



Nasdaq Calypso

Volatility Surfaces

Version 18

Revision 3.0
October 2024
Approved

1. Volatility Surfaces Overview

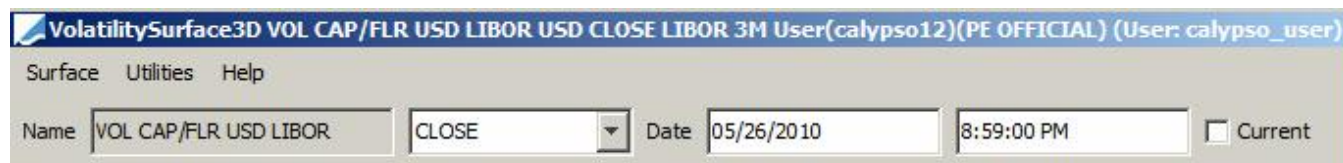
The following volatility surfaces can be built to support pricing for options:

- [BOND volatility surface](#)
- [BONDFUTURE volatility surface](#)
- [BONDOPTION volatility surface](#)
- [COMMODITY volatility surface](#)
- [Proxy COMMODITY volatility surface](#)
- [CREDIT volatility surface](#)
- [EQUITY volatility surface](#)
- [MMFUTURE volatility surface](#)
- [RATE volatility surface](#)
- [Volatility surface charts](#)

 **[NOTE: Curves and surfaces can be updated in real-time using the Market Data Server]**

► Refer to *Calypso Market Data Server Documentation* for information on configuring and running the market data server.

1.1 General Volatility Surface Information



- The name of the volatility surface is set upon saving. It will identify the volatility surface throughout the system.
- The instance of the volatility surface dictates the quote side of the underlying instruments to be used for generating the volatility surface.
 - The CLOSE instance uses CLOSE quotes.
 - The LAST instance uses BID, MID, and ASK quotes.
 - The OPEN instance uses OPEN quotes.
- By default, the volatility surface is saved as of the current date and time. You can clear the Current checkbox and change the volatility surface date as needed.

Vol Model

The Vol Model allows converting volatilities between Black Vol, Bp Vol and Daily BE Vol (daily break even vol) as follows:

- $\text{Bp Vol} = \text{Daily BE Vol} * \text{Sqrt}(252)$
- $\text{Bp Vol} = \text{Forward Rate} * \text{Black Vol}$

Graph Panel

► See [Volatility surface charts](#) for details.

Underlying Instruments

► See [Volatility Surface Underlying Instruments](#) for details.

Volatility Surface Update

You can use the scheduled task PROP_RATE_1BUSDAY to roll the quotes which are not liquid.

You can use the scheduled task GENERATE_VOLSURF to regenerate a volatility surface as of the current valuation date.

Interpolator

Note that Interpolator3DLinearExtended is only used for FX Volatility surfaces.

► Refer to the *Calypso FX and MM Analytics Guide* for details.

2. BOND Volatility Surface

From the Calypso Navigator, navigate to **Market Data > Volatilities > Volatility Surface** (menu action `marketdata.VolatilitySurface3DWindow`).

BOND volatility surfaces can be created from offset points using the Default generation algorithm.

► See also [Volatility Surface Overview](#).

BOND Volatility Surface from Offsets Quick Reference

Configuration Requirements

- Bond products are created using **Configuration > Fixed Income > Bond Product Definition** from the Calypso Navigator.

Surface Generation

- Click **New** to start a new surface.
- The Current checkbox is selected by default, meaning that when you save the surface, the system timestamps the surface with the current date and time. Clear the Current checkbox to enter a back-dated surface. You can modify the date and time fields.
- Definition Panel — Select the following to define the surface: currency, volatility type “BOND”, bond product, strike type, interpolator, vol model, the Derived checkbox should not be selected, Default generator, date-roll convention, holiday calendars, pricing environment.
- Offsets Panel — Select expirations, and enter strikes.
- Points Panel — Click **Generate** to generate the points. Enter the point values.
- Click **Save**, enter a name for the surface, and click **OK**.

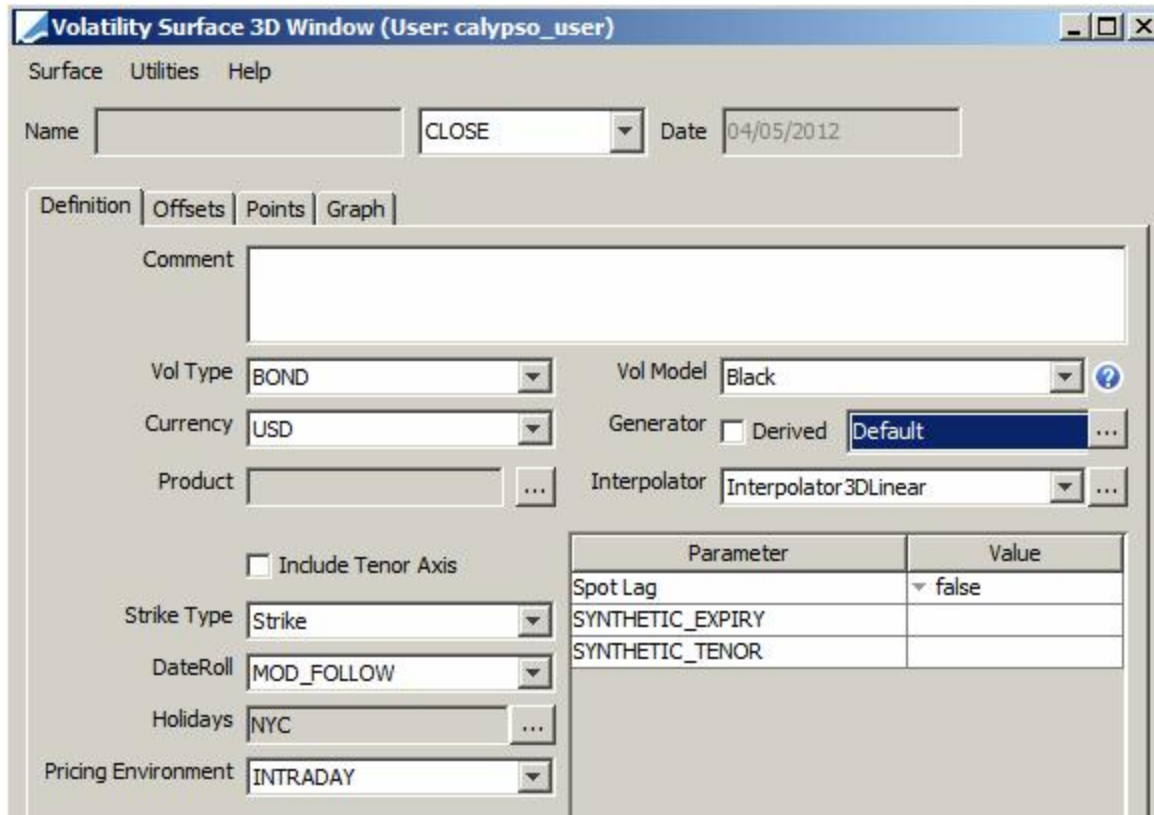
Pricer Configuration

A BOND volatility surface is associated with a pricing environment under the Surfaces panel of the pricer configuration for the BOND volatility type and VOL usage.

2.1 Definition Panel

Click **New** to start a new surface.

Select the following to define the surface: currency, volatility type “BOND”, bond product, strike type, interpolator, vol model, the Derived checkbox should not be selected, Default generator, date-roll convention, holiday calendars, pricing environment.



Volatility Surface 3D Window (User: calypso_user)

Surface Utilities Help

Name: [] CLOSE [v] Date: 04/05/2012

Definition | Offsets | Points | Graph

Comment: []

Vol Type: BOND [v] Vol Model: Black [v] ?

Currency: USD [v] Generator: ☐ Derived Default [v] ...

Product: [] ... Interpolator: Interpolator3DLinear [v] ...

☐ Include Tenor Axis

Strike Type: Strike [v]

DateRoll: MOD_FOLLOW [v]

Holidays: NYC [v] ...

Pricing Environment: INTRADAY [v]

Parameter	Value
Spot Lag	false
SYNTHETIC_EXPIRY	
SYNTHETIC_TENOR	

- » Select the type of strike: Strike, Relative Spread, Strike Offsets BPs, or Relative % - They are described below.
- » Select the "Default" generation algorithm.

If the spot lag parameter is set to true, the generated exercise dates are rolled using the conventions of the definition screen.

Note that SYNTHETIC_EXPIRY and SYNTHETIC_TENOR are not currently used.

Strike Types Details

Surface Type	Definition
Strike	<p>Absolute strike.</p> <p>Offset Points</p> <p>In the Offset panel, enter absolute strikes.</p>

Surface Type	Definition
	<div> <div>Strike</div> <div></div> <div>AddRemove</div> <div>9999.299.5</div> </div> <p>Underlying Instruments</p> <p>The underlying instruments must be specified using an absolute strike.</p> <div> <div>Strike</div> <div>3.10000</div> <div><input type="checkbox"/> Relative ATM</div> </div>
Relative Spread	<p>Current strike +/- spread minus ATM strike (in %).</p> <p>Offset Points</p> <p>In the Offset panel, enter relative spreads over the current strike in %. Make sure to add 0.</p> <div> <div>Relative Spread</div> <div></div> <div>AddRemove</div> <div>-101</div> </div> <p>Underlying Instruments</p> <p>The underlying instruments must be specified using a relative strike in %. In this example the relative strike is -1%.</p> <div> <div>Strike</div> <div>-1.00000</div> <div><input checked="" type="checkbox"/> Relative ATM</div> </div> <p>Note that when using a relative strike, one of the underlying instruments must be defined with a strike of 0.</p>

Surface Type	Definition
	<div> <div>Strike</div> <div>0.00000</div> <div> <input checked="" type="checkbox"/> Relative ATM </div> </div>
Strike Offset BPs	<p>Current strike +/- offset minus ATM strike (in bp).</p> <p>Offset Points</p> <p>In the Offset panel, enter relative offset over the current strike in bp Make sure to add 0.</p> <div> <div>Strike Offset bp</div> <div> <input type="text"/> </div> <div> <div>Add</div> <div>Remove</div> </div> <div> <div>-20</div> <div>0</div> <div>20</div> </div> </div> <p>Underlying Instruments</p> <p>The underlying instruments must be specified using a relative strike in bp. In this example the relative strike is +25bp.</p> <div> <div>Strike</div> <div>25.00000</div> <div> <input checked="" type="checkbox"/> Relative ATM </div> </div> <p>Note that when using a relative strike, one of the underlying instruments must be defined with a strike of 0.</p> <div> <div>Strike</div> <div>0.00000</div> <div> <input checked="" type="checkbox"/> Relative ATM </div> </div>
Relative %	<p>% (current strike) minus ATM strike.</p> <p>Offset Points</p> <p>In the Offset panel, enter a percentage of the current strike.</p>

Surface Type	Definition
	<div> <div>Relative %</div> <div> <input type="text"/> </div> <div> <div>Add</div> <div>Remove</div> </div> <div> 85 100 115 </div> </div> <p>Underlying Instruments</p> <p>The underlying instrument must be specified using a percentage of the current strike. In this example, it is 85% of the current strike.</p> <div> <div>Strike</div> <div>85.00000</div> <div> <input checked="" type="checkbox"/> Relative ATM </div> </div>

2.2 Offsets Panel

Select the Offsets panel.

Definition
Offsets
Points
Graph

Expiration

1M
6M
1Y
3Y
5Y

Add

D
▼

Specific Expiration

Add

Remove

Strike

Add

Remove

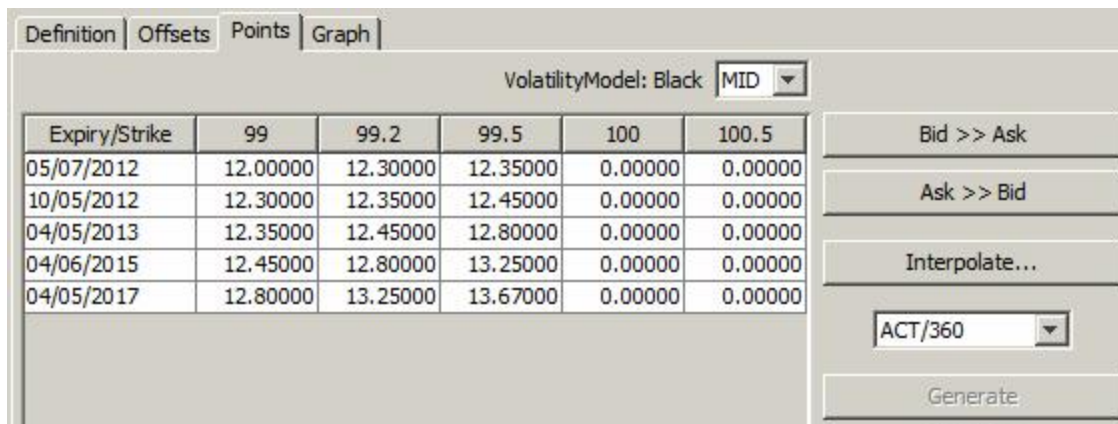
99
99.2
99.5
100
100.5

» Click to select expirations.

- » Enter a strike and click **Add**. Repeat for each strike value.

2.3 Points Panel

Select the Points panel, and click **Generate** to generate the points.



Expiry/Strike	99	99.2	99.5	100	100.5
05/07/2012	12.00000	12.30000	12.35000	0.00000	0.00000
10/05/2012	12.30000	12.35000	12.45000	0.00000	0.00000
04/05/2013	12.35000	12.45000	12.80000	0.00000	0.00000
04/06/2015	12.45000	12.80000	13.25000	0.00000	0.00000
04/05/2017	12.80000	13.25000	13.67000	0.00000	0.00000

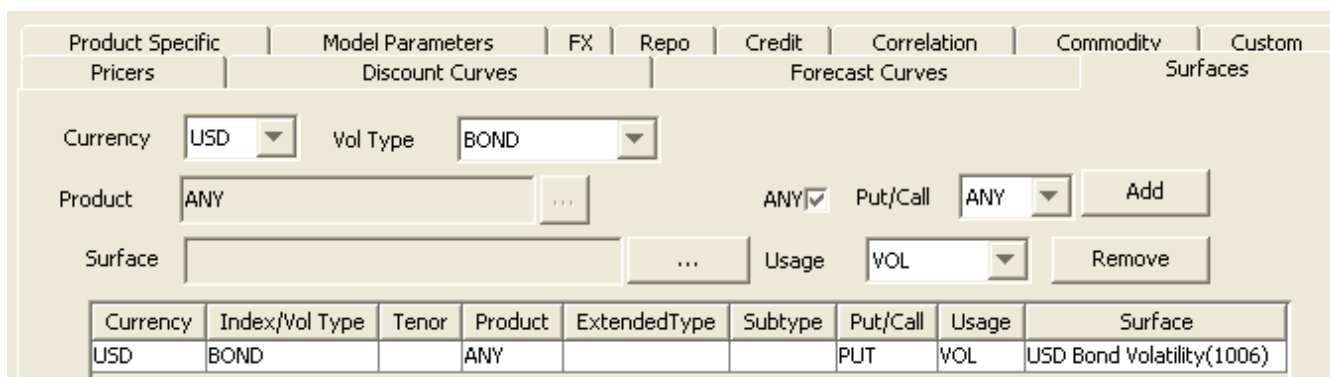
In this example, volatilities are entered manually. Volatilities can also be copied from Excel.

2.4 Save Surface

Click **Save** in the bottom of the surface window. Enter a name for the surface, and click **OK**.

2.5 Pricer Configuration

From the Calypso Navigator, navigate to **Market Data > Pricing Environment > Pricer Configuration**. Load a pricer configuration and select the Surfaces panel.



Currency	Index/Vol Type	Tenor	Product	ExtendedType	Subtype	Put/Call	Usage	Surface
USD	BOND		ANY			PUT	VOL	USD Bond Volatility(1006)

- » Select the currency and BOND volatility type.
- » Select a product or click ANY, and select PUT / CALL / or ANY.
- » Select the VOL usage.

- » Click **...** to select the volatility surface.
- » Click **Add** to add the surface to the list.
- » Click **Save** to save the pricer configuration.

3. BOND FUTURE Volatility Surface

From the Calypso Navigator, navigate to **Market Data > Volatilities > Volatility Surface** (menu action `marketdata.VolatilitySurface3DWindow`).

BONDFUTURE volatility surfaces can be created from offset points using the Default generation algorithm.

► See also [Volatility Surface Overview](#).

BONDFUTURE Volatility Surface Quick Reference

Configuration Requirements

- Bond futures are created using **Configuration > Listed Derivatives > Future contracts** from the Calypso Navigator.

Surface Generation

- Click **New** to start a new surface.
- The Current checkbox is selected by default, meaning that when you save the surface, the system timestamps the surface with the current date and time. Clear the Current checkbox to enter a back-dated surface. You can modify the date and time fields.
- Definition Panel — Select the following to define the surface: currency, volatility type “BONDFUTURE”, bond future product, strike type, interpolator, vol model, the Derived checkbox should not be selected, Default generator, date-roll convention, holiday calendars, pricing environment.
- Offsets Panel — Select expirations, and enter strikes.
- Points Panel — Click **Generate** to generate the points. Enter the point values.
- Click **Save**, enter a name for the surface, and click **OK**.

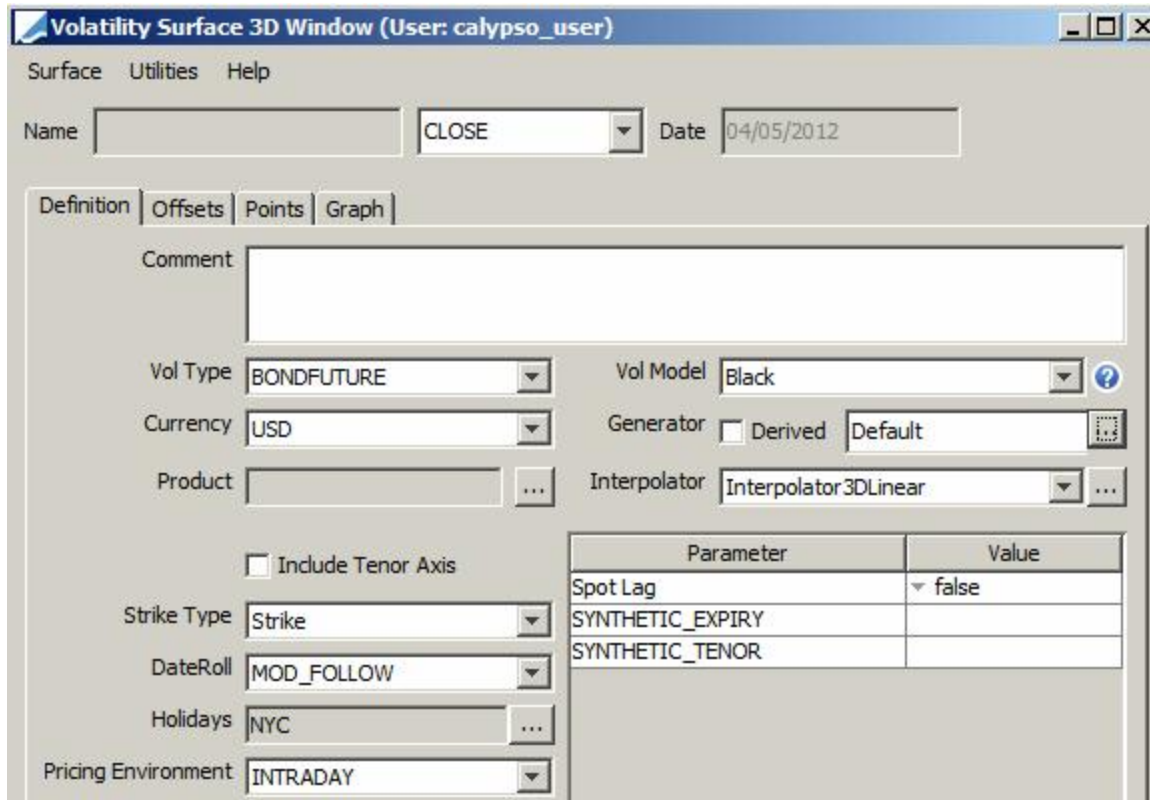
Pricer Configuration

A BONDFUTURE volatility surface is associated with a pricing environment under the Surfaces panel of the pricer configuration for the BONDFUTURE volatility type and VOL usage.

3.1 Definition Panel

Click **New** to start a new surface.

Select the following to define the surface: currency, volatility type “BONDFUTURE”, bond future product, strike type, interpolator, vol model, the Derived checkbox should not be selected, Default generator, date-roll convention, holiday calendars, pricing environment.



Volatility Surface 3D Window (User: calypso_user)

Surface Utilities Help

Name: CLOSE Date: 04/05/2012

Definition | Offsets | Points | Graph

Comment:

Vol Type: BONDFUTURE Vol Model: Black

Currency: USD Generator: ☐ Derived Default

Product: Interpolator: Interpolator3DLinear

☐ Include Tenor Axis

Strike Type: Strike

DateRoll: MOD_FOLLOW

Holidays: NYC

Pricing Environment: INTRADAY

Parameter	Value
Spot Lag	false
SYNTHETIC_EXPIRY	
SYNTHETIC_TENOR	

- » Select the type of strike: Strike or Strike Offsets BPs - They are described below.
- » Select the "Default" generation algorithm.

If the spot lag parameter is set to true, the generated exercise dates are rolled using the conventions of the definition screen.

Note that SYNTHETIC_EXPIRY and SYNTHETIC_TENOR are not currently used.

Strike Types Details

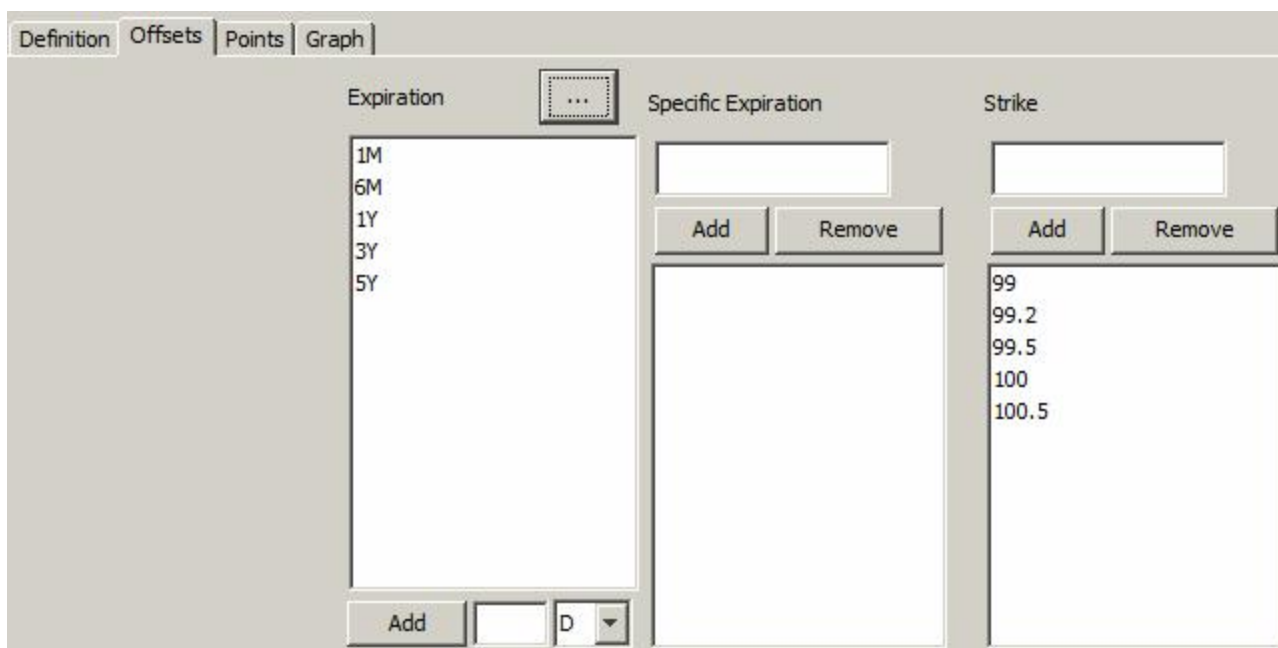
Surface Type	Definition
Strike	<p>Absolute strike.</p> <p>Offset Points</p> <p>In the Offset panel, enter absolute strikes.</p>

Surface Type	Definition
	<div> <div>Strike</div> <div></div> <div>AddRemove</div> <div>9999.299.5</div> </div> <p>Underlying Instruments</p> <p>The underlying instruments must be specified using an absolute strike.</p> <div> <div>Strike</div> <div>3.10000</div> <div><input type="checkbox"/> Relative ATM</div> </div>
Strike Offset BPs	<p>Current strike +/- offset minus ATM strike (in bp).</p> <p>Offset Points</p> <p>In the Offset panel, enter relative offset over the current strike in bp Make sure to add 0.</p> <div> <div>Strike Offset bp</div> <div></div> <div>AddRemove</div> <div>-20020</div> </div> <p>Underlying Instruments</p> <p>The underlying instruments must be specified using a relative strike in bp. In this example the relative strike is +25bp.</p> <div> <div>Strike</div> <div>25.00000</div> <div><input checked="" type="checkbox"/> Relative ATM</div> </div> <p>Note that when using a relative strike, one of the underlying instruments must be defined with a strike of 0.</p>

Surface Type	Definition
	<div>Strike 0.00000</div> <div><input checked="" type="checkbox"/> Relative ATM</div>

3.2 Offsets Panel

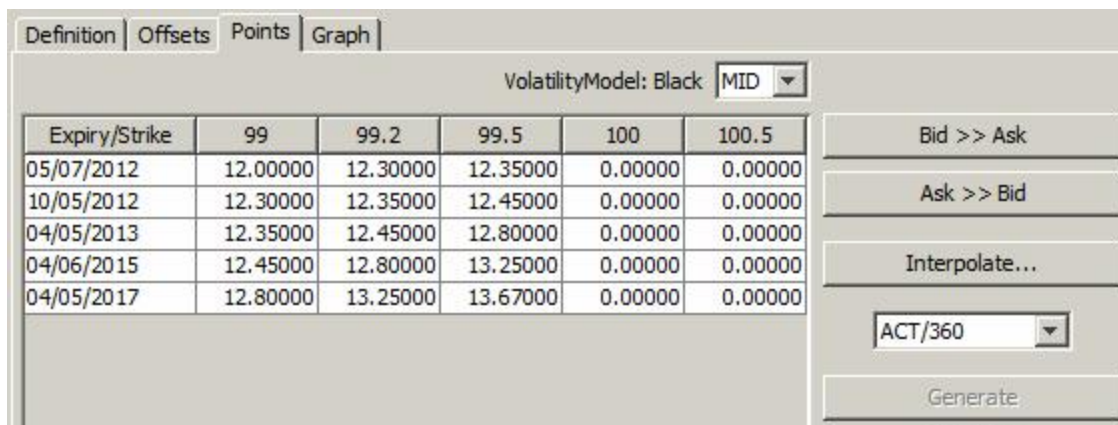
Select the Offsets panel.



- » Click **...** to select expirations.
- » Enter a strike and click **Add**. Repeat for each strike value.

3.3 Points Panel

Select the Points panel, and click **Generate** to generate the points.



Expiry/Strike	99	99.2	99.5	100	100.5
05/07/2012	12.00000	12.30000	12.35000	0.00000	0.00000
10/05/2012	12.30000	12.35000	12.45000	0.00000	0.00000
04/05/2013	12.35000	12.45000	12.80000	0.00000	0.00000
04/06/2015	12.45000	12.80000	13.25000	0.00000	0.00000
04/05/2017	12.80000	13.25000	13.67000	0.00000	0.00000

In this example, volatilities are entered manually. Volatilities can also be copied from Excel.

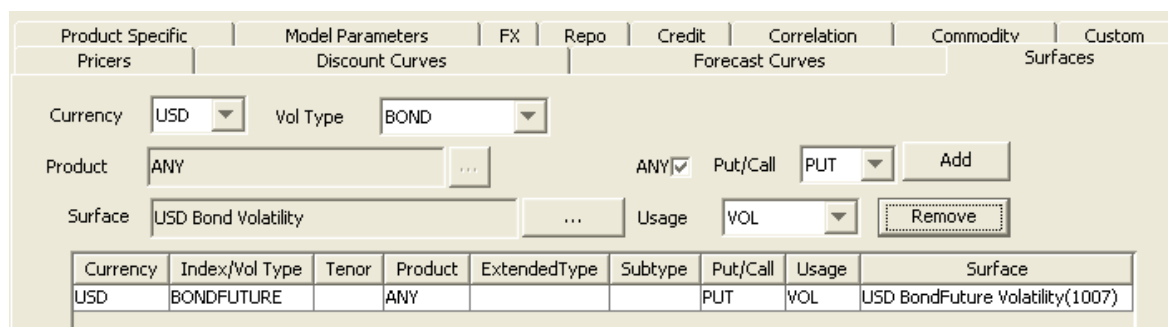
3.4 Save Surface

Click **Save** in the bottom of the surface window. Enter a name for the surface, and click **OK**.

3.5 Pricer Configuration

From the Calypso Navigator, navigate to **Market Data > Pricing Environment > Pricer Configuration**.

- » Click **Load**, select the pricer configuration name, and click **OK**.
- » Click the Surfaces tab to bring it to the front.



Currency	Index/Vol Type	Tenor	Product	ExtendedType	Subtype	Put/Call	Usage	Surface
USD	BONDFUTURE		ANY			PUT	VOL	USD BondFuture Volatility(1007)

- » Select the currency and BONDFUTURE volatility type.
- » Select a product or click ANY, and select PUT / CALL / or ANY.
- » Select the VOL usage.
- » Click **...** to select the volatility surface.
- » Click **Add** to add the surface to the list.
- » Click **Save** to save the pricer configuration.

4. BOND OPTION Volatility Surface

From the Calypso Navigator, navigate to **Market Data > Volatilities > Volatility Surface** (menu action `marketdata.VolatilitySurface3DWindow`).

Bond Option volatility surfaces are created by combining a volatility surface created from underlying instruments, and a volatility surface of coefficients for quadratic adjustments.

Follow the steps below to build the Bond Option volatility surface that will be used for pricing bond options.

► See also [Volatility Surface Overview](#).

Bond Option Volatility Surface Quick Reference

Surface Generation

- Step 1 – Create a BondOption volatility surface from underlying instruments for ATM volatilities.
- Step 2 – Create a volatility surface for quadratic adjustments from offsets, using the generator `QuadraticSmileParams`.
- Step 3 – Create the final volatility surface by combining the surface previously created.

Pricer Configuration

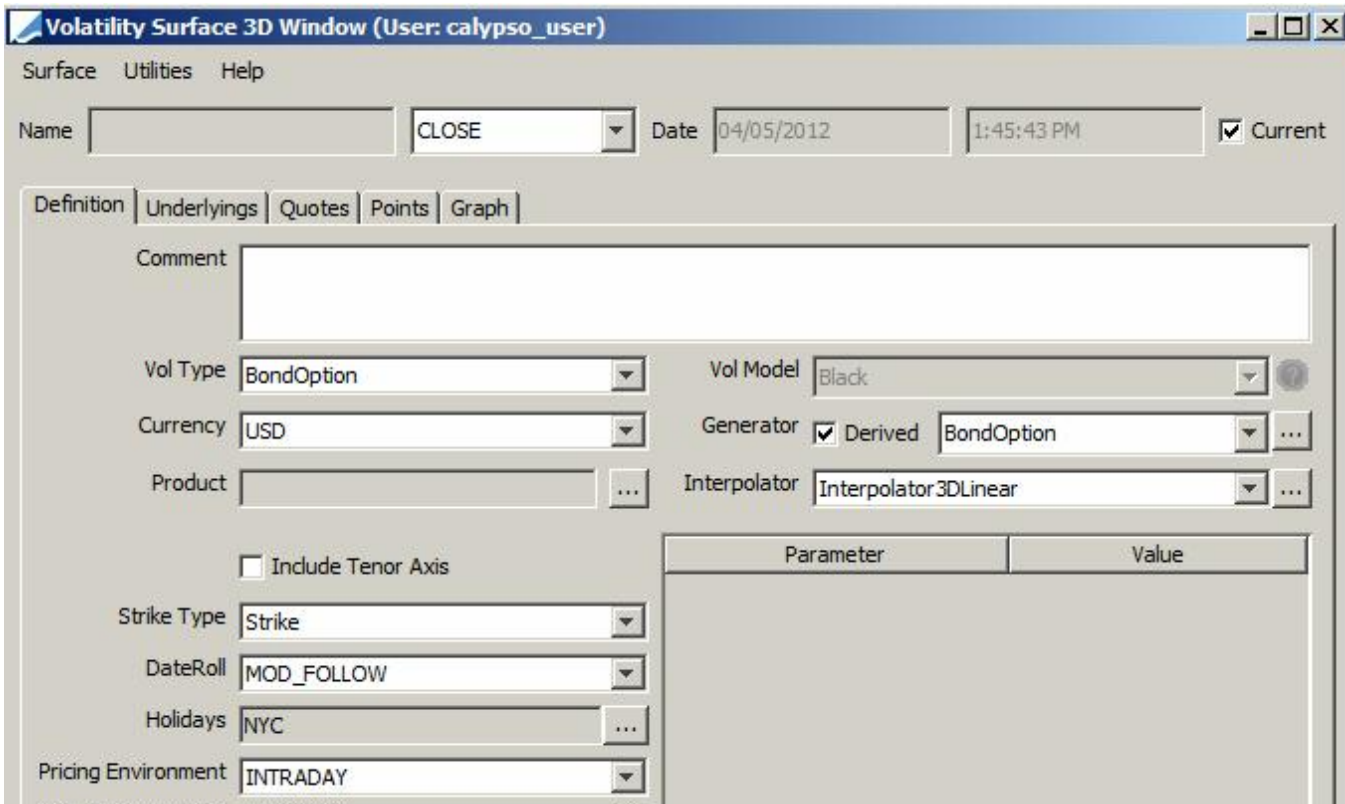
A BondOption volatility surface is associated with a pricing environment under the Surfaces panel of the pricer configuration for the BondOption volatility type and VOL usage.

4.1 Step 1 - Volatility Surface from Bond Options

Click **New** to start a new surface.

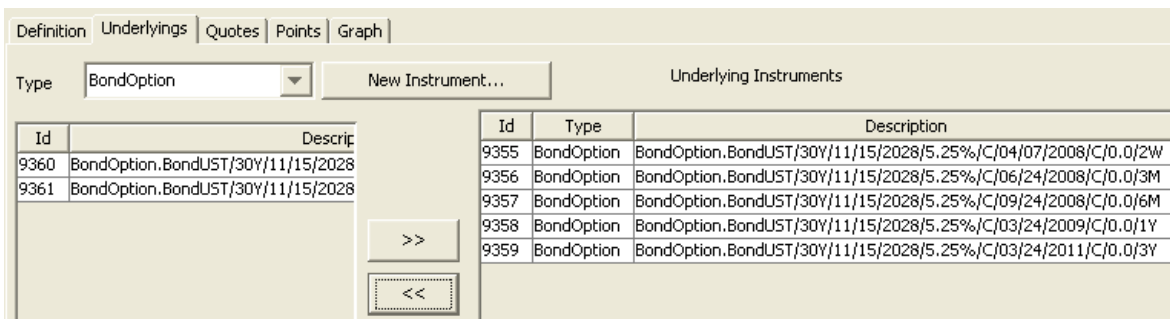
4.1.1 Definition Panel

Select the following to define the surface: currency, product, volatility type “BondOption”, strike type, interpolator, check the Derived checkbox, generator BondOption, date-roll convention, holiday calendars, pricing environment.



4.1.2 Underlyings Panel

Select the Underlyings panel.



Id	Type	Description
9360	BondOption	BondOption.BondUST/30Y/11/15/2028
9361	BondOption	BondOption.BondUST/30Y/11/15/2028
9355	BondOption	BondOption.BondUST/30Y/11/15/2028/5.25%/C/04/07/2008/C/0.0/2W
9356	BondOption	BondOption.BondUST/30Y/11/15/2028/5.25%/C/06/24/2008/C/0.0/3M
9357	BondOption	BondOption.BondUST/30Y/11/15/2028/5.25%/C/09/24/2008/C/0.0/6M
9358	BondOption	BondOption.BondUST/30Y/11/15/2028/5.25%/C/03/24/2009/C/0.0/1Y
9359	BondOption	BondOption.BondUST/30Y/11/15/2028/5.25%/C/03/24/2011/C/0.0/3Y

- » Select BondOption from the Type field and select bond options, then click ... to add them to the list of underlying instruments.

4.1.3 Quotes Panel

Select the Quotes panel, and enter quotes for the underlying instruments as needed.

Definition	Underlyings	Quotes	Points	Graph
Quote Name		Type	CLOSE	
BondOTC.USD.C.2W.UST.0.0		▼ Yield	5.32000000	
BondOTC.USD.C.3M.UST.0.0		▼ Yield	5.45000000	
BondOTC.USD.C.6M.UST.0.0		▼ Yield	5.68000000	
BondOTC.USD.C.1Y.UST.0.0		▼ Yield	5.85000000	
BondOTC.USD.C.3Y.UST.0.0		▼ Yield	6.02000000	

» You can click **Save Quotes** to save the quotes.

4.1.4 Points Panel

Select the Points panel. Click **Generate** to generate the points.

Definition	Underlyings	Quotes	Points	Graph
VolatilityModel: Black MID				
Expiry/Strike	92	95	98	
04/05/2013	0.00000	0.00000	532.00000	Bid >> Ask
04/06/2015	0.00000	545.00000	0.00000	Ask >> Bid
04/05/2017	575.00000	0.00000	0.00000	Interpolate...
				ACT/360
				Generate

4.1.5 Save Surface

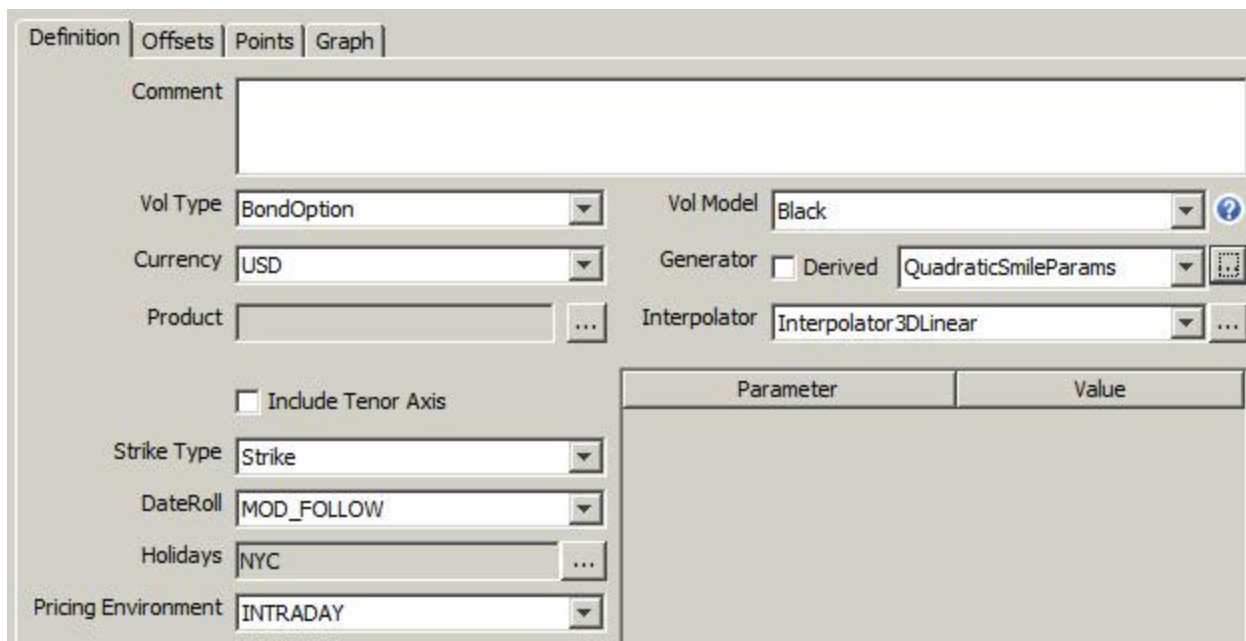
Click **Save** in the bottom of the surface window. Enter a name for the surface, and click **OK**.

4.2 Step 2 – Quadratic Adjustments Volatility Surface

Click **New** to start a new surface.

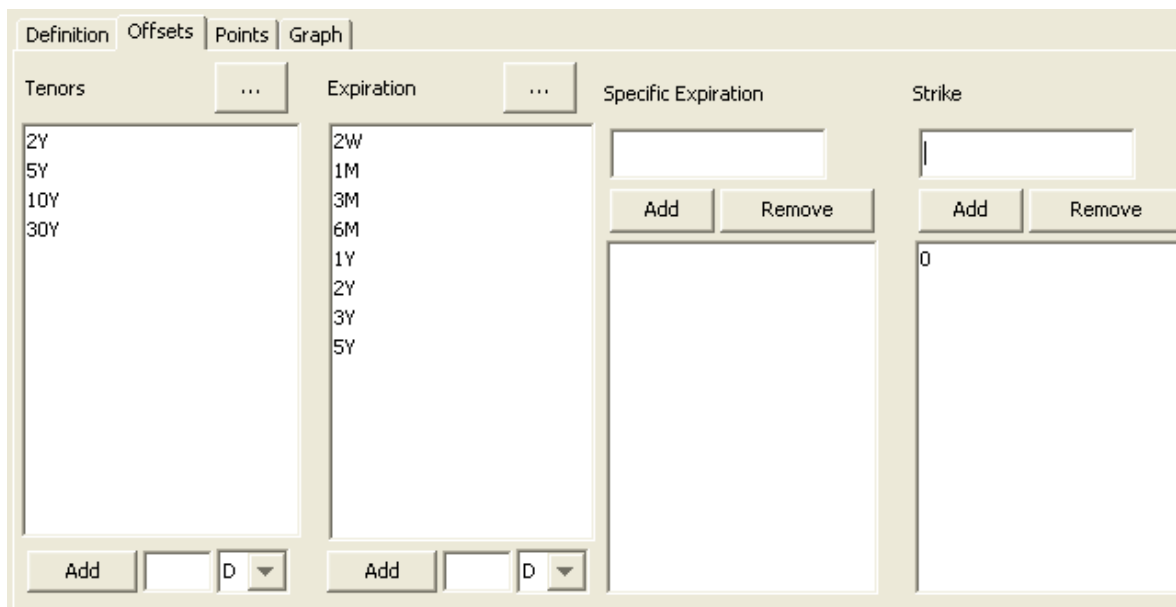
4.2.1 Definition Panel

Select the following to define the surface: currency, volatility type “BondOption”, bond product, strike type, interpolator, vol model, the Derived checkbox should not be checked, generator QuadraticSmileParams, date-roll convention, holiday calendars, pricing environment.



4.2.2 Offsets Panel

Select the Offsets panel.



- » Select the tenors and expirations.
- » Enter 0 in the Strike field and click **Add**.

4.2.3 Points Panel

Select the Points panel, and click **Generate** to generate the points.

Select QuadAlpha / QuadBeta from the Volatility Model field, and enter the adjustments.



Expiry/Tenor	2Y	5Y	10Y	30Y
04/19/2012	0.25000	0.25000	0.20000	0.18000
05/07/2012	0.25000	0.20000	0.18000	0.12000
07/05/2012	0.20000	0.18000	0.12000	0.10000
10/05/2012	0.18000	0.12000	0.10000	0.05000
04/05/2013	0.12000	0.10000	0.05000	0.04000
04/07/2014	0.10000	0.05000	0.04000	0.03000
04/05/2017	0.05000	0.04000	0.03000	0.01000

4.2.4 Save Surface

Click **Save** in the bottom of the surface window. Enter a name for the surface, and click **OK**.

4.3 Step 3 – Final Bond Option Volatility Surface

Click **New** to start a new surface.

4.3.1 Definition Panel

Select the following to define the surface: currency, volatility type “BondOption”, bond product, strike type Delta, interpolator, vol model, the Derived checkbox should not be checked, generator BondOptionQuadraticSmile, date-roll convention, holiday calendars, pricing environment.

Definition
Offsets
Points
Graph

Comment

Vol Type
BondOption
Vol Model
Black

Currency
USD
Generator
☐ Derived
BondOptionQuadraticSmile

Product
Interpolator
Interpolator3DLinear

☐ Include Tenor Axis

Strike Type
Delta

DateRoll
MOD_FOLLOW

Holidays
NYC

Pricing Environment
INTRADAY

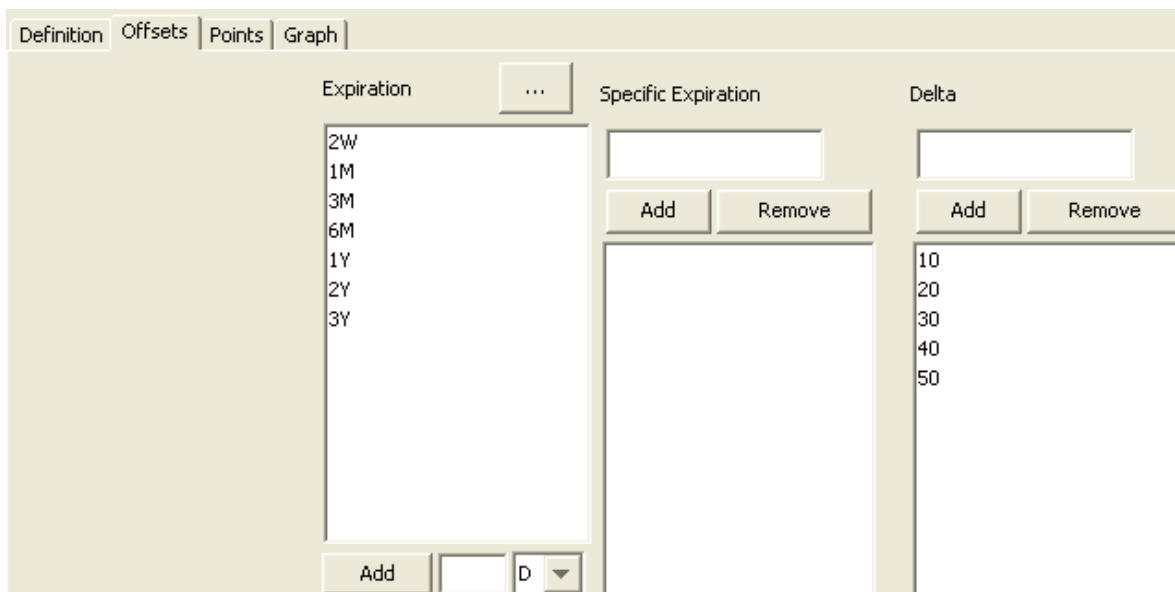
Parameter	Value
DURATION_LIQUIDITY_CORRECTED	false

MDI Name	Value
Simple smile	Quad Adj 4/5/12 3:20:37.000 PM PDT
ATM Vol Surface	Bond Option ATM Volatility 4/5/12 3:...

» In the MDI area, select the quadratic adjustments volatility surface, and the ATM volatility surface.

4.3.2 Offsets Panel

Select the Offsets panel.



- » Select the expirations.
- » Enter the deltas.

4.3.3 Points Panel

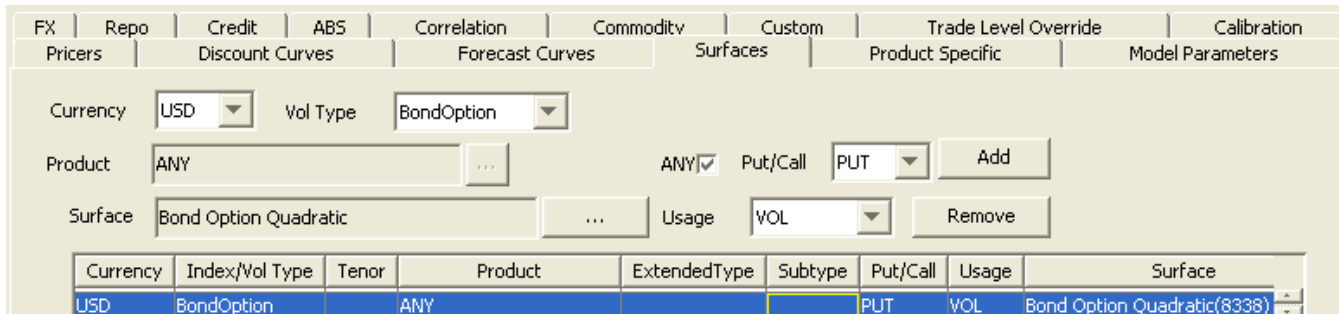
Select the Points panel, and click **Generate** to generate the points.

4.3.4 Save Surface

Click **Save** in the bottom of the surface window. Enter a name for the surface, and click **OK**.

4.4 Pricer Configuration

From the Calypso Navigator, navigate to **Market Data > Pricing Environment > Pricer Configuration**. Load a pricer configuration and select the Surfaces panel.



Currency	Index/Vol Type	Tenor	Product	ExtendedType	Subtype	Put/Call	Usage	Surface
USD	BondOption	ANY				PUT	VOL	Bond Option Quadratic(8338)

- » Select the currency and BondOption volatility type.

- » Select a product or click ANY, and select PUT / CALL / or ANY.
- » Select the VOL usage.
- » Click **...** to select the volatility surface.
- » Click **Add** to add the surface to the list.
- » Click **Save** to save the pricer configuration.

5. COMMODITY Volatility Surface

From the Calypso Navigator, navigate to **Market Data > Volatilities > Volatility Surface** (menu action `marketdata.VolatilitySurface3DWindow`).

This page describes setting up:

- [The COMMODITY volatility surface from offsets](#) using this CommoditySimple generator
- [The derived COMMODITY volatility surface](#) using the Moneyness and CommodityDelta generator
- [Pricer configuration](#)

► See also [Volatility Surface Overview](#).

5.1 Generating a COMMODITY Volatility Surface from Offsets

COMMODITY Volatility Surface from Offsets Quick Reference

Configuration Requirements

- Commodity Product – Define the commodity as a product in the system. From the Calypso Navigator, navigate to **Configuration > Commodities > Commodities**.

Surface Generation

1. Click **New** to start a new surface.
2. The Current checkbox is selected by default, meaning that when you save the surface, the system timestamps the surface with the current date and time. Clear the Current checkbox to enter a back-dated surface. You can modify the date and time fields.
3. Definition Panel — Select the following to define the surface: currency, volatility type “Commodity”, click **...** to select the commodity product, volatility quote type, “Derived” should not be selected so that you can create the surface from offsets, CommoditySimple generator.
4. Offsets Panel — Select the tenor and expirations. Enter the strikes or relative moneyness.
5. Points Panel — Click **Generate** to generate the points. Enter the market volatilities.
6. Click **Save**, enter a name for the surface, and click **OK**.

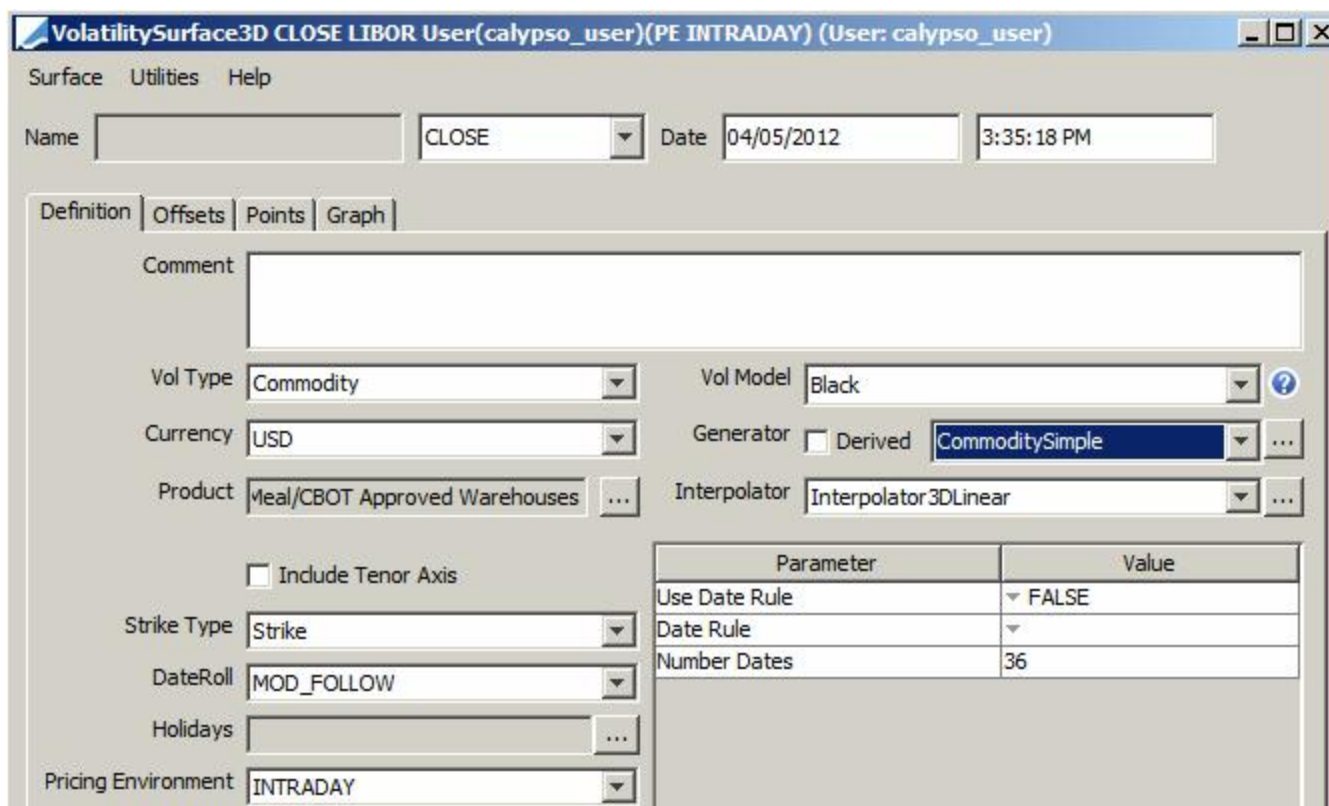
Pricer Configuration

A COMMODITY volatility surface is associated with a pricing environment under the Surfaces panel of the pricer configuration for the volatility type Commodity and the usage VOL.

5.1.1 Definition Panel

Click **New** to start a new surface.

Select the following to define the surface: currency, volatility type "Commodity", click **...** to select the commodity product, "Derived" should not be selected so that you can create the surface from offsets, select the CommoditySimple generator.



» You can set the following CommoditySimple generator parameters.

Parameter	Description
Use Date Rule	Set to "TRUE" to use a date rule to generate the dates, instead of selecting tenors in the Offset panel.
Date Rule	Select a date rule to generate the tenors. Create date rules using Configuration > Definitions > Date Rule Definitions from the Calypso Navigator.
Number Dates	Enter the number of dates you want to generate in the Number Dates parameter.

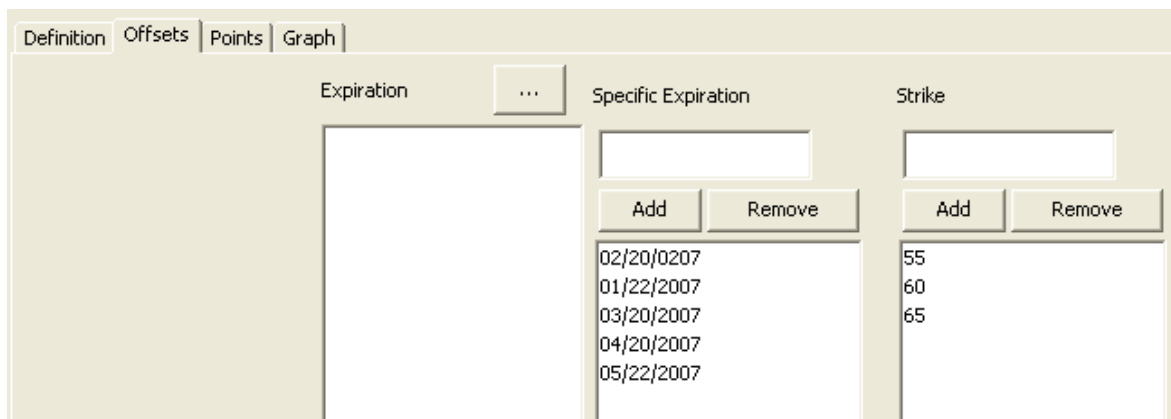
» Select the strike type: Strike or Relative %.

Surface Type	Definition
Strike	In the Offset panel, enter absolute strikes.

Surface Type	Definition
	<div>Strike</div> <div><div></div></div> <div><div>Add</div><div>Remove</div></div> <div><div>55</div><div>60</div><div>65</div></div>
Relative %	<div>In the Offset panel, enter relative moneyyness.</div> <div><div>- 100% means the strike is equal to forward projected price</div><div>- 50% means the strike is 50% of the forward projected price</div><div>- 150% means the strike is 150% of the forward projected price</div></div> <div><div>Relative %</div><div><div></div></div><div><div>Add</div><div>Remove</div></div><div><div>50</div><div>100</div><div>150</div></div></div>

5.1.2 Offsets Panel

Select the Offsets panel.

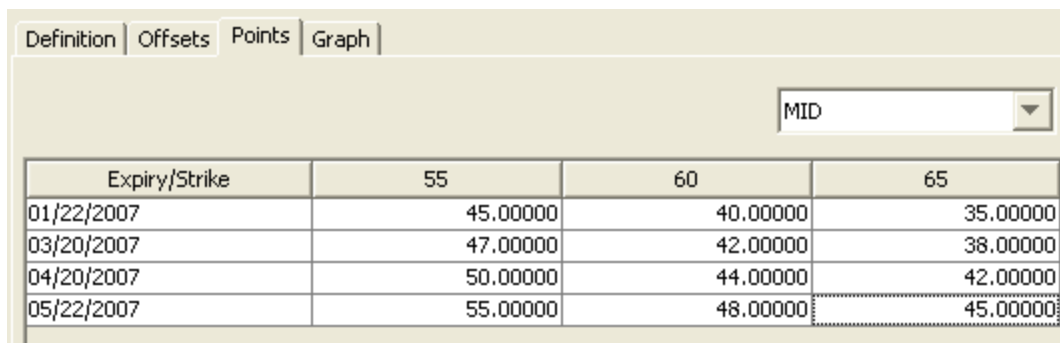


Expiration	Specific Expiration	Strike
	Add Remove	Add Remove
	02/20/2007	55
	01/22/2007	60
	03/20/2007	65
	04/20/2007	
	05/22/2007	

- » Select the expirations. Click **...** to select the expirations by tenor. Alternatively, enter the specific dates for the expirations and click **Add** to add the dates to the panel below.
[NOTE: If the generation parameter “Use Date Rule” is true, you only need to enter strikes or relative moneyness, the dates are automatically generated using the selected date rule.]
- » Enter the strikes or relative moneyness and click **Add**. Repeat for each strike or relative moneyness.

5.1.3 Points Panel

Select the Points panel.



Expiry/Strike	55	60	65
01/22/2007	45.00000	40.00000	35.00000
03/20/2007	47.00000	42.00000	38.00000
04/20/2007	50.00000	44.00000	42.00000
05/22/2007	55.00000	48.00000	45.00000

- » Click **Generate** to generate the surface.
- » Enter market volatilities.

5.1.4 Save Surface

Click **Save** in the bottom of the surface window. Enter a name for the surface, and click **OK**.

5.2 Derived Commodity Volatility Surface Generator

5.2.1 Generating a Derived Delta based COMMODITY Volatility Surface

Commodity Volatility Surface from Underlying Instruments – CommodityDelta & CommodityVolatilitySpread Generators Quick Reference

Configuration Requirements

- Commodity Product – Define the commodity as a product in the system. From the Calypso Navigator, navigate to **Configuration > Commodities > Commodities**.

Surface Underlying Instruments

You can use Commodity Option underlying instruments. From the Calypso Navigator, navigate to **Configuration > Market Data > Volatility Surface Underlyings**, or in the surface application's Underlyings panel, click **New Instrument**.

Surface Generation

- Click **New** to start a new surface.
- Select the quote instance to use in the surface generation (CLOSE, LAST, or OPEN).
- The Current checkbox is selected by default, meaning that when you save the surface, the system timestamps the surface with the current date and time. Clear the Current checkbox to enter a back-dated surface. You can modify the date and time fields.
- Definition Panel — Select the following to define the surface: currency, volatility type "Commodity", click **...** to select the commodity product, "Derived" should be selected, select the "Delta" strike type, select the CommodityDelta or CommodityVolatilitySpread generator.
- Underlyings Panel — Select the underlying instruments. For the CommodityVolatilitySpread generator, the spread underlying has to match that of the underlying surface.
- Quotes Panel — Enter quotes manually, use quotes from the quote set, or use real-time quotes.
- Points Panel — Click **Generate** to generate the points.
- Click **Save**, enter a name for the surface, and click **OK**.

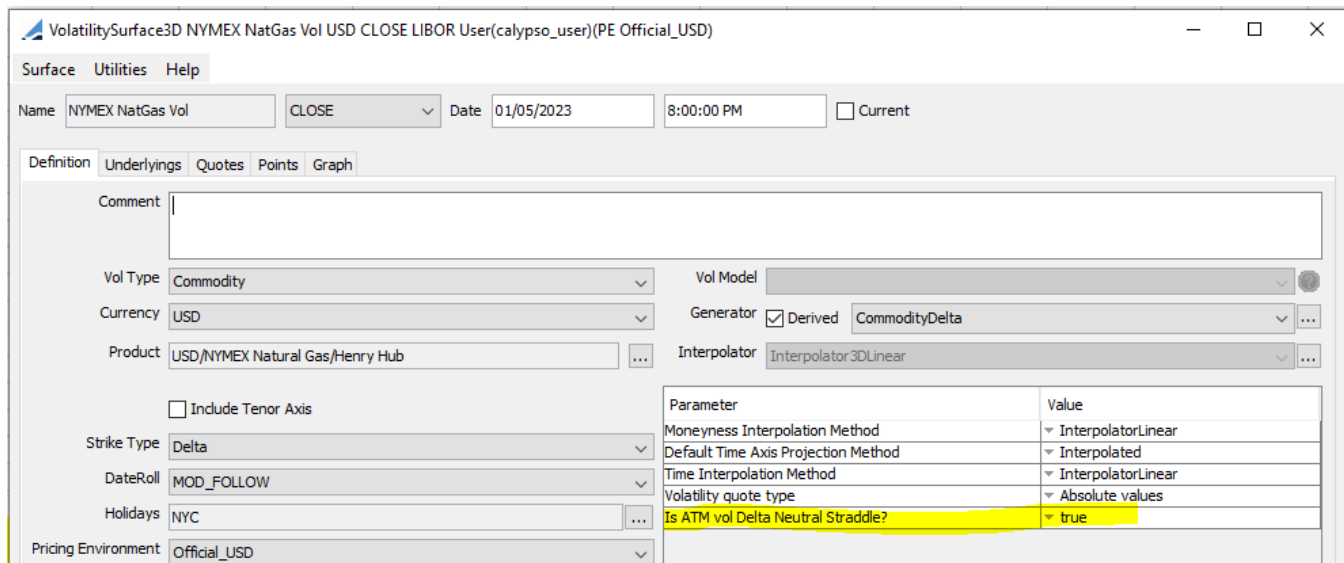
Pricer Configuration

- A COMMODITY volatility surface is associated with a pricing environment under the Surfaces panel of the pricer configuration for the volatility type Commodity and the usage VOL.
- The VOLATILITY pricing parameter allows you to set a constant volatility for a given product, which allows you to price CMD products without the need to generate a vol surface. If your vol surface is in the pricing environment but not being picked up, check to see if this parameter is set in your pricing environment.

5.2.1.1 Definition Panel

Click **New** to start a new surface.

Select the following to define the surface: currency, volatility type “Commodity”, click ... to select the commodity product, “Derived” should be selected, select the “Delta” surface type, select the CommodityDelta or CommodityVolatilitySpread generator (click ... to add the generator as needed).



Parameter	Value
Moneyness Interpolation Method	InterpolatorLinear
Default Time Axis Projection Method	Interpolated
Time Interpolation Method	InterpolatorLinear
Volatility quote type	Absolute values
Is ATM vol Delta Neutral Straddle?	true

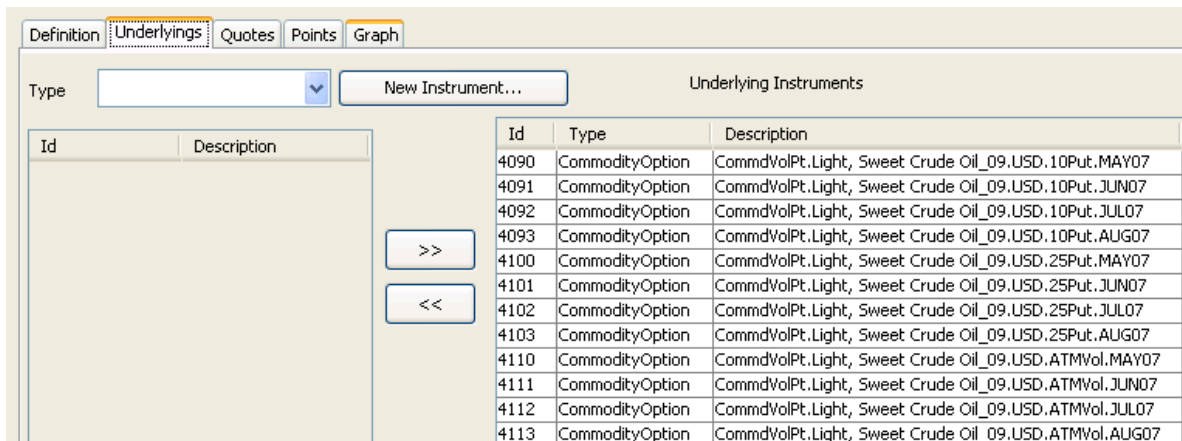
» You can set the following generator parameters as desired.

Parameter	Description
Moneyness Interpolation Method	You can select an interpolation method for the moneyness axis independently of the extrapolation method.
Default Time Axis Projection Method	You can select the projection method as Interpolated or Use Commodity Reset.
Time Interpolation Method	Can be selected as <i>InterpolatorLinear</i> or <i>InterpolatorPiecewiseConstantRight</i> . <i>InterpolatorLinear</i> interpolates for the trade option expiry from the vol surface expiry dates linearly. When using <i>InterpolatorPiecewiseConstantRight</i> interpolator, if the trade option expiry is greater than “an” expiry pillar of the vol surface, the interpolator will return the next expiry pillar’s volatility.
Is ATM vol Delta Neutral Straddle	To control whether the ATM vol corresponds to Moneyness as 1 (false) or to the delta neutral strike (true). Default value is false which keeps backward compatibility. Note: When Parameter is set to TRUE, ATM Vol would represent 50Delta. If FALSE, ATM Vol would represent Moneyness as 1.

Parameter	Description
Volatility quote type	Select the quote type for the quotes: <ul style="list-style-type: none"> “Spread values relative to ATM”, to set the quotes as spread values over the ATM volatility (quote type VolatilitySpread) “Absolute values”, to set the quotes as actual volatilities (quote type Volatility)

5.2.1.2 Underlyings Panel

Select the Underlyings panel.

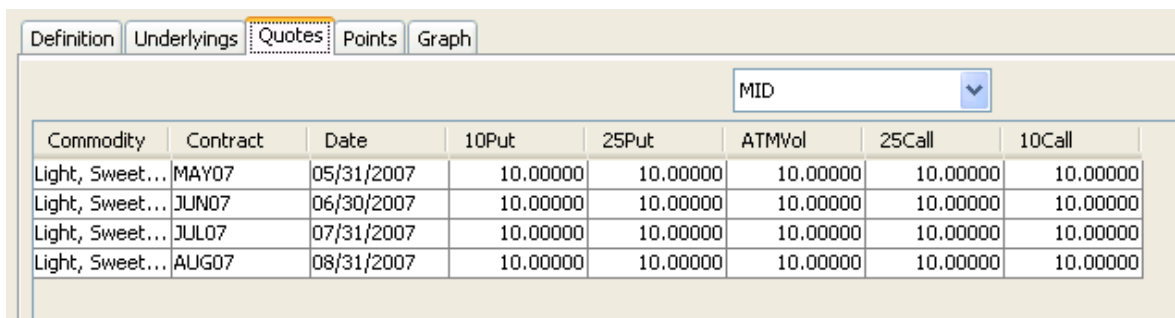


Id	Type	Description
4090	CommodityOption	CommdVolPt.Light, Sweet Crude Oil_09.USD.10Put.MAY07
4091	CommodityOption	CommdVolPt.Light, Sweet Crude Oil_09.USD.10Put.JUN07
4092	CommodityOption	CommdVolPt.Light, Sweet Crude Oil_09.USD.10Put.JUL07
4093	CommodityOption	CommdVolPt.Light, Sweet Crude Oil_09.USD.10Put.AUG07
4100	CommodityOption	CommdVolPt.Light, Sweet Crude Oil_09.USD.25Put.MAY07
4101	CommodityOption	CommdVolPt.Light, Sweet Crude Oil_09.USD.25Put.JUN07
4102	CommodityOption	CommdVolPt.Light, Sweet Crude Oil_09.USD.25Put.JUL07
4103	CommodityOption	CommdVolPt.Light, Sweet Crude Oil_09.USD.25Put.AUG07
4110	CommodityOption	CommdVolPt.Light, Sweet Crude Oil_09.USD.ATMVol.MAY07
4111	CommodityOption	CommdVolPt.Light, Sweet Crude Oil_09.USD.ATMVol.JUN07
4112	CommodityOption	CommdVolPt.Light, Sweet Crude Oil_09.USD.ATMVol.JUL07
4113	CommodityOption	CommdVolPt.Light, Sweet Crude Oil_09.USD.ATMVol.AUG07

- » Select the instrument type to display the list of available instruments. The panel is blank if you have not set up any instruments. Click **New Instruments** to create new instruments.
- » Select instruments and click **>>** to add them to the instrument list in the right panel.

5.2.1.3 Quotes Panel

Select the Quotes panel. Enter quotes for the underlying instruments; enter the delta quotes as spreads over the ATM volatility or as absolute values depending on the "Volatility quote type" generator parameter. For example, the value entered for the 25 Delta Call is the difference between the volatility for a call with a 25% (forward) delta and the volatility of an ATM (forward) option.



Commodity	Contract	Date	10Put	25Put	ATMVol	25Call	10Call
Light, Sweet...	MAY07	05/31/2007	10.00000	10.00000	10.00000	10.00000	10.00000
Light, Sweet...	JUN07	06/30/2007	10.00000	10.00000	10.00000	10.00000	10.00000
Light, Sweet...	JUL07	07/31/2007	10.00000	10.00000	10.00000	10.00000	10.00000
Light, Sweet...	AUG07	08/31/2007	10.00000	10.00000	10.00000	10.00000	10.00000

- » You can click **Save Quotes** to save the quotes.

5.2.1.4 Points Panel

Select the Points panel, and click **Generate** to generate the points.

Change the drop-down menu value to view Pillar Dates vs. Volatilities or Pillar Dates vs. Moneyness.

Definition

Underlyings

Quotes

Points

Graph

MID

Expiry/Delta	10Put	25Put	ATMVol	25Call	10Call
05/31/2007	20.00000	20.00000	10.00000	20.00000	20.00000
06/30/2007	20.00000	20.00000	10.00000	20.00000	20.00000
07/31/2007	20.00000	20.00000	10.00000	20.00000	20.00000
08/31/2007	20.00000	20.00000	10.00000	20.00000	20.00000

5.2.1.5 Save Surface

Click **Save** in the bottom of the surface window. Enter a name for the surface, and click **OK**.

5.2.2 Generating a Derived Moneyness based COMMODITY Volatility Surface

Commodity Volatility Surface from Underlying Instruments – Commodity & CommodityVolatilitySpread Generators Quick Reference

Configuration Requirements


- Commodity Product – Define the commodity as a product in the system. From the Calypso Navigator, navigate to **Configuration > Commodities > Commodities**.

Surface Underlying Instruments

You can use OTC Commodity Option underlying instruments. From the Calypso Navigator, navigate to **Configuration > Market Data > Volatility Surface Underlyings**, or in the surface application's Underlyings panel, click **New Instrument**.

Surface Generation

- Click **New** to start a new surface.
- Select the quote instance to use in the surface generation (CLOSE, LAST, or OPEN).
- The Current checkbox is selected by default, meaning that when you save the surface, the system timestamps the surface with the current date and time. Clear the Current checkbox to enter a back-dated surface. You can modify the date and time fields.



4. Definition Panel — Select the following to define the surface: currency, volatility type “Commodity”, click  to select the commodity product, “Derived” should be selected, select the “Relative %” strike type, select the Commodity or CommodityVolatilitySpread generator.
5. Underlyings Panel — Select the underlying instruments. For the CommodityVolatilitySpread generator, the spread underlying has to match that of the underlying surface.
6. Quotes Panel — Enter quotes manually, use quotes from the quote set, or use real-time quotes.
7. Points Panel — Click **Generate** to generate the points.
8. Click **Save**, enter a name for the surface, and click **OK**.

Pricer Configuration

- A COMMODITY volatility surface is associated with a pricing environment under the Surfaces panel of the pricer configuration for the volatility type Commodity and the usage VOL.
- The VOLATILITY pricing parameter allows you to set a constant volatility for a given product, which allows you to price CMD products without the need to generate a vol surface. If your vol surface is in the pricing environment but not being picked up, check to see if this parameter is set in your pricing environment.

5.2.2.1 Definition Panel

Click **New** to start a new surface.

Select the following to define the surface: currency, volatility type “Commodity”, click  to select the commodity product, “Derived” should be selected, select the “Relative%” surface type, select the Commodity or CommodityVolatilitySpread generator (click  to add the generator as needed).

Volatility Surface 3D Window

Surface Utilities Help

Name CLOSE Date ☒ Current

Definition Underlyings Quotes Points Spline

Comment

Vol Type Vol Model

Currency Generator ☒ Derived

Product Interpolator

☐ Include Tenor Axis

Strike Type

DateRoll

Holidays

Pricing Environment

Parameter	Value
Monotonicity	None
Boundary	Natural
Extrapolation	Linear
Data type	VarianceLogMoneyness
Interpolation in time	Linear in variance
Default Time Axis Projection Method	Interpolated
Local Vol Repair	SEARCH
Local Vol Cap	10.0
Local Vol Floor	1E-3

» You can set the following generator parameters as desired.

Parameter	Description
Monotonicity	This parameter offers the possibility to interpolate according to the monotonicity of the data, thereby removing the potential artificial oscillations stemming from cubic splines.
Default Time Axis Projection Method	You can select the projection method as Interpolated or Use Commodity Reset.
Extrapolation	<p>This parameter controls the extrapolation in the strike space.</p> <p>Flat will flat extrapolate the volatilities. Linear will extrapolate linearly using the slope of the first and last cubic polynomials so that the slice stays C2 with natural boundary conditions. Note that if the data type is variance, the extrapolation will be linear in variance, which is typical of stochastic volatility models behavior (for example Heston). The extrapolation is floored to machine epsilon to avoid negative variance.</p> <p>In general, we recommend Linear as it will lead to a smooth implied volatility and therefore a smooth local volatility with Natural spline boundaries, around the extrapolation.</p>
Data Type	<p>This parameters controls which data the spline is applied to.</p> <p>Volatility means that the spline is built from strikes and volatilities, strikes being in the unity defined in the volatility surface (absolute, relative, Delta for SplineSimple). Variance means that the spline is built from strikes and the square of volatilities, strikes being in the unity</p>

Parameter	Description
	defined in the volatility surface, and input volatilities being internally converted to variances. This is particularly interesting when combined with a linear extrapolation. VarianceLogMoneyness means that the is spline built from log-moneyness $\log(K/F)$ and variances σ^2 , strikes are internally converted to log-moneyness.
Interpolation in Time	By default, the interpolation in time is in linear total variance across the axis (absolute strike, or relative strike or Delta). Through the generator parameter "Interpolation in time", it may be changed to "Linear in volatility", in which case the implied volatilities are interpolated in time across the natural axis of the volatility surface.
Local Vol Repair	This parameter is used when the generator is used with a Local volatility pricer such as PricerLocalVolatility1FFiniteDifference or PricerLocalVolatilityNFMonteCarloExotic.

5.2.2.2 Underlyings Panel

Select the Underlyings panel.

VolatilitySurface3D WTI Crude Oil New Generator USD CLOSE 0D User(calypso_user)(PE PS_EQDFX)

Surface Utilities Help

Name CLOSE 7:00:00 AM ☐ Current

Definition Underlyings Quotes Points Spline

Type ☒ All Underlying Instruments

☐ Filter on description

Id	Description	Id	Type	Description
300942	OTCCommodityOption	300942	OTCCommodityOption	CommdVolPt.WTI_Crude New v1.USD.80%.Call.European.1.APR24
300948	OTCCommodityOption	300948	OTCCommodityOption	CommdVolPt.WTI_Crude New v1.USD.90%.Call.European.1.APR24
300954	OTCCommodityOption	300954	OTCCommodityOption	CommdVolPt.WTI_Crude New v1.USD.100%.Call.European.1.APR24
300946	OTCCommodityOption	300946	OTCCommodityOption	CommdVolPt.WTI_Crude New v1.USD.110%.Call.European.1.APR24
300940	OTCCommodityOption	300940	OTCCommodityOption	CommdVolPt.WTI_Crude New v1.USD.120%.Call.European.1.APR24
300938	OTCCommodityOption	300938	OTCCommodityOption	CommdVolPt.WTI_Crude New v1.USD.80%.Call.European.2.MAY24
300931	OTCCommodityOption	300931	OTCCommodityOption	CommdVolPt.WTI_Crude New v1.USD.90%.Call.European.2.MAY24
300944	OTCCommodityOption	300944	OTCCommodityOption	CommdVolPt.WTI_Crude New v1.USD.100%.Call.European.2.MAY24
300943	OTCCommodityOption	300943	OTCCommodityOption	CommdVolPt.WTI_Crude New v1.USD.110%.Call.European.2.MAY24
300947	OTCCommodityOption	300947	OTCCommodityOption	CommdVolPt.WTI_Crude New v1.USD.120%.Call.European.2.MAY24
300935	OTCCommodityOption	300935	OTCCommodityOption	CommdVolPt.WTI_Crude New v1.USD.80%.Call.European.3.JUN24
300941	OTCCommodityOption	300941	OTCCommodityOption	CommdVolPt.WTI_Crude New v1.USD.90%.Call.European.3.JUN24
300939	OTCCommodityOption	300939	OTCCommodityOption	CommdVolPt.WTI_Crude New v1.USD.100%.Call.European.3.JUN24
300937	OTCCommodityOption	300937	OTCCommodityOption	CommdVolPt.WTI_Crude New v1.USD.110%.Call.European.3.JUN24
300933	OTCCommodityOption	300933	OTCCommodityOption	CommdVolPt.WTI_Crude New v1.USD.120%.Call.European.3.JUN24
300952	OTCCommodityOption	300952	OTCCommodityOption	CommdVolPt.WTI_Crude New v1.USD.80%.Call.European.4.JUL24
300949	OTCCommodityOption	300949	OTCCommodityOption	CommdVolPt.WTI_Crude New v1.USD.90%.Call.European.4.JUL24
300932	OTCCommodityOption	300932	OTCCommodityOption	CommdVolPt.WTI_Crude New v1.USD.100%.Call.European.4.JUL24
300934	OTCCommodityOption	300934	OTCCommodityOption	CommdVolPt.WTI_Crude New v1.USD.110%.Call.European.4.JUL24
300936	OTCCommodityOption	300936	OTCCommodityOption	CommdVolPt.WTI_Crude New v1.USD.120%.Call.European.4.JUL24
300945	OTCCommodityOption	300945	OTCCommodityOption	CommdVolPt.WTI_Crude New v1.USD.80%.Call.European.5.AUG24

Load... New Delete... Save Save As Close

- » Select the instrument type to display the list of available instruments. The panel is blank if you have not set up any instruments. Click **New Instruments** to create new instruments.
- » Select instruments and click **>>** to add them to the instrument list in the right panel.

5.2.2.3 Quotes Panel

Select the Quotes panel. Enter quotes for the underlying instruments.

VolatilitySurface3D Moneyless NYMEX BRENT New USD CLOSE 0D User(calypso_user)(PE PS_EQDFX)

Surface Utilities Help

Name: Moneyless NYMEX BRENT New CLOSE Date: 04/05/2024 10:32:43 AM ☐ Current

Definition Underlyings **Quotes** Points Spline

MID

Commodity	Contract	Date	80%.Call	90%.Call	100%.Call	110%.Call	120%.Call
NYMEX Brent	15APR24	04/15/2024	22	23.00000000	24.00000000	25.00000000	26.00000000
NYMEX Brent	16MAY24	05/16/2024	27.00000000	28.00000000	29.00000000	30.00000000	31.00000000
NYMEX Brent	13JUN24	06/13/2024	32.00000000	33.00000000	34.00000000	35.00000000	36.00000000
NYMEX Brent	16JUL24	07/16/2024	37.00000000	38.00000000	39.00000000	40.00000000	41.00000000
NYMEX Brent	15AUG24	08/15/2024	42.00000000	43.00000000	44.00000000	45.00000000	46.00000000

Save Quotes Refresh Quotes ☐ Quotes List ☒ Quotes Matrix

- » You can click **Save Quotes** to save the quotes.

5.2.2.4 Points Panel

Select the Points panel, and click **Generate** to generate the points.

VolatilitySurface3D Moneyless NYMEX BRENT New USD CLOSE User(calypso_user)(PE PS_EQDFX)

Surface Utilities Help

Name: Moneyless NYMEX BRENT New CLOSE Date: 04/05/2024 10:32:43 AM ☐ Current

Definition Underlyings Quotes **Points** Spline

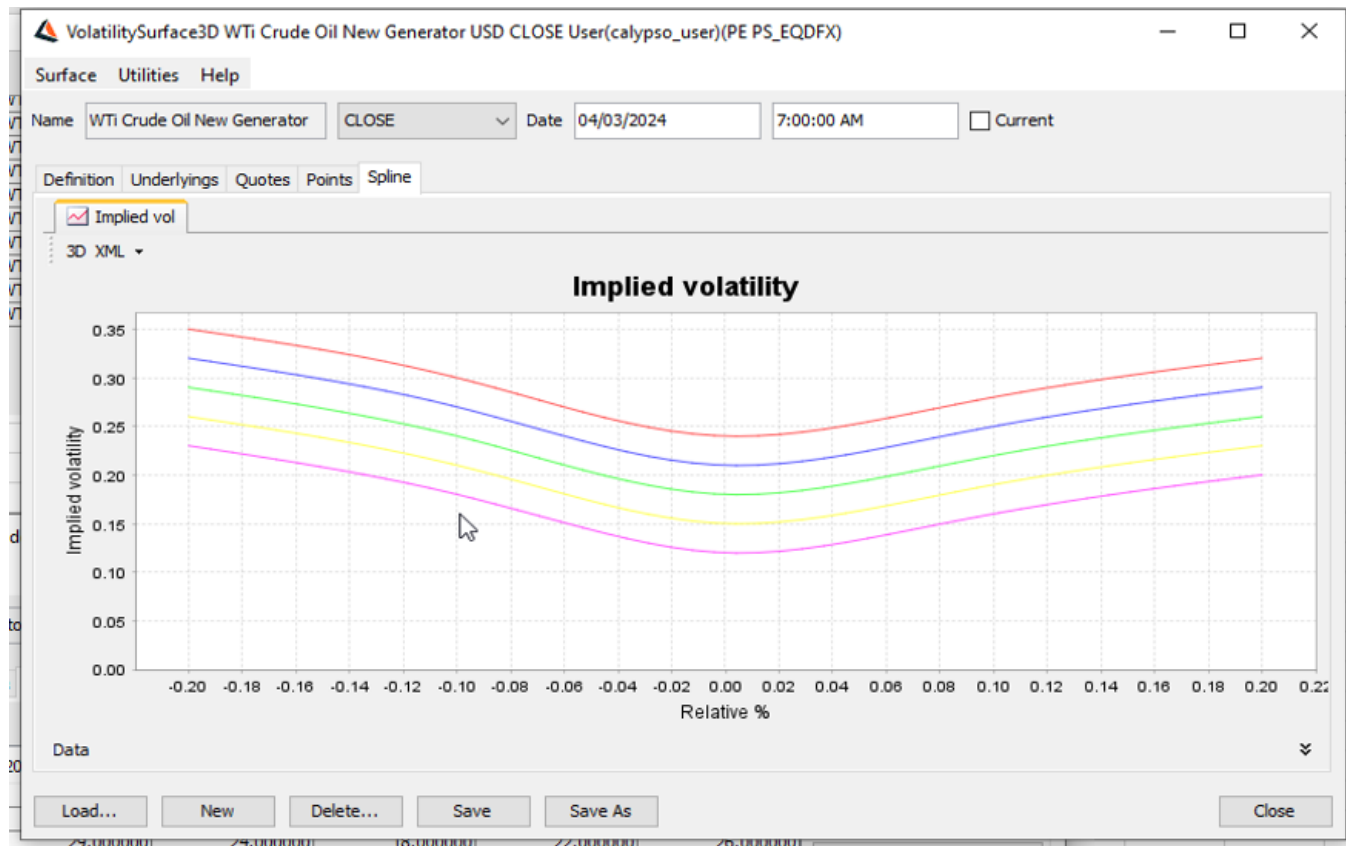
VolatilityModel: MID

Expiry/Relative %	-20	-10	0	10	20
04/17/2024	17.00000000	18.00000000	19.00000000	20.00000000	21.00000000
05/16/2024	22.00000000	23.00000000	24.00000000	25.00000000	26.00000000
06/17/2024	27.00000000	28.00000000	29.00000000	30.00000000	31.00000000
07/17/2024	32.00000000	33.00000000	34.00000000	35.00000000	36.00000000
08/15/2024	37.00000000	38.00000000	39.00000000	40.00000000	41.00000000

Bid >> Ask
Ask >> Bid
Interpolate...
ACT/365
Generate

5.2.2.5 Spline Panel

Select the Spline panel, to generate the implied volatility with respect to relative %.



5.2.2.6 Save Surface

Click **Save** in the bottom of the surface window. Enter a name for the surface, and click **OK**.

5.3 Pricer Configuration

From the Calypso Navigator, navigate to **Market Data > Pricing Environment > Pricer Configuration**.

Click **Load**, and select a pricer configuration.

Click the Surfaces tab.

Pricers
Discount Curves
Forecast Curves
Surfaces

Currency: USD Vol Type: Commodity

Product: Light, Sweet Crude Oil/CUSHING, OK Commodity... ANY Put/Call: PUT Add

Surface: CLVolSurface Usage: VOL Remove

Currency	Index/Vol Type	Tenor	Product	ExtendedType
USD	LIBOR	ANY	FutureOptionMM	ANY
USD	EQUITY		2923:/EquityIndex.SPX500	VarianceSwap
USD	Commodity		1202:/USD/Light, Sweet Crude Oil/CUSHING, OK	CommoditySw

Load New Delete Save Save As Close

- » Click **...** to select the volatility surface.
- » Select the currency, volatility type, product, type of commodity trade, put/call, and usage.
- » Click **...** to select the volatility surface.
- » Select the surface in the Selection window and click **Load** to display the surface name in the pricer configuration.
- » Click **Add** to add the surface to the list.
- » Click **Save** to save the pricer configuration.

6. Proxy Commodity Volatility Surface

Commodities are traded globally. Commodity futures and Commodity options trading in different markets and countries are highly correlated. For portfolios consisting of such products in different markets and different currencies, there is a need to have cross volatility surface that is constructed with a more liquid but foreign currency based commodity volatility surface, FX volatility surface and correlation between these two assets. This volatility surface can then be used in risk decomposition.

For this purpose, it is possible to build the proxy commodity volatility surface in Calypso. This is useful in order to provide vega risk towards a foreign commodity future option when the local market futures options are not liquid enough.

Below is a description of how to use proxy commodity volatility surface, which is created using the proxy volatility surface generator by capturing the commodity correlation such that commodity options can be priced using this proxy surface.

Base (foreign) commodity vol surface and FX vol surface along with the correlation matrix between commodity and FX is used to derive a proxy vol surface. In the example below, base (foreign) commodity is in USD, domestic commodity is in BRL. The proxy commodity vol surface is generated in BRL using base USD vol surface , USD/BRL FX vol surface and correlation between base commodity in USD and USD/BRL FX.

6.1 Defining Commodities

Define the commodity products by choosing **Configuration > Commodities > Commodities** from Calypso Navigator

► Refer to *Calypso Commodity Definitions Documentation* for more details.

Commodity: USD/CBOT Corn/CBOT Approved Warehouses

File Help

Definition

Commodity

Currency: USD Name: CBOT Corn Location: CBOT Approved Warehouse

Settings

Source: CBOT

Quote Unit: 50-Net Kilo Bag

Code: BB_MARKET_SECT...

Type: Commodity

Risk Config

Risk Unit: 50-Net Kilo Bag

Settlement Days

Physical: 0 Cash: 0

Quantity Config

Decimals: 5

Id	Commodity
7359	USD/Anhydrous Ethanol/Porto Santos
7361	USD/Arabica Coffee/Sao Paulo
7365	USD/BM&F Cotton/Sao Paulo
7364	USD/BM&F Robusta Coffee/Vitoria
7363	USD/Brazilian Soybeans/Paranagua
3047	USD/CBOT Corn/CBOT Approved Warehouses
3042	USD/CBOT Gold/CBOT Approved Warehouses

Defining USD commodity

Commodity: BRL/BM&F Corn/Campinas

File Help

Definition

Commodity: BRL Name: BM&F Corn Location: Campinas

Settings

Source: BM&F Risk Config

Quote Unit: 60-Net Kilo Bag Risk Unit: MTonnes

Code: BB_MARKET_SECT... Settlement Days

Type: Storage Based Physical: 0 Cash: 0

Quantity Config

Decimals: 5

Id	Commodity
7367	BRL/BM&F Corn/Campinas
7366	BRL/BM&F Feeder Cattle/Campo Grande
7368	BRL/BM&F Live Cattle/Aracatuba
7362	BRL/Brazilian Yellow Corn/Campinas
7360	BRL/Hydrous Ethanol/Paulina
5187	EUR/Phase II CER Large Hydro/EU ETS
5190	EUR/Phase II CER LULUCF/EU ETS
1510	EUR/Phase II CER Hydro/EU ETS

Defining BRL commodity

6.2 Defining Commodity Future and Option

Define the future and option contract by choosing **Configuration > Listed Derivatives > Future Contracts** and **Configuration > Listed Derivatives > Future Contracts Options** from Calypso Navigator respectively.

► Refer to *Calypso Capturing Commodities Documentation* for more details.

A detailed example of base USD commodity future and option definition is shown below.

Future Contract Specification Window

File Futures Help

Search: CBOT Corn C/CBOT

From Date: 30 Jul, 2018 Load

Config

Details Underlying		Futures Existing	Curve Underlying Existing	Expiration Date	Last Trade Date	First Delivery Date	Last Delivery Date	First Notification Date	Last Notification Date
Name	Value			14/09/2018	18/06/2018	31/08/2018	18/09/2018	31/08/2018	30/09/2018
Contract Summary				14/12/2018	17/09/2018	30/11/2018	18/12/2018	30/11/2018	31/12/2018
Exchange	CBOT			14/03/2019	17/12/2018	28/02/2019	18/03/2019	28/02/2019	31/03/2019
Currency	USD			14/05/2019	18/03/2019	30/04/2019	16/05/2019	30/04/2019	31/05/2019
Name	CBOT Corn C			12/07/2019	17/06/2019	30/06/2019	16/07/2019	30/06/2019	31/07/2019
Type	Commodity			13/09/2019	17/06/2019	31/08/2019	17/09/2019	31/08/2019	30/09/2019
General				13/12/2019	16/09/2019	30/11/2019	17/12/2019	30/11/2019	31/12/2019
Quote Type	Price			13/03/2020	16/12/2019	29/02/2020	17/03/2020	29/02/2020	31/03/2020
Quote Decimals	5			14/05/2020	16/03/2020	30/04/2020	18/05/2020	30/04/2020	31/05/2020
Is Contract Size Variable	<input type="checkbox"/>			14/07/2020	15/06/2020	30/06/2020	16/07/2020	30/06/2020	31/07/2020
Contract Size	5,000			14/09/2020	14/09/2020	31/08/2020	16/09/2020	31/08/2020	30/09/2020
No. of Futures in Contract	13			14/12/2020	14/12/2020	30/11/2020	16/12/2020	30/11/2020	31/12/2020
Settle Type	Physical			12/03/2021	14/12/2020	28/02/2021	16/03/2021	28/02/2021	31/03/2021
Negative Price Liquidation	<input type="checkbox"/>								
Attributes									
Fungible with	Select...								
Future Name Month	First Delivery Date								
Last CCP Date Log	0								
Long Name									
Exchange Clearing Ticker									
Ticks									
Tick Type	Fixed								
Tick Size	400								
Minimum move (ticks)	0.0025								
Tick Value	12.5								
Dates/Time									
Date Format	Monthly								
Holidays	FCBT-CBA								
Last Trading Time	12:00								
TimeZone	America/Chicago								
Daylight Saving Time									
Expiration Date Schedule	CBOT Corn Last Trading ...								
Last Trade Date Schedule	OMX FRA Last Trade Date								
First Delivery Date Schedule	@End of Month								
First Delivery Use Prev Date	<input type="checkbox"/>								
Last Delivery Date Schedule	CBOT Corn Last Delivery...								
Last Delivery Use Prev Date	<input type="checkbox"/>								
First Notification Date Schedule	@End of Month								
First Notification Use Prev ...	<input type="checkbox"/>								
Last Notification Date Schedule	@End of Month								
Last Notification Use Prev ...	<input type="checkbox"/>								

New Save Delete

Save Futures Save Curve Underlyings Delete Future Close

Future Option Contract Specification Window									
File Future Options Help									
Search CBOT Corn/CBOT									
From Date 30 Jul 2018 Load									
Definition	Expiration Date	Last Trade Date	First Delivery Date	Last Delivery Date	Underlying Future	Attributes	Quote Name	Strike	Option T...
Contract Summary	31/07/2018	31/07/2018	31/07/2018	31/07/2018	FutureCommodity/CBOT Corn C/30/04/2019	Select...	FutureOption.USD.4	\$2.80000	CALL
Exchange	31/08/2018	31/08/2018	31/08/2018	31/08/2018	FutureCommodity/CBOT Corn C/30/06/2019	Select...	FutureOption.USD.4	\$2.8-52.0	CALL
Currency	30/09/2018	30/09/2018	30/09/2018	30/09/2018	FutureCommodity/CBOT Corn C/30/06/2019	Select...	FutureOption.USD.4	\$2.80000	CALL
Name	31/10/2018	31/10/2018	31/10/2018	31/10/2018	FutureCommodity/CBOT Corn C/31/08/2019	Select...	FutureOption.USD.4	\$2.2-52.2	CALL
Type	30/11/2018	30/11/2018	30/11/2018	30/11/2018	FutureCommodity/CBOT Corn C/31/08/2019	Select...	FutureOption.USD.4	\$2.20000	CALL
Underlying	31/12/2018	31/12/2018	31/12/2018	31/12/2018	FutureCommodity/CBOT Corn C/30/11/2019	Select...	FutureOption.USD.4	\$2.4-52.4	CALL
Underlying Exchange	31/01/2019	31/01/2019	31/01/2019	31/01/2019	FutureCommodity/CBOT Corn C/30/11/2019	Select...	FutureOption.USD.4	\$2.5-52.5	CALL
Underlying Currency	28/02/2019	28/02/2019	28/02/2019	28/02/2019	FutureCommodity/CBOT Corn C/30/11/2019	Select...	FutureOption.USD.4	\$2.4-52.4	CALL
Underlying Name	31/03/2019	31/03/2019	31/03/2019	31/03/2019	FutureCommodity/CBOT Corn C/29/02/2020	Select...	FutureOption.USD.4	\$2.7-52.7	CALL
Underlying Dates	30/04/2019	30/04/2019	30/04/2019	30/04/2019	FutureCommodity/CBOT Corn C/29/02/2020	Select...	FutureOption.USD.4	\$2.8-52.8	CALL
Underlying Add Months								\$2.80000	CALL
General								\$2.80000	CALL
Quote Type								\$2.80000	CALL
Quote Decimals								\$2.80000	CALL
Exercise Type								\$2.80000	CALL
AutoExercise								\$2.80000	CALL
Settle Type Option								\$2.80000	CALL
No. of Option Contract								\$2.80000	CALL
Attributes								\$2.80000	CALL
Putable with								\$2.80000	CALL
Future Option Name Month								\$2.80000	CALL
Long Name								\$2.80000	CALL
Exchange Clearing Ticker								\$2.80000	CALL
Premium Payment Convention								\$2.80000	CALL
Tick								\$2.80000	CALL
Tick Type								\$2.80000	CALL
Tick Size								\$2.80000	CALL
Minimum move (ticks)								\$2.80000	CALL
Tick Value								\$2.80000	CALL
Business/Time								\$2.80000	CALL
Date Format								\$2.80000	CALL
Last Trading Time								\$2.80000	CALL
Timezone								\$2.80000	CALL
Expiration Date Schedule								\$2.80000	CALL
Last Trade Date Schedule								\$2.80000	CALL
First Delivery Date Schedule								\$2.80000	CALL
Last Delivery Date Schedule								\$2.80000	CALL

6.3 Defining Base (foreign) Volatility Surface

From the Calypso Navigator, navigate to **Market Data > Volatilities > Volatility Surface** (menu action `marketdata.VolatilitySurface3DWindow`).

Create a USD commodity vol surface on product CBOT Corn commodity defined above.

► Refer to *Calypso Commodity Volatility Surface Documentation* for more details.

Volatility Surface 3D Window	
Surface Utilities Help	
Name CBOT Corn	CLOSE Date 30/07/2018 5:21:57 AM <input checked="" type="checkbox"/> Current
Definition Underlyings Quotes Points Graph	
Comment	
Vol Type Commodity	Vol Model
Currency USD	Generator <input checked="" type="checkbox"/> Derived FutureOption
Product CBOT Corn/CBOT Approved Warehouses	Interpolator Interpolator3DLinear
<input type="checkbox"/> Include Tenor Axis	Parameter
Strike Type Strike	FILL_MISSING Value true
DateRoll MOD_FOLLOW	
Holidays NYC	
Pricing Environment OFFICIAL	
Load... New Delete... Save Save... Close	

Volatility Surface 3D Window	
Surface Utilities Help	
Name CBOT Corn	CLOSE Date 30/07/2018 5:21:57 AM <input checked="" type="checkbox"/> Current
Definition Underlyings Quotes Points Graph	
Type FutureOption	<input checked="" type="checkbox"/> All New Instrument... Underlying Instruments
<input checked="" type="checkbox"/> Filter on descri...	
Id	Description
324705	FutureOption CBOT Corn C/31.00000/31/08/2018
324704	FutureOption CBOT Corn C/31.00000/31/08/2018
324703	FutureOption CBOT Corn C/31.00000/30/09/2018
324702	FutureOption CBOT Corn C/31.00000/31/10/2018
324701	FutureOption CBOT Corn C/31.00000/30/11/2018
324700	FutureOption CBOT Corn C/31.00000/31/12/2018

Volatility Surface 3D Window

Surface Utilities Help

Name: CBOT Corn CLOSE Date: 30/07/2018 5:21:57 AM ☒ Current

Definition Underlyings Quotes Points Graph

Quote Name	Type	CLOSE
FutureOption.USD.CBOT.CBOT Corn.C.51.50000.JUL.18	Future	51.000000
Future.USD.CBOT.CBOT Corn C.APR.19	Price	51.0000000000
FutureOption.USD.CBOT.CBOT Corn.C.51.00000.AUG.18	Future	51.000000
FutureOption.USD.CBOT.CBOT Corn.C.51.00000.SEP.18	Future	52.000000
Future.USD.CBOT.CBOT Corn C.JUN.19	Price	51.0000000000
FutureOption.USD.CBOT.CBOT Corn.C.52.00000.OCT.18	Future	52.000000
FutureOption.USD.CBOT.CBOT Corn.C.51.00000.NOV.18	Future	51.000000
Future.USD.CBOT.CBOT Corn C.AUG.19	Price	52.0000000000
FutureOption.USD.CBOT.CBOT Corn.C.52.00000.DEC.18	Future	51.000000
FutureOption.USD.CBOT.CBOT Corn.C.51.00000.JAN.19	Future	52.000000
FutureOption.USD.CBOT.CBOT Corn.C.0.00005.FEB.19	Future	51.000000
Future.USD.CBOT.CBOT Corn C.NOV.19	Price	52.0000000000
FutureOption.USD.CBOT.CBOT Corn.C.52.00000.MAR.19	Future	51.000000

Save Quotes Refresh Quotes

Load... New Delet... Save Save... Close

Volatility Surface 3D Window

Surface Utilities Help

Name: CBOT Corn CLOSE Date: 30/07/2018 5:21:57 AM ☒ Current

Definition Underlyings Quotes Points Graph

VolatilityModel: MID

Expiry/Strike	0.000052	51	51.5	52
31/07/2018	1000.00000	1000.00000	1000.00000	1000.00000
31/08/2018	1000.00000	1000.00000	1000.00000	1000.00000
30/09/2018	1000.00000	1000.00000	1000.00000	1000.00000
31/10/2018	1000.00000	1000.00000	1000.00000	1000.00000
30/11/2018	1000.00000	1000.00000	1000.00000	1000.00000
31/12/2018	1000.00000	1000.00000	1000.00000	1000.00000
31/01/2019	1000.00000	1000.00000	1000.00000	1000.00000
28/02/2019	0.00100	0.00100	0.00100	0.00100
31/03/2019	1000.00000	1000.00000	1000.00000	1000.00000
30/04/2019	1000.00000	1000.00000	1000.00000	1000.00000

Bid >> Ask
Ask >> Bid
Interpolate...
ACT/360
Generate

Load... New Delet... Save Save... Close

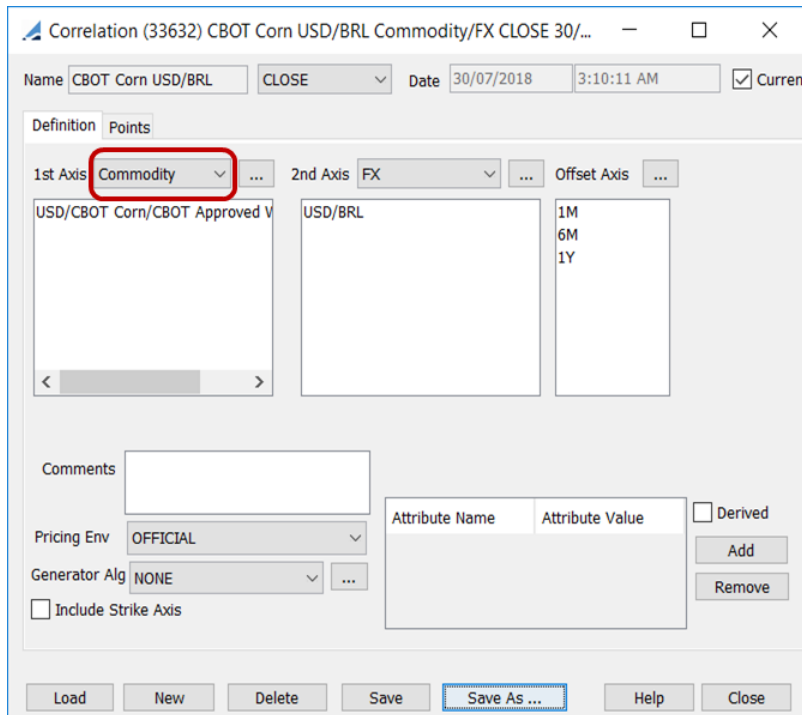
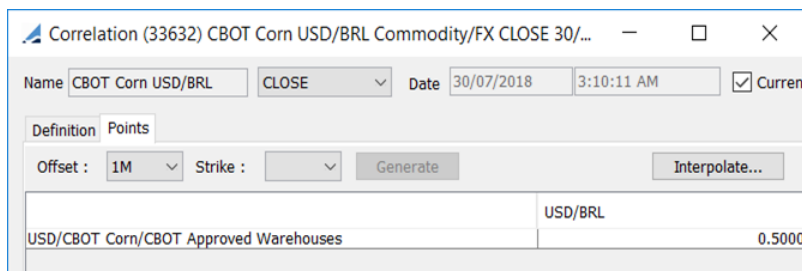
6.4 Defining Correlation Matrix

From the Calypso Navigator, navigate to **Market Data > Correlation & Covariance > Correlation Matrix** (menu action `marketdata.CorrelationMatrixWindow`).

A Commodity/Commodity Future axis should be used. For the same commodity future, the correlation is specific per futures maturity. The commodity future, including its expiry month is to be selected as a FutureCommodity instrument under first axis. Hence the maturity/tenor axis is not required. This will allow you to define a correlation matrix between FX rates and commodity futures.

When the first axis is selected as Commodity, the tenor axis can be used for defining the correlation of the commodity per tenor with FX. The correlation matrix window will look like the one shown below.

► Refer to *Calypso Correlation Matrix Documentation* for more details on defining a Correlation Matrix.

	USD/BRL
USD/CBOT Corn/CBOT Approved Warehouses	0.5000

6.5 Defining FX Vol Surface

From Calypso Navigator, navigate to **Market Data > Volatilities > FX Volatility Surface** (menu action `marketdata.FXVolatilitySurfaceWindow`).

An FX volatility surface is created from FX Option underlying instruments, or from offsets. Create a FX vol surface as shown below.

► Refer to *Calypso FX Volatility Surface documentation* for more details.

FX Vol Qt Entry: USD/BRL Vol surface CLOSE 30/7/18 5:47:49 AM

Surface Utilities Help

Name: USD/BRL Vol surface CLOSE Date: 30/07/2018 5:47:49 AM ☐ Current

Definition Underlyings Quotes Points Graph Surface

Type: ATM

☐ Filter on descri...

Id	Description
324709	FXOpt USD/BRL 1W ATM
324708	FXOpt USD/BRL 1M ATM
324707	FXOpt USD/BRL 3M ATM
324706	FXOpt USD/BRL 6M ATM
324710	FXOpt USD/BRL 1Y ATM

FX Vol Qt Entry: USD/BRL Vol surface CLOSE 30/7/18 5:47:49 AM

Surface Utilities Help

Name: USD/BRL Vol surface CLOSE Date: 30/07/2018 5:47:49 AM ☐ Current

Definition Underlyings Quotes Points Graph Surface

USD/BRL 30/07/2018 TOK 15:00 MID

Term	Exp	Day	Cal Days	ATM
1W	06/08/2018	MON	7	\$1.0000
1M	31/08/2018	FRI	32	\$2.0000
3M	30/10/2018	TUE	92	\$2.0000
6M	30/01/2019	WED	184	\$3.0000
1Y	30/07/2019	TUE	365	\$4.0000

☐ Quotes List ☒ Quotes Ma...

FX Vol Qt Entry: USD/BRL Vol surface CLOSE 30/7/18 5:47:49 AM

Surface Utilities Help

Name: USD/BRL Vol surface CLOSE Date: 30/07/2018 5:47:49 AM ☐ Current

Definition Underlyings Quotes Points Graph Surface

Volatility model: Black MID

Expiry/Delta	C (ATM) P
06/08/2018	\$1.00000
31/08/2018	\$2.00000
30/10/2018	\$2.00000
30/01/2019	\$3.00000
30/07/2019	\$4.00000

ACT/365

6.6 Defining Proxy Commodity Volatility Surface

A Derived volatility surface generator called *CommodityVolatilityProxy* should be used.

An example of proxy commodity vol surface with underlying commodity and domestic currency BRL as currency is shown below.

Additional dependent Market data Items (MDI): Base (Foreign) Vol Surface, FX Vol Surface, Correlation Matrix need to be added to the commodity vol surface screen when the generator is selected as *CommodityVolatilityProxy*.

In the Underlyings tab, it relies on two OTC domestic futures options underlyings corresponding to Call and Put At the money (ATM) per expiry.

VolatilitySurface3D USD/BRL Corn Proxy Vol Surface BRL CLOSE User(calypso_user)(PE OFFICIAL)

Surface Utilities Help

Name: RL Corn Proxy Vol Surface CLOSE Date: 13/08/2018 6:00:00 AM Current

Definition Underlyings Quotes Points Graph

Comment

Vol Type: Commodity Vol Model: CommodityVolatilityProxy

Currency: BRL Generator: ☒ Derived CommodityVolatilityProxy

Product: BRL/BM&F Corn/Campinas Interpolator: Interpolator3DLinear

☒ Include Tenor Axis

Strike Type: Strike

DateRoll: MOD_FOLLOW

Holidays

Pricing Environment: OFFICIAL

Parameter	Value
SYNTHETIC_EXPIRY	
SYNTHETIC_TENOR	
FX Correlation Override	0.3
Spread Type	Additive

MDI Name	Value
Base CMD Surface	CBOT_CORN_VOL_30/7/18 2:0...
FX Vol Surface	USD/BRL Vol surface 10/8/18 ...
Correlation Matrix	CBOT Corn USD/BRL 10/8/18 ...

Load... New Delet... Save Save... Close

VolatilitySurface3D USD/BRL Corn Proxy Vol Surface BRL CLOSE User(calypso_user)(PE OFFICIAL)

Surface Utilities Help

Name: RL Corn Proxy Vol Surface CLOSE Date: 13/08/2018 6:00:00 AM Current

Definition Underlyings Quotes Points Graph

Type: ☒ All New Instrument... Underlying Instruments

☐ Filter on descri...

Id	Description
326716	CommodityOption CommdVolPLABCDATM.BRL.ATMVol.AUG18
326717	CommodityOption CommdVolPLABCDATM.BRL.ATMVol.SEP18
326715	CommodityOption CommdVolPLABCDATM.BRL.ATMVol.OCT18
326727	CommodityOption CommdVolPLABCDATM.BRL.ATMVol.NOV18
326732	CommodityOption CommdVolPLABCDATM.BRL.ATMVol.DEC18
326728	CommodityOption CommdVolPLABCDATM.BRL.ATMVol.JAN19
326731	CommodityOption CommdVolPLABCDATM.BRL.ATMVol.FEB19
326730	CommodityOption CommdVolPLABCDATM.BRL.ATMVol.MAR19
326729	CommodityOption CommdVolPLABCDATM.BRL.ATMVol.APR19

Load... New Delet... Save Save... Close

VolatilitySurface3D USD/BRL Corn Proxy Vol Surface BRL CLOSE User(calypso_user)(PE OFFICIAL)

Surface Utilities Help

Name: RL Corn Proxy Vol Surface CLOSE Date: 13/08/2018 6:00:00 AM ☐ Current

Definition Underlyings Quotes Points Graph

Quote Name	Type	CLOSE
CommVolPLABCDATM.BRL.ATMVol.AUG18	Volatility	52.000000
CommVolPLABCDATM.BRL.ATMVol.SEP18	Volatility	52.000000
CommVolPLABCDATM.BRL.ATMVol.OCT18	Volatility	53.000000
CommVolPLABCDATM.BRL.ATMVol.NOV18	Volatility	54.000000
CommVolPLABCDATM.BRL.ATMVol.DEC18	Volatility	55.000000
CommVolPLABCDATM.BRL.ATMVol.JAN19	Volatility	53.000000
CommVolPLABCDATM.BRL.ATMVol.FEB19	Volatility	54.000000
CommVolPLABCDATM.BRL.ATMVol.MAR19	Volatility	55.000000
CommVolPLABCDATM.BRL.ATMVol.APR19	Volatility	55.000000

Save Quotes Refresh Quotes

Load... New Delet... Save Save... Close

VolatilitySurface3D USD/BRL Corn Proxy Vol Surface BRL CLOSE User(calypso_user)(PE OFFICIAL)

Surface Utilities Help

Name: RL Corn Proxy Vol Surface CLOSE Date: 13/08/2018 6:00:00 AM ☐ Current

Definition Underlyings Quotes Points Graph

☒ Tenor ☐ Expiry ☐ Strike Tenor: 0D VolatilityMod...: MID

Expiry/Strike	0.00915039	8,974.41826259	9,062.40275536	9,150.38724813
31/08/2018	52.000000	52.000000	52.000000	52.000000
30/09/2018	52.000000	52.000000	52.000000	52.000000
31/10/2018	53.000000	53.000000	53.000000	53.000000
30/11/2018	54.000000	54.000000	54.000000	54.000000
31/12/2018	55.000000	55.000000	55.000000	55.000000
31/01/2019	53.000000	53.000000	53.000000	53.000000
28/02/2019	54.000000	54.000000	54.000000	54.000000
31/03/2019	55.000000	55.000000	55.000000	55.000000
30/04/2019	55.000000	55.000000	55.000000	55.000000

Bid >> Ask
Ask >> Bid
Interpolate...
BU/252
Generate

Load... New Delet... Save Save... Close

On clicking **Generate**, the volatility points following the expiries and FX-adjusted strikes of the base(foreign) volatility surface are computed. USD is used in the example.

The volatility formula is as follows :

$$V_d^2 = V_f^2 + V_{fx}^2 - 2 \rho V_f V_{fx}$$

where,

V_d : The volatility of the commodity in domestic currency. The strike will be converted using FX rate.

V_f : The volatility of the commodity asset in foreign currency.

Vfx: The ATM volatility of FX with same maturity as the future option.

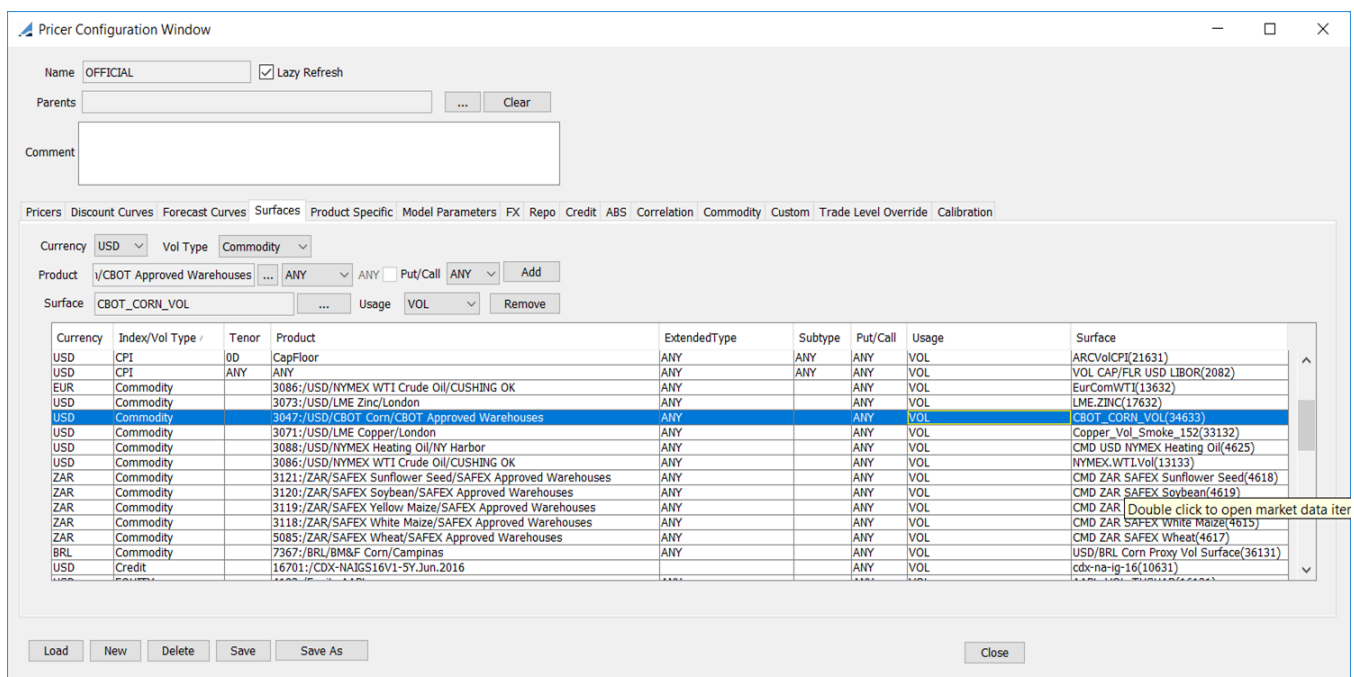
Rho: Correlation between foreign commodity and FX.

6.7 Pricer Configuration

Make sure all the vol surfaces and correlation matrix is defined correctly in the pricer configuration. You can bring up the Pricer Configuration window from the Pricing Environment window, or navigate to **Market Data > Pricing Environment > Pricer Configuration** from the Calypso Navigator.

► Refer to *Calypso Pricer Configuration Documentation* for more details.

Examples of configuring base vol, proxy vol, FX vol and correlation is shown below.



The screenshot shows the 'Pricer Configuration Window' with the 'Surfaces' tab selected. The window includes fields for Name (OFFICIAL), Parents, Comment, and a 'Lazy Refresh' checkbox. Below these are tabs for Pricers, Discount Curves, Forecast Curves, Surfaces, Product Specific, Model Parameters, FX, Repo, Credit, ABS, Correlation, Commodity, Custom, Trade Level Override, and Calibration. The 'Surfaces' tab displays a table with columns: Currency, Index/Vol Type, Tenor, Product, ExtendedType, Subtype, Put/Call, Usage, and Surface. The table lists various surfaces such as 'USD CPI', 'EUR Commodity', 'USD Commodity', and 'USD Credit'. The 'USD Commodity' row is highlighted in blue.

Currency	Index/Vol Type	Tenor	Product	ExtendedType	Subtype	Put/Call	Usage	Surface
USD	CPI	0D	CapFloor	ANY	ANY	ANY	VOL	ARCVolCPI(21631)
USD	CPI	ANY	ANY	ANY	ANY	ANY	VOL	VOL CAP/FLR USD LIBOR(2082)
EUR	Commodity		3086:/USD/NYMEX WTI Crude Oil/CUSHING OK	ANY		ANY	VOL	EurComWTI(13632)
USD	Commodity		3073:/USD/LME Zinc/London	ANY		ANY	VOL	LME.ZINC(17632)
USD	Commodity		3047:/USD/CBOT Corn/CBOT Approved Warehouses	ANY		ANY	VOL	CBOT_CORN_VOL(34633)
USD	Commodity		3071:/USD/LME Copper/London	ANY		ANY	VOL	Copper_Vol_Smoke_152(33132)
USD	Commodity		3088:/USD/NYMEX Heating Oil/NY Harbor	ANY		ANY	VOL	CMD USD NYMEX Heating Oil(4625)
USD	Commodity		3086:/USD/NYMEX WTI Crude Oil/CUSHING OK	ANY		ANY	VOL	NYMEX.WTI1Vol(13133)
ZAR	Commodity		3121:/ZAR/SAFEX Sunflower Seed/SAFEX Approved Warehouses	ANY		ANY	VOL	CMD ZAR SAFEX Sunflower Seed(4618)
ZAR	Commodity		3120:/ZAR/SAFEX Soybean/SAFEX Approved Warehouses	ANY		ANY	VOL	CMD ZAR SAFEX Soybean(4619)
ZAR	Commodity		3119:/ZAR/SAFEX Yellow Maize/SAFEX Approved Warehouses	ANY		ANY	VOL	CMD ZAR Double click to open market data iter
ZAR	Commodity		3118:/ZAR/SAFEX White Maize/SAFEX Approved Warehouses	ANY		ANY	VOL	CMD ZAR SAFEX White Maize(4615)
ZAR	Commodity		5085:/ZAR/SAFEX Wheat/SAFEX Approved Warehouses	ANY		ANY	VOL	CMD ZAR SAFEX Wheat(4617)
BRL	Commodity		7367:/BRL/BM&F Corn/Campinas	ANY		ANY	VOL	USD/BRL Corn Proxy Vol Surface(36131)
USD	Credit		16701:/CDX-NAIGS16V1-5Y.Jun.2016	ANY		ANY	VOL	cdx-na-ig-16(10631)

Base USD Vol in Pricer Config

Pricer Configuration Window

Name: OFFICIAL ☒ Lazy Refresh

Parents: ... Clear

Comment:

Prickers Discount Curves Forecast Curves Surfaces Product Specific Model Parameters FX Repo Credit ABS Correlation Commodity Custom Trade Level Override Calibration

Currency: BRL Vol Type: Commodity

Product: BRL/BM&F Corn/Campinas ANY ANY Put/Call ANY Add

Surface: USD/BRL Corn Proxy Vol Surface Usage: VOL Remove

Currency	Index/Vol Type	Tenor	Product	ExtendedType	Subtype	Put/Call	Usage	Surface
USD	CP1	0D	CapFloor	ANY	ANY	ANY	VOL	ARCVolCP1(21631)
USD	CP1	ANY	ANY	ANY	ANY	ANY	VOL	VOL CAP/FLR USD LIBOR(2082)
EUR	Commodity		3086:/USD/NYMEX WTI Crude Oil/CUSHING OK	ANY		ANY	VOL	EurComWTI(13632)
USD	Commodity		3073:/USD/LME Zinc/London	ANY		ANY	VOL	LME_ZINC(17632)
USD	Commodity		3047:/USD/CBOT Corn/CBOT Approved Warehouses	ANY		ANY	VOL	CBOT_CORN_VOL(34633)
USD	Commodity		3071:/USD/LME Copper/London	ANY		ANY	VOL	Copper_Vol_Smoke_152(33132)
USD	Commodity		3088:/USD/NYMEX Heating Oil/MY Harbor	ANY		ANY	VOL	CMD USD NYMEX Heating Oil(4625)
USD	Commodity		3086:/USD/NYMEX WTI Crude Oil/CUSHING OK	ANY		ANY	VOL	NYMEX.WTI.Vol(13133)
ZAR	Commodity		3121:/ZAR/SAFEX Sunflower Seed/SAFEX Approved Warehouses	ANY		ANY	VOL	CMD ZAR SAFEX Sunflower Seed(4618)
ZAR	Commodity		3120:/ZAR/SAFEX Soybean/SAFEX Approved Warehouses	ANY		ANY	VOL	CMD ZAR SAFEX Soybean(4619)
ZAR	Commodity		3119:/ZAR/SAFEX Yellow Maize/SAFEX Approved Warehouses	ANY		ANY	VOL	CMD ZAR SAFEX Yellow Maize(4616)
ZAR	Commodity		3118:/ZAR/SAFEX White Maize/SAFEX Approved Warehouses	ANY		ANY	VOL	CMD ZAR SAFEX White Maize(4615)
ZAR	Commodity		5085:/ZAR/SAFEX Wheat/SAFEX Approved Warehouses	ANY		ANY	VOL	CMD ZAR SAFEX Wheat(4617)
BRL	Commodity		7367:/BRL/BM&F Corn/Campinas	ANY		ANY	VOL	USD/BRL Corn Proxy Vol Surface(36131)
USD	Credit		16701:/CDX-NAIGS16V1-5Y.Jun.2016	ANY		ANY	VOL	cdx-na-ig-16(10631)

Double click to open market data item

Load New Delete Save Save As Close

Proxy Vol in Pricer Config

Pricer Configuration Window

Name: OFFICIAL ☒ Lazy Refresh

Parents: ... Clear

Comment:

Prickers Discount Curves Forecast Curves Surfaces Product Specific Model Parameters FX Repo Credit ABS Correlation Commodity Custom Trade Level Override Calibration

Primary: USD Quoting: BRL Domiciliation: ANY

Product Type: ANY ExtendedType: ANY Subtype: ANY

Usage: FX... Market Data: USD/BRL Vol surface Add Remove

Ccy1	Ccy2	Domiciliation	Prod Type	Extended Type	Subtype	Usage	Market Data Item
NZD	USD	ANY	ANY	ANY	ANY	FX_VOL	NZD/USD VOL Strategies(4489)
NZD	USD	ANY	ANY	ANY	ANY	FX	NZD/USD(2156)
USD	BRL	ANY	ANY	ANY	ANY	FX_VOL	USD/BRL Vol surface(34131)
USD	CAD	ANY	ANY	ANY	ANY	FX_VOL	USD/CAD VOL Strategies(4490)
USD	CAD	ANY	ANY	ANY	ANY	FX	USD/CAD(2131)
USD	CHF	ANY	ANY	ANY	ANY	FX_VOL	USD/CHF VOL Strategies(4491)
USD	CHF	ANY	ANY	ANY	ANY	FX	USD/CHF(2170)
USD	DKK	ANY	ANY	ANY	ANY	FX_VOL	USD/DKK VOL Strategies(4593)
USD	DKK	ANY	ANY	ANY	ANY	FX	USD/DKK(2159)
USD	HKD	ANY	ANY	ANY	ANY	FX_VOL	USD/HKD VOL Strategies(4592)
USD	CNY	ANY	ANY	ANY	ANY	FX	USD/HKD(2157)
USD	JPY	ANY	ANY	ANY	ANY	FX	USD/JPY(2129)
USD	JPY	ANY	ANY	ANY	ANY	FX_VOL	USD/JPY VOL Strategies(4513)
USD	MXN	ANY	ANY	ANY	ANY	FX_VOL	USD/MXN VOL Strategies(4592)

Double click to open market d

Load New Delete Save Save As Close

FX USD/BRL Vol in Pricer Config

Pricer Configuration Window

Name: ☒ Lazy Refresh

Parents: ...

Comment:

Axis Types:

Correlation Matrix: ...

First Axis Type	Second Axis Type	Correlation Matrix
Commodity	FX	CBOT Corn USD/BRL

Correlation Matrix in Pricer Config

7. CREDIT Volatility Surface

From the Calypso Navigator, navigate to **Market Data > Volatilities > Volatility Surface** (menu action `marketdata.VolatilitySurface3DWindow`).

CREDIT volatility surfaces can be created from offset points, or derived from underlying instruments.

- [Surface from offset points](#)
- [Surface from underlying instruments](#)
- [Pricer configuration](#)

Interpolation methods and generation algorithms are provided out-of-the-box. Refer to the Credit Derivatives Analytics documentation for details.

► See also [Volatility Surface Overview](#).

7.1 Generating a CREDIT Volatility Surface from Offsets

CREDIT Volatility Surface from Offsets Quick Reference

Configuration Requirements

- Issuer Definition – From the Calypso Navigator, navigate to **Configuration > Legal Data > Legal Entity**.

Surface Generation

1. Click **New** to start a new surface.
2. The Current checkbox is selected by default, meaning that when you save the surface, the system timestamps the surface with the current date and time. Clear the Current checkbox to enter a back-dated surface. You can modify the date and time fields.
3. Definition Panel — Select the following to define the surface: currency, issuer / ticker / or basket, volatility type “Credit”, strike type, interpolator, the Derived checkbox should not be selected, generator, date-roll convention, holiday calendars, pricing environment.
4. Offsets Panel — Select the tenor and expirations. Enter the strikes.
5. Points Panel — Click **Generate** to generate the points. Enter the point values.
6. Click **Save**, enter a name for the surface, and click **OK**.

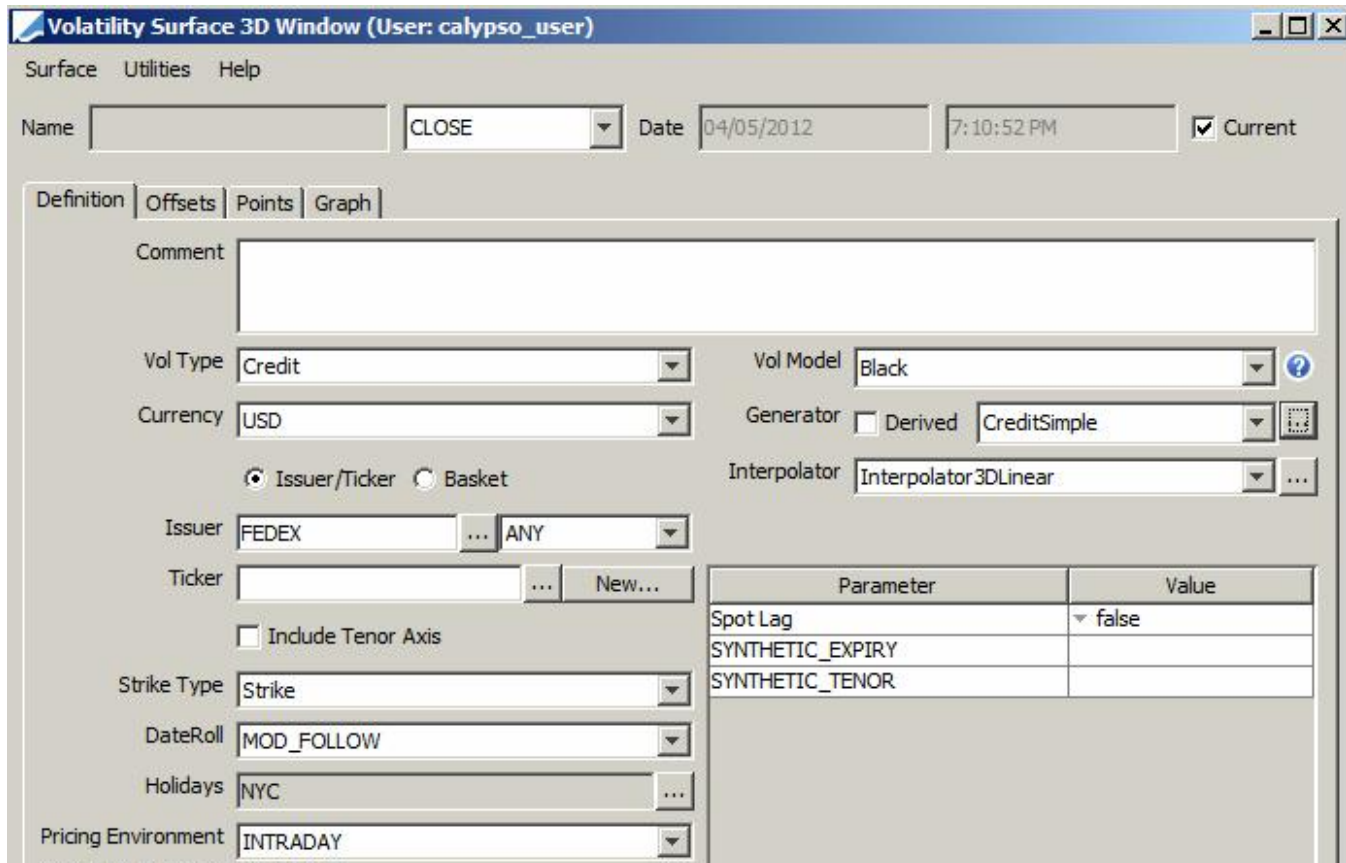
Pricer Configuration

A CREDIT volatility surface is associated with a pricing environment under the Credit panel of the pricer configuration for the VOL usage.

7.1.1 Definition Panel

Click **New** to start a new surface.

Select the following to define the surface: currency, volatility type "Credit", issuer / ticker / or basket, strike type, interpolator, the Derived checkbox should not be selected, generator, date-roll convention, holiday calendars, pricing environment.



Volatility Surface 3D Window (User: calypso_user)

Surface Utilities Help

Name: CLOSE Date: 04/05/2012 7:10:52 PM ☒ Current

Definition Offsets Points Graph

Comment:

Vol Type: Credit Vol Model: Black

Currency: USD Generator: ☐ Derived CreditSimple

☒ Issuer/Ticker ☐ Basket Interpolator: Interpolator3DLinear

Issuer: FEDEX ANY

Ticker: New...

☐ Include Tenor Axis

Strike Type: Strike

DateRoll: MOD_FOLLOW

Holidays: NYC

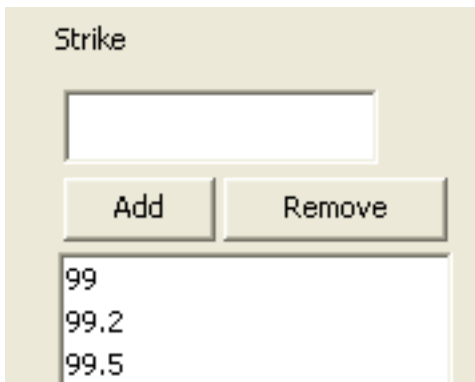
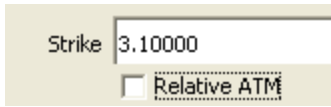
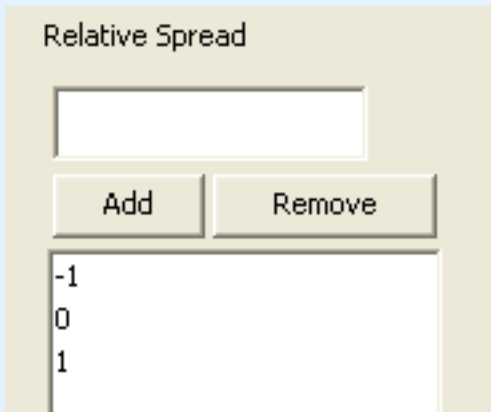
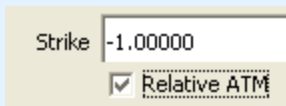
Pricing Environment: INTRADAY

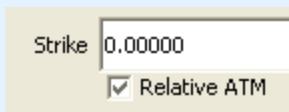
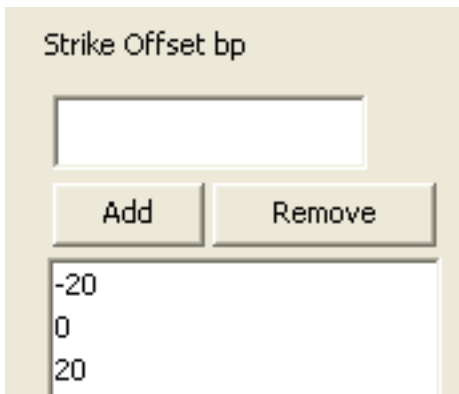
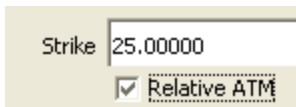
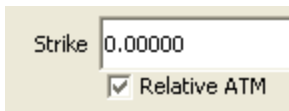
Parameter	Value
Spot Lag	false
SYNTHETIC_EXPIRY	
SYNTHETIC_TENOR	

- » Select the type of strike: Strike, Relative Spread, Strike Offsets BPs, or Relative % - They are described below.
 - » Select the generation algorithm: Default, or CreditSimple. You can set the following generator parameters.
If the spot lag parameter is set to true, the generated exercise dates are rolled using the conventions of the definition screen.
- Note that SYNTHETIC_EXPIRY and SYNTHETIC_TENOR are not currently used.

Strike Types Details

Surface Type	Definition
Strike	Absolute strike. Offset Points

Surface Type	Definition
	<p>In the Offset panel, enter absolute strikes.</p>  <p>Underlying Instruments</p> <p>The underlying instruments must be specified using an absolute strike.</p> 
Relative Spread	<p>Current strike +/- spread minus ATM strike (in %).</p> <p>Offset Points</p> <p>In the Offset panel, enter relative spreads over the current strike in %. Make sure to add 0.</p>  <p>Underlying Instruments</p> <p>The underlying instruments must be specified using a relative strike in %. In this example the relative strike is -1%.</p>  <p>Note that when using a relative strike, one of the underlying instruments must be defined</p>

Surface Type	Definition
	<p>with a strike of 0.</p> 
Strike Offset BPs	<p>Current strike +/- offset minus ATM strike (in bp).</p> <p>Offset Points</p> <p>In the Offset panel, enter relative offset over the current strike in bp Make sure to add 0.</p>  <p>Underlying Instruments</p> <p>The underlying instruments must be specified using a relative strike in bp. In this example the relative strike is +25bp.</p>  <p>Note that when using a relative strike, one of the underlying instruments must be defined with a strike of 0.</p> 
Relative %	<p>% (current strike) minus ATM strike.</p> <p>Offset Points</p> <p>In the Offset panel, enter a percentage of the current strike.</p>

Surface Type	Definition
	<div> <div>Relative %</div> <div> <input type="text"/> </div> <div> <div>Add</div> <div>Remove</div> </div> <div> 85 100 115 </div> </div> <p>Underlying Instruments</p> <p>The underlying instrument must be specified using a percentage of the current strike. In this example, it is 85% of the current strike.</p> <div> <div>Strike</div> <div>85.00000</div> <div> <input checked="" type="checkbox"/> Relative ATM </div> </div>

7.1.2 Offsets Panel

Select the Offsets panel.

Definition	Offsets	Points	Graph
<div> <div>Expiration</div> <div>...</div> <div>Specific Expiration</div> <div>Strike</div> </div> <div> 1M 3M 6M 1Y 3Y 7Y 10Y </div> <div> <div>Add</div> <div>Remove</div> </div> <div> <div>Add</div> <div>Remove</div> </div> <div> 3 3.2 3.5 </div>			

- » Click **...** to select expirations.
- » Enter a strike and click **Add**. Repeat for each strike value.

7.1.3 Points Panel

Select the Points panel, and click **Generate** to generate the points.

Definition Offsets Points Graph			
MID			
Expiry/Strike	3	3.2	3.5
02/01/2007	14.50000	14.65000	15.68000
04/02/2007	0.00000	0.00000	0.00000
07/02/2007	0.00000	0.00000	0.00000
01/02/2008	0.00000	0.00000	0.00000
01/04/2010	0.00000	0.00000	0.00000
01/02/2014	0.00000	0.00000	0.00000
01/03/2017	0.00000	0.00000	0.00000

» Enter market volatilities for each expiration / strike.

7.1.4 Save Surface

Click **Save** in the bottom of the surface window. Enter a name for the surface, and click **OK**.

7.2 Generating a Derived CREDIT Volatility Surface

Derived CREDIT Volatility Surface Quick Reference

Configuration Requirements

- Issuer Definition – From the Calypso Navigator, navigate to **Configuration > Legal Data > Legal Entity**.
- CDS Index Definition – From the Calypso Navigator, navigate to **Configuration > Credit Derivatives > CDS Index Definition**.
- You need a probability curve for the issuers in the basket, and a basket correlation matrix.

The upper bound volatility when solving for implied volatility is set to 1 (100%) by default. You can modify the upper bound volatility using the pricing parameter UPPER_BOUND_VOL_SURF. Set to 2 for example for 200%.

Surface Underlying Instruments

You can use CDS Index Option underlying instruments. From the Calypso Navigator, navigate to **Configuration > Market Data > Volatility Surface Underlyings**, or in the surface application's Underlyings panel, click **New Instrument**.

Surface Generation

1. Click **New** to start a new surface.

2. Select the quote instance to use in the surface generation (CLOSE, LAST, or OPEN).
3. The Current checkbox is selected by default, meaning that when you save the surface, the system timestamps the surface with the current date and time. Clear the Current checkbox to enter a back-dated surface. You can modify the date and time fields.
4. Definition Panel — Select the following to define the surface: currency, issuer / ticker / or basket, volatility type “Credit”, strike type, interpolator, select the Derived checkbox, CDSIndexOption generator, date-roll convention, holiday calendars, pricing environment.
5. Underlyings Panel — Select the underlying instruments.
6. Quotes Panel — Enter quotes manually, use quotes from the quote set, or use real-time quotes.
7. Points Panel — Click **Generate** to generate the points.
8. Click **Save**, enter a name for the surface, and click **OK**.

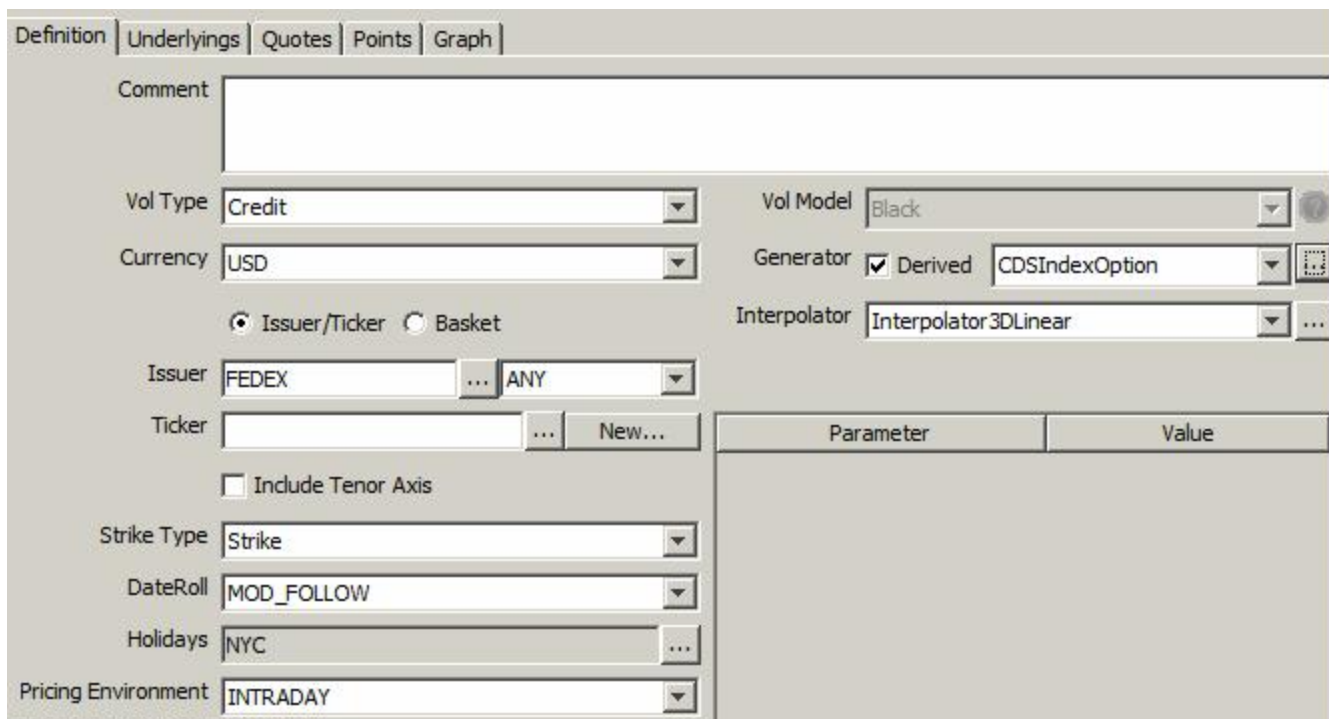
Pricer Configuration

A CREDIT volatility surface is associated with a pricing environment under the Credit panel of the pricer configuration for the VOL usage.

7.2.1 Definition Panel

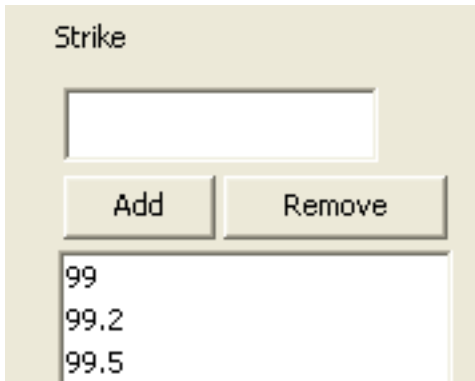
Click **New** to start a new surface.

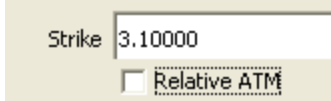
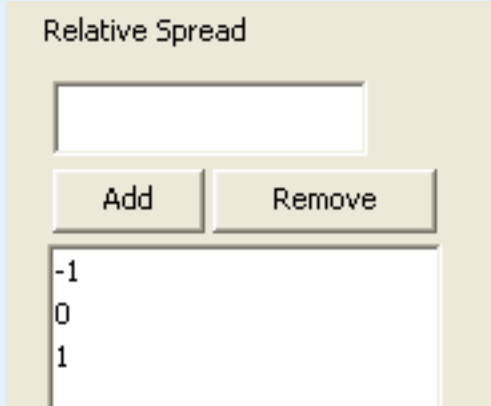
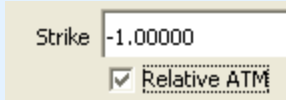
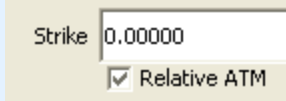
Select the following to define the surface: currency, issuer / ticker / or basket, volatility type “Credit”, strike type, interpolator, select the Derived checkbox, CDSIndexOption generator, date-roll convention, holiday calendars, pricing environment.



» Select the type of strike - They are described below.

Strike Types Details

Surface Type	Definition
Strike	<p>Absolute strike.</p> <p>Offset Points</p> <p>In the Offset panel, enter absolute strikes.</p>  <p>Underlying Instruments</p> <p>The underlying instruments must be specified using an absolute strike.</p>

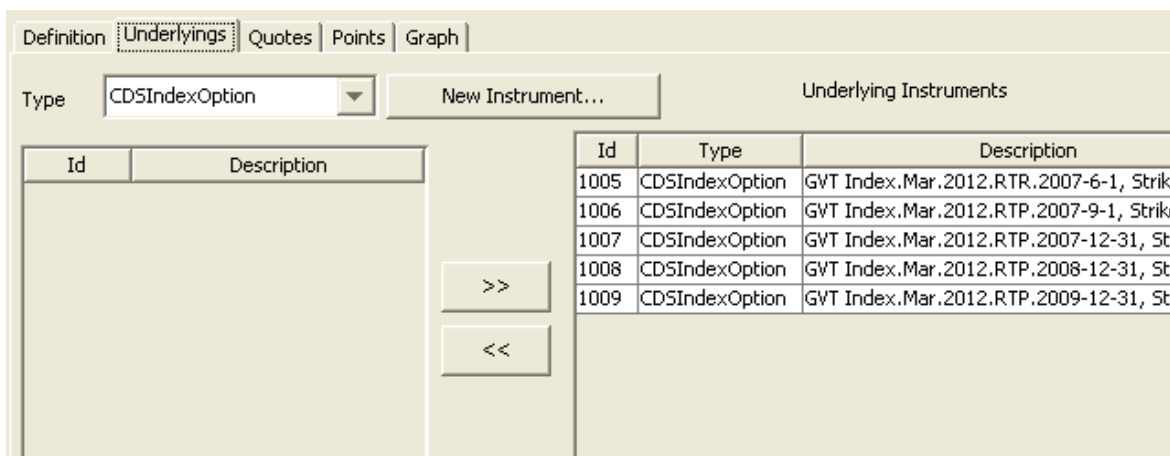
Surface Type	Definition
	
Relative Spread	<p>Current strike +/- spread minus ATM strike (in %).</p> <p>Offset Points</p> <p>In the Offset panel, enter relative spreads over the current strike in %. Make sure to add 0.</p>  <p>Underlying Instruments</p> <p>The underlying instruments must be specified using a relative strike in %. In this example the relative strike is -1%.</p>  <p>Note that when using a relative strike, one of the underlying instruments must be defined with a strike of 0.</p> 
Strike Offset BPs	<p>Current strike +/- offset minus ATM strike (in bp).</p> <p>Offset Points</p> <p>In the Offset panel, enter relative offset over the current strike in bp Make sure to add 0.</p>

Surface Type	Definition
	<div> <div> <div>Strike Offset bp</div> <div></div> <div> <div>Add</div> <div>Remove</div> </div> <div> <div>-20</div> <div>0</div> <div>20</div> </div> </div> <div> Underlying Instruments The underlying instruments must be specified using a relative strike in bp. In this example the relative strike is +25bp. <div> <div>Strike</div> <div>25.00000</div> <div> <input checked="" type="checkbox"/> Relative ATM </div> </div> <p>Note that when using a relative strike, one of the underlying instruments must be defined with a strike of 0.</p> <div> <div>Strike</div> <div>0.00000</div> <div> <input checked="" type="checkbox"/> Relative ATM </div> </div> </div> </div>
Relative %	<p>% (current strike) minus ATM strike.</p> <div> Offset Points In the Offset panel, enter a percentage of the current strike. <div> <div>Relative %</div> <div></div> <div> <div>Add</div> <div>Remove</div> </div> <div> <div>85</div> <div>100</div> <div>115</div> </div> </div> <div> Underlying Instruments The underlying instrument must be specified using a percentage of the current strike. In this </div> </div>

Surface Type	Definition
	<p>example, it is 85% of the current strike.</p> <div> <div>Strike 85.00000</div> <div><input checked="" type="checkbox"/> Relative ATM</div> </div>

7.2.2 Underlyings Panel

Select the Underlyings panel.

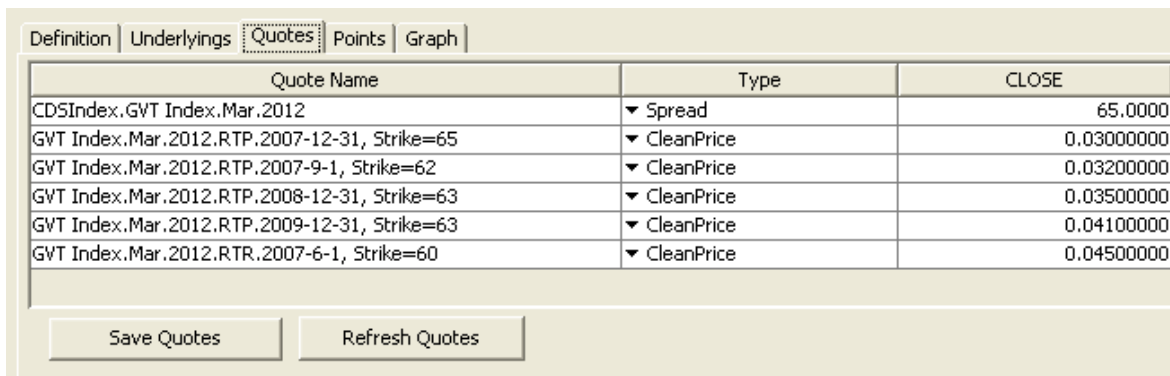


Id	Type	Description
1005	CDSIndexOption	GVT Index.Mar.2012.RTR.2007-6-1, Strik
1006	CDSIndexOption	GVT Index.Mar.2012.RTP.2007-9-1, Strik
1007	CDSIndexOption	GVT Index.Mar.2012.RTP.2007-12-31, St
1008	CDSIndexOption	GVT Index.Mar.2012.RTP.2008-12-31, St
1009	CDSIndexOption	GVT Index.Mar.2012.RTP.2009-12-31, St

- » Select the instrument type to display the list of available instruments. The panel is blank if you have not set up any instruments. Click **New Instruments** to create new instruments.
- » Select instruments and click **>>** to add them to the instrument list in the right panel.

7.2.3 Quotes Panel

Select the Quotes panel. Enter quotes for the underlying instruments.



Quote Name	Type	CLOSE
CDSIndex.GVT Index.Mar.2012	▼ Spread	65.0000
GVT Index.Mar.2012.RTP.2007-12-31, Strike=65	▼ CleanPrice	0.03000000
GVT Index.Mar.2012.RTP.2007-9-1, Strike=62	▼ CleanPrice	0.03200000
GVT Index.Mar.2012.RTP.2008-12-31, Strike=63	▼ CleanPrice	0.03500000
GVT Index.Mar.2012.RTP.2009-12-31, Strike=63	▼ CleanPrice	0.04100000
GVT Index.Mar.2012.RTR.2007-6-1, Strike=60	▼ CleanPrice	0.04500000

- » You can click **Save Quotes** to save the quotes.

7.2.4 Points Panel

Select the Points panel, and click **Generate** to generate the points.

Definition	Underlyings	Quotes	Points	Graph
MID				
Expiry/Strike	60	62	63	65
06/01/2007	11.72219	11.78102	11.82100	11.84103
09/01/2007	11.73402	11.78903	0.00000	0.00000
12/31/2007	11.75601	11.80201	0.00000	0.00000
12/31/2008	11.76800	11.80210	0.00000	0.00000
12/31/2009	11.77102	11.83215	0.00000	0.00000


7.2.5 Save Surface

Click **Save** in the bottom of the surface window. Enter a name for the surface, and click **OK**.

7.3 Pricer Configuration


From the Calypso Navigator, navigate to **Market Data > Pricing Environment > Pricer Configuration**.

Load a pricer configuration and select the Credit panel.

Pricers	Discount Curves	Forecast Curves	Surfaces	Product Specific	Model Parameters	FX																											
Repo	Credit	ABS	Correlation	Commodity	Custom	Trade Level Override																											
Curves																																	
<div>  <input type="text" value="Q-"/> </div> <table border="1"> <thead> <tr> <th>Usage</th> <th>Key</th> <th>Market Data Item</th> </tr> </thead> <tbody> <tr> <td>PROB</td> <td>USD.PACKAGECARRIER.ANY.ANY</td> <td>USD PACKAGECARRIER Probability</td> </tr> <tr> <td>CORR_FORMULA</td> <td>Basket.AIRTRANSPORT</td> <td>Air Transport Correlation</td> </tr> <tr> <td>CORR_SKEW</td> <td>Basket.AIRTRANCHES</td> <td>AirTranchesBasket</td> </tr> <tr> <td>REC</td> <td>USD.JETCARRIER.ANY.ANY</td> <td>Recovery JC</td> </tr> <tr> <td>PROB</td> <td>USD.JETCARRIER.ANY.ANY</td> <td>USD JETCARRIER Probability</td> </tr> <tr> <td>PROB</td> <td>Basket.AIRTRANSPORT</td> <td>USD AIRTRANSPORT Basket Probability</td> </tr> <tr> <td>PROB</td> <td>USD.PASSCARRIER.ANY.ANY</td> <td>USD PASSCARRIER Probability</td> </tr> <tr> <td>VOL</td> <td>USD.USGVT.ANY.ANY</td> <td>USD USGVT Volatility</td> </tr> </tbody> </table>							Usage	Key	Market Data Item	PROB	USD.PACKAGECARRIER.ANY.ANY	USD PACKAGECARRIER Probability	CORR_FORMULA	Basket.AIRTRANSPORT	Air Transport Correlation	CORR_SKEW	Basket.AIRTRANCHES	AirTranchesBasket	REC	USD.JETCARRIER.ANY.ANY	Recovery JC	PROB	USD.JETCARRIER.ANY.ANY	USD JETCARRIER Probability	PROB	Basket.AIRTRANSPORT	USD AIRTRANSPORT Basket Probability	PROB	USD.PASSCARRIER.ANY.ANY	USD PASSCARRIER Probability	VOL	USD.USGVT.ANY.ANY	USD USGVT Volatility
Usage	Key	Market Data Item																															
PROB	USD.PACKAGECARRIER.ANY.ANY	USD PACKAGECARRIER Probability																															
CORR_FORMULA	Basket.AIRTRANSPORT	Air Transport Correlation																															
CORR_SKEW	Basket.AIRTRANCHES	AirTranchesBasket																															
REC	USD.JETCARRIER.ANY.ANY	Recovery JC																															
PROB	USD.JETCARRIER.ANY.ANY	USD JETCARRIER Probability																															
PROB	Basket.AIRTRANSPORT	USD AIRTRANSPORT Basket Probability																															
PROB	USD.PASSCARRIER.ANY.ANY	USD PASSCARRIER Probability																															
VOL	USD.USGVT.ANY.ANY	USD USGVT Volatility																															
<div> <div>Details</div> <div> <div>Curve Type</div> <div>Type</div> <div>Issuer</div> </div> <div>Key</div> <div>Ccy</div> <div>USD</div> <div>Issuer</div> <div>USGVT</div> <div>Seniority</div> <div>ANY</div> <div>Restructur...</div> <div>ANY</div> </div> <div>Curve</div> <div>Usage</div> <div>VOL</div> <div>Market Data</div> <div>USD USGVT Vo...</div>																																	

Add

Update

- » Click  to add market data.
- » In the Details area, select the type of association you want to perform: Basket, Issuer, or Ticker. Then select the corresponding key for the selected type.
For Basket, select a basket or ANY.

For Issuer, select a currency, an issuer, a seniority or ANY, and a restructuring type or ANY.

For Ticker, select a ticker – A ticker is a combination of currency, issuer, seniority and reference obligation – You can create tickers from the Credit Market Data window.

Select the VOL usage, and select a volatility surface from the Market Data field.

- » Then click **Add**.
- » Click **Save** to save the changes.

8. EQUITY Volatility Surface

From the Calypso Navigator, navigate to **Market Data > Volatilities > Volatility Surface** (menu action `marketdata.VolatilitySurface3DWindow`).

EQUITY volatility surfaces can be created from offset points, or derived from OTC Equity Option or Exchange Traded Option underlying instruments.

- [Surface from offset points](#)
- [Surface from underlying instruments](#)
- [Pricer configuration](#)

► See also [Volatility Surface Overview](#).

8.1 Surface from Offsets

EQUITY Volatility Surface from Offsets Quick Reference

Configuration Requirements

- You can create equity products using **Configuration > Equity > Equity** from the Calypso Navigator.

Surface Generation

1. Click **New** to start a new surface.
2. The Current checkbox is selected by default, meaning that when you save the surface, the system timestamps the surface with the current date and time. Clear the Current checkbox to enter a back-dated surface. You can modify the date and time fields.
3. Definition Panel — Select the following to define the surface: currency, volatility type “EQUITY”, equity product, strike type, interpolator, the Derived checkbox should not be selected, generator, date-roll convention, holiday calendars, pricing environment.
4. Offsets Panel — Select the tenor and expirations. Enter the strikes / delta values.
5. Points Panel — Click **Generate** to generate the points. Enter the point values.
6. Click **Save**, enter a name for the surface, and click **OK**.

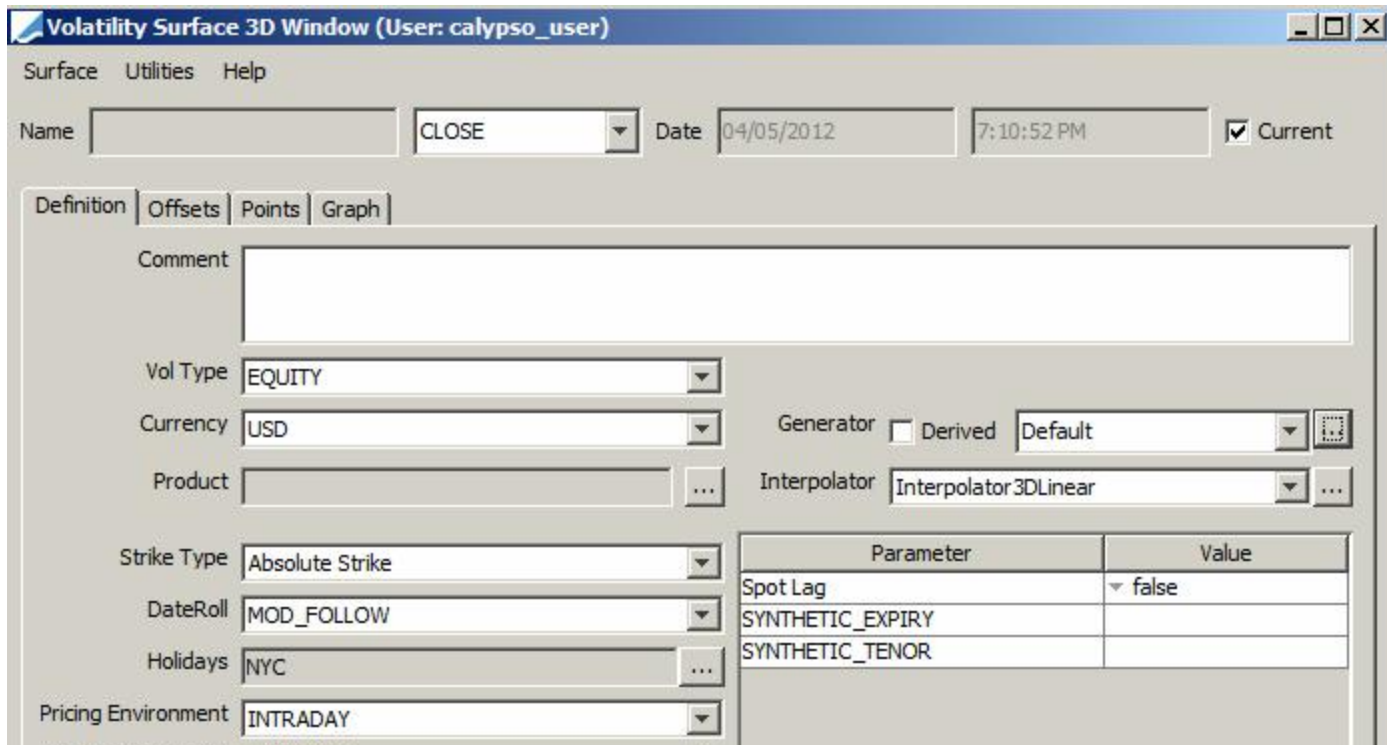
Pricer Configuration

An EQUITY volatility surface is associated with a pricing environment under the Surfaces panel of the pricer configuration for the volatility type EQUITY and the VOL usage.

8.1.1 Definition Panel

Click **New** to start a new surface.

Select the following to define the surface: currency, volatility type “EQUITY”, equity product, strike type, interpolator, the Derived checkbox should not be selected, generator, date-roll convention, holiday calendars, pricing environment.



Volatility Surface 3D Window (User: calypso_user)

Surface Utilities Help

Name: CLOSE Date: 04/05/2012 7:10:52 PM ☒ Current

Definition | Offsets | Points | Graph

Comment:

Vol Type: EQUITY

Currency: USD Generator: ☐ Derived Default

Product: Interpolator: Interpolator3DLinear

Strike Type: Absolute Strike

DateRoll: MOD_FOLLOW

Holidays: NYC

Pricing Environment: INTRADAY

Parameter	Value
Spot Lag	false
SYNTHETIC_EXPIRY	
SYNTHETIC_TENOR	

- » Select the type of strike : Strike, Delta, or Relative % - They are described below.
- » Select the generation algorithm: Default, SVISimple, or SplineSimple.

Default generator - You can set the following generator parameters:

- If the spot lag parameter is set to true, the generated exercise dates are rolled using the conventions of the definition screen.
- Note that SYNTHETIC_EXPIRY and SYNTHETIC_TENOR are not currently used.

SVISimple generator - Support for local volatility model using the SVI methodology, for pricing and risk.

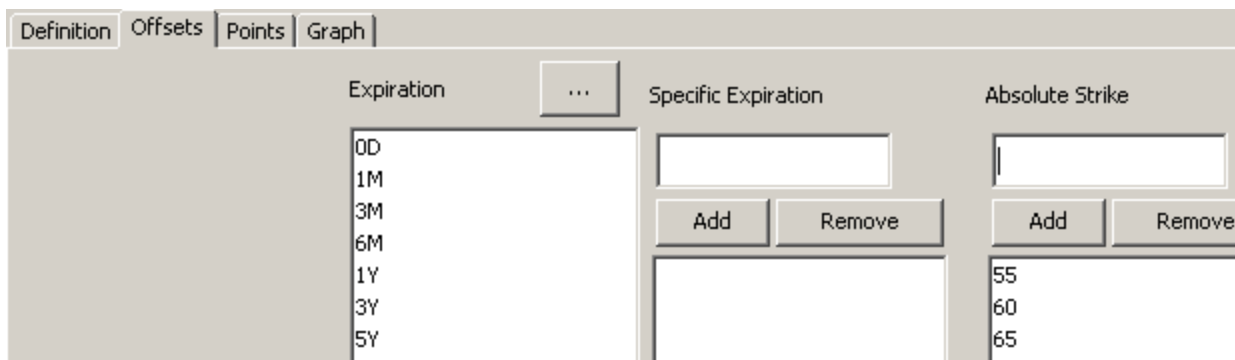
SplineSimple generator - Generation of volatility surface based on delta.

Surface Type	Description
Strike	In the Offset panel, enter absolute strikes.

Surface Type	Description
	<div><div>Strike</div><div><div></div><div>AddRemove</div><div>556065</div></div></div>
Relative %	<div><div>In the Offset panel, enter a percentage of the current spot.</div><div><div>ⓘ Note: 0% = ATM for offset based relative vol surface & 100%= ATM for derived relative vol surface.</div><div><div>Relative %</div><div><div></div><div>AddRemove</div><div>85100115</div></div></div></div></div>
Delta	<div><div>In the Offset panel, enter delta values.</div><div><div>Delta</div><div><div></div><div>AddRemove</div><div>1020-10</div></div></div></div>

8.1.2 Offsets Panel

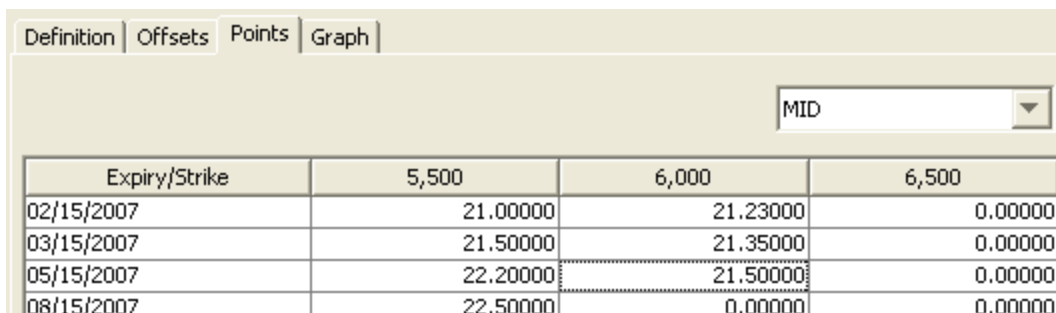
Select the Offsets panel.



- » Click **...** to select expirations.
- » Enter a strike and click **Add**. Repeat for each strike value.

8.1.3 Points Panel

Select the Points panel, and click **Generate** to generate the points.



Expiry/Strike	5,500	6,000	6,500
02/15/2007	21.00000	21.23000	0.00000
03/15/2007	21.50000	21.35000	0.00000
05/15/2007	22.20000	21.50000	0.00000
08/15/2007	22.50000	0.00000	0.00000

- » Enter market volatilities for each expiration / strike.

8.1.4 Save Surface

Click **Save** in the bottom of the surface window. Enter a name for the surface, and click **OK**.

8.2 Surface from Underlying Instruments

EQUITY Volatility Surface from Underlying Instruments – Quick Reference

Configuration Requirements

- You can create equity products using **Configuration > Equity > Equity** from the Calypso Navigator.
- You need a dividend curve for the equity in the pricing environment.

Surface Underlying Instruments

You can use ETOs, Equity OTC Option and warrants underlying instruments. From the Calypso Navigator, navigate to **Configuration > Market Data > Volatility Surface Underlyings**, or in the surface application's Underlyings panel, click **New Instrument**.

Surface Generation

1. Click **New** to start a new surface.
2. Select the quote instance to use in the surface generation (CLOSE, LAST, or OPEN).
3. The Current checkbox is selected by default, meaning that when you save the surface, the system timestamps the surface with the current date and time. Clear the Current checkbox to enter a back-dated surface. You can modify the date and time fields.
4. Definition Panel — Select the following to define the surface: currency, volatility type "EQUITY", equity product, strike type, interpolator, select the Derived checkbox, generator, date-roll convention, holiday calendars, pricing environment.
5. Underlyings Panel — Select the underlying instruments.
6. Quotes Panel — Enter quotes manually, use quotes from the quote set, or use real-time quotes.
7. Points Panel — Click **Generate** to generate the points.
8. Click **Save**, enter a name for the surface, and click **OK**.

Pricer Configuration

An EQUITY volatility surface is associated with a pricing environment under the Surfaces panel of the pricer configuration for the volatility type EQUITY and the VOL usage.

8.2.1 Definition Panel

Click **New** to start a new surface.

Select the following to define the surface: currency, issuer / ticker / or basket, volatility type "EQUITY", strike type, interpolator, select the Derived checkbox, generator, date-roll convention, holiday calendars, pricing environment.

Surface
Utilities
Help

Name
CLOSE
Date
07/02/2019
1:21:41 PM
☒ Current

Definition
Underlyings
Quotes
Spline

Comment

Vol Type
EQUITY

Currency
USD

Generator
☒ Derived
Spline

Product

Interpolator
Interpolator3DLinear

Strike Type
Absolute Strike

DateRoll
MOD_FOLLOW

Holidays
NYC

Pricing Environment
INTRADAY

Parameter	Value
AmericanPricing	Bjerk Sund Stensland
Monotonicity	None
Boundary	Natural
Extrapolation	Flat
Data type	Volatility
Local Vol Repair	SEARCH
Local Vol Cap	10.0
Local Vol Floor	1E-6

» Select the type of strike:

Surface Type	Description
Strike	Absolute strike. The underlying instruments must be specified using an absolute strike. <div>Strike 65</div>
Relative %	% (current strike). The underlying instrument must be specified using a percentage of the current strike. In this example, it is 85% of the current strike. <div>Strike 85.00000</div>

» Select the generator:

- The SVI generator allows support for the local volatility model, using the SVI methodology, for pricing and risk. Local volatility surface can be derived from ETO or OTC instruments.
- The Spline generator allows generating a volatility surface from warrants.

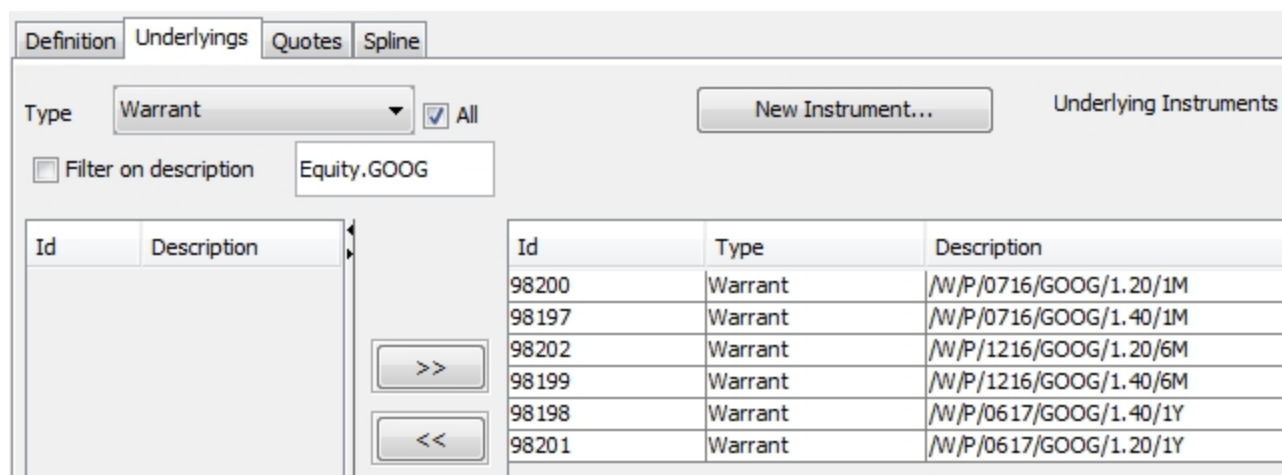
» You can set the following generator parameters as desired.

Parameter	Description
AmericanPricing	The default value is Bjerk Sund Stensland. This parameter defines the method used to invert

Parameter	Description
	American option prices (when the quotes are in price and not in volatility). As of today this is the only supported value. In the future we plan to support the Finite difference method, also used in the Calypso price PricerBlack1FFiniteDifference. The inversion is done with a Brent solver. To invert European option prices, the implied volatility is computed from option prices using P. Jäckel's method.
Monotonicity	This parameter offers the possibility to interpolate according to the monotonicity of the data, thereby removing the potential artificial oscillations stemming from cubic splines. None corresponds to the standard cubic spline, no monotonicity constraint is enforced. Hyman83 will apply the monotonicity constraints of Hyman. Hyman89 will apply the less strict monotonicity constraints of Dougherty et al. Note that applying monotonicity constraints means that the interpolant will be only C1 where monotonicity is violated.
Extrapolation	<p>This parameter controls the extrapolation in the strike space.</p> <p>Flat will flat extrapolate the volatilities. Linear will extrapolate linearly using the slope of the first and last cubic polynomials so that the slice stays C2 with natural boundary conditions. Note that if the data type is variance, the extrapolation will be linear in variance, which is typical of stochastic volatility models behavior (for example Heston). The extrapolation is floored to machine epsilon to avoid negative variance.</p> <p>In general, we recommend Linear as it will lead to a smooth implied volatility and therefore a smooth local volatility with Natural spline boundaries, around the extrapolation.</p>
Data Type	<p>This parameters controls which data the spline is applied to.</p> <p>Volatility means that the spline is built from strikes and volatilities, strikes being in the unity defined in the volatility surface (absolute, relative, Delta for SplineSimple). Variance means that the spline is built from strikes and the square of volatilities, strikes being in the unity defined in the volatility surface, and input volatilities being internally converted to variances. This is particularly interesting when combined with a linear extrapolation. VarianceLogMoneyness means that the is spline built from log-moneyness $\log(K/F)$ and variances σ^2, strikes are internally converted to log-moneyness.</p>
Local Vol Repair	<p>This parameter is used when the generator is used with a Local volatility pricer such as PricerLocalVolatility1FFiniteDifference or PricerLocalVolatilityNFMonteCarloExotic.</p> <p>In general we recommend the use of the SVI generator for local volatility, as it is much more robust against arbitrage, but if the quotes are of very good quality then it can make sense to use the Spline generator directly.</p> <p>SEARCH will search for a defined local volatility towards the moneyness and stop at the moneyness, it will then revert to CAP_FLOOR.</p> <p>CAP_FLOOR will use the Cap value if there is a butterfly spread arbitrage (or equivalently, when the local variance denominator becomes negative), it will use the Floor value if there is a calendar spread arbitrage (or equivalently, when the local variance numerator is negative). If Cap and Floor are blank, nothing is done. If only Floor is set and Cap is blank, the local volatility will be floored, even in presence of butterfly spread arbitrage.</p>

8.2.2 Underlyings Panel

Select the Underlyings panel.

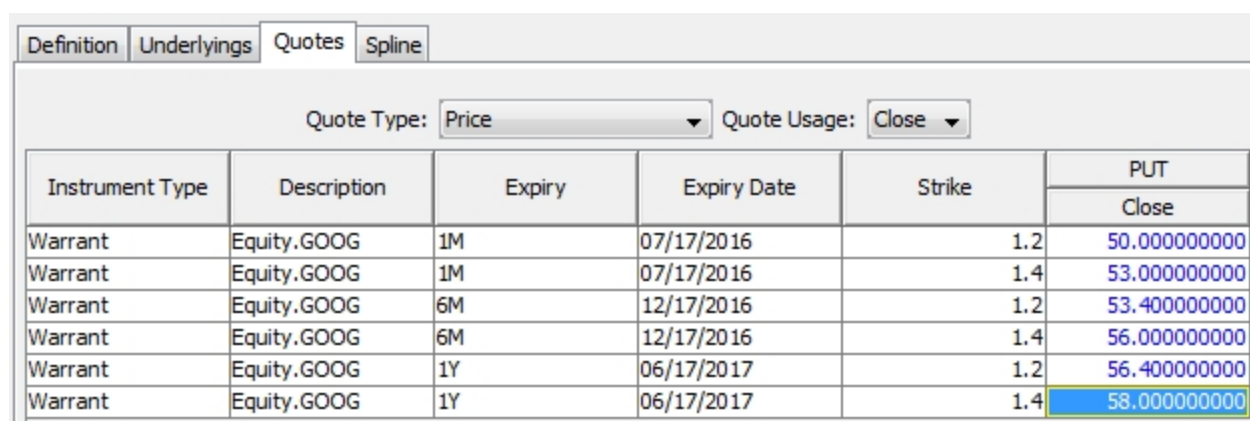


Id	Type	Description
98200	Warrant	/W/P/0716/GOOG/1.20/1M
98197	Warrant	/W/P/0716/GOOG/1.40/1M
98202	Warrant	/W/P/1216/GOOG/1.20/6M
98199	Warrant	/W/P/1216/GOOG/1.40/6M
98198	Warrant	/W/P/0617/GOOG/1.40/1Y
98201	Warrant	/W/P/0617/GOOG/1.20/1Y

- » Select the instrument type to display the list of available instruments. The panel is blank if you have not set up any instruments. Click **New Instruments** to create new instruments.
- » Select instruments and click **>>** to add them to the instrument list in the right panel.

8.2.3 Quotes Panel

Select the Quotes panel. Enter quotes for the underlying instruments.

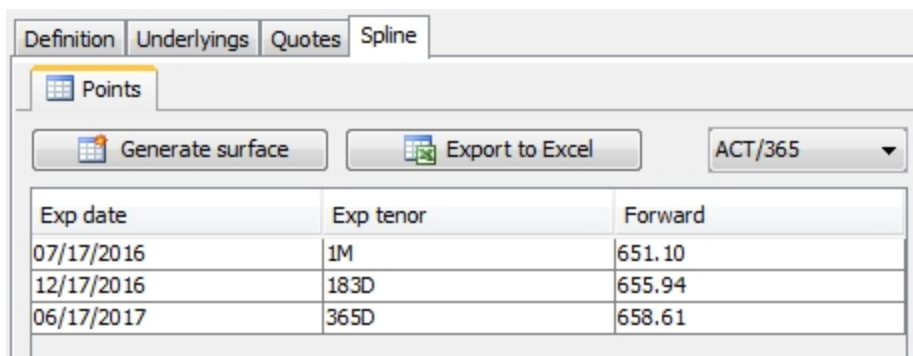


Instrument Type	Description	Expiry	Expiry Date	Strike	PUT Close
Warrant	Equity.GOOG	1M	07/17/2016	1.2	50.00000000
Warrant	Equity.GOOG	1M	07/17/2016	1.4	53.00000000
Warrant	Equity.GOOG	6M	12/17/2016	1.2	53.40000000
Warrant	Equity.GOOG	6M	12/17/2016	1.4	56.00000000
Warrant	Equity.GOOG	1Y	06/17/2017	1.2	56.40000000
Warrant	Equity.GOOG	1Y	06/17/2017	1.4	58.00000000

- » You can click **Save Quotes** to save the quotes.
- » You can choose to display the quotes in a as shown above, or as a list.

8.2.4 Spline Panel

Select the Spline panel, and click **Generate** to generate the points.



Exp date	Exp tenor	Forward
07/17/2016	1M	651.10
12/17/2016	183D	655.94
06/17/2017	365D	658.61

8.2.5 Save Surface

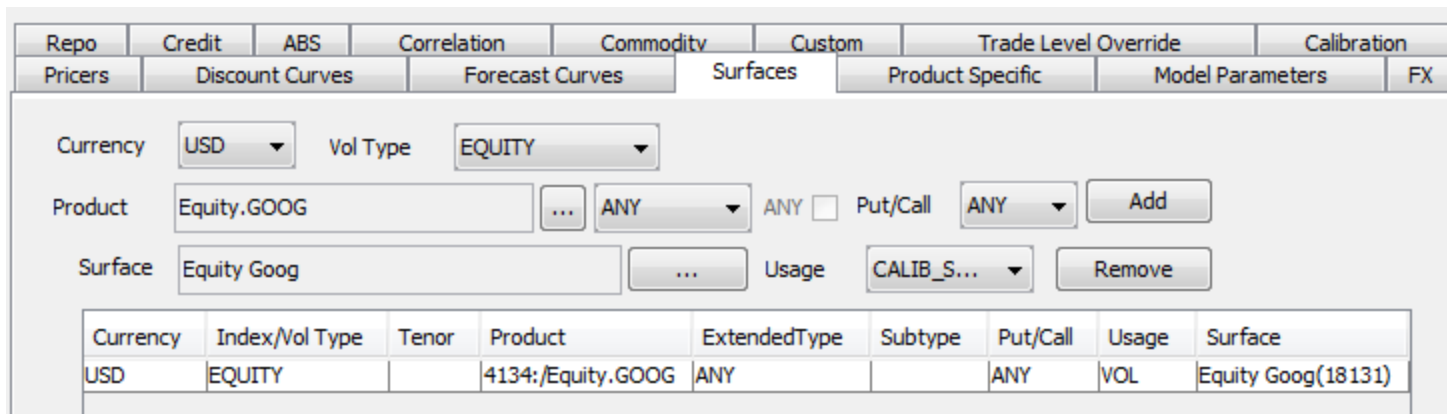
Click **Save** in the bottom of the surface window. Enter a name for the surface, and click **OK**.

8.3 Pricer Configuration

From the Calypso Navigator, navigate to **Market Data > Pricing Environment > Pricer Configuration**.

Click **Load**, and select a pricer configuration.

Select the Surfaces panel.



Currency	Index/Vol Type	Tenor	Product	ExtendedType	Subtype	Put/Call	Usage	Surface
USD	EQUITY		4134:/Equity.GOOG	ANY		ANY	VOL	Equity Goog(18131)

- » Select the volatility type EQUITY, select an equity product or ANY.
- » Click **...** to select the volatility surface.
- » Select the VOL usage.
- » Click **Add** to add the surface to the list.
- » Click **Save** to save the pricer configuration.

9. MMFUTURE Volatility Surface

From the Calypso Navigator, navigate to **Market Data > Volatilities > Volatility Surface** (menu action `marketdata.VolatilitySurface3DWindow`).

MMFUTURE volatility surfaces can be derived from underlying instruments.

Interpolation methods and generation algorithms are provided out-of-the-box. Refer to the *Interest Rate Derivatives Analytics* documentation for details.

► See also [Volatility Surface Overview](#).

Derived MMFUTURE Volatility Surface Quick Reference

Configuration Requirements

- MM Futures – From the Calypso Navigator, navigate to **Configuration > Listed Derivatives > Future Contracts**.

Surface Underlying Instruments

You can use FutureOption underlying instruments. From the Calypso Navigator, navigate to **Configuration > Market Data > Volatility Surface Underlyings**, or in the surface application's Underlyings panel, click **New Instrument**.

Surface Generation

1. Click **New** to start a new surface.
2. Select the quote instance to use in the surface generation (CLOSE, LAST, or OPEN).
3. The Current checkbox is selected by default, meaning that when you save the surface, the system timestamps the surface with the current date and time. Clear the Current checkbox to enter a back-dated surface. You can modify the date and time fields.
4. Definition Panel — Select the following to define the surface: currency, index, and tenor, volatility type "MMFUTURE", strike type, interpolator, select the Derived checkbox, generator "FutureOption", date-roll convention, holiday calendars, pricing environment.
To price Eurodollar future options with pricer `PricerFutureOptionMMBpVol`, you need to use the `FutureOptionBpVol` generator.
5. Underlyings Panel — Select the underlying instruments.
6. Quotes Panel — Enter quotes manually, use quotes from the quote set, or use real-time quotes.
7. Points Panel — Click **Generate** to generate the points.
8. Click **Save**, enter a name for the surface, and click **OK**.

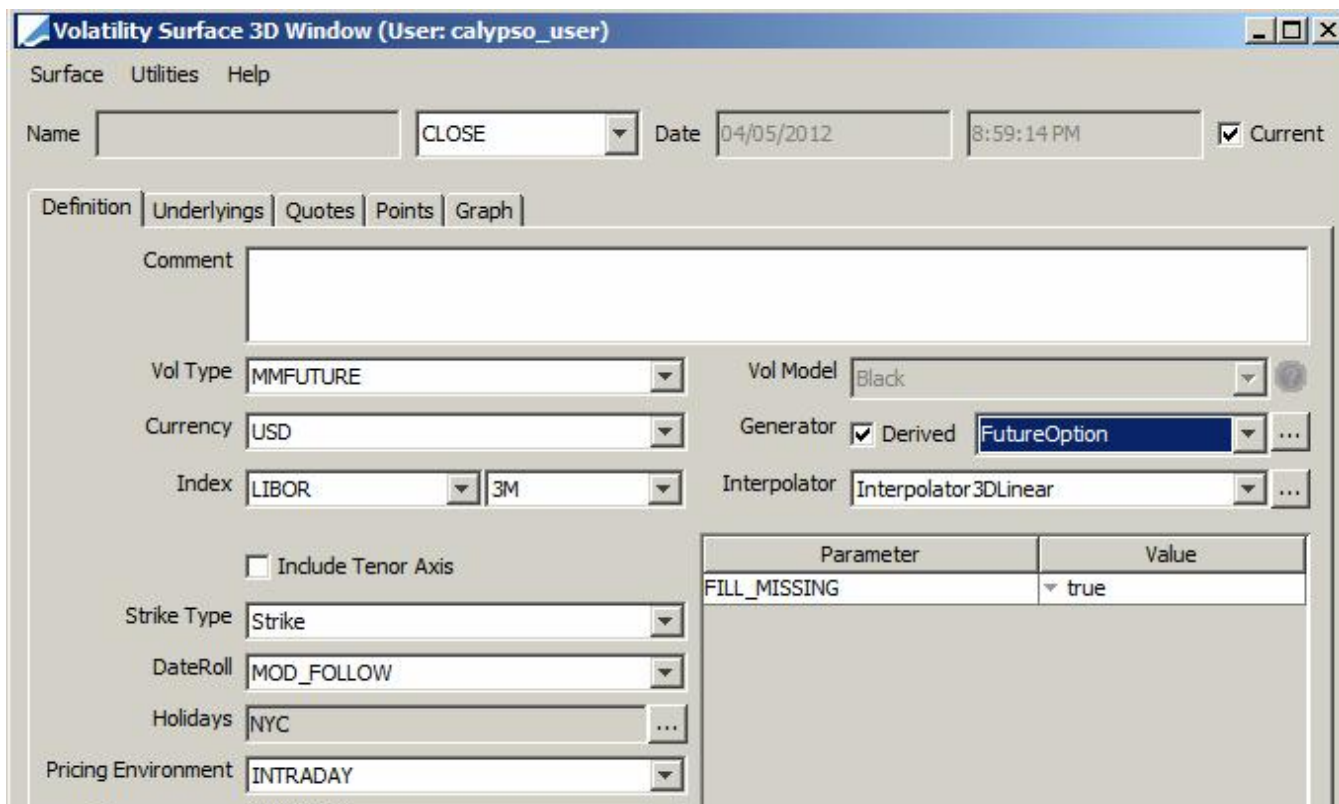
Pricer Configuration

A MMFUTURE volatility surface is associated with a pricing environment under the Surfaces panel of the pricer configuration for the MMFUTURE volatility type and VOL usage.

9.1 Definition Panel

Click **New** to start a new surface.

Select the following to define the surface: currency, index, and tenor, volatility type “MMFUTURE”, strike type, interpolator, select the Derived checkbox, generator “FutureOption”, date-roll convention, holiday calendars, pricing environment.



Volatility Surface 3D Window (User: calypso_user)

Surface Utilities Help

Name: CLOSE Date: 04/05/2012 8:59:14 PM ☒ Current

Definition Underlyings Quotes Points Graph

Comment:

Vol Type: MMFUTURE Vol Model: Black

Currency: USD Generator: ☒ Derived FutureOption

Index: LIBOR 3M Interpolator: Interpolator3DLinear

☐ Include Tenor Axis

Strike Type: Strike

DateRoll: MOD_FOLLOW

Holidays: NYC

Pricing Environment: INTRADAY

Parameter	Value
FILL_MISSING	true

» Select the type of strike: Strike or Strike Offset BPs - They are described below.

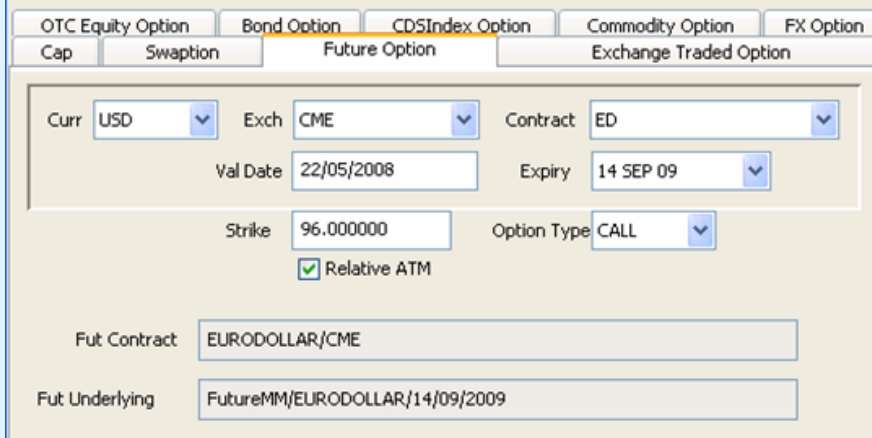
Strike Types Details

Surface Type	Definition
Strike	<p>Absolute strike.</p> <p>Offset Points</p> <p>In the Offset panel, enter absolute strikes.</p>

Surface Type	Definition
	<div> <div> <div>Strike</div> <div></div> <div> <div>Add</div> <div>Remove</div> </div> <div> <div>99</div> <div>99.2</div> <div>99.5</div> </div> </div> <p>Underlying Instruments</p> <p>The underlying instruments must be specified using an absolute strike.</p> <div> <div>Strike</div> <div>3.10000</div> <div> <input type="checkbox"/> Relative ATM </div> </div> </div>
Strike Offset BPs	<p>Current strike +/- offset minus ATM strike (in bp).</p> <p>Offset Points</p> <p>In the Offset panel, enter relative offset over the current strike in bp Make sure to add 0.</p> <div> <div> <div>Strike Offset bp</div> <div></div> <div> <div>Add</div> <div>Remove</div> </div> <div> <div>-20</div> <div>0</div> <div>20</div> </div> </div> <p>Underlying Instruments</p> <p>The underlying instruments must be specified using a relative strike in bp. In this example the relative strike is +25bp.</p> <div> <div>Strike</div> <div>25.00000</div> <div> <input checked="" type="checkbox"/> Relative ATM </div> </div> <p>Note that when using a relative strike, one of the underlying instruments must be defined with a strike of 0.</p> </div>

Surface Type	Definition
	<div> <div>Strike</div> <div>0.00000</div> <div> <input checked="" type="checkbox"/> Relative ATM </div> </div>

» Select the generation algorithm - It controls the type of underlying instruments that you can select:

Generation Algorithm	Description
FutureOption	Generates and stores volatilities where the underlyings are options on futures.
FutureOptionBpVol	<p>To price Eurodollar future options with pricer PricerFutureOptionMMBpVol.</p> <p>You can set the TRANSFORMATION_METHOD generator parameter in the Definition panel. The default value is EXACT. See below for details.</p> <p>Sample Eurodollar future option underlying.</p> 

» Set the generator parameter as applicable.

When FILL_MISSING is true (default value) the missing points are filled using linear interpolation in the strike axis, more specifically, InterpolatorLinear is used on all quotes for a particular expiry to fill any missing point. Otherwise, 0 points are generated.

Transformation Methods Details

The transformation method allows converting between normal / lognormal vols as needed.

Name	Transformation
EXACT	$\sigma = f^{-1}(v)$

Name	Transformation
ANDERSON_RATCLIFFE_LN	$\nu = \frac{\ln(F/K)}{F-K} \sigma - \frac{\ln(F/K)}{(F-K)^3} \ln\left(\frac{\ln(F/K)}{F-K} \sqrt{FK}\right) \sigma^3 T$
ANDERSON_RATCLIFFE_N	$\sigma = \frac{F-K}{\ln(F/K)} \nu - \frac{F-K}{\ln(F/K)^3} \ln\left(\frac{F-K}{\ln(F/K)} \sqrt{FK}\right) \nu^3 T$
HAGAN_APPROX	$\nu = \frac{2\sigma}{(F+K)} \left(1 + \frac{1}{3} \left(\frac{F-K}{F+K} \right)^2 + \frac{1}{6} \left(\frac{\sigma^2 T}{(F+K)^2} \right) + \dots \right)$
STREET_PROXY1	$\sigma = \sqrt{FK} \nu$
STREET_PROXY2	$\sigma = \nu \sqrt{\frac{1}{2} (F^2 + K^2)}$
STREET_PROXY3	$\sigma = \nu F \left(1 - \frac{1}{24} \nu^2 T \right)$
STREET_PROXY4	$\sigma = F \nu$
STREET_PROXY5	$\sigma = K \nu$

9.2 Underlyings Panel

Select the Underlyings panel.

- » Select the instrument type, and the panel below displays the list of available instruments. The panel is blank if you have not set up any instruments. Click **New Instrument** to create new instruments.
- » Select instruments and click **>>** to add them to the instrument list in the right panel.

Select the Quotes panel. Enter quotes for the underlying instruments.

» You can click **Save Quotes** to save the quotes.

9.4 Points Panel

Click the Points tab. Click **Generate** to generate the points.

Definition Underlyings Quotes Points Graph			
MID			
Expiry/Strike	95	96	
05/14/2007	115.83299	205.38332	
06/18/2007	10.24330	46.07647	
07/16/2007	151.87171	43.91538	

- » You can view the points for each combination of expiry and strike (and tenor).
- » For the FutureOptionBpVol generator, you can select MID_BPVol, BID_BPVol, or ASK_BPVol to view the bp vol points.

Definition Underlyings Quotes Points Graph			
MID_BPVol			
Expiry/Strike	97		
15/09/2008		1.46742	

9.5 Save Surface

Click **Save** in the bottom of the surface window. Enter a name for the surface, and click **OK**.

9.6 Pricer Configuration

From the Calypso Navigator, navigate to **Market Data > Pricing Environment > Pricer Configuration**. Load a pricer configuration and select the Surfaces panel.

Pricers	Discount Curves	Forecast Curves	Surfaces	Product Specific	Model Parameters	FX	Repo	Credit	Correlation	Commodity	Custom
---------	-----------------	-----------------	----------	------------------	------------------	----	------	--------	-------------	-----------	--------

Currency	USD	Vol Type	MMFUTURE	Index	LIBOR	ANY
Product	FutureOptionMM	ANY	ANY	Put/Call	PUT	Add
Surface		...	Usage	VOL	Remove	

Currency	Index/Vol Type	Tenor	Product	ExtendedType	Subtype	Put/Call	Usage	Surface
USD	LIBOR	ANY	FutureOptionMM	ANY	ANY	PUT	VOL	ED_FutureOption_VolSurface(6512)

Load	New	Delete	Save	Save As	Close
------	-----	--------	------	---------	-------

- » Select the currency, volatility type, index, and tenor.

- » Select the product type, extended type or ANY, subtype or ANY, PUT or CALL.
- » Click **...** to select the volatility surface. Select the surface in the Selection window and click **Load** to display the surface name in the pricer configuration.
- » Click **Add** to add the surface to the list.
- » Click **Save** to save the pricer configuration.

10. RATE Volatility Surface

From the Calypso Navigator, navigate to **Market Data > Volatilities > Volatility Surface** (menu action `marketdata.VolatilitySurface3DWindow`).

RATE volatility surfaces can be created from offset points, or derived from underlying instruments.

Interpolation methods and generation algorithms are provided out-of-the-box. Refer to the Interest Rate Derivatives Analytics documentation for details.

- [Surface from offset points](#)
- [Surface from underlying instruments](#)
- [Pricer configuration](#)

► See also [Volatility Surface Overview](#).

10.1 RATE Volatility Surface from Offsets

RATE Volatility Surface from Offsets Quick Reference

Surface Generation

1. Click **New** to start a new surface.
2. The Current checkbox is selected by default, meaning that when you save the surface, the system timestamps the surface with the current date and time. Clear the Current checkbox to enter a back-dated surface. You can modify the date and time fields.
3. Definition Panel — Select the following to define the surface: currency, index, and tenor, volatility type “RATE”, strike type, interpolator, the Derived checkbox should not be selected, generator, date-roll convention, holiday calendars, pricing environment.
4. Offsets Panel — Select the tenor and expirations. Enter the strikes.
5. Points Panel — Click **Generate** to generate the points. Enter the point values.
6. Click **Save**, enter a name for the surface, and click **OK**.

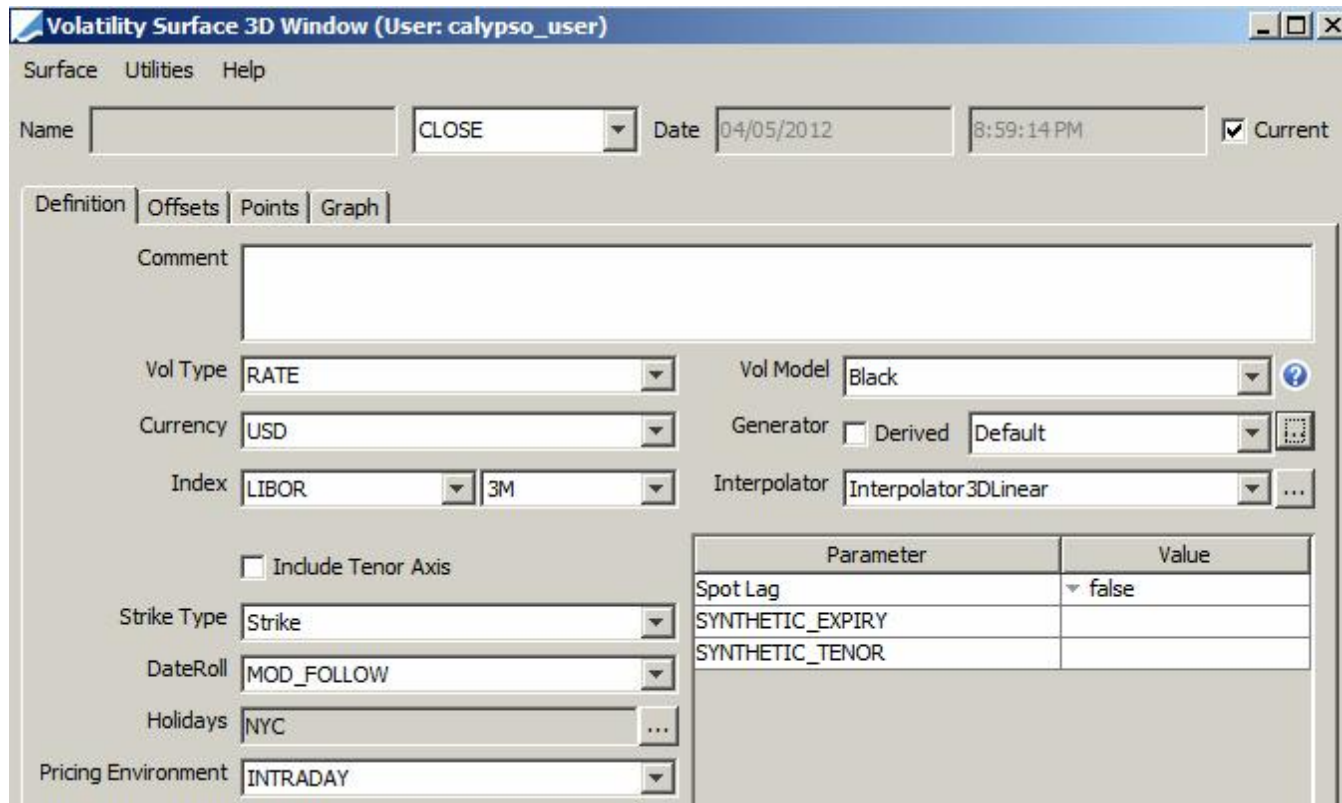
Pricer Configuration

A RATE volatility surface is associated with a pricing environment under the Surfaces panel of the pricer configuration for the RATE volatility type and VOL usage.

10.1.1 Definition Panel

Click **New** to start a new surface.

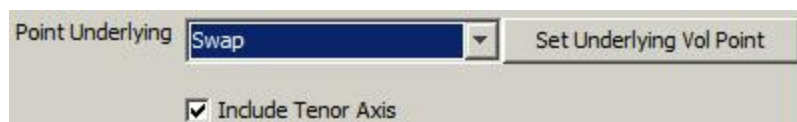
Select the following to define the surface: currency, index, and tenor, volatility type "RATE", strike type, interpolator, the Derived checkbox should not be selected, generator, date-roll convention, holiday calendars, pricing environment.



Parameter	Value
Spot Lag	false
SYNTHETIC_EXPIRY	
SYNTHETIC_TENOR	

- » Select the type of strike: Strike, Relative Spread, Strike Offsets BPs, or Relative % - They are described below.
- » Select the generation algorithm - They are described below.
- » "Include Axis Tenor" - There are circumstances where pricing requires a Tenor axis on top of the regular Strike and Maturity; such as pricing for Swaptions.

The default volatility surface setup in Calypso is for Maturity vs. Strike on a 2D graph. Selecting "Include Tenor Axis" gives us a 3D graph where necessary.



When you select "Include Tenor Axis", you can select a point underlying.

The point underlying option is an option that has been added for use with the LGMM pricers where we need to calibrate Bermudan swaptions to vanilla swaption NPVs. The structure of the underlying swap in the calibration swaption is taken in the circumstance that Point Underlying = Swap. When Point Underlying = None the surface cannot be used for LGMM pricers but can still be used for any other applicable product type.

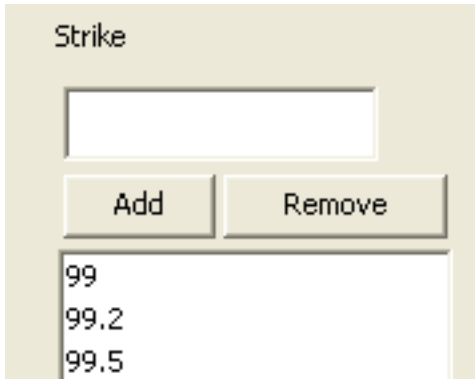
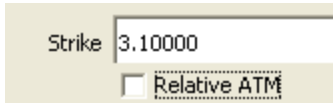
When selecting "Swap", you can click **Set Underlying Vol Point** to define the swap.

Once the swap is defined, you can select additional curves for calibration:

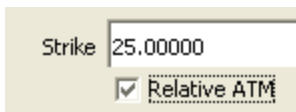
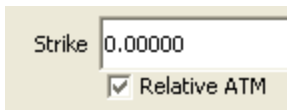
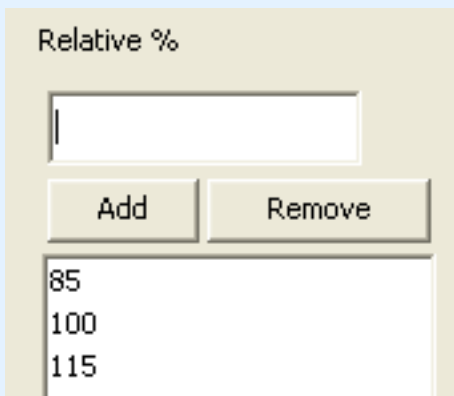
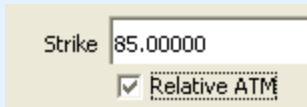
MDI Name	Value
SWAP_DISCOUNT	Discount USD LIB 5/29/13 2:43:18.000 PM PDT
SWAP_FORECAST	Forecast USD LIB 5/29/13 2:43:18.000 PM PDT
SWAPTION_DISCOUNT	Discount USD LIB 5/29/13 2:43:18.000 PM PDT

You can double-click the Value field to select a curve.

Strike Types Details

Surface Type	Definition
Strike	<p>Absolute strike.</p> <p>Offset Points</p> <p>In the Offset panel, enter absolute strikes.</p>  <p>Underlying Instruments</p> <p>The underlying instruments must be specified using an absolute strike.</p> 
Relative Spread	<p>Current strike +/- spread minus ATM strike (in %).</p> <p>Offset Points</p> <p>In the Offset panel, enter relative spreads over the current strike in %. Make sure to add 0.</p>

Surface Type	Definition
	<div> <div> <div>Relative Spread</div> <div></div> <div> <div>Add</div> <div>Remove</div> </div> <div> <div>-1</div> <div>0</div> <div>1</div> </div> </div> <div> <p>Underlying Instruments</p> <p>The underlying instruments must be specified using a relative strike in %. In this example the relative strike is -1%.</p> <div> <div>Strike</div> <div>-1.00000</div> <div> <input checked="" type="checkbox"/> Relative ATM </div> </div> <p>Note that when using a relative strike, one of the underlying instruments must be defined with a strike of 0.</p> <div> <div>Strike</div> <div>0.00000</div> <div> <input checked="" type="checkbox"/> Relative ATM </div> </div> </div> </div>
Strike Offset BPs	<p>Current strike +/- offset minus ATM strike (in bp).</p> <p>Offset Points</p> <p>In the Offset panel, enter relative offset over the current strike in bp Make sure to add 0.</p> <div> <div> <div>Strike Offset bp</div> <div></div> <div> <div>Add</div> <div>Remove</div> </div> <div> <div>-20</div> <div>0</div> <div>20</div> </div> </div> <div> <p>Underlying Instruments</p> <p>The underlying instruments must be specified using a relative strike in bp. In this example</p> </div> </div>

Surface Type	Definition
	<p>the relative strike is +25bp.</p>  <p>Note that when using a relative strike, one of the underlying instruments must be defined with a strike of 0.</p> 
Relative %	<p>% (current strike) minus ATM strike.</p> <p>Offset Points</p> <p>In the Offset panel, enter a percentage of the current strike.</p>  <p>Underlying Instruments</p> <p>The underlying instrument must be specified using a percentage of the current strike. In this example, it is 85% of the current strike.</p> 

Generation Algorithms

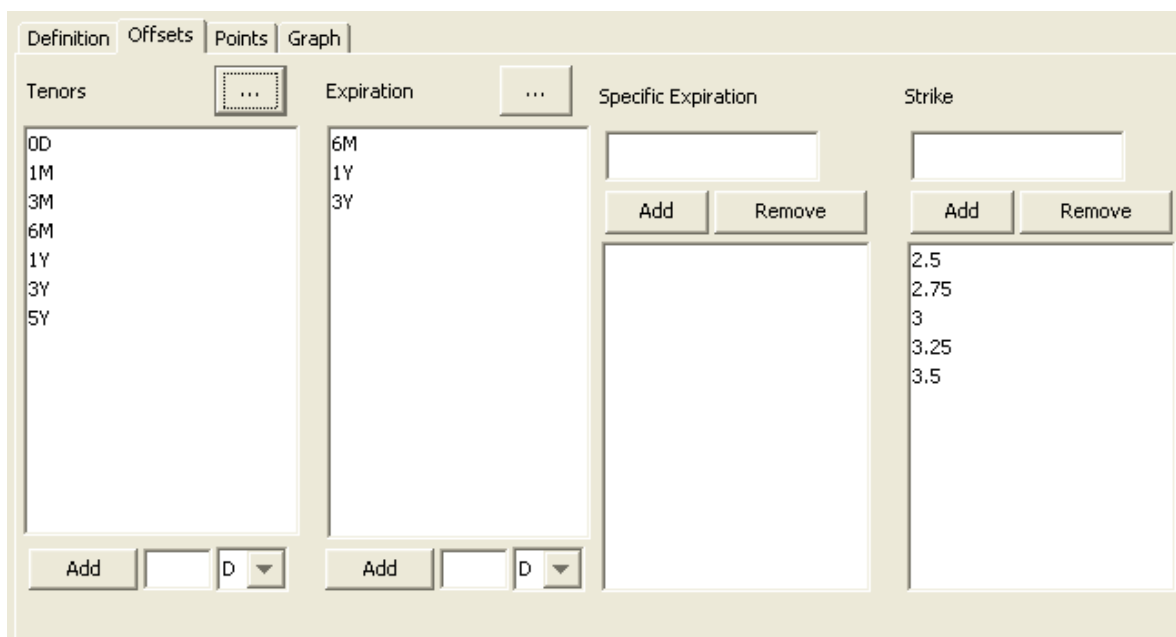
Generation Algorithms	Definition
NONE	You can select "NONE" for the most "simple" generator from offsets.
Default	Can be used for caps, swaptions, bond options, etc. If the spot lag parameter is set to true, the generated exercise dates are rolled using the conventions of the definition screen.

Generation Algorithms	Definition								
	<table border="1"> <thead> <tr> <th>Parameter</th><th>Value</th></tr> </thead> <tbody> <tr> <td>Spot Lag</td><td>false</td></tr> <tr> <td>SYNTHETIC_EXPIRY</td><td></td></tr> <tr> <td>SYNTHETIC_TENOR</td><td></td></tr> </tbody> </table> <p>Note that SYNTHETIC_EXPIRY and SYNTHETIC_TENOR are not currently used.</p>	Parameter	Value	Spot Lag	false	SYNTHETIC_EXPIRY		SYNTHETIC_TENOR	
Parameter	Value								
Spot Lag	false								
SYNTHETIC_EXPIRY									
SYNTHETIC_TENOR									
Swaption Generators									
CEVSimple	<p>CEV stands for constant elasticity of variance. A key feature of the model is that given the parameters of the model, the entire smile can be determined analytically; that is, for a given strike one can analytically determine the correct Black-Scholes volatility to 'plug into' the usual Black-Scholes model to determine the premium of the option under the assumptions of the CEV model.</p> $dF = \alpha F^{\beta} dW$ <p>where Beta (β) controls the distribution and Alpha (α) is intimately related to the overall level of volatility.</p>								
CMSBasisAdjSimple	Used to store CMS volatility basis adjustments on the volatility surface.								
LGMMMeanRev	<p>The Linear Gauss Markov Model is really the Hull-White one factor model reset in the Heath-Jarrow-Morton framework for Bermudan Swaptions. This alternative characterization greatly helps with calibration and trade valuation.</p> <p>Calibration</p> <p>The calibration is stored in a layer of a volatility surface on the Points panel. The generator takes a list of ATM swaption volatilities as inputs and creates an empty container for the mean reversion values. In the case of this model, these values change very infrequently and so it is reasonable that they would remain their original values for the better part of a year. For this reason we have separated the volatility surface that the model requires from the mean reversion parameters that it also requires. This enables the volatility surface to change and be regenerated daily whereas the mean reversion values can remain constant.</p> <p>Calibration Matrix</p> <p>In the Points panel of a volatility surface generated with the (simple) LGMMMeanRev generator, there is a layer created titled LGMM_MeanRev. This is where the user is required to key in the values, possibly calculated on a spreadsheet, and then save the surface.</p>								

Generation Algorithms	Definition																																																
	<div><div>DefinitionOffsetsPointsGraph</div><div><div><div><input type="radio"/> Tenor</div><div><input type="radio"/> Expiry</div><div><input checked="" type="radio"/> Strike</div></div><div>Strike</div><div><div>0</div><div>▼</div></div><div><div>LGMM_MeanRev</div><div>▼</div></div></div><table><tr><th>Expiry/Tenor</th><th>1Y</th><th>2Y</th><th>3Y</th><th>4Y</th><th>5Y</th><th>7Y</th><th>10Y</th></tr><tr><td>07/11/2007</td><td>-0.7500</td><td>-0.2500</td><td>0.0000</td><td>0.0000</td><td>0.0000</td><td>0.0000</td><td>0.0000</td></tr><tr><td>10/11/2007</td><td>-0.5000</td><td>0.0000</td><td>0.2500</td><td>0.2500</td><td>0.2500</td><td>0.2500</td><td>0.2500</td></tr><tr><td>04/11/2008</td><td>0.0000</td><td>0.2500</td><td>0.5000</td><td>0.5000</td><td>0.5000</td><td>0.5000</td><td>0.5000</td></tr><tr><td>04/13/2009</td><td>0.2500</td><td>0.5000</td><td>1.0000</td><td>1.0000</td><td>1.0000</td><td>1.0000</td><td>1.0000</td></tr><tr><td>04/12/2010</td><td>0.5000</td><td>1.0000</td><td>1.2500</td><td>1.2500</td><td>1.2500</td><td>1.2500</td><td>1.2500</td></tr></table></div>	Expiry/Tenor	1Y	2Y	3Y	4Y	5Y	7Y	10Y	07/11/2007	-0.7500	-0.2500	0.0000	0.0000	0.0000	0.0000	0.0000	10/11/2007	-0.5000	0.0000	0.2500	0.2500	0.2500	0.2500	0.2500	04/11/2008	0.0000	0.2500	0.5000	0.5000	0.5000	0.5000	0.5000	04/13/2009	0.2500	0.5000	1.0000	1.0000	1.0000	1.0000	1.0000	04/12/2010	0.5000	1.0000	1.2500	1.2500	1.2500	1.2500	1.2500
Expiry/Tenor	1Y	2Y	3Y	4Y	5Y	7Y	10Y																																										
07/11/2007	-0.7500	-0.2500	0.0000	0.0000	0.0000	0.0000	0.0000																																										
10/11/2007	-0.5000	0.0000	0.2500	0.2500	0.2500	0.2500	0.2500																																										
04/11/2008	0.0000	0.2500	0.5000	0.5000	0.5000	0.5000	0.5000																																										
04/13/2009	0.2500	0.5000	1.0000	1.0000	1.0000	1.0000	1.0000																																										
04/12/2010	0.5000	1.0000	1.2500	1.2500	1.2500	1.2500	1.2500																																										
SABRDirect	<p>Similar to SABRSimple, except you input the ATM volatilities as MID point adjustments rather than link to another volatility surface to get the ATM volatilities as in SABRSimple. MDI is not required.</p> <p>You can set the generator parameter "Calibrate SABR values" to true. In that case:</p> <ul style="list-style-type: none">You can input ATM bpVol Quotes only using 3M Caplets as underlying instruments.You can input rho, nu, beta values directly in the SABR Points tab and Generate a SABR surface.																																																
SABRSimple	<p>Deprecated - It is recommended to use Swaption, SwaptionDerived or Default instead.</p> <p>Used to create the implied smile along the strike axis. ATM Black volatilities are the input and the model parameters alpha, beta, rho, nu create the implied smile that is applied to the volatility surface.</p>																																																

10.1.2 Offsets Panel

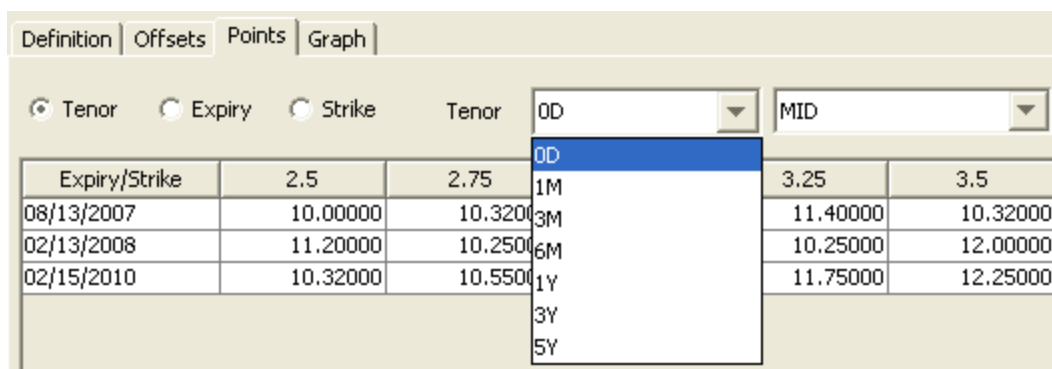
Select the Offsets panel.



- » Click **...** to select tenors and expirations.
- » Enter a strike and click **Add**. Repeat for each strike value.

10.1.3 Points Panel

- » Select the Points panel, and click **Generate** to generate the points.

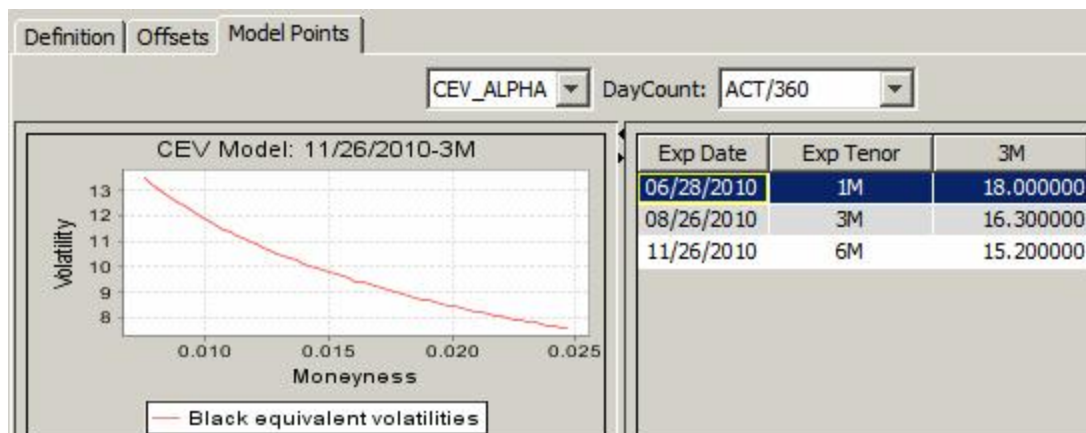


Expiry/Strike	2.5	2.75	3.25	3.5
08/13/2007	10.00000	10.32000	11.40000	10.32000
02/13/2008	11.20000	10.25000	10.25000	12.00000
02/15/2010	10.32000	10.55000	11.75000	12.25000

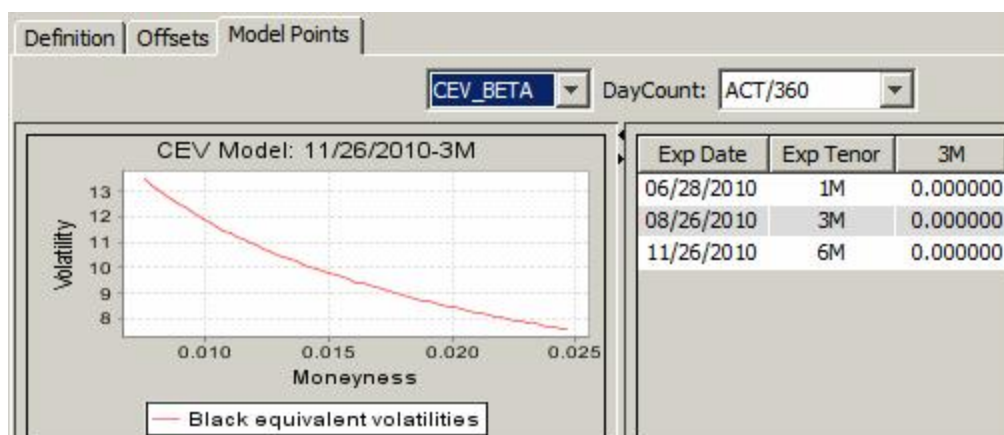
In this example, volatilities are entered manually. Volatilities can also be copied from Excel.

For the CEVSimple generator, you can set:

- » CEV_ALPHA points



» CEV_BETA points



10.1.4 Save Surface

Click **Save** at the bottom of the surface window. Enter a name for the surface, and click **OK**.

10.2 RATE Volatility Surface from Underlying Instruments

RATE Volatility Surface from Underlying Instruments Quick Reference

Surface Underlying Instruments

You can use Cap or Swaption underlying instruments for the respective product type. From the Calypso Navigator, navigate to **Configuration > Market Data > Volatility Surface Underlyings**, or in the surface application's Underlyings panel, click **New Instrument**.

Surface Generation

1. Click **New** to start a new surface.

2. Select the quote instance to use in the surface generation (CLOSE, LAST, or OPEN).
3. The Current checkbox is selected by default, meaning that when you save the surface, the system timestamps the surface with the current date and time. Clear the Current checkbox to enter a back-dated surface. You can modify the date and time fields.
4. Definition Panel — Select the following to define the surface: currency, index, and tenor, volatility type “RATE”, strike type, interpolator, select the Derived checkbox, generator, date-roll convention, holiday calendars, pricing environment.
5. Underlyings Panel — Select the underlying instruments.
6. Quotes Panel — Enter quotes manually, use quotes from the quote set, or use real-time quotes.
7. Points Panel — Click **Generate** to generate the points.
8. Click **Save**, enter a name for the surface, and click **OK**.

Pricer Configuration

A RATE volatility surface is associated with a pricing environment under the Surfaces panel of the pricer configuration for the RATE volatility type and VOL usage.

A RATE volatility surface generated with LGMM2FMultiStartBestFit is associated with a pricing environment under the Product Specific panel of the pricer configuration for the GLOBAL_LGMM2F usage.

10.2.1 Definition Panel

Click **New** to start a new surface.

Select the following to define the surface: currency, index, and tenor, volatility type “RATE”, strike type, interpolator, select the Derived checkbox, generator, date-roll convention, holiday calendars, pricing environment.

VolatilitySurface3D SABRExample USD CLOSE LIBOR 3M User(calypso12)(PE default) (User: calypso_user)

Surface Utilities Help

Name: SABRExample CLOSE Date: 03/20/2009 6:00:00 PM

Definition Underlyings Quotes Points Graph

Comment

Vol Type: RATE Vol Model: Black

Currency: USD Generator: ☒ Derived Cap

Index: LIBOR 3M Interpolator: Interpolator3DLinear

Point Underlying: None

☒ Include Tenor Axis

Strike Type: Relative Spread

DateRoll: MOD_FOLLOW

Holidays: NYC

Pricing Environment: default

Parameter	Value
USE_MIN_VOL	false
MIN_VOL	0.0001
USE_MAX_VOL	false
MAX_VOL	3.0

- » Select the type of strike - They are described below.
- » Select the generation algorithm - It controls the type of underlying instruments that you can select - They are described below.

Strike Types Details

Surface Type	Definition
Strike	<p>Absolute strike.</p> <p>Offset Points</p> <p>In the Offset panel, enter absolute strikes.</p>

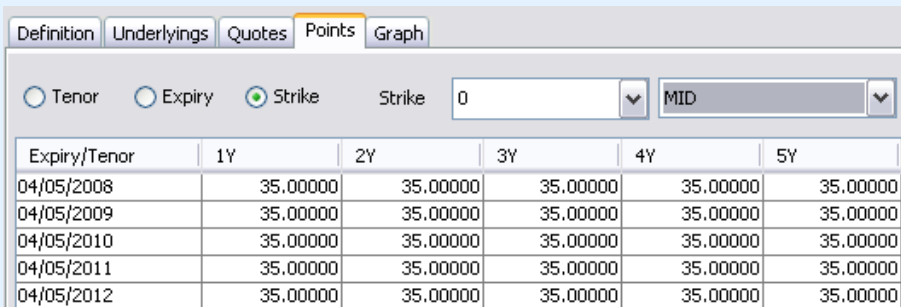
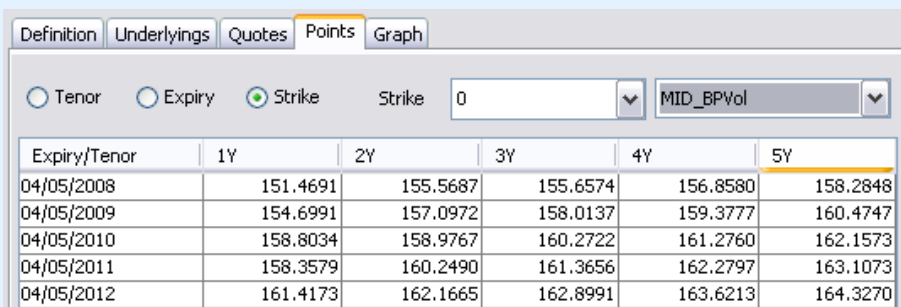
Surface Type	Definition
	<div> <div>Strike</div> <div> <input type="text"/> </div> <div> <div>Add</div> <div>Remove</div> </div> <div> <div>99</div> <div>99.2</div> <div>99.5</div> </div> </div> <p>Underlying Instruments</p> <p>The underlying instruments must be specified using an absolute strike.</p> <div> <div>Strike</div> <div>3.10000</div> <div> <input type="checkbox"/> Relative ATM </div> </div>
Relative Spread	<p>Current strike +/- spread minus ATM strike (in %).</p> <p>Offset Points</p> <p>In the Offset panel, enter relative spreads over the current strike in %. Make sure to add 0.</p> <div> <div>Relative Spread</div> <div> <input type="text"/> </div> <div> <div>Add</div> <div>Remove</div> </div> <div> <div>-1</div> <div>0</div> <div>1</div> </div> </div> <p>Underlying Instruments</p> <p>The underlying instruments must be specified using a relative strike in %. In this example the relative strike is -1%.</p> <div> <div>Strike</div> <div>-1.00000</div> <div> <input checked="" type="checkbox"/> Relative ATM </div> </div> <p>Note that when using a relative strike, one of the underlying instruments must be defined with a strike of 0.</p>

Surface Type	Definition
	<div> <div>Strike</div> <div>0.00000</div> <div><input checked="" type="checkbox"/> Relative ATM</div> </div>
Strike Offset BPs	<p>Current strike +/- offset minus ATM strike (in bp).</p> <p>Offset Points</p> <p>In the Offset panel, enter relative offset over the current strike in bp Make sure to add 0.</p> <div> <div>Strike Offset bp</div> <div> <div></div> <div>Add</div> <div>Remove</div> <div> -20 0 20 </div> </div> </div> <p>Underlying Instruments</p> <p>The underlying instruments must be specified using a relative strike in bp. In this example the relative strike is +25bp.</p> <div> <div>Strike</div> <div>25.00000</div> <div><input checked="" type="checkbox"/> Relative ATM</div> </div> <p>Note that when using a relative strike, one of the underlying instruments must be defined with a strike of 0.</p> <div> <div>Strike</div> <div>0.00000</div> <div><input checked="" type="checkbox"/> Relative ATM</div> </div>
Relative %	<p>% (current strike) minus ATM strike.</p> <p>Offset Points</p> <p>In the Offset panel, enter a percentage of the current strike.</p>

Surface Type	Definition
	<div> <div>Relative %</div> <div> <input type="text"/> </div> <div> <div>Add</div> <div>Remove</div> </div> <div> 85 100 115 </div> </div> <p>Underlying Instruments</p> <p>The underlying instrument must be specified using a percentage of the current strike. In this example, it is 85% of the current strike.</p> <div> Strike <input type="text" value="85.00000"/> <input checked="" type="checkbox"/> Relative ATM </div>

Generation Algorithms

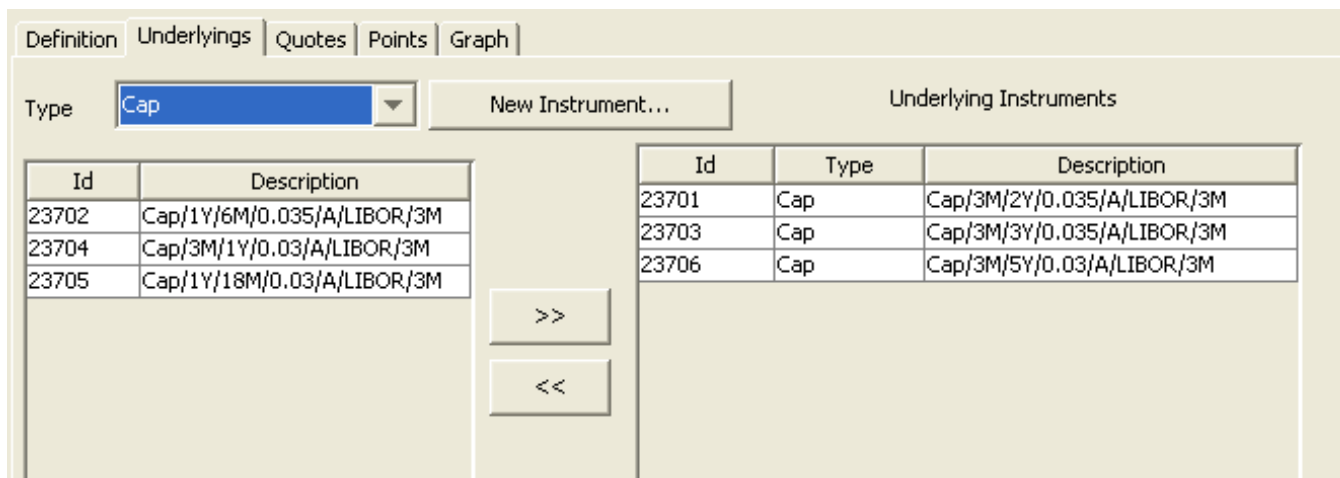
Generation Algorithms	Definition
Cap Generators	
Cap	Generates a volatility surface from caps/floors using the standard Black model.
CapBpVols	<p>The bootstrapping algorithm is using the BpVol (a.k.a. Normal) model to generate forward volatilities. Volatility surfaces built using this generator can then expose Black or BpVol volatilities to pricers.</p> <p>The settings are similar to the configuration of the CapBlack generator, in particular the pricing parameters are the same.</p> <p>► Please refer to the Calypso Analytics Library guide for complete setup details.</p>
CapShiftedLognormal	<p>This generator computes the forward caplet volatilities from the market quoted Cap volatilities.</p> <p>► Please refer to the Calypso Analytics Library guide for complete setup details.</p>
CapTerm	Used for storing cap volatilities in a surface. The points are linked to specific underlying volatilities. The surface points have the same maturity, strike, rate index tenor, and volatility as the underlying cap.
Swaption Generators	

Generation Algorithms	Definition
CMSBasisAdjSimple	Used to store CMS volatility basis adjustments on the volatility surface.
LGMM2FMultiStartBestFit	<p>Used to price multi-index TARN bonds using PricerBondLGMM2F.</p> <p>This generator calibrates in a best fit sense ATM swaptions. Typically, one calibrates to the entire ATM vol surface. This can take several minutes, depending on the number of quotes in the surface. The solution is a set of model parameters, kappa1, kappa2, sigma1, sigma2, rho.</p> <p>The quotes for the ATM swaptions are the volatilities.</p>
Swaption	Generates and stores volatilities on a surface according to market quoted volatilities from underlying European swaptions. A basic volatility surface.
SwaptionBpVols	<p>The generator SwaptionsBpVols uses underlying swaptions to produce a volatility surface. The main advantage of this generator is that it can take a mixture of points, some quoted in Black volatility (or Yield Quote Type) and others quoted in basis point volatility (or BpVol Quote Type) and then the generator will perform all the necessary conversions to get a surface layer all in Black Volatilities and another surface layer all in basis point volatilities. The pricers can then use the black layer if they require Black volatilities, or use the basis point layer if they require basis point volatilities and both layers are on the same surface.</p> <p>Black Volatilities</p> <p>Black volatilities are constructed in the MID layer in the Points panel.</p>  <p>Basis Point Volatilities</p> <p>Basis Point volatilities are constructed in the MID_BPVol layer in the Points panel.</p> 

Generation Algorithms	Definition
	Generator Parameters <ul style="list-style-type: none"> TRANSFORMATION_METHOD - The only supported transformation method is EXACT. FAIL_FOR_NEGATIVE_STRIKES - Default is false. When set to true and the strike is negative, if the input is black vol, return NaN for both black and bpvol. If the input is bp vol, return NaN for black vol and correct bp vol.
SwaptionSABR	Deprecated - It is recommended to use SwaptionSABRDerived instead. Used to create the implied smile on a set of Swaption underlyings by setting the model parameters alpha, beta, rho, and nu.
SwaptionSABRDerived	Please refer to the Calypso Analytics Library Guide (CALIB) for complete setup details.
Future Option Generator	
FutureOption	Generates and stores volatilities where the underlyings are options on futures. This only applies if the quote type of the future is rate. If the quote type of the future is price, use instead the MMFUTUTE volatility type and the FutureOption generator.

10.2.2 Underlyings Panel

Select the Underlyings panel.



Id	Description
23702	Cap/1Y/6M/0.035/A/LIBOR/3M
23704	Cap/3M/1Y/0.03/A/LIBOR/3M
23705	Cap/1Y/18M/0.03/A/LIBOR/3M

Id	Type	Description
23701	Cap	Cap/3M/2Y/0.035/A/LIBOR/3M
23703	Cap	Cap/3M/3Y/0.035/A/LIBOR/3M
23706	Cap	Cap/3M/5Y/0.03/A/LIBOR/3M

- » Select the instrument type, and the panel below displays the list of available instruments. The panel is blank if you have not set up any instruments. Click **New Instrument** to create new instruments.
- » Select instruments and click **>>** to add them to the instrument list in the right panel.

For the cap/floor underlying instruments you can either use only caplets/floorlets (they all contain one cashflow only), or only cap/floors (they all contain multiple cashflows).

Cap

Swaption

Future Option

Exchange Traded Option

OTC Equity Option

CDSIndex Option

Currency

USD

Option Type

Cap

Index

LIBOR

Strike

3.5

☐ Relative ATM

Tenor

3M

Frequency

QTR

Source

T3750

Date Roll

END_MONTH

Maturity

2Y

Fwd Start

3M

Create Multiple Strikes...

Create Multiple Maturities ...

Holidays

...

Id	Currency	Index	Maturity	OptionType	Strike	Rel. ATM	Fwd Start
23706	USD	LIBOR/3M	5Y	Cap	3.00000	<input type="checkbox"/>	3M
23703	USD	LIBOR/3M	3Y	Cap	3.50000	<input type="checkbox"/>	3M
23701	USD	LIBOR/3M	2Y	Cap	3.50000	<input type="checkbox"/>	3M

» Click **Create Multiple Strikes** or **Create Multiple Maturities** to create multiple instruments.

Sample underlying ATM swaption.

[NOTE: For a given surface with swaption underlyings, you can only use ATM swaptions (underlying ending with "/A") OR relative swaptions (underlying ending with "/R"), you cannot mix both]

Volatility Surface Underlying Window

OTC Equity Option

Bond Option

CDSIndex Option

Commodity Option

Cap

Swaption

Future Option

Exchange Traded Option

Currency

USD

Rate Index

LIBOR

Index Tenor

3M

Source

T3750

Option Expiry

1M

Swap Maturity

3M

Pay Fixed

Physical

Create Multiple Rates...

Create Multiple Expiries ...

Fixed Side

Rate

0

Relative ATM

☒

Frequency

MTH

Day Count

ACT/360

Date Roll

FOLLOWING

Holidays

NYC

Float Side

Date Roll

FOLLOWING

Holidays

NYC

Frequency

QTR

10.2.3 Quotes Panel

Select the Quotes panel. Enter quotes for the underlying instruments.

Definition

Underlyings

Quotes

Points

Graph

Quote Name	Type	CLOSE
Cap,USD,3M,2Y,0.035,LIBOR,3M,T3750	▼ Yield	3.25000000
Cap,USD,3M,3Y,0.035,LIBOR,3M,T3750	▼ Yield	3.12000000
Cap,USD,3M,5Y,0.03,LIBOR,3M,T3750	▼ Yield	3.02000000

Save Quotes

Refresh Quotes

» You can click **Save Quotes** to save the quotes.

10.2.4 Points Panel

Click the Points tab. Click **Generate** to generate the points.

Definition	Underlyings	Quotes	Points	Graph
<input checked="" type="radio"/> Tenor <input type="radio"/> Expiry <input type="radio"/> Strike Tenor: 3M MID: MID				
Expiry/Strike	3	3.5		
05/11/2007	0.00000	3.25000		
05/28/2008	0.00000	3.24504		
05/27/2009	0.05800	3.06008		
05/27/2010	1.68566	1.49794		
05/26/2011	3.32661	0.00000		

» You can view the points for each combination of tenor, expiry and strike.

For the LGMM2FMultiStartBestFit generator, you can view all the generated parameters.

Definition	Underlyings	Quotes	Points	Graph
<div> <div> <div>Expiry/Strike</div> <div>0</div> </div> <div> <div>03/11/2008</div> <div>150.000000</div> </div> </div> <div> <div>LGMM2F_KAPPA1</div> <div>MID</div> <div>LGMM2F_KAPPA1</div> <div>LGMM2F_KAPPA2</div> <div>LGMM2F_SIGMA1</div> <div>LGMM2F_SIGMA2</div> <div>LGMM2F_RHO</div> </div>				

10.2.5 Save Surface

Click **Save** in the bottom of the surface window. Enter a name for the surface, and click **OK**.

10.3 Pricer Configuration

From the Calypso Navigator, navigate to **Market Data > Pricing Environment > Pricer Configuration**. Load a pricer configuration and select the Surfaces panel.

Pricers
Discount Curves
Forecast Curves
Surfaces
Product Specific
Model Parameters
FX
Repo
Credit
Correlation
Commodity
Custom

Currency: USD Vol Type: RATE Index: LIBOR ANY

Product: Swaption ANY ANY Put/Call: PUT Add

Surface: Surface-USD-LIBOR-6M ... Usage: VOL Remove

Currency	Index/Vol Type	Tenor	Product	ExtendedType	Subtype	Put/Call	Usage	Surface
USD	LIBOR	ANY	Swaption	ANY	ANY	PUT	VOL	Surface-USD-LIBOR-6M(2101)

Load New Delete Save Save As Close

- » Select the currency, volatility type, index, and tenor.
- » Select the product type, extended type or ANY, subtype or ANY, PUT or CALL.
- » Click ... to select the volatility surface. Select the surface in the Selection window and click **Load** to display the surface name in the pricer configuration.
- » Click **Add** to add the surface to the list.
- » Click **Save** to save the pricer configuration.

10.3.1 RATE Volatility Surface Generated with LGMM2FMultiStartBestFit Generator

From the Calypso Navigator, navigate to **Market Data > Pricing Environment > Pricer Configuration**. Load a pricer configuration and select the Product Specific panel.

Pricers
Discount Curves
Forecast Curves
Surfaces
Product Specific
Model Parameters
FX

☐ Select Specific Product ANY ... ?

Currency: USD Type: Bond ANY ANY

Pricer: PricerBondLGMM2F Usage: GLOBAL_LGMM2F Add

Market Data Item: LGMM2F ... Remove

Product	Usage	Pricer	Market Data Item
USD.Swaption.ANY.ANY	LGMM_MEAN_REV	PricerSwaptionLGMM	USD_LGMM_MEANREV(25815)
USD.Swap.ANY.ONEFACTORMODEL_SURFACE	PricerSwapOneFactorModel	ANY	usd_libor_hw_vols(2701)
USD.Bond.ANY.ANY	GLOBAL_LGMM2F	PricerBondLGMM2F	LGMM2F(25834)
EUR.Swaption.ANY.ANY	LGMM_MEAN_REV	PricerSwaptionLGMM	lgmm_mean_rev(4801)
USD.Swaption.ANY.ONEFACTORMODEL_SURFACE	PricerSwaptionOneFactorModel	ANY	usd_libor_fixed_strike(3101)
Equity.GM	DIVIDEND	ANY	GM_DIVIDEND(25823)

- » Select the pricer PricerBondLGMM2F and the usage GLOBAL_LGMM2F.

- » Click **...** to select the volatility surface.
- » Click **Add** to add the surface to the list.
- » Click **Save** to save the pricer configuration.

11. Surface Charts

This topic describes how you can view and use surface charts in the Graph panel of the Volatility Surface window.

11.1 Before you Begin

The Graph panel requires the installation of the Vecmath library. It can be downloaded as part of Java 3D at the following link: <http://java3d.java.net/binary-builds.html>

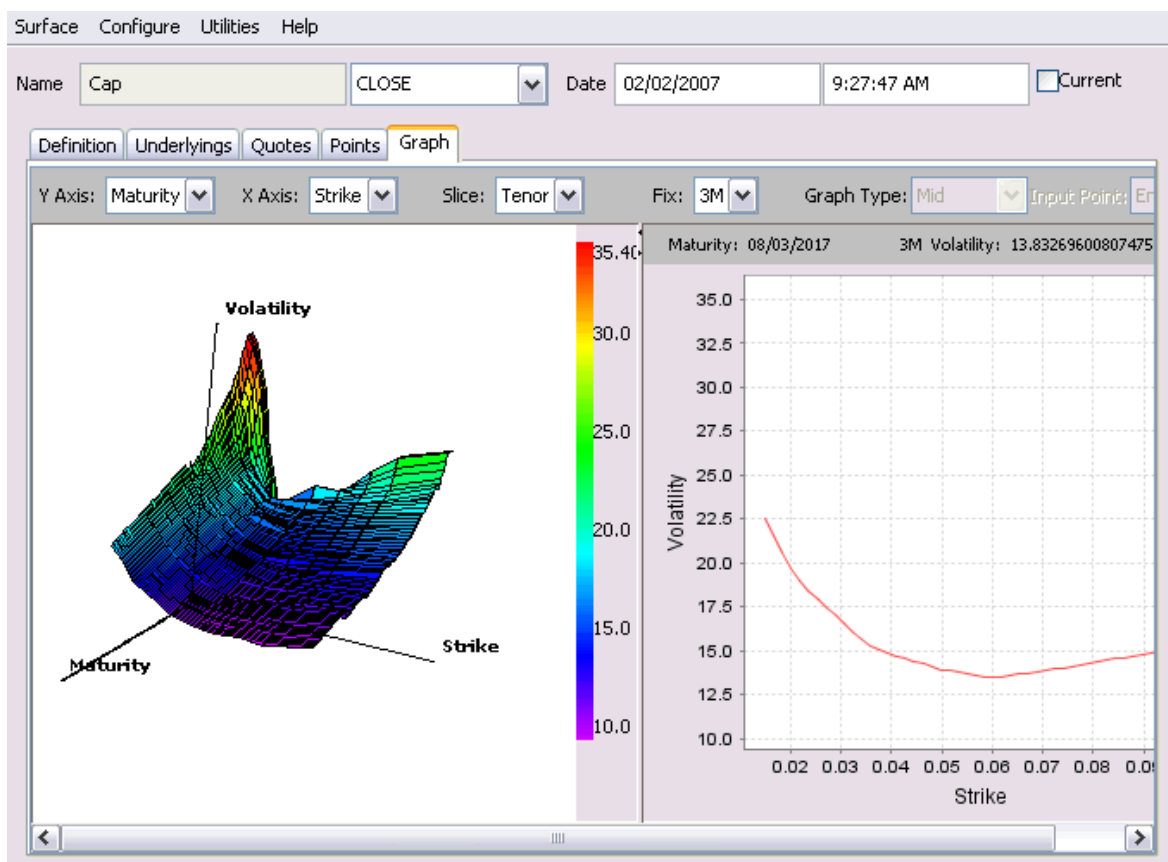
You need to add the following jar to the Libraries (Jar files) of the Calypso Installer - "Common Third Party Libraries & Extension":

- vecmath.jar

ⓘ [NOTE: The Calypso License to use this Calypso integration does not include a license to the actual third-party library - Clients are responsible for contracting with the appropriate third-party provider prior to using this Calypso integration]

11.2 Graph Panel

The surface chart has two halves: a 3D graph on the left and a line chart on the right. The line chart shows details from the 3D graph.



11.2.1 Axes

Most volatility surfaces have 3 dimensions: maturity, strike and volatility. In such cases, the default setup for the 3D graph has the strike on the x-axis and maturity on the y-axis. Swaption volatility surfaces may have a fourth dimension: the tenor of the underlying swap. The default setup for 4D surfaces has tenor on the x-axis of the graph and maturity on the y-axis.

You can change the axes using the combo-boxes above the graph.

11.2.2 3D Graph

The 3D graph is divided into colored sections. The color of a section denotes the volatility for the corresponding strike and maturity. The hotter or redder the color, the higher the volatility; the cooler or more blue/violet the color, the lower the volatility.

There may be many strikes for a given tenor and maturity, but the system has to pick one to use for the color setting. By default, this will be the middle strike in the list because this is often the ATM strike. The user can have the colors represent the volatility at a different strike by changing the value of the "Fix" combo box.

11.2.3 Line Chart

If you click on the 3D graph, a maturity is selected and the line chart on the right will show the volatilities for all the strikes at that maturity (and tenor, where applicable). You can inspect any smile or skew.

The line chart is drawn by interpolating values for 50 evenly spaced strikes. By clicking on the 3D graph, you can see the precise volatility for the closest strike to your mouse position.

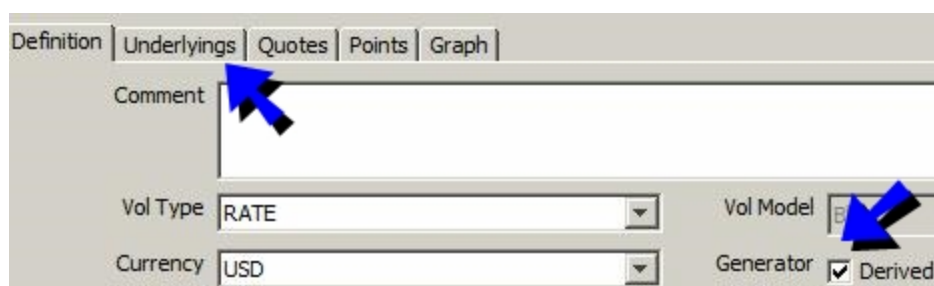
On a swaption surface, the line chart will also show points representing the volatilities of the underlying swaptions that were used to generate the surface. (These points will not be shown for a cap surface because the cap surface represents forward volatilities whereas the underlying caps' quotes are flat volatilities).

To compare the displayed skew with the skew at a second maturity, hold down the Control key and select the other maturity on the 3D graph. A line will be added to the line chart for each selected maturity.

12. Volatility Surface Underlying Overview

You can set up underlying instruments before creating the volatility surface using **Configuration > Market Data > Volatility Surface Underlyings** from the Calypso Navigator, or while you are creating the volatility surface. When you save an underlying instrument, the system automatically creates a quote name for that instrument.

To use the instruments in building the surface, check “Derived” in the volatility surface window. The window then displays the Underlyings panel where you can select the underlying instruments.



The following types of underlying instruments are available.

[Bond Option - Vol Surface Underlying](#)

[Cap - Vol Surface Underlying](#)

[CDS Index Option - Vol Surface Underlying](#)

[Commodity Option - Vol Surface Underlying](#)

[Exchange Traded Option - Vol Surface Underlying](#)

[Future Option - Vol Surface Underlying](#)

[FX Option - Vol Surface Underlying](#)

[OTC Equity Option - Vol Surface Underlying](#)

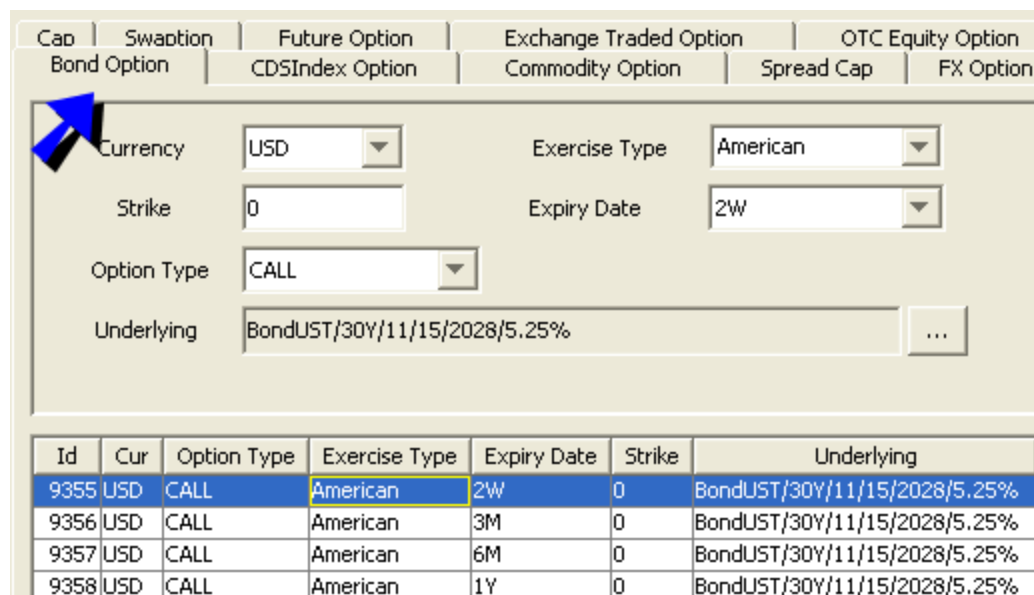
[Spread Cap - Vol Surface Underlying](#)

[Swaption - Vol Surface Underlying](#)

[Warrant - Vol Surface Underlying](#)

13. Bond Option - Vol Surface Underlying

Bond option underlying instruments are used to create Bond Option volatility surfaces. They are created for ATM volatilities.



Id	Cur	Option Type	Exercise Type	Expiry Date	Strike	Underlying
9355	USD	CALL	American	2W	0	BondUST/30Y/11/15/2028/5.25%
9356	USD	CALL	American	3M	0	BondUST/30Y/11/15/2028/5.25%
9357	USD	CALL	American	6M	0	BondUST/30Y/11/15/2028/5.25%
9358	USD	CALL	American	1Y	0	BondUST/30Y/11/15/2028/5.25%


- » Select the details as described in the table below.
- » Set the strike to 0.
- » Then click **Save**.
- » You can change any field and click **Save As New** to create additional underlying instruments.

The system creates quotes like: "BondOTC.<currency>.<option type>.<expiry>.<bond quote name>", type = PriceVol.

Example "BondOTC.USD.C.2W.UST.11-15-2028.5.25000.0.0"

Fields Details

Field	Description
Currency	Select the currency of the underlying bond.
Exercise Type	Select the exercise type (American or European).
Strike	Enter the strike for the bond option.

Field	Description
Expiry Date	Select the expiry date of the option.
Option Type	Select the option type (PUT or CALL).
Underlying	Click  to select the underlying bond product in the Product Chooser Window.
Id	Displays the system assigned unique identifier for the Bond Option volatility surface underlying.

14. Cap - Vol Surface Underlying

The Cap underlying can be used in construction of the RATE volatility surface.

Cap Configuration

- Create the Rate Index Definition using [Configuration > Interest Rates > Rate Index Definitions](#) from the Calypso Navigator.

14.1 Cap Volatility Surface Underlying

Create the underlying instruments in the Volatility Surface Underlying Window, Cap panel.

Volatility Surface Underlying Window

Cap	Swaption	Future Option	Exchange Traded Option	OTC Equity Option	Bond Option	CDSIndex Option	Commodity Option	Spread Cap	Warrant	FX Option																								
<div> <div>Curre... USD</div> <div>Index LIBOR</div> <div>Tenor 5M</div> <div>Source LIBOR01</div> <div>Matur... 3Y</div> <div>Fwd ... 0D</div> <div>Create Multiple Strike...</div> <div>Create Multiple Maturi...</div> <div>Payment Lag 0 Bus</div> </div> <div> <div>Option ... Cap</div> <div>Strike 2</div> <div><input type="checkbox"/> Relative A...</div> <div>Frequ... QTR</div> <div>Date ... MOD_FOLLOW</div> <div>Holidays NYC ...</div> <div><input type="checkbox"/> Exclude Fi...</div> <div><input checked="" type="checkbox"/> Cmp DLY Flat</div> </div>																																		
<table border="1"> <thead> <tr> <th>Id /</th> <th>Currency</th> <th>Index</th> <th>Maturity</th> <th>OptionType</th> <th>Strike</th> </tr> </thead> <tbody> <tr> <td>243700</td> <td>AUD</td> <td>BBSW/2M</td> <td>1Y</td> <td>Cap</td> <td></td> </tr> <tr> <td>243701</td> <td>USD</td> <td>LIBOR/5M</td> <td>3Y</td> <td>Cap</td> <td></td> </tr> <tr> <td>243702</td> <td>USD</td> <td>LIBOR/7M</td> <td>3Y</td> <td>Cap</td> <td></td> </tr> </tbody> </table>	Id /	Currency	Index	Maturity	OptionType	Strike	243700	AUD	BBSW/2M	1Y	Cap		243701	USD	LIBOR/5M	3Y	Cap		243702	USD	LIBOR/7M	3Y	Cap											
Id /	Currency	Index	Maturity	OptionType	Strike																													
243700	AUD	BBSW/2M	1Y	Cap																														
243701	USD	LIBOR/5M	3Y	Cap																														
243702	USD	LIBOR/7M	3Y	Cap																														

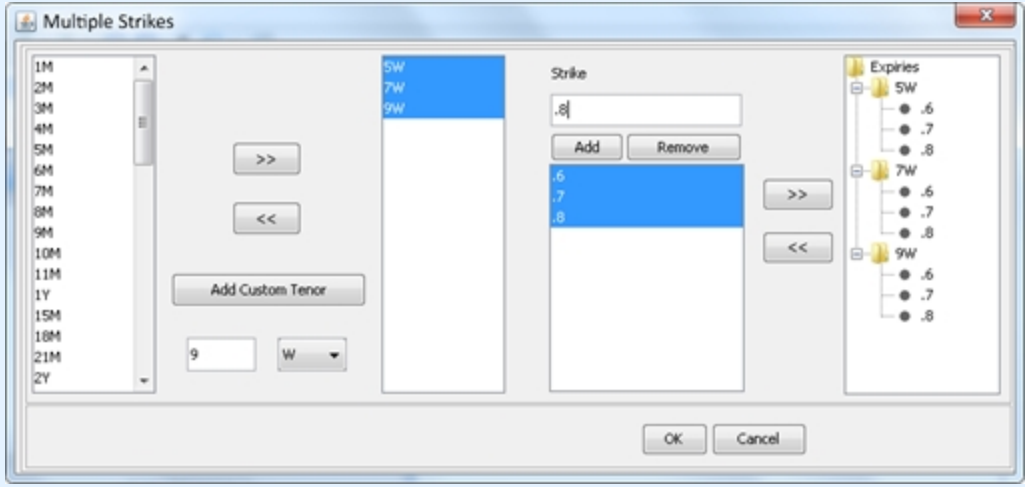
- Click **New** to create new volatility surface underlying.
Select the details as described in the table below.
- Click **Save** to create the underlying. They appear in the table below.

The system creates quotes like: "Cap.<currency>.<expiry>.<rate expiry>.<strike>.<rate index>".

Example "Cap.JPY.2D.1Y.0.05.LIBOR.6M.T3750".

Fields Details

Field	Description
Currency	Reference index currency.
Index	Name of the reference index.

Field	Description
Tenor	Tenor for the reference index.
Source	Source for publishing the reference index.
Maturity	Cap/Floor maturity tenor.
Fwd Start	Start tenor.
Option Type	Type of option, such as Cap or Floor.
Strike	Strike in percentage.
Relative ATM	Select if relative ATM is used.
Frequency	Frequency code such as QTR, WK, SA.
Date Roll	Type of date roll such as MOD_FOLLOWING, FOLLOWING.
Holidays	Calendar used for Holidays.
Exclude First	Check to exclude the first caplet. It is included by default.
Create Multiple Strikes	<p>You can click Create Multiple Strikes to create multiple instruments at once by using the Multiple Strikes window.</p>  <ul style="list-style-type: none"> » Select one or more tenors and move them to the tenor field to the right. To create custom tenors, add a number in the text field, select either Day, Week, Month, or Year in the drop-down list, and click Add Custom Tenor. The tenors are added to the tenor field. » Under "Strike," add a value and click Add to move the value to the Strike field below. » To create multiple strikes, select and highlight the preferred tenors and strikes added in steps above, then use the arrow button to move them into the Expiries structure. When the structure is complete, click OK. The multiple strikes are added to the list of underlying instruments on the Cap panel. <p>[NOTE: before creating multiple strikes, make sure to specify other relevant</p>

Field	Description
	information - such as currency, index, source, option type, date roll, and holidays - on the Cap panel.]
Create Multiple Maturities	<p>You can click Create Multiple Maturities to create multiple instruments.</p> <ul style="list-style-type: none"> » Select the frequency, date roll method, and holiday calendars for calculating the dates.
Payment Lag	Enter the number of days between the interest date and the payment date, and specify Business or Calendar.
Cmp	<p>Check the Cmp checkbox to enable interest compounding.</p> <ul style="list-style-type: none"> » Select the DLY from the adjacent field. » Double-click the Flat label to toggle between: <ul style="list-style-type: none"> – Flat — Flat compounding. – Spread — Does not apply to fixed rates, only to floating rates. – SimpleSpread - Does not apply to fixed rates, only to floating rates. – NoCmp — A cashflow is created at the compounding period without actually compounding the interest. <p>There is no compounding otherwise.</p>
Id	Displays the system assigned unique identifier for the Cap volatility surface underlying.

15. CDS Index Option - Vol Surface Underlying

The CDS Index Option underlying can be used in construction of the CREDIT volatility surface.

CDS Index Configuration

- Create the CDS Index using **Configuration > Credit Derivatives > CDS Index Definition** from the Calypso Navigator.

15.1 CDS Index Volatility Surface Underlying

Create the underlying instruments in the Volatility Surface Underlying Window, CDSIndex Option panel.

Volatility Surface Underlying Window

Cap
Swaption
Future Option
Exchange Traded Option
OTC Equity Option

Bond Option
CDXIndex Option
Commodity Option
Spread Cap
Warrant

Index
CDX-NAHYS18V3-5Y.Jun.2017

Option Type
RTR

Strike
80
CleanPrice
Maturity
12/20/2014

Id	Cur	Option Type	Maturity	Strike	Underlying	Description
215707	USD	RTR	08/20/2014	75	CDX-NAIGS22V1-5Y.Jun.2019	CDX-NAIGS22
215708	USD	RTR	09/20/2014	75	CDX-NAIGS22V1-5Y.Jun.2019	CDX-NAIGS22
215709	USD	RTR	09/20/2014	70	CDX-NAIGS22V1-5Y.Jun.2019	CDX-NAIGS22
215710	USD	RTR	09/20/2014	65	CDX-NAIGS22V1-5Y.Jun.2019	CDX-NAIGS22
215711	USD	RTR	09/20/2014	60	CDX-NAIGS22V1-5Y.Jun.2019	CDX-NAIGS22
215712	USD	RTR	12/20/2014	60	CDX-NAIGS22V1-5Y.Jun.2019	CDX-NAIGS22
215713	USD	RTR	12/20/2014	65	CDX-NAIGS22V1-5Y.Jun.2019	CDX-NAIGS22
215714	USD	RTR	12/20/2014	70	CDX-NAIGS22V1-5Y.Jun.2019	CDX-NAIGS22
215715	USD	RTR	12/20/2014	75	CDX-NAIGS22V1-5Y.Jun.2019	CDX-NAIGS22
215716	USD	RTP	12/20/2014	75	CDX-NAIGS22V1-5Y.Jun.2019	CDX-NAIGS22
215717	USD	RTP	12/20/2014	70	CDX-NAIGS22V1-5Y.Jun.2019	CDX-NAIGS22
215718	USD	RTP	12/20/2014	65	CDX-NAIGS22V1-5Y.Jun.2019	CDX-NAIGS22
215719	USD	RTP	12/20/2014	60	CDX-NAIGS22V1-5Y.Jun.2019	CDX-NAIGS22

Load
New
Delete
Save
Save As New
Id 234196

Help
Close

- » Click **New** to create new volatility surface underlying.
Complete the details as described in the table below.
- » Click **Save** to create the underlying. They appear in the table below.

The system creates quotes like in the following example.

Quote Name	Type
CDSIndex.CDX.NA.IG..6-V1 5Y.Jun.2011	Spread
CDX.NA.IG..6-V1 5Y.Jun.2011.RTR.2006-12-20, Strike=39	CleanPrice
CDX.NA.IG..6-V1 5Y.Jun.2011.RTR.2006-12-20, Strike=41	CleanPrice
CDX.NA.IG..6-V1 5Y.Jun.2011.RTR.2006-12-20, Strike=43	CleanPrice
CDX.NA.IG..6-V1 5Y.Jun.2011.RTR.2006-12-20, Strike=45	CleanPrice
CDX.NA.IG..6-V1 5Y.Jun.2011.RTR.2006-9-20, Strike=36	CleanPrice
CDX.NA.IG..6-V1 5Y.Jun.2011.RTR.2006-9-20, Strike=38	CleanPrice
CDX.NA.IG..6-V1 5Y.Jun.2011.RTR.2006-9-20, Strike=40	CleanPrice
CDX.NA.IG..6-V1 5Y.Jun.2011.RTR.2006-9-20, Strike=42	CleanPrice

Fields Details

Field	Description
Strike	Enter the strike in percentage. The strike is displayed in the quote type defined in the index definition.
Maturity	Maturity date and time.
Option Type	Select the Option Type: RTR (right to sell credit protection) or RTR (right to buy credit protection).
Index	Click <input type="button" value="..."/> to select the CDS Index.
Id	Displays the system assigned unique identifier for the CDS Index volatility surface underlying.

16. Commodity Option - Vol Surface Underlying

The commodity option underlying can be used in construction of the COMMODITY volatility surface.

Commodity Option Configuration

- Create the commodity product using **Configuration > Commodities > Commodities** from the Calypso Navigator.
- Create the date rules using **Configuration > Definitions > Date Rule Definitions** from the Calypso Navigator.
- Run the GENERATE_COMM_VOL_POINTS scheduled task once to create the commodity vol surface underlyings. From that point on, only the GENERATE_COMM_VOL_POINTS_QUOTES should be used to create quote names for rolled commodity vol surface underlyings as of the val date when the scheduled task is executed, creating quote names for the new expiry.
 - ▶ Refer to Calypso Scheduled Tasks documentation for details.

16.1 Delta based Volatility Surface Underlying

Create Delta based underlying instruments in Volatility Surface Underlying Window using 'Commodity Option' panel. The Delta based Volatility Surface Underlyings are supported by **Commodity Delta** generator while generating Commodity Volatility Surface.

Volatility Surface Underlying Window

Cap
Swaption
Future Option
Exchange Traded Option
OTC Equity Option
Bond Option
CDSIndex Option
Commodity Option
Spread Cap
Warrant
FX Option

Underlying Type

☒ DateRule
☐ Tenor

Generator
ICE Brent
Commodity
USD/ICE Brent/North Sea (ICE)
Expiry Date Rule
ICE Brent LTD
Pillar Date Rule
@Begin of Month

☐ Spread Vol

Number of Dates
78
Currency
USD
Start Date
02/05/2020
Date Format

☐ Daily
☒ Monthly

10Put
25Put
ATMVol
25Call
10Call

Id	Generator	Commodity	Currency	DateFormat	VolType	Expiry	Pillar	Quote Name	Rank
96697	ICE Brent	ICE Brent	USD	Monthly	ATMVol	11/15/2035	12/01/2035	CommdVolPt.ICE Brent.USD.ATMVol.50.DEC35	50
96698	ICE Brent	ICE Brent	USD	Monthly	ATMVol	05/16/2045	06/01/2045	CommdVolPt.ICE Brent.USD.ATMVol.69.JUN45	69
96699	ICE Brent	ICE Brent	USD	Monthly	ATMVol	02/11/2021	03/01/2021	CommdVolPt.ICE Brent.USD.ATMVol.13.MAR21	13
96700	ICE Brent	ICE Brent	USD	Monthly	ATMVol	09/15/2020	10/01/2020	CommdVolPt.ICE Brent.USD.ATMVol.8.OCT20	8

Load
New
Delete
Save
Save As New
Id 18474

Help
Close

- » Click **New** to create new volatility surface underlyings.
Complete the details as described in the table below.
- » Click **Generate** to create a list of underlying instruments. A preview is displayed.
- » Click **Save** to create the underlyings. They appear in the table below.

The Underlying Type can be either DateRule or Tenor based.

Underlying Type

☐ DateRule
☒ Tenor

A DateRule based underlying is configured with a specific expiry date and specific pillar date. With a Tenor based underlying, the user can map the tenors against a live feed to capture quotes. This eliminates the need to recreate new underlyings with new expiry and pillar dates as well as eliminating the need to enter quotes manually.

Quotes using a DateRule underlying use the following naming convention:
CommdVolPt.VolPtGeneratorName.Currency.VolType.Expiry as in the example below.

CommdVolPt.ICE Brent.USD.ATMVol.01JAN18





CommdVolPt.ICE Brent.USD.ATMVol.01FEB18

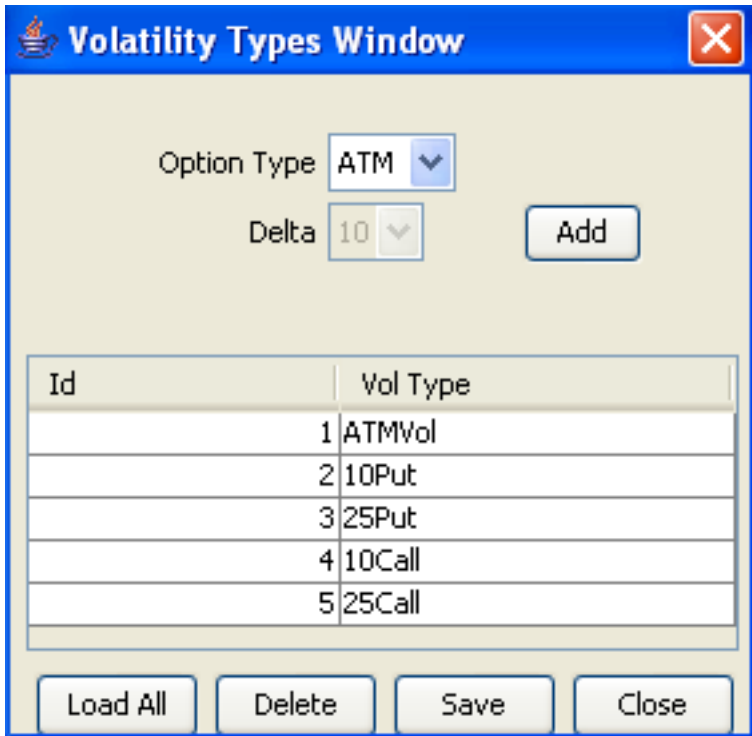
Quotes using a Tenor underlying use the following naming convention: *CommdVolPt.VolPtGeneratorName.Currency.VolType.Tenor* as in the example below.

CommdVolPt.LME Tin.USD.25Put.3D

CommdVolPt.LME Tin.USD.25Put.5D

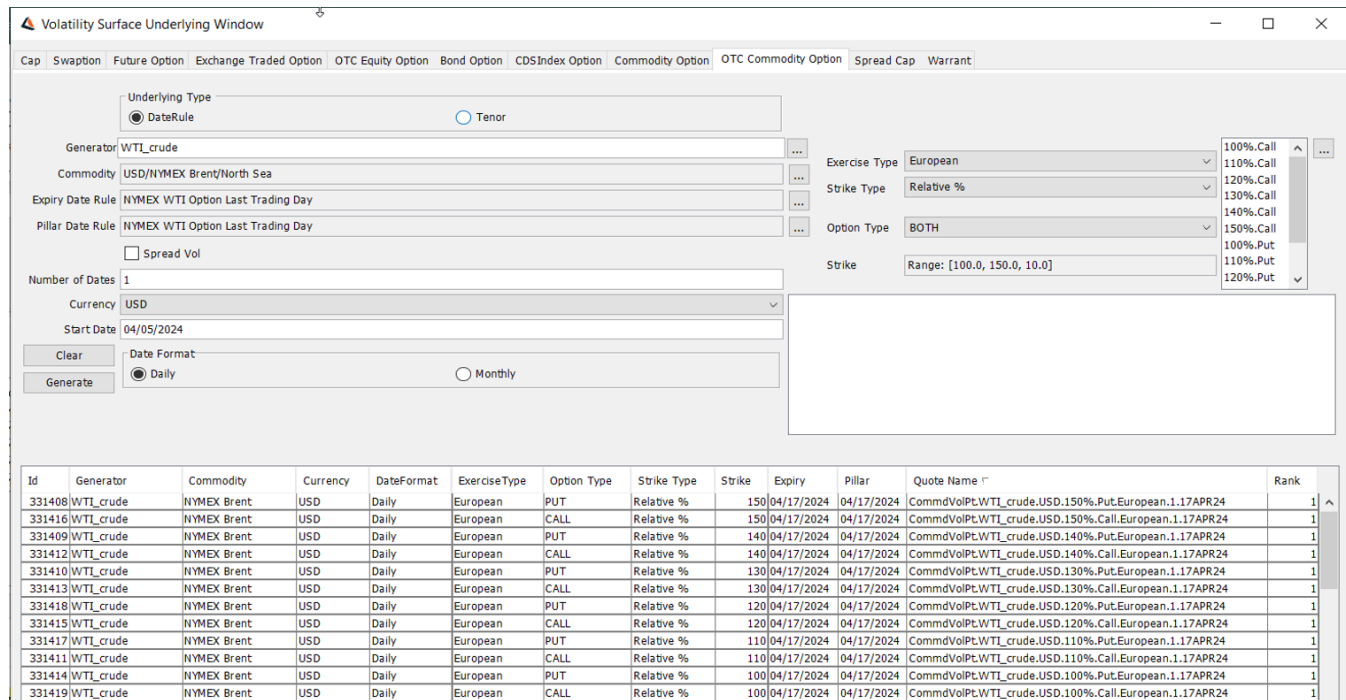
Fields Details

Field	Description
Generator	Enter a generator name for the volatility surface.
Commodity	Displays the associated commodity product if any. You can click  to select the underlying commodity product.
Expiry Date Rule / Expiry Tenor	Displays the expiry date rule or tenors of the commodity product by default. Click  to select the date rule or tenors to generate the expiry for each underlying.
Pillar Date Rule / Expiry Tenor	Displays the pillar date rule or tenors of the commodity product by default. Click  to select the date rule to generate the pillar dates. Note: When using the <i>Tenor</i> Underlying Type, this field is automatically populated with the same tenors selected for the Expiry Tenor.
Volatility Types	Select the volatilities for which you want to generate underlyings. You can click  to add new volatility types.

Field	Description
	 <p>» Click Load All to display existing volatility types.</p> <p>» You can select ATM and click Save to add the ATM volatility, or select PUT/CALL and a Delta value, and click Save to add a PUT/CALL volatility.</p> <p>» You can click Add to add Delta values as needed.</p>
Spread Vol	Check to indicate that the underlying is a volatility spread, to be used for the volatility surfaces generated with the <i>CommodityVolatilitySpread</i> generator.
Number of Dates	Enter the number of dates that you want to generate.
Currency	Select the reference currency for the underlyings.
Start Date	Enter the start date from which the underlyings will be generated.
Date Format	Select a date format for the underlying according to the market convention: <ul style="list-style-type: none"> Daily — Includes the date, month, and year in the underlying quote name. Use the daily format when generating multiple underlying in the same month. Monthly — Includes the month name and year in the underlying quote name.
Id	Displays the system assigned unique identifier.

16.2 Commodity Volatility Surface Underlying

Create Strike, Relative% and Delta based underlying instruments in Volatility Surface Underlying Window using 'OTC Commodity Option' panel. Currently the Moneyness based i.e., Relative% Volatility Surface Underlings are supported by **Commodity** generator while generating Commodity Volatility Surface.



Id	Generator	Commodity	Currency	DateFormat	ExerciseType	Option Type	Strike Type	Strike	Expiry	Pillar	Quote Name	Rank
331408	WTI_crude	NYMEX Brent	USD	Daily	European	PUT	Relative %	150	04/17/2024	04/17/2024	CommdVolPt.WTI_crude.USD.150%.Put.European.1.17APR24	1
331416	WTI_crude	NYMEX Brent	USD	Daily	European	CALL	Relative %	150	04/17/2024	04/17/2024	CommdVolPt.WTI_crude.USD.150%.Call.European.1.17APR24	1
331409	WTI_crude	NYMEX Brent	USD	Daily	European	PUT	Relative %	140	04/17/2024	04/17/2024	CommdVolPt.WTI_crude.USD.140%.Put.European.1.17APR24	1
331412	WTI_crude	NYMEX Brent	USD	Daily	European	CALL	Relative %	140	04/17/2024	04/17/2024	CommdVolPt.WTI_crude.USD.140%.Call.European.1.17APR24	1
331410	WTI_crude	NYMEX Brent	USD	Daily	European	PUT	Relative %	130	04/17/2024	04/17/2024	CommdVolPt.WTI_crude.USD.130%.Put.European.1.17APR24	1
331413	WTI_crude	NYMEX Brent	USD	Daily	European	CALL	Relative %	130	04/17/2024	04/17/2024	CommdVolPt.WTI_crude.USD.130%.Call.European.1.17APR24	1
331418	WTI_crude	NYMEX Brent	USD	Daily	European	PUT	Relative %	120	04/17/2024	04/17/2024	CommdVolPt.WTI_crude.USD.120%.Put.European.1.17APR24	1
331415	WTI_crude	NYMEX Brent	USD	Daily	European	CALL	Relative %	120	04/17/2024	04/17/2024	CommdVolPt.WTI_crude.USD.120%.Call.European.1.17APR24	1
331417	WTI_crude	NYMEX Brent	USD	Daily	European	PUT	Relative %	110	04/17/2024	04/17/2024	CommdVolPt.WTI_crude.USD.110%.Put.European.1.17APR24	1
331411	WTI_crude	NYMEX Brent	USD	Daily	European	CALL	Relative %	110	04/17/2024	04/17/2024	CommdVolPt.WTI_crude.USD.110%.Call.European.1.17APR24	1
331414	WTI_crude	NYMEX Brent	USD	Daily	European	PUT	Relative %	100	04/17/2024	04/17/2024	CommdVolPt.WTI_crude.USD.100%.Put.European.1.17APR24	1
331419	WTI_crude	NYMEX Brent	USD	Daily	European	CALL	Relative %	100	04/17/2024	04/17/2024	CommdVolPt.WTI_crude.USD.100%.Call.European.1.17APR24	1

- » Click **New** to create new volatility surface underlyings.
Complete the details as described in the table below.
- » Click **Generate** to create a list of underlying instruments. A preview is displayed.
- » Click **Save** to create the underlyings. They appear in the table below.

The Underlying Type can be either DateRule or Tenor based.



A DateRule based underlying is configured with a specific expiry date and specific pillar date. With a Tenor based underlying, the user can map the tenors against a live feed to capture quotes. This eliminates the need to recreate new underlyings with new expiry and pillar dates as well as eliminating the need to enter quotes manually.

- Quotes using a DateRule underlying use the following naming convention:

CommdVolPt.VolPtGeneratorName.Currency.StrikeType.OptionType.ExerciseType.Rank.Expiry as in the example below:

Strike type - Strike

CommdVolPt.WTI_crude.USD.64.Call.European.1.Nov22

CommdVolPt.WTI_crude.USD.72.Call.European.1.Nov22

Strike type - Relative%

CommdVolPt.WTI_crude.USD.80%.Call.European.1.Nov22

CommdVolPt.WTI_crude.USD.90%.Call.European.1.Nov22

Strike type - Delta

CommdVolPt.WTI_crude.USD.40Delta.Call.European.1.Nov22

CommdVolPt.WTI_crude.USD.ATMDelta.European.1.Nov22

- Quotes using a Tenor underlying use the following naming convention:

CommdVolPt.VolPtGeneratorName.Currency.StrikeType.OptionType.ExerciseType.Tenor as in the example below:

Strike type - Strike

CommdVolPt.WTI_crude.USD.64.Call.European.1M

CommdVolPt.WTI_crude.USD.72.Call.European.1M

Strike type - Relative%

CommdVolPt.WTI_crude.USD.80%.Call.European.1M





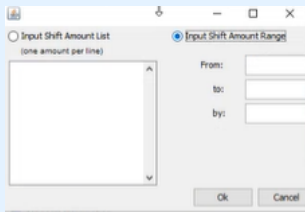
CommdVolPt.WTI_crude.USD.90%.Call.European.1M

Strike type - Delta

CommdVolPt.WTI_crude.USD.40Delta.Call.European.2M

CommdVolPt.WTI_crude.USD.ATMDelta.European.2M

Fields Details

Field	Description
Generator	Enter a generator name for the volatility surface.
Commodity	Displays the associated commodity product if any. You can click  to select the underlying commodity product.
Expiry Date Rule / Expiry Tenor	Displays the expiry date rule or tenors of the commodity product by default. Click  to select the date rule or tenors to generate the expiry for each underlying.
Pillar Date Rule / Expiry Tenor	Displays the pillar date rule or tenors of the commodity product by default. Click  to select the date rule to generate the pillar dates. Note: When using the <i>Tenor</i> Underlying Type, this field is automatically populated with the same tenors selected for the Expiry Tenor.
Spread Vol	Check to indicate that the underlying is a volatility spread, to be used for the volatility surfaces generated with the <i>CommodityVolatilitySpread</i> generator.
Number of Dates	Enter the number of dates that you want to generate.
Currency	Select the reference currency for the underlyings.
Start Date	Enter the start date from which the underlyings will be generated.
Date Format	Select a date format for the underlying according to the market convention: <ul style="list-style-type: none"> Daily — Includes the date, month, and year in the underlying quote name. Use the daily format when generating multiple underlying in the same month. Monthly — Includes the month name and year in the underlying quote name.
Id	Displays the system assigned unique identifier.
Exercise Type	Select Exercise Type from American and European.
Strike Type	Select from Strike, Relative %, and Delta.
Option Type	Select Options from CALL, PUT, BOTH.
Strike	Click  to select the Strike to Input from Shift Amount List or Shift Amount Range. 

17. Exchange Traded Option - Vol Surface Underlying

The Equity ETO underlying can be used in construction of the EQUITY volatility surface.

Exchange Traded Option Configuration

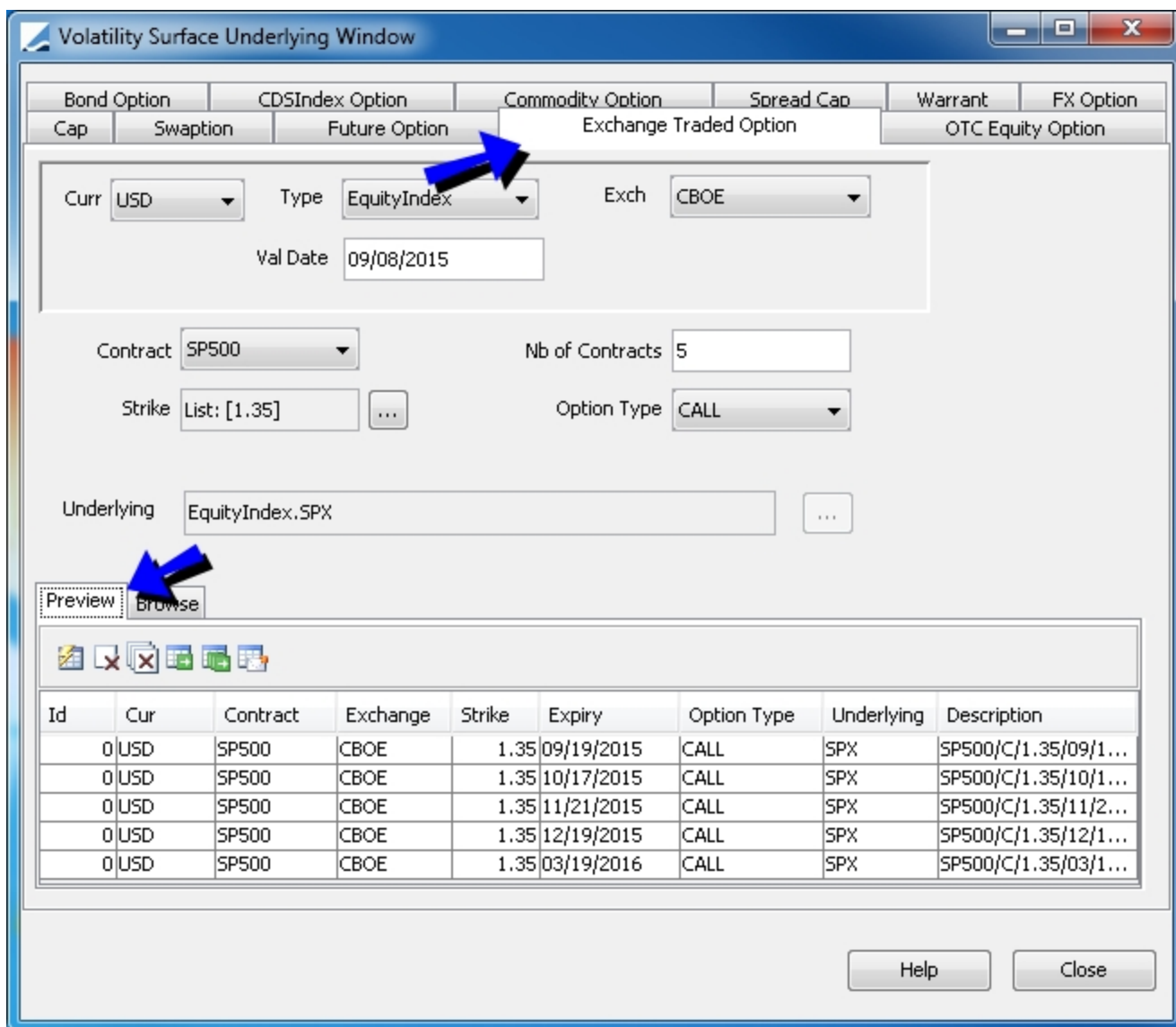
- Create the ETO contracts using **Configuration > Listed Derivatives > Options Contracts** from the Calypso Navigator.

17.1 Exchange Traded Option Volatility Surface Underlying





Create the underlying instruments in the Volatility Surface Underlying Window, Exchange Traded Option panel.

You can select the Browse tab to load existing underlying instruments.

Otherwise, select the Preview tab to create new underlying instruments.



Id	Cur	Contract	Exchange	Strike	Expiry	Option Type	Underlying	Description
0	USD	SP500	CBOE	1.35	09/19/2015	CALL	SPX	SP500/C/1.35/09/1...
0	USD	SP500	CBOE	1.35	10/17/2015	CALL	SPX	SP500/C/1.35/10/1...
0	USD	SP500	CBOE	1.35	11/21/2015	CALL	SPX	SP500/C/1.35/11/2...
0	USD	SP500	CBOE	1.35	12/19/2015	CALL	SPX	SP500/C/1.35/12/1...
0	USD	SP500	CBOE	1.35	03/19/2016	CALL	SPX	SP500/C/1.35/03/1...

- » Complete the details as described in the table below.
- » Click  to generate the underlying instruments.
- » Then select rows and click  to save the selected rows, or click  to save all rows.
- » Click  to save the quote names.

The system creates quotes like in the following example: "ETOEquityIndex.SPX.SP500.C.1.35.APR.14", type = Price

Fields Details

Fields	Description
Curr	Select the currency of the underlying.
Type	Select the type of ETO (Commodity, FX, Equity, Equity Index).
Exch	Select the exchange where the contract is listed. The application then loads the available contracts.
Val Date	Valuation date. It defaults to the current date.
Contract	Select the ETO contract. The application automatically displays the corresponding underlying products.
Nb of contracts	Enter the number of products traded in the contract.
Strike	Click ... to set a list of strikes.
Option Type	Select the option type: CALL, PUT, or BOTH.
Underlying	Displays the underlying product of the selected contract.

17.2 Automatic Creation of Underlying Instruments

The scheduled task GENERATE_EQUITY_VOL_INSTRUMENTS creates underlying instruments as of the scheduled task value date. The scheduled task also creates the corresponding Quote Names in the Quote Set.

Task Type	GENERATE_EQUITY_VOL_INSTRUMENTS
External Reference	
Description	
Attempts	1
Retry After, In Minutes	0
JVM Settings	-Xms512m -Xmx1024m
Allow Task To	<input type="checkbox"/> Skip Execute <input type="checkbox"/> Send Emails <input type="checkbox"/> Publish Business Events
+ Common Attributes	
- Task Attributes	
Market Data Group	

The scheduled task uses the information of the ETO contract (Expiration date rule, Number of. Contracts) and of the Volatility Surface Underlying window (Strikes) to create the missing ETO underlying instruments. It creates all underlying instruments with Strikes and Expiries that do not exist yet in the database. The number of Expiries (per Strike) is limited to the value of the field "No. Contracts", with respect to the Value Date of the scheduled task.

18. Future Option - Vol Surface Underlying

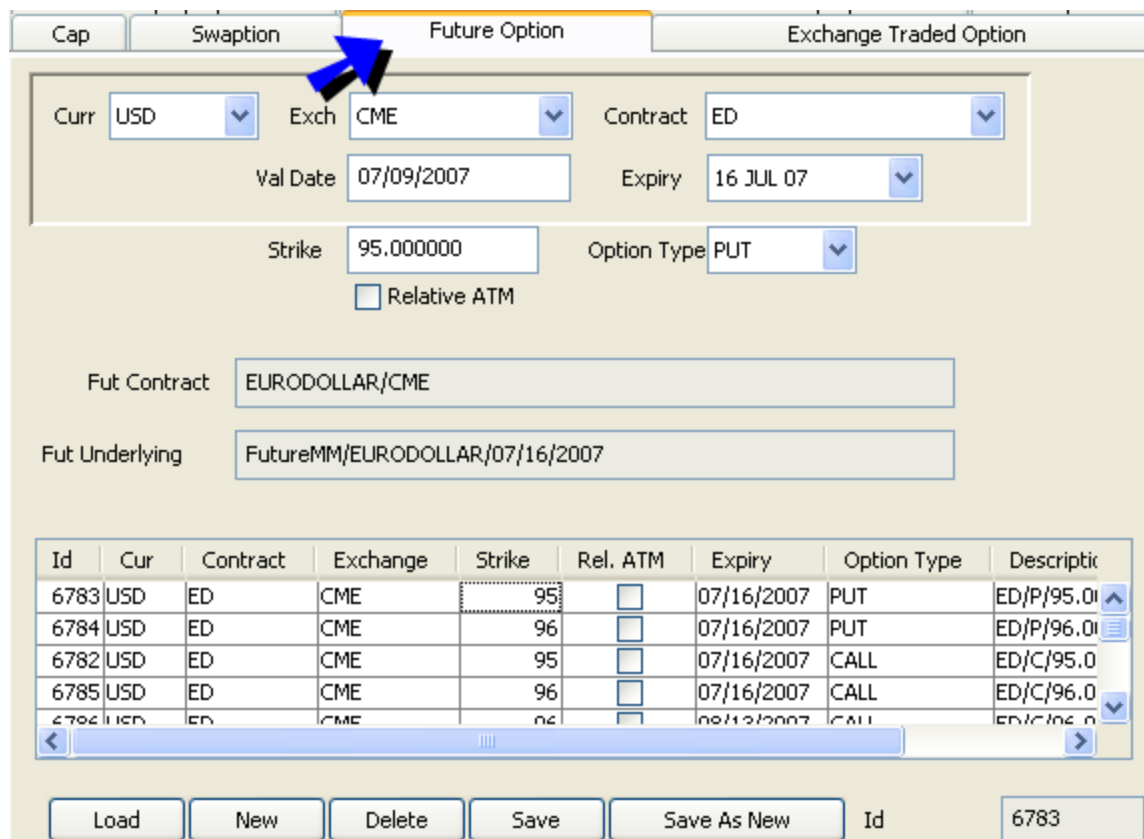
The Future Option underlying can be used in construction of the MMFUTURE and RATE volatility surface.

Future Option Configuration

- Create the Future Contract and Futures using **Configuration > Listed Derivatives > Future Contracts** from the Calypso Navigator.
- Create the Future Options Contract and Future Options using **Configuration > Listed Derivatives > Future Contracts Options** from the Calypso Navigator.

18.1 Future Option Volatility Surface Underlying

Create the underlying instruments in the Volatility Surface Underlying Window, Future Option panel.



Id	Cur	Contract	Exchange	Strike	Rel. ATM	Expiry	Option Type	Description
6783	USD	ED	CME	95	<input type="checkbox"/>	07/16/2007	PUT	ED/P/95.0
6784	USD	ED	CME	96	<input type="checkbox"/>	07/16/2007	PUT	ED/P/96.0
6782	USD	ED	CME	95	<input type="checkbox"/>	07/16/2007	CALL	ED/C/95.0
6785	USD	ED	CME	96	<input type="checkbox"/>	07/16/2007	CALL	ED/C/96.0
6786	USD	ED	CME	96	<input type="checkbox"/>	08/13/2007	CALL	ED/C/96.0

- » Click **New** to create new volatility surface underlying.

Select the currency and exchange. The application then loads the available contracts.

Select the contract, expiry, enter the strike, and select the option type.

» Click **Save** to create the underlying. They appear in the table below.

The system creates quotes like in the following example.

Quote Name	Quote Type
FutureOption.USD.CME.ED.C.95.000000.JUL.07	▼ Price
FutureOption.USD.CME.ED.C.95.000000.JUN.07	▼ Price
FutureOption.USD.CME.ED.C.95.000000.MAY.07	▼ Price
FutureOption.USD.CME.ED.C.96.000000.JUL.07	▼ Price
FutureOption.USD.CME.ED.C.96.000000.JUN.07	▼ Price
FutureOption.USD.CME.ED.P.90.000000.JUL.07	▼ Price
FutureOption.USD.CME.ED.P.95.000000.MAY.07	▼ Price
FutureOption.USD.CME.ED.P.96.000000.MAY.07	▼ Price

Fields Details

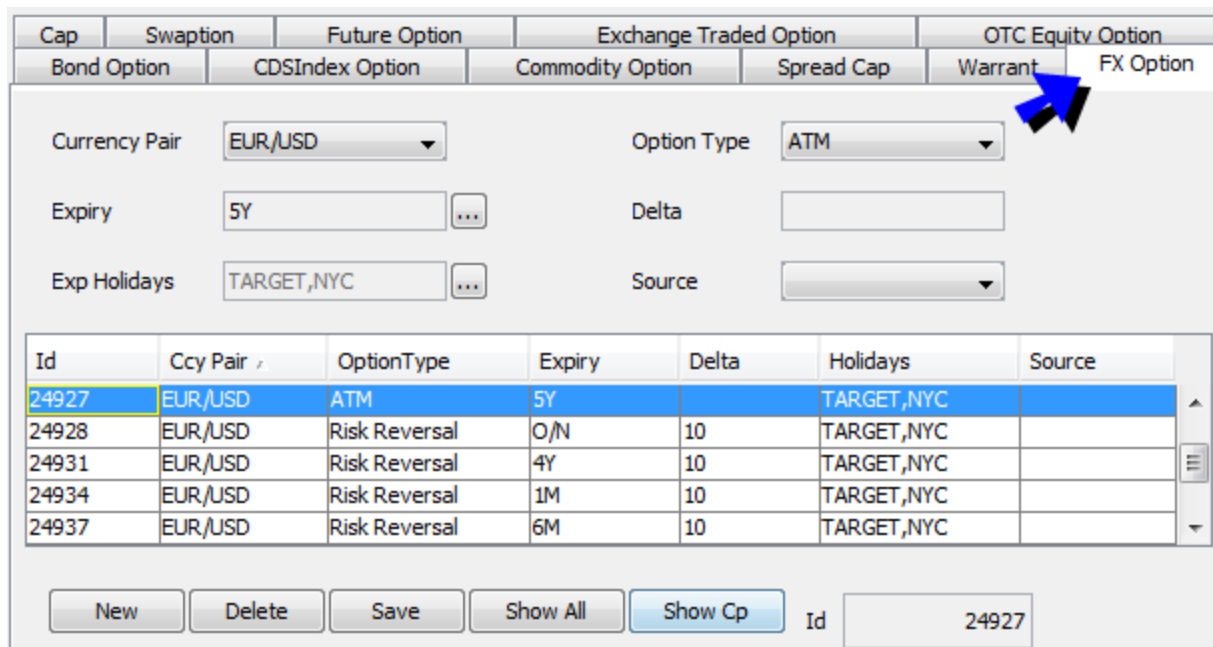
Field	Description
Curr	Select the currency of the underlying.
Exch	Select the exchange where the contract is listed. The application then loads the available contracts.
Contract	Select the Future Option contract.
Val Date	Valuation date. It defaults to the current date.
Expiry	Select the expiry for the option.
Strike	Enter the strike.
Relative ATM	Select if the strike is relative at-the-money.
Option Type	Select the option type: CALL or PUT.
Fut Contract	Displays the details of the future contract.
Fut Underlying	Displays the details of the contract's underlying product.
Id	Displays the system assigned unique identifier for the Future Option volatility surface underlying.

19. FX Option - Vol Surface Underlying

The FX Option underlying can be used in construction of the FX OPTION volatility surface.

19.1 FX Option Volatility Surface Underlying

Create the underlying instruments in the Volatility Surface Underlying Window, FX Option panel.



Id	Ccy Pair	OptionType	Expiry	Delta	Holidays	Source
24927	EUR/USD	ATM	5Y		TARGET, NYC	
24928	EUR/USD	Risk Reversal	O/N	10	TARGET, NYC	
24931	EUR/USD	Risk Reversal	4Y	10	TARGET, NYC	
24934	EUR/USD	Risk Reversal	1M	10	TARGET, NYC	
24937	EUR/USD	Risk Reversal	6M	10	TARGET, NYC	

- » You can click **Show All** to view all existing instruments. You can also select a currency pair, and click **Show Cp** to view the existing instruments for that currency pair.
- » Click **New** to create new volatility surface underlyings, and enter the fields described below.
- » Click **Save** to create the instruments. They appear in the table below.

The system creates quotes like in the following example.

Quote Name	Quote Type
FXOption.EUR/USD.1M.ATM	▼ Yield
FXOption.EUR/USD.1M.Butterfly.10-delta	▼ Yield
FXOption.EUR/USD.1M.Butterfly.25-delta	▼ Yield
FXOption.EUR/USD.1M.Risk Reversal.10-delta	▼ Yield
FXOption.EUR/USD.1M.Risk Reversal.25-delta	▼ Yield
FXOption.EUR/USD.1M.Strangle.10-delta	▼ Yield
FXOption.EUR/USD.1M.Strangle.25-delta	▼ Yield

Sample quotes with source name.

Definition	Underlyings	Quotes	Points	Graph
Quote Name		Type		
FXOption.EUR/USD.1M.ATM.Reuters		▼ Yield		
FXOption.EUR/USD.1M.Butterfly.25-delta.Reuters		▼ Yield		
FXOption.EUR/USD.1M.Risk Reversal.25-delta.Reuters		▼ Yield		
FXOption.EUR/USD.1M.Strangle.25-delta.Reuters		▼ Yield		
FXOption.EUR/USD.1M.Butterfly.10-delta.Reuters		▼ Yield		
FXOption.EUR/USD.1M.Risk Reversal.10-delta.Reuters		▼ Yield		
FXOption.EUR/USD.1M.Strangle.10-delta.Reuters		▼ Yield		

Fields Details

Fields	Description
Currency Pair	<p>Select the currency pair for the FX Option from the drop-down menu.</p> <p>You can click Show Cp to display existing instruments for this currency pair.</p>
Option Type	<p>Select one of the following option types:</p> <ul style="list-style-type: none"> ATM — An at-the-money (ATM) option has a 50 delta. There is no need to select the delta, so the application disables the Delta drop-down menu when you select ATM. Risk Reversal — A combination of a long out-of-the-money call and a short out-of-the-money put at the same delta. The volatility of the risk reversal is the absolute value of the volatility of the call minus the volatility of the put. $V_{\text{reversal}} = V_{\text{call}} - V_{\text{put}}$ Butterfly — The spread between a strangle and a straddle. The volatility of the butterfly is the average of the volatility of the call and put options minus the volatility of the at-the-money option. $V_{\text{butterfly}} = 0.5 * (V_{\text{call}} + V_{\text{put}}) - V_{\text{atm}}$ Strangle — A long out-of-the-money call and a long out-of-the-money put at the same delta. The volatility of the strangle is the average of the volatility of the call and put options. $V_{\text{strangle}} = 0.5 * (V_{\text{call}} + V_{\text{put}})$ Vanilla.
Expiry	<p>Use this feature to create multiple instruments with different maturities. The application creates an instrument for each maturity that you select. For example, create ATM options with a maturity of 1D, 1W, 2W, and so on.</p> <p>Click ... to open the selector window.</p>
Delta	Not applicable for ATM options.

Fields	Description
	Enter the delta for the instruments. You can enter a list of comma-separated deltas.
Exp Holidays	Currently not used. The default value is to use the calendar(s) specified in the currency defaults when calculating the expiration dates of the underlying instruments. Do not specify any holiday calendar(s) on the underlying instruments.
Source	Optional. Select the source for the volatilities as applicable. If specified, it is added to the quote name. Sources can be added to the domain "FXOptVolSurfUndSource".

20. OTC Equity Option - Vol Surface Underlying

The OTC Equity Option underlying can be used in construction of the EQUITY volatility surface.

OTC Equity Option Configuration

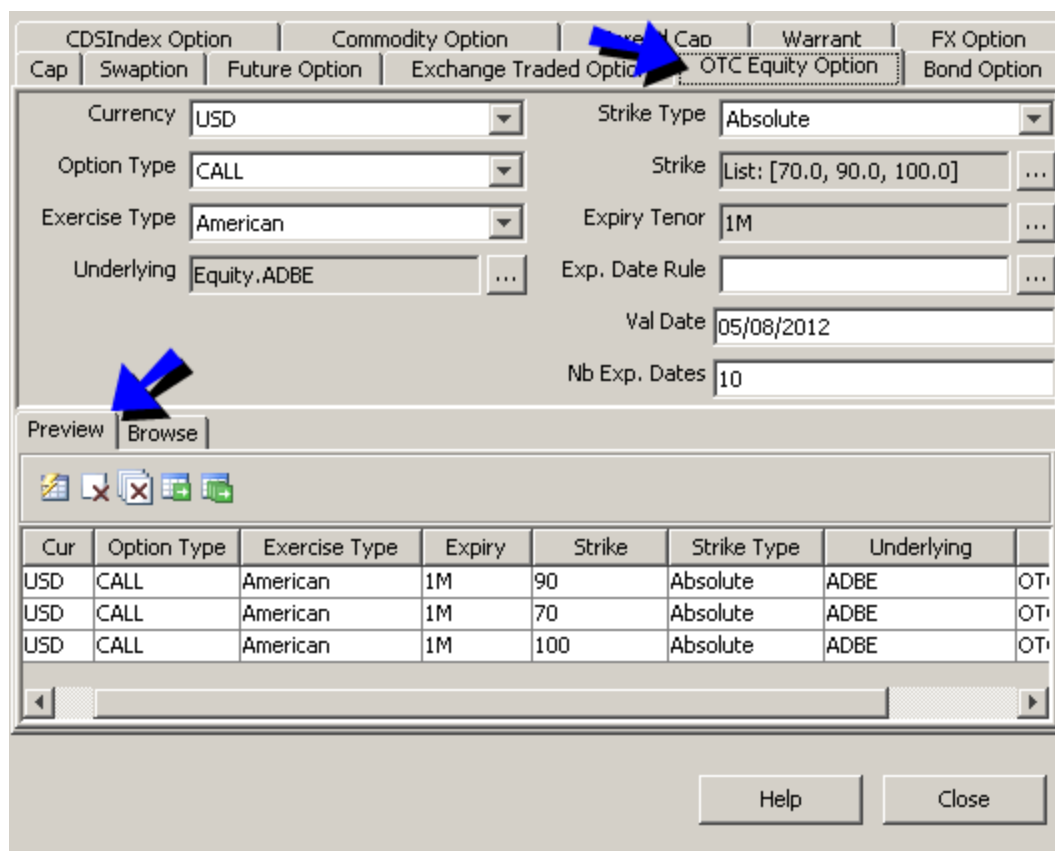
- Create equity products using **Configuration > Equity > Equity** from the Calypso Navigator.

20.1 OTC Equity Option Volatility Surface Underlying


Create the underlying instruments in the Volatility Surface Underlying Window, OTC Equity Option panel.

You can select the Browse tab to load existing underlying instruments.

Otherwise, select the Preview tab to create new underlying instruments.



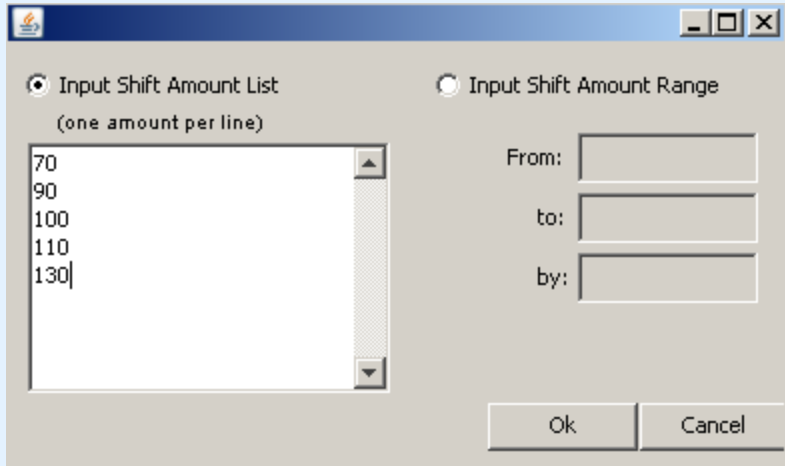



Cur	Option Type	Exercise Type	Expiry	Strike	Strike Type	Underlying	OT
USD	CALL	American	1M	90	Absolute	ADBE	OT
USD	CALL	American	1M	70	Absolute	ADBE	OT
USD	CALL	American	1M	100	Absolute	ADBE	OT

- » Complete the details as described in the table below.
- » Click  to generate the underlying instruments.

» Then select rows and click  to save the selected rows, or click  to save all rows.

Fields Details

Field	Description
Currency	Select the currency of the underlying.
Option Type	Select the option type: PUT, CALL, or BOTH.
Exercise Type	Select the exercise type: American or European.
Underlying	Click  and select an Equity or Equity Index.
Strike Type	Select the strike type: Absolute or Relative (%)
Strike	Click  and enter a list or range of strike amounts. 
Expiry Tenor Exp. Date Rule	Click  to select a set of expiry tenors, or select a date rule to generate the tenors.
Val Date	Enter the generation start date.
Nb Exp. Dates	Enter the number of expiry dates to be generated.

20.2 Automatic Creation of Underlying Instruments

The scheduled task GENERATE_EQUITY_VOL_INSTRUMENTS creates underlying instruments as of the scheduled task value date. The scheduled task also creates the corresponding Quote Names in the Quote Set.

Task Type	GENERATE_EQUITY_VOL_INSTRUMENTS		
External Reference			
Description			
Attempts	1		
Retry After, In Minutes	0		
JVM Settings	-Xms512m -Xmx1024m		
Allow Task To	<input type="checkbox"/> Skip Execute	<input type="checkbox"/> Send Emails	<input type="checkbox"/> Publish Business Events
+ Common Attributes			
- Task Attributes			
Market Data Group			

The scheduled task GENERATE_EQUITY_VOL_INSTRUMENTS will use the information stored in the Volatility Underlying Definition window to create the missing instruments. It will create all underlying instruments with Strikes and Expiries that do not exist yet in the database. For the instruments with Expiries based on a date rule, the number of Expiries (per Strike) will be limited to the value in the “Number of Expiry Dates” field , with respect to the Value Date of the scheduled task.

21. Spread Cap - Vol Surface Underlying

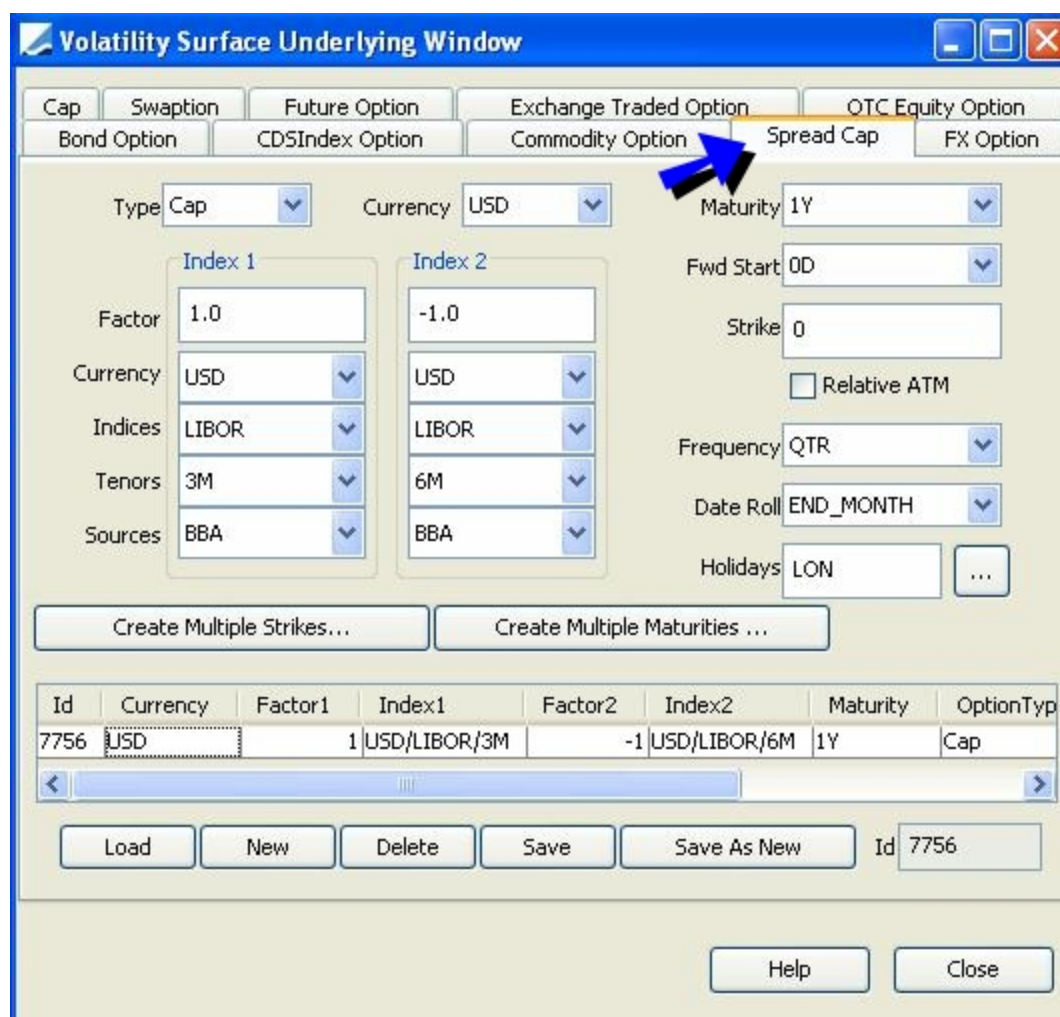
The Spread Cap underlying can be used in construction of the RATE volatility surfaces using the SpreadCap generator, and as calibration instruments.

Spread Cap Configuration

- Create the Rate Index Definition using [Configuration > Interest Rates > Rate Index Definitions](#) from the Calypso Navigator.

21.1 Spread Cap Volatility Surface Underlying

Create the underlying instruments in the Volatility Surface Underlying Window, Spread Cap panel.



Volatility Surface Underlying Window

Cap Swaption Future Option Exchange Traded Option OTC Equity Option
Bond Option CDSIndex Option Commodity Option **Spread Cap** FX Option

Type: Cap Currency: USD Maturity: 1Y
Fwd Start: 0D Strike: 0
☐ Relative ATM
Frequency: QTR Date Roll: END_MONTH
Holidays: LON ...

Index 1: Factor 1.0 Currency USD Indices LIBOR Tenors 3M Sources BBA
Index 2: Factor -1.0 Currency USD Indices LIBOR Tenors 6M Sources BBA

Create Multiple Strikes... Create Multiple Maturities ...

Id	Currency	Factor1	Index1	Factor2	Index2	Maturity	OptionTyp
7756	USD	1	USD/LIBOR/3M	-1	USD/LIBOR/6M	1Y	Cap

Load New Delete Save Save As New Id 7756

Help Close

- » Click **New** to create new volatility surface underlying.

Complete the details as described in the table below.

- » Click **Save** to create the underlying. They appear in the table below.

The system creates quotes like in the following example.

Definition	Underlyings	Quotes	Points	Graph
Quote Name		Type		
SpreadCap.USD.1Y.0.0.LIBOR.3M.BBA/LIBOR.6M.BBA		Yield		
SpreadCap.USD.2Y.0.0.LIBOR.3M.BBA/LIBOR.6M.BBA		Yield		
SpreadCap.USD.3Y.0.0.LIBOR.3M.BBA/LIBOR.6M.BBA		Yield		
SpreadCap.USD.4Y.0.0.LIBOR.3M.BBA/LIBOR.6M.BBA		Yield		
SpreadCap.USD.5Y.0.0.LIBOR.3M.BBA/LIBOR.6M.BBA		Yield		

Fields Details

Field	Description
Type	Cap or Floor.
Currency	Cap currency.
Index 1 / Index 2	
Factor	Factor for the index.
Currency	Underlying currency for the index.
Indices	Select the name of the index.
Tenors	Tenor for the index.
Sources	Sources for the index.
Other Details	
Maturity	Maturity for the spread cap.
Fwd Start	Start tenor.
Strike	Strike in percentage.
Relative ATM	Select for relative at-the-money.
Frequency	Frequency code such as QTR, WK, SA.
Date Roll	Type of date roll such as MOD_FOLLOWING, FOLLOWING.
Holidays	Calendar used for Holidays.
Create Multiple Rates / Create Multiple Expiries	You can click Create Multiple Rates and Create Multiple Expiries to create multiple instruments.

Field	Description
Id	Displays the system assigned unique identifier for the Spread Cap volatility surface underlying.

22. Swaption - Vol Surface Underlying

The Swaption underlying can be used in construction of the RATE volatility surfaces.

Swaption Configuration

- Create the Rate Index Definition in **Configuration > Interest Rates > Rate Index Definitions** from the Calypso Navigator.

22.1 Swaption Volatility Surface Underlying

Create the underlying instruments in the Volatility Surface Underlying Window, Swaption panel.

Volatility Surface Underlying Window

Bond Option
CDSIndex Option
Commodity Option
Spread Cap
Warrant
FX Option

Cap
Swaption
Future Option
Exchange Traded Option
OTC Equity Option

Currency:

Rate Index:

Index Tenor:

Source:

Option Expiry:

Swap Maturity:

☐ Pay Fixed

Fixed Side

Rate:

☐ Relative ATM

Frequency:

Day Count:

Date Roll:

Holidays:

Float Side

Date Roll:

Holidays:

Frequency:

Payment Lag: Cal

Payment Lag: Cal

☒ Cmp

Id	Currency	Index	Expiration	Swap Tenor	Pay/Receive	Fixed Rate	Rel. ATM
134732	USD	SOFR/1D	11Y	3Y	<input type="checkbox"/>	0.28000	<input type="checkbox"/>
134733	USD	SOFR/1D	12Y	1Y	<input type="checkbox"/>	1.00000	<input type="checkbox"/>
134734	USD	SOFR/1D	13Y	4Y	<input checked="" type="checkbox"/>	1.00000	<input type="checkbox"/>
135231	USD	SOFR/1D	10Y	1M	<input type="checkbox"/>	1.00000	<input type="checkbox"/>
135232	USD	SOFR/1D	11Y	1M	<input type="checkbox"/>	0.10000	<input type="checkbox"/>
5621	USD	LIBOR/3M	1M	1Y	<input type="checkbox"/>	-0.25000	<input checked="" type="checkbox"/>
5622	USD	LIBOR/3M	1M	1Y	<input type="checkbox"/>	-0.50000	<input checked="" type="checkbox"/>
5623	USD	LIBOR/3M	1M	1Y	<input type="checkbox"/>	-1.00000	<input checked="" type="checkbox"/>
5624	USD	LIBOR/3M	1M	1Y	<input type="checkbox"/>	-2.00000	<input checked="" type="checkbox"/>
5625	USD	LIBOR/3M	1M	1Y	<input type="checkbox"/>	0.00000	<input checked="" type="checkbox"/>
5626	USD	LIBOR/3M	1M	1Y	<input type="checkbox"/>	0.25000	<input checked="" type="checkbox"/>
5627	USD	LIBOR/3M	1M	1Y	<input type="checkbox"/>	0.50000	<input checked="" type="checkbox"/>
5628	USD	LIBOR/3M	1M	1Y	<input type="checkbox"/>	1.00000	<input checked="" type="checkbox"/>
5629	USD	LIBOR/3M	1M	1Y	<input type="checkbox"/>	2.00000	<input checked="" type="checkbox"/>
5630	USD	LIBOR/3M	3M	1Y	<input type="checkbox"/>	-0.25000	<input checked="" type="checkbox"/>
5631	USD	LIBOR/3M	3M	1Y	<input type="checkbox"/>	-0.50000	<input checked="" type="checkbox"/>

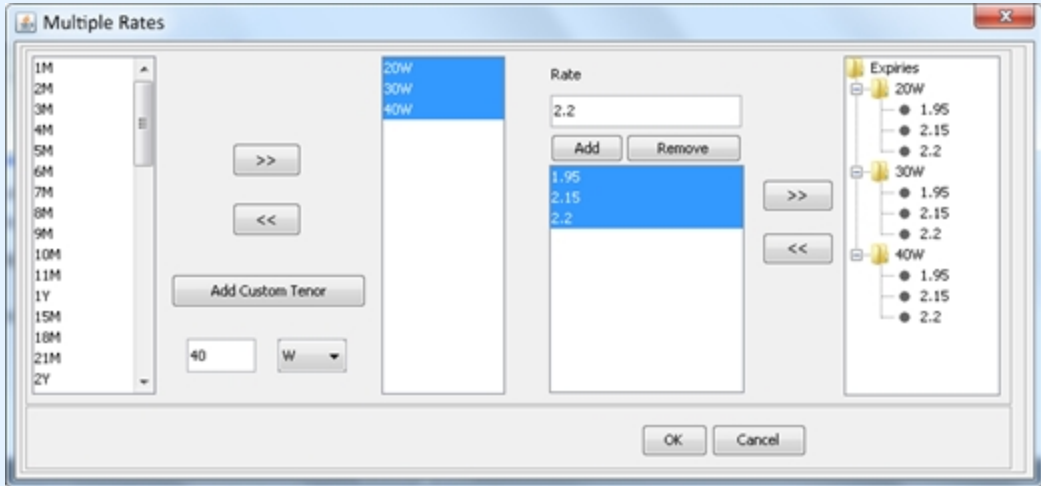
Id:

- » Click **New** to create new volatility surface underlying.
Complete the details as described in the table below.
- » Click **Save** to create the underlying. They appear in the table below.

The system creates quotes like in the following example.

Quote Name	Quote Type
SWAPTION.USD.Pay.5Y.5Y.LIBOR.6M.T3750.0.04	▼ Yield

Fields Details

Field	Description
Currency	Base currency selected in the Currency drop-down list in the bottom of the window.
Rate Index	Select the rate index.
Index Tenor	Tenor for the index.
Source	Quoting source for the index.
Option Expiry	Tenor for the option expiry.
Swap Maturity	Maturity for the swap.
Pay Fixed	Select the cash settlement method in order to affect the calculation of the value of the underlying when generating the surface.
Create Multiple Rates	<p>You can click Create Multiple Rates to create multiple rates for instruments in the Multiple Rates window.</p>  <ul style="list-style-type: none"> » Select one or more tenors and move them to the tenor field to the right. To create custom tenors, add a number in the text field, select either Day, Week, Month, or Year in the drop-down list, and click Add Custom Tenor. The tenors are added to the tenor field. » Under "Rate," add a value and click Add to move the value to the Rate field below. » To create multiple rates, select and highlight the preferred tenors and rates added in steps above, then use the arrow button to move them into the Expiries structure. When the structure is complete, click OK. The multiple rates are added to the list of underlying instruments on the Swaption panel. <p>① [NOTE: before creating multiple rates, make sure to specify other relevant information for the fixed and float side - such as currency, rate index, source, date roll, and holidays - on the Swaption panel.]</p>

Field	Description
Create Multiple Expiries	You can click Create Multiple Expiries to create multiple instruments associated with the specified expiries.
Payment Lag	Enter the number of days between the interest date and the payment date, and specify Business or Calendar.
Cmp	<p>Check the Cmp checkbox to enable interest compounding.</p> <ul style="list-style-type: none"> » Select the DLY from the adjacent field. » Double-click the Flat label to toggle between: <ul style="list-style-type: none"> – Flat — Flat compounding. – Spread — Does not apply to fixed rates, only to floating rates. – SimpleSpread - Does not apply to fixed rates, only to floating rates. – NoCmp — A cashflow is created at the compounding period without actually compounding the interest. <p>There is no compounding otherwise.</p>
Fixed Side	
Rate	Enter the fixed interest rate in percentage.
Relative ATM	Select for relative at-the-money.
Frequency	Payment frequency.
Day Count	Select the daycount convention used for determining the periods.
Date Roll	Select the date roll convention to use when the date falls on a non-business day.
Holidays	Holiday calendars used in calculating the pay dates.
Float Side	
Date Roll	Select the date roll convention to use when the date falls on a non-business day.
Holidays	Holiday calendars used in calculating the pay dates.
Frequency	Payment frequency.
Other Details	
Id	Displays the system assigned unique identifier for the Swaption volatility surface underlying.

23. Warrant - Vol Surface Underlying

The Warrant underlying can be used in construction of the Equity volatility surface with the Spline generator.

Underlying Configuration

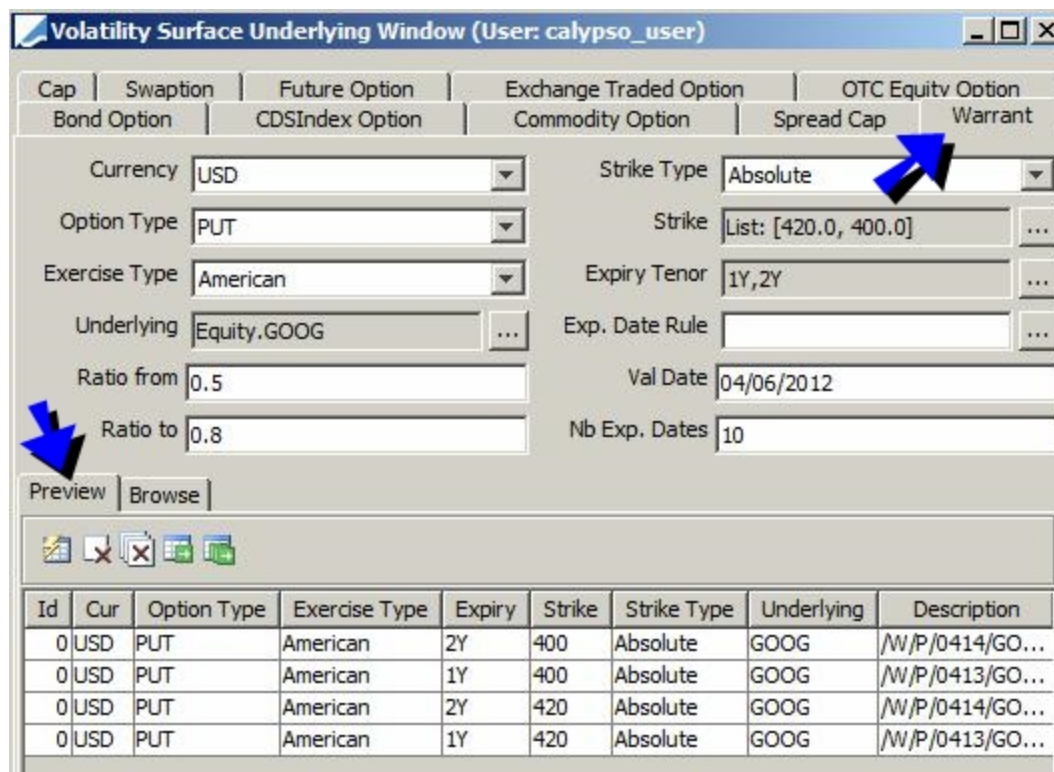
- Create equity products using **Configuration > Equity > Equity** from the Calypso Navigator.
- Create equity indices using **Configuration > Equity > Equity Indexes** from the Calypso Navigator.

23.1 Warrant Volatility Surface Underlying




Create the underlying instruments in the Volatility Surface Underlying Window, Warrant panel.

You can select the Browse tab to load existing underlying instruments.

Otherwise, select the Preview tab to create new underlying instruments.



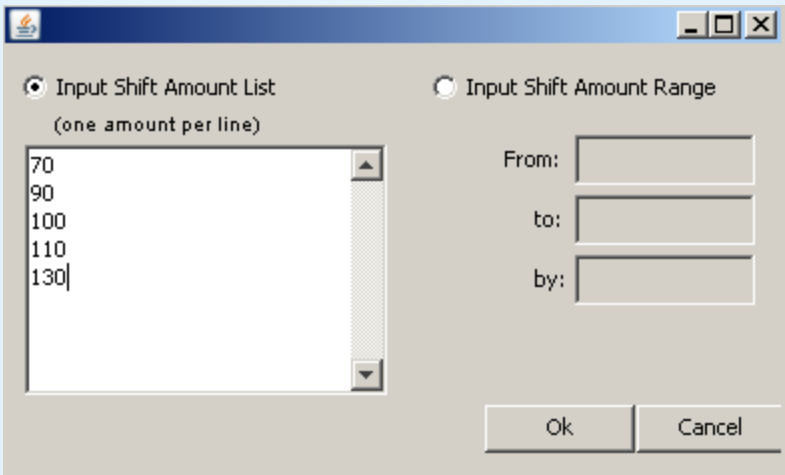
Id	Cur	Option Type	Exercise Type	Expiry	Strike	Strike Type	Underlying	Description
0	USD	PUT	American	2Y	400	Absolute	GOOG	/W/P/0414/GO...
0	USD	PUT	American	1Y	400	Absolute	GOOG	/W/P/0413/GO...
0	USD	PUT	American	2Y	420	Absolute	GOOG	/W/P/0414/GO...
0	USD	PUT	American	1Y	420	Absolute	GOOG	/W/P/0413/GO...

- » Enter the parameters to define the warrant, the fields are described below.
- » Click  to generate the underlying instruments.
- » Then select rows and click  to save the selected rows, or click  to save all rows.

The system creates quotes like in the following example.

Quote Name	Type
Warrant./N/P/0511/GOOG/400.00	▼ Price
Warrant./N/P/0511/GOOG/420.00	▼ Price
Warrant./N/P/0512/GOOG/400.00	▼ Price
Warrant./N/P/0512/GOOG/420.00	▼ Price

Fields Details

Fields	Description
Currency	Select the warrant currency.
Option Type	Select PUT, CALL, or BOTH.
Exercise Type	Select the type of exercise: <i>American</i> or <i>European</i> .
Underlying	Click ... to select the underlying product.
Ratio from Ratio to	Select the quantity of warrant to exercise (Ratio from) to obtain a quantity of underlying (Ratio to).
fixed FX Rate	If the warrant currency is different from the underlying currency, enter an FX rate. The warrant will be generated as a quanto using this FX rate.
Strike Type	Select the strike type: Absolute or Relative %.
Strike	Click ... and enter a list or range of strike amounts. 
Expiry Tenor Exp. Date Rule	Click ... to select a set of expiry tenors, or select a date rule to generate the tenors.
Val Date	Enter the generation start date.
Nb Exp. Dates	Enter the number of expiry dates to be generated.

24. Proxy Commodity Volatility Surface

Commodities are traded globally. Commodity futures and Commodity options trading in different markets and countries are highly correlated. For portfolios consisting of such products in different markets and different currencies, there is a need to have cross volatility surface that is constructed with a more liquid but foreign currency based commodity volatility surface, FX volatility surface and correlation between these two assets. This volatility surface can then be used in risk decomposition.

For this purpose, it is possible to build the proxy commodity volatility surface in Calypso. This is useful in order to provide vega risk towards a foreign commodity future option when the local market futures options are not liquid enough.

Below is a description of how to use proxy commodity volatility surface, which is created using the proxy volatility surface generator by capturing the commodity correlation such that commodity options can be priced using this proxy surface.

Base (foreign) commodity vol surface and FX vol surface along with the correlation matrix between commodity and FX is used to derive a proxy vol surface. In the example below, base (foreign) commodity is in USD, domestic commodity is in BRL. The proxy commodity vol surface is generated in BRL using base USD vol surface , USD/BRL FX vol surface and correlation between base commodity in USD and USD/BRL FX.

24.1 Defining Commodities

Define the commodity products by choosing **Configuration > Commodities > Commodities** from Calypso Navigator

► Refer to *Calypso Commodity Definitions Documentation* for more details.

Commodity: USD/CBOT Corn/CBOT Approved Warehouses

File Help

Definition

Commodity

Currency: USD Name: CBOT Corn Location: CBOT Approved Warehouse

Settings

Source: CBOT Risk Config

Quote Unit: 50-Net Kilo Bag Risk Unit: 50-Net Kilo Bag

Code: BB_MARKET_SECT... Settlement Days

Type: Commodity Physical: 0 Cash: 0

Quantity Config

Decimals: 5

Id	Commodity
7359	USD/Anhydrous Ethanol/Porto Santos
7361	USD/Arabica Coffee/Sao Paulo
7365	USD/BM&F Cotton/Sao Paulo
7364	USD/BM&F Robusta Coffee/Vitoria
7363	USD/Brazilian Soybeans/Paranagua
3047	USD/CBOT Corn/CBOT Approved Warehouses
3042	USD/CBOT Gold/CBOT Approved Warehouses

Defining USD commodity

Commodity: BRL/BM&F Corn/Campinas

File Help

Definition

Commodity: BRL Name: BM&F Corn Location: Campinas

Settings

Source: BM&F Risk Config

Quote Unit: 60-Net Kilo Bag Risk Unit: MTonnes

Code: BB_MARKET_SECT... Settlement Days

Type: Storage Based Physical: 0 Cash: 0

Quantity Config

Decimals: 5

Id	Commodity
7367	BRL/BM&F Corn/Campinas
7366	BRL/BM&F Feeder Cattle/Campo Grande
7368	BRL/BM&F Live Cattle/Aracatuba
7362	BRL/Brazilian Yellow Corn/Campinas
7360	BRL/Hydrous Ethanol/Paulina
5187	EUR/Phase II CER Large Hydro/EU ETS
5190	EUR/Phase II CER LULUCF/EU ETS
1510	EUR/Phase II CER Hydro/EU ETS

Defining BRL commodity

24.2 Defining Commodity Future and Option

Define the future and option contract by choosing **Configuration > Listed Derivatives > Future Contracts** and **Configuration > Listed Derivatives > Future Contracts Options** from Calypso Navigator respectively.

► Refer to *Calypso Capturing Commodities Documentation* for more details.

A detailed example of base USD commodity future and option definition is shown below.

Future Contract Specification Window

File Futures Help

Search: CBOT Corn C/CBOT

From Date: 30 Jul, 2018 Load

Config

Futures Existing	Curve Underlying Existing	Expiration Date	Last Trade Date	First Delivery Date	Last Delivery Date	First Notification Date	Last Notification Date
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	14/09/2018	18/06/2018	31/08/2018	18/09/2018	31/08/2018	30/09/2018
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	14/12/2018	17/09/2018	30/11/2018	18/12/2018	30/11/2018	31/12/2018
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	14/03/2019	17/12/2018	28/02/2019	18/03/2019	28/02/2019	31/03/2019
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	14/05/2019	18/03/2019	30/04/2019	16/05/2019	30/04/2019	31/05/2019
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	12/07/2019	17/06/2019	30/06/2019	16/07/2019	30/06/2019	31/07/2019
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	13/09/2019	17/06/2019	31/08/2019	17/09/2019	31/08/2019	30/09/2019
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	13/12/2019	16/09/2019	30/11/2019	17/12/2019	30/11/2019	31/12/2019
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	13/03/2020	16/12/2019	29/02/2020	17/03/2020	29/02/2020	31/03/2020
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	14/05/2020	16/03/2020	30/04/2020	18/05/2020	30/04/2020	31/05/2020
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	14/07/2020	15/06/2020	30/06/2020	16/07/2020	30/06/2020	31/07/2020
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	14/09/2020	14/09/2020	31/08/2020	16/09/2020	31/08/2020	30/09/2020
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	14/12/2020	14/12/2020	30/11/2020	16/12/2020	30/11/2020	31/12/2020
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	12/03/2021	14/12/2020	28/02/2021	16/03/2021	28/02/2021	31/03/2021

Details Underlying

Name Value

Contract Summary

Exchange CBOT

Currency USD

Name CBOT Corn C

Type Commodity

General

Quote Type Price

Quote Decimals 5

Is Contract Size Variable ☐

Contract Size 5,000

No. of Futures in Contract 13

Settle Type Physical

Negative Price Liquidation ☐

Attributes Select...

Fungible with

Future Name Month First Delivery Date

Last CCP Date Log 0

Long Name

Exchange Clearing Ticker

Ticks

Tick Type Fixed

Tick Size 400

Minimum move (ticks) 0.0025

Tick Value 12.5

Dates/Time

Date Format Monthly

Holidays FCBT-CBA

Last Trading Time 12:00

TimeZone America/Chicago

Daylight Saving Time

Expiration Date Schedule CBOT Corn Last Trading ...

Last Trade Date Schedule OMX FRA Last Trade Date

First Delivery Date Schedule @End of Month

First Delivery Use Prev Date ☒

Last Delivery Date Schedule CBOT Corn Last Delivery...

Last Delivery Use Prev Date ☐

First Notification Date Sch... @End of Month

First Notification Use Prev ... @End of Month

Last Notification Date Sch... @End of Month

New Save Delete

Save Futures Save Curve Underlyings Delete Future Close

Future Option Contract Specification Window									
File Future Options Help									
Search CBOT Corn/CBOT									
From Date 30 Jul 2018 Load									
Definition									
Name	Value	Expiration Date	Last Trade Date	First Delivery Date	Last Delivery Date	Underlying Future	Attributes	Quote Name	
Contract Summary	CBOT	31/07/2018	31/07/2018	31/07/2018	31/07/2018	FutureCommodity/CBOT Corn C/30/04/2019	Select...	FutureOption.USD.4	52.8-52.8
Exchange	CBOT	31/08/2018	31/08/2018	31/08/2018	31/08/2018	FutureCommodity/CBOT Corn C/30/06/2019	Select...	FutureOption.USD.4	52.8-52.8
Currency	USD	30/09/2018	30/09/2018	30/09/2018	30/09/2018	FutureCommodity/CBOT Corn C/30/06/2019	Select...	FutureOption.USD.4	52.8-52.8
Name	CBOT Corn	31/10/2018	31/10/2018	31/10/2018	31/10/2018	FutureCommodity/CBOT Corn C/31/08/2019	Select...	FutureOption.USD.4	52.8-52.8
Type	Commodity	30/11/2018	30/11/2018	30/11/2018	30/11/2018	FutureCommodity/CBOT Corn C/31/08/2019	Select...	FutureOption.USD.4	52.8-52.8
Underlying	CBOT	31/12/2018	31/12/2018	31/12/2018	31/12/2018	FutureCommodity/CBOT Corn C/30/11/2019	Select...	FutureOption.USD.4	52.8-52.8
Underlying Currency	USD	31/01/2019	31/01/2019	31/01/2019	31/01/2019	FutureCommodity/CBOT Corn C/30/11/2019	Select...	FutureOption.USD.4	52.8-52.8
Underlying Name	CBOT Corn C/CBOT	28/02/2019	28/02/2019	28/02/2019	28/02/2019	FutureCommodity/CBOT Corn C/30/11/2019	Select...	FutureOption.USD.4	52.8-52.8
Underlying Dates	Underlying Add Months	31/03/2019	31/03/2019	31/03/2019	31/03/2019	FutureCommodity/CBOT Corn C/29/02/2020	Select...	FutureOption.USD.4	52.8-52.8
Underlying Add Months	10	30/04/2019	30/04/2019	30/04/2019	30/04/2019	FutureCommodity/CBOT Corn C/29/02/2020	Select...	FutureOption.USD.4	52.8-52.8
General	Quote Type								
Exercise Type	American								
Settle Type Option	Cash								
No. of Option Contract	10								
Attributes	Select...								
Fungible with	First Delivery Date								
Future Option Name Month	Long Name								
Exchange Clearing Ticker	Premium Payment Convention								
Tick	Tick Type								
Tick Size	Fixed								
Minimum move (ticks)	0.01								
Tick Value	1								
Business/Time	Date Format								
Last Trading Time	Monthly								
Timezone	0:00								
Expiration Date Schedule	America/New_York								
Last Trade Date Schedule	@End of Month								
First Delivery Date Schedule	@End of Month								
Last Delivery Date Schedule	@End of Month								

24.3 Defining Base (foreign) Volatility Surface

From the Calypso Navigator, navigate to **Market Data > Volatilities > Volatility Surface** (menu action `marketdata.VolatilitySurface3DWindow`).

Create a USD commodity vol surface on product CBOT Corn commodity defined above.

► Refer to *Calypso Commodity Volatility Surface Documentation* for more details.

Volatility Surface 3D Window	
Surface Utilities Help	
Name CBOT Corn	CLOSE Date 30/07/2018 5:21:57 AM Current
Definition Underlyings Quotes Points Graph	
Comment	
Vol Type Commodity	Vol Model
Currency USD	Generator Derived FutureOption
Product CBOT Corn/CBOT Approved Warehouses	Interpolator Interpolator3DLinear
Include Tenor Axis	Parameter Value
Strike Type Strike	FILL_MISSING true
DateRoll MOD_FOLLOW	
Holidays NYC	
Pricing Environment OFFICIAL	
Load...	New Delete... Save Save... Close

Volatility Surface 3D Window	
Surface Utilities Help	
Name CBOT Corn	CLOSE Date 30/07/2018 5:21:57 AM Current
Definition Underlyings Quotes Points Graph	
Type FutureOption	New Instrument... Underlying Instruments
Filter on descri...	
Id	Description
324705	FutureOption CBOT Corn/C/51.00000/31/08/2018
324704	FutureOption CBOT Corn/C/51.00000/31/08/2018
324703	FutureOption CBOT Corn/C/51.00000/30/09/2018
324702	FutureOption CBOT Corn/C/52.00000/31/10/2018
324701	FutureOption CBOT Corn/C/51.00000/30/11/2018
324700	FutureOption CBOT Corn/C/52.00000/31/12/2018

Volatility Surface 3D Window

Surface Utilities Help

Name CBOT Corn CLOSE Date 30/07/2018 5:21:57 AM ☒ Current

Definition Underlyings Quotes Points Graph

Quote Name	Type	CLOSE
FutureOption.USD.CBOT.CBOT Corn.C.51.50000.JUL.18	Future	51.000000
Future.USD.CBOT.CBOT Corn C.APR.19	Price	51.0000000000
FutureOption.USD.CBOT.CBOT Corn.C.51.00000.AUG.18	Future	51.000000
FutureOption.USD.CBOT.CBOT Corn.C.51.00000.SEP.18	Future	52.000000
Future.USD.CBOT.CBOT Corn C.JUN.19	Price	51.0000000000
FutureOption.USD.CBOT.CBOT Corn.C.52.00000.OCT.18	Future	52.000000
FutureOption.USD.CBOT.CBOT Corn.C.51.00000.NOV.18	Future	51.000000
Future.USD.CBOT.CBOT Corn C.AUG.19	Price	52.0000000000
FutureOption.USD.CBOT.CBOT Corn.C.52.00000.DEC.18	Future	51.000000
FutureOption.USD.CBOT.CBOT Corn.C.51.00000.JAN.19	Future	52.000000
FutureOption.USD.CBOT.CBOT Corn.C.0.00005.FEB.19	Future	51.000000
Future.USD.CBOT.CBOT Corn C.NOV.19	Price	52.0000000000
FutureOption.USD.CBOT.CBOT Corn.C.52.00000.MAR.19	Future	51.000000

Save Quotes Refresh Quotes

Load... New Delet... Save Save... Close

Volatility Surface 3D Window

Surface Utilities Help

Name CBOT Corn CLOSE Date 30/07/2018 5:21:57 AM ☒ Current

Definition Underlyings Quotes Points Graph

VolatilityModel: MID

Expiry/Strike	0.000052	51	51.5	52
31/07/2018	1000.00000	1000.00000	1000.00000	1000.00000
31/08/2018	1000.00000	1000.00000	1000.00000	1000.00000
30/09/2018	1000.00000	1000.00000	1000.00000	1000.00000
31/10/2018	1000.00000	1000.00000	1000.00000	1000.00000
30/11/2018	1000.00000	1000.00000	1000.00000	1000.00000
31/12/2018	1000.00000	1000.00000	1000.00000	1000.00000
31/01/2019	1000.00000	1000.00000	1000.00000	1000.00000
28/02/2019	0.00100	0.00100	0.00100	0.00100
31/03/2019	1000.00000	1000.00000	1000.00000	1000.00000
30/04/2019	1000.00000	1000.00000	1000.00000	1000.00000

Bid >> Ask
Ask >> Bid
Interpolate...
ACT/360
Generate

Load... New Delet... Save Save... Close

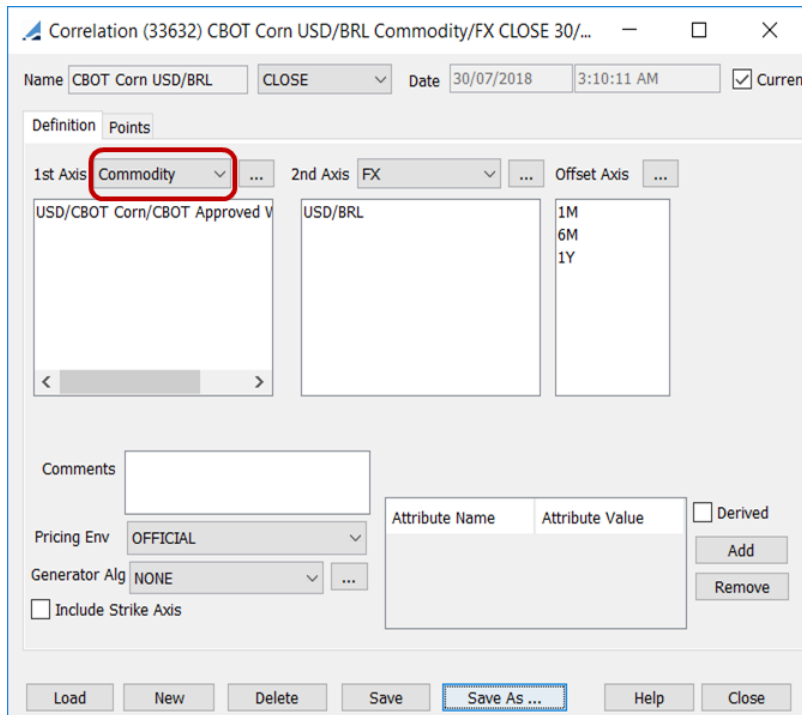
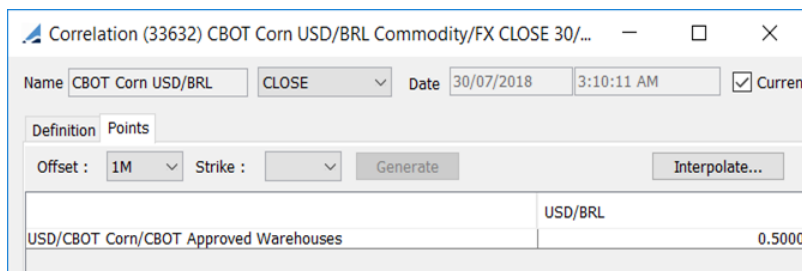
24.4 Defining Correlation Matrix

From the Calypso Navigator, navigate to **Market Data > Correlation & Covariance > Correlation Matrix** (menu action `marketdata.CorrelationMatrixWindow`).

A Commodity/Commodity Future axis should be used. For the same commodity future, the correlation is specific per futures maturity. The commodity future, including its expiry month is to be selected as a FutureCommodity instrument under first axis. Hence the maturity/tenor axis is not required. This will allow you to define a correlation matrix between FX rates and commodity futures.

When the first axis is selected as Commodity, the tenor axis can be used for defining the correlation of the commodity per tenor with FX. The correlation matrix window will look like the one shown below.

► Refer to *Calypso Correlation Matrix Documentation* for more details on defining a Correlation Matrix.

	USD/BRL
USD/CBOT Corn/CBOT Approved Warehouses	0.5000

24.5 Defining FX Vol Surface

From Calypso Navigator, navigate to **Market Data > Volatilities > FX Volatility Surface** (menu action `marketdata.FXVolatilitySurfaceWindow`).

An FX volatility surface is created from FX Option underlying instruments, or from offsets. Create a FX vol surface as shown below.

► Refer to *Calypso FX Volatility Surface documentation* for more details.

FX Vol Qt Entry: USD/BRL Vol surface CLOSE 30/7/18 5:47:49 AM

Surface Utilities Help

Name: USD/BRL Vol surface CLOSE Date: 30/07/2018 5:47:49 AM ☐ Current

Definition Underlyings Quotes Points Graph Surface

Type: ATM

☐ Filter on descri...

Id	Description
324709	FXOpt USD/BRL 1W ATM
324708	FXOpt USD/BRL 1M ATM
324707	FXOpt USD/BRL 3M ATM
324706	FXOpt USD/BRL 6M ATM
324710	FXOpt USD/BRL 1Y ATM

FX Vol Qt Entry: USD/BRL Vol surface CLOSE 30/7/18 5:47:49 AM

Surface Utilities Help

Name: USD/BRL Vol surface CLOSE Date: 30/07/2018 5:47:49 AM ☐ Current

Definition Underlyings Quotes Points Graph Surface

USD/BRL 30/07/2018 TOK 15:00 MID

Term	Exp	Day	Cal Days	ATM
1W	06/08/2018	MON	7	\$1.0000
1M	31/08/2018	FRI	32	\$2.0000
3M	30/10/2018	TUE	92	\$2.0000
6M	30/01/2019	WED	184	\$3.0000
1Y	30/07/2019	TUE	365	\$4.0000

☐ Quotes List ☒ Quotes Ma...

FX Vol Qt Entry: USD/BRL Vol surface CLOSE 30/7/18 5:47:49 AM

Surface Utilities Help

Name: USD/BRL Vol surface CLOSE Date: 30/07/2018 5:47:49 AM ☐ Current

Definition Underlyings Quotes Points Graph Surface

Volatility model: Black MID

Expiry/Delta	C (ATM) P
06/08/2018	\$1.00000
31/08/2018	\$2.00000
30/10/2018	\$2.00000
30/01/2019	\$3.00000
30/07/2019	\$4.00000

ACT/365

24.6 Defining Proxy Commodity Volatility Surface

A Derived volatility surface generator called *CommodityVolatilityProxy* should be used.

An example of proxy commodity vol surface with underlying commodity and domestic currency BRL as currency is shown below.

Additional dependent Market data Items (MDI): Base (Foreign) Vol Surface, FX Vol Surface, Correlation Matrix need to be added to the commodity vol surface screen when the generator is selected as *CommodityVolatilityProxy*.

In the Underlyings tab, it relies on two OTC domestic futures options underlyings corresponding to Call and Put At the money (ATM) per expiry.

VolatilitySurface3D USD/BRL Corn Proxy Vol Surface BRL CLOSE User(calypso_user)(PE OFFICIAL)

Surface Utilities Help

Name: RL Corn Proxy Vol Surface CLOSE Date: 13/08/2018 6:00:00 AM ☐ Current

Definition Underlyings Quotes Points Graph

Comment

Vol Type: Commodity Vol Model: ☐ Synthetic ☒ CommodityVolatilityProxy

Currency: BRL Generator: ☒ Derived CommodityVolatilityProxy

Product: BRL/BM&F Corn/Campinas Interpolator: Interpolator3DLinear

☒ Include Tenor Axis

Strike Type: Strike

DateRoll: MOD_FOLLOW

Holidays: ...

Pricing Environment: OFFICIAL

Parameter	Value
SYNTHETIC_EXPIRY	
SYNTHETIC_TENOR	
FX Correlation Override	0.3
Spread Type	Additive

MDI Name	Value
Base CMD Surface	CBOT_CORN_VOL_30/7/18 2:0...
FX Vol Surface	USD/BRL Vol surface 10/8/18 ...
Correlation Matrix	CBOT Corn USD/BRL 10/8/18 ...

Load... New Delet... Save Save... Close

VolatilitySurface3D USD/BRL Corn Proxy Vol Surface BRL CLOSE User(calypso_user)(PE OFFICIAL)

Surface Utilities Help

Name: RL Corn Proxy Vol Surface CLOSE Date: 13/08/2018 6:00:00 AM ☐ Current

Definition Underlyings Quotes Points Graph

Type: ☐ All ☒ Underlying Instruments

☐ Filter on descri...

New Instrument...

Id	Description
326716	CommodityOption CommdVolPLABCDATM.BRL.ATMVol.AUG18
326717	CommodityOption CommdVolPLABCDATM.BRL.ATMVol.SEP18
326715	CommodityOption CommdVolPLABCDATM.BRL.ATMVol.OCT18
326727	CommodityOption CommdVolPLABCDATM.BRL.ATMVol.NOV18
326732	CommodityOption CommdVolPLABCDATM.BRL.ATMVol.DEC18
326728	CommodityOption CommdVolPLABCDATM.BRL.ATMVol.JAN19
326731	CommodityOption CommdVolPLABCDATM.BRL.ATMVol.FEB19
326730	CommodityOption CommdVolPLABCDATM.BRL.ATMVol.MAR19
326729	CommodityOption CommdVolPLABCDATM.BRL.ATMVol.APR19

Load... New Delet... Save Save... Close

VolatilitySurface3D USD/BRL Corn Proxy Vol Surface BRL CLOSE User(calypso_user)(PE OFFICIAL)

Surface Utilities Help

Name: RL Corn Proxy Vol Surface CLOSE Date: 13/08/2018 6:00:00 AM ☐ Current

Definition Underlyings Quