Scenario Analysis report.  Alternatively, click  to hide the panel and click  to display the panel.
Export	Select to display the Export panel in the Scenario Analysis report.  Alternatively, click  to hide the panel and click  to display the panel.

2.1.5 Saving Risk Results

You can click **Save** from the Scenario Analysis window to save risk results to the database. You will be prompted to select a frame. This is optional. A frame allows specifying what data should be saved to the database.

You can define frames using Utilities > Saved frame editor. See Utilities Menu for details.

Risk results can also be automatically saved when you define a risk analysis form the Risk Analysis window.

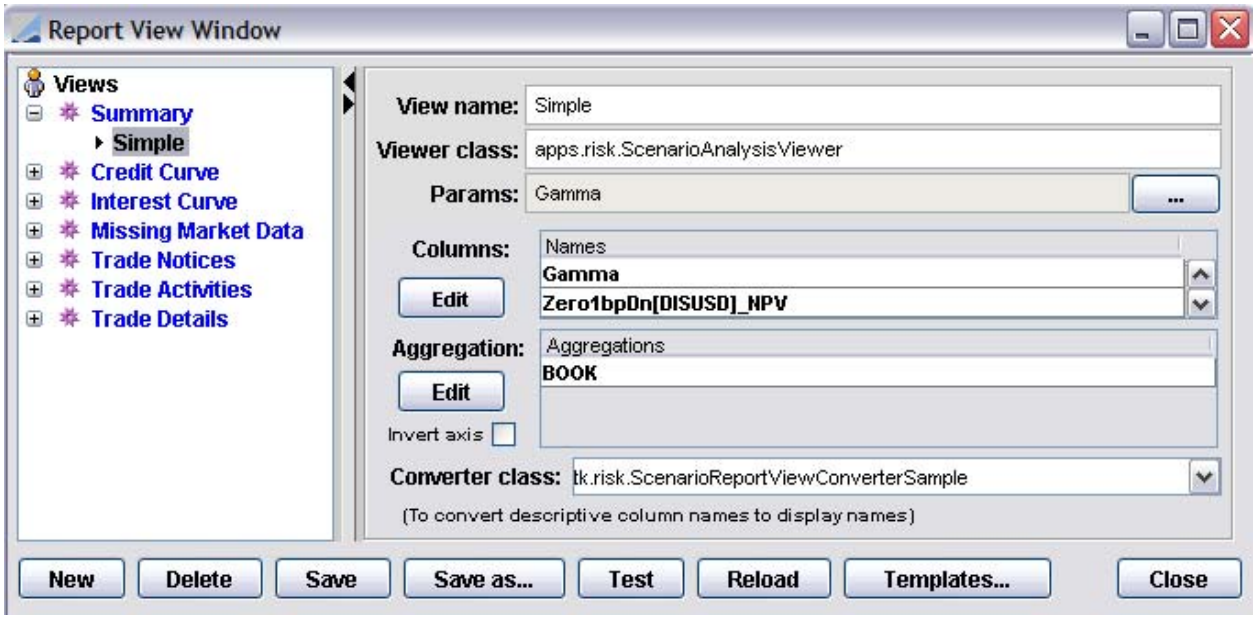
You can specify the following environment properties, to control whether to save the trades along with the risk results, or not.

- SCENARIO_SAVE_ALL_TRADES — True or False. True to save all trades with a scenario output, or False to use SCENARIO_NEW_SAVE_TRADE_LIMIT. Default is False.
- SCENARIO_NEW_SAVE_TRADE_LIMIT — Maximum number of trades that can be saved with a scenario output. If there is no trade filter and the number of trades is under the limit, then all the trades are saved with the output. If there is a trade filter or the number of trades is above the limit, only trades with negative trade ids are saved with the output. For the other trades, only the trade id is saved with the output. Default is 1000.
- SCENARIO_USE_VIEWER_WHEN_EXPORTING – True or False. True to permit aggregation details to be included in the saved report output. This applies to Scenario and Scenario Risk Position reports. This affects risk reports saved directly to a file (eg. if your risk analysis config has the 'save to format' option checked).

2.2 Defining a Report View

2.2.1 Creating a Report View

Choose Utilities > View Editor from the Scenario Analysis window, or Main Entry > Configuration > Reporting & Risk > View Report (`risk.ScenarioReportViewWindow`) to invoke the Report View window as shown below.



» Select a view type under the Views label, then enter the fields as described below.

The following types of view can be defined and configured:

- Summary views — To display the actual report results of a given scenario. Multiple summary views can be setup to aggregate results in various fashions.
- Credit Curve views — To display the credit curves used for a given scenario.
- Interest Curve views — To display the interest rate curves used for a given scenario.
- Missing Market Data views — To display missing market data for a given scenario.
- Trade Notices views — To display the Cashflow report for a given scenario. Refer to the *Calypso Reporting User Guide* for details on the Cashflow report.
- Trade Activities views — To display the Trade Diary report for a given scenario. Refer to the *Calypso Reporting User Guide* for details on the Trade Diary report.
- Trade Details views — To display the Trade report for a given scenario. Refer to the *Calypso Reporting User Guide* for details on the Trade report.

» Click **Test** to test the report view on a saved report. See Testing a Report View for details.

» Click **Templates** to group report views into templates. See Defining a Report Template

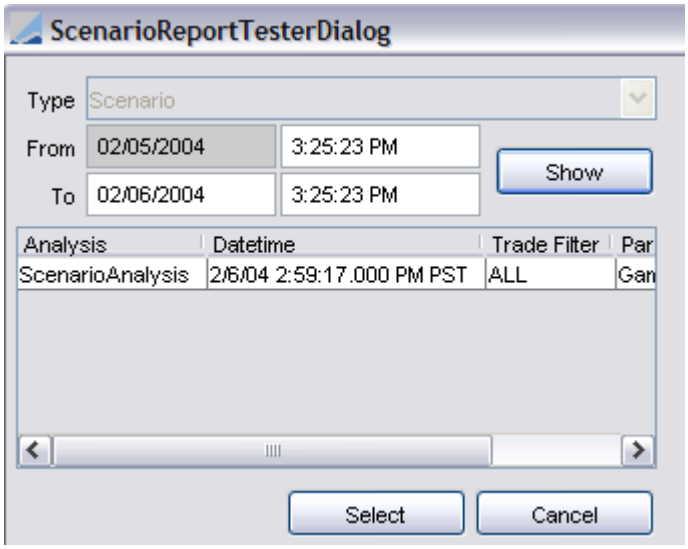
» Click **Save** to save the report view.

Fields	Description
Name	Enter a name for the report view.
Viewer Class	The default viewer class appears. Enter a custom viewer class as applicable. You must enter the fully qualified name.
Params	Select a scenario that you have created using Scenario Editor.
Columns	Click **Edit** under the Columns label to select the columns that you wish to display in the report output.
Aggregation	Click **Edit** under the Aggregation label to select aggregation criteria.
Invert axis	Check “Invert axis” to reverse the axes of the report.
Converter class	Select a converter class to convert the column names to friendly names. You need to

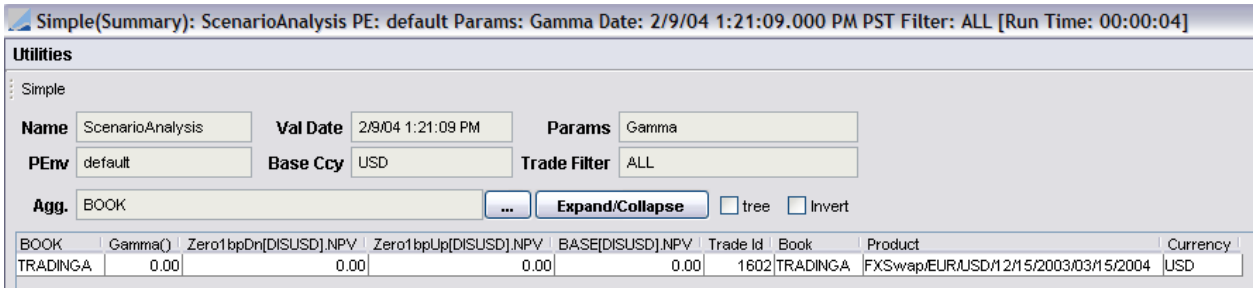
Fields	Description
	enter the fully qualified name of the class, for example `tk.risk.ScenarioReportViewConverterSample`. Note that the class `tk.risk.ScenarioReportViewConverterSample1` that appears for selection is not active. You need to create a class named `tk.risk.<viewer converter>` that implements `com.calypso.tk.risk.ScenarioReportViewConverterInterface`. There is a sample in `calypsox.tk.risk.ScenarioReportViewConverterSample` that changes the "_" character in a column name to a "." character.

2.2.2 Testing a Report View

The Scenario Report Tester Dialog will appear as shown below.



- Enter a From date and a To date, then click **Show** to display the saved reports between those dates.
- Select a report and click **Select**. The report view will be applied to the report and the report will be displayed as shown below.



2.3 Defining a Report Template

A report template is a set of views that will appear on the Scenario Analysis window for a saved report.

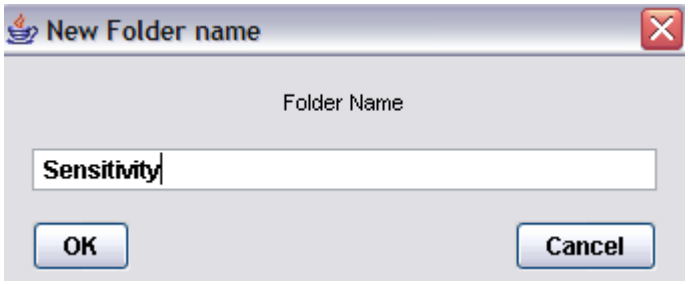
Choose Main Entry > Configuration > Reporting & Risk > Scenario Report Template (`risk.ScenarioReportTemplateWindow`) to invoke the Report window as shown below. This window is also invoked from the Report View window when you click the **Templates** button.

You can group the templates within folders.

2.3.1 Creating a Folder

You can create folders to group the templates according to user-defined categories, but this is not mandatory. You can directly create templates.

Choose Folder > New to create a folder. You will be prompted to enter a folder name as shown below.

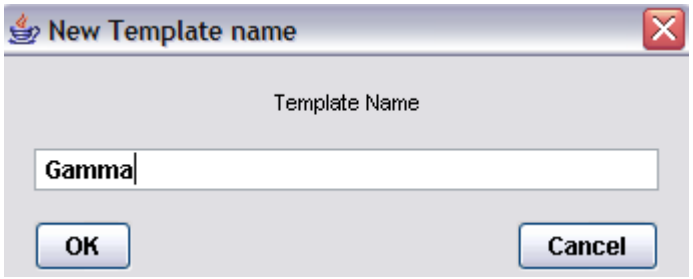


» Click **OK** when you are done.

2.3.2 Creating a Template

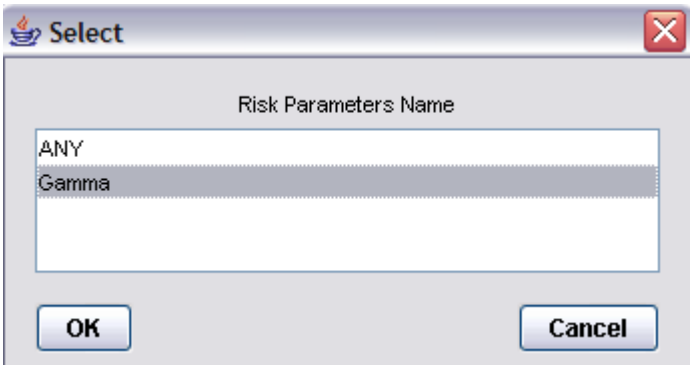
If a folder is selected when you create a template, the template will be added to that folder. Otherwise, the template will be created on its own.

Choose Template > New to create a template. You will be prompted to enter a template name as shown below.



» Click **OK** when you are done.

You will then be prompted to select a scenario that you have created using Scenario Editor as shown below.



Click **OK** when you are done.

You will be prompted to save the template.

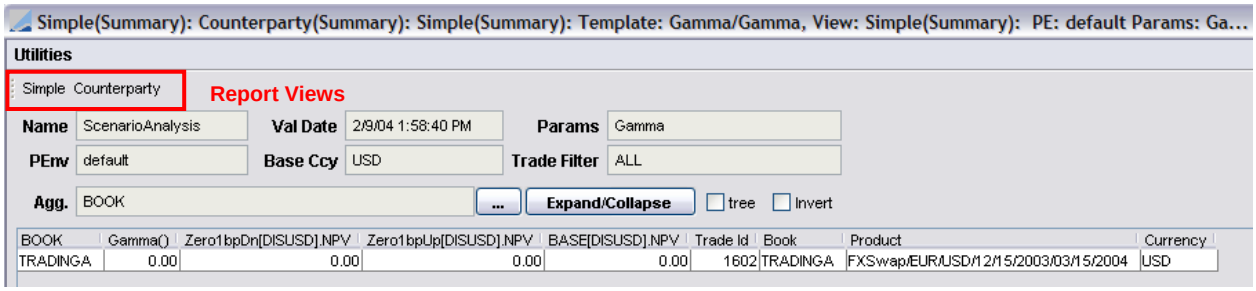
Once a template is created, you can add report views to the template.

Select the template and click **Add** or choose View > Add. You will be prompted to select a view type and a view. Repeat as applicable. All the views will be available from the Scenario Analysis window after you apply the template to a saved report.

2.3.3 Applying a Template

Choose Report > Run Template to apply the template to a saved report. The Scenario Report Tester Dialog will appear. Select a saved report and click **Select**.

The Scenario Analysis window will appear as shown below with all the report views of the template available for selection.



» Click on a report view to display it.

See Testing a Report View for details.

Section 3. Customization Capabilities

ScenarioAnalysis allows defining market data scenarios to be applied to a set of trades, and calculates risk measures for those scenarios. You can create custom scenario market data, custom scenario rules, custom report viewers, and custom report viewer converters.

3.1 Creating a Custom Notification Process

This API allows notification before, and or after pricing a trade.

Fix — Added two methods in CustomScenarioAnalysisInterface: *beforeApplyingAllRules()* and *afterApplyingAllRules()*.

Create a class named `tk.risk.DefaultCustomScenarioAnalysisInterface` that implements `com.calypso.tk.risk.CustomScenarioAnalysisInterface`. This interface has the following methods: *beforeApplyingAllRules()* and *afterApplyingAllRules()*.

This class will be invoked from `com.calypso.apps.risk.ScenarioAnalysis`.

Sample Code

- Sample in `calypsox/tk/risk/DefaultCustomScenarioAnalysisInterface.java`

3.2 Creating a Custom Scenario Rule

Create a class named `tk.risk.ScenarioRule<name>` that implements `com.calypso.tk.risk.ScenarioRule`.

This class will be invoked from `com.calypso.apps.risk.ScenarioRulePanel`.

You need to register the custom rule name with the customScenarioRule domain using Main Entry > Configuration > System > Domain Values (`refdata.DomainValueWindow`).

Sample Code

- Sample in `calypsox/tk/risk/ScenarioRuleCustomZeroInterest.java`

3.3 Creating a Custom Scenario Market Data

Create a class named `tk.risk.CustomScenarioMarketData` that implements `com.calypso.tk.risk.CustomScenarioMarketDataInterface`.

This class will be invoked from `com.calypso.tk.risk.ScenarioMarketData`.

Sample Code

- Sample in `calypsox/tk/risk/SampleCustomScenarioMarketData.java`

3.4 Creating a Custom Report Viewer

Create a class named `tk.risk.<viewer>` that implements `com.calypso.tk.risk.ScenarioReportViewInterface`.

This class will be invoked from `com.calypso.tk.risk.ScenarioReportView` and `com.calypso.apps.risk.ScenarioReportViewWindow`.

The custom viewers must be registered in the domain ScenarioViewerClassNames.

ScenarioInputViewer

If you want to extend calypsox.apps.risk.ScenarioInputViewer, check the method ScenarioInputViewer:display to see how the ScenarioOutput object can be parsed to produce a new viewer. Below is some code that shows how the input parameters can be extracted from the scenario output for each risk measure:

```
ScenarioOutput output   = ...; // a scenario report
```

```
    TradeArray     trades   = output.getTrades();
    Vector         measures = output.getRiskMeasures();
    Hashtable      inputs   = output.getInputParameters();
    ScenarioItemOutputCommonDetail detail;
    ScenarioItemOutputRuleInfo input;
    for (int k=0; k<trades.size(); k++) {
       ScenarioItemOutput item = output.findItem(trades.get(k).getId());
       for (int i=0; i<measures.size(); i++) {
           detail = (ScenarioItemOutputCommonDetail)measures.get(i);
           input  = (ScenarioItemOutputRuleInfo)inputs.get(detail);
           String measureName = detail.getMeasureName();
           double riskValue   = item.getRiskValue(detail.toString(), false);
           String curveId     = detail.getMkDataId();
           System.out.println("TradeId: "+trades.get(k).getId()+", "+
                              "Measure: "+measureName+", "+
                              "Value:   "+riskValue+", "+
                              "CurveId: "+curveId+", "+
                              "Attributes: "+input);
       }
    }
```

See ScenarioItemOutputRuleInfo for a list of the returned attributes for each rule.

3.5 Creating a Custom Report Viewer Converter

Create a class named `tk.risk.<viewer converter>` that implements `com.calypso.tk.risk.ScenarioReportViewConverterInterface`.

This class will be invoked from `com.calypso.tk.risk.ScenarioReportView` to convert the standard columns names to user-defined column names.

Sample Code

- Sample in `calypsox/tk/risk/ScenarioReportViewConverterSample.java`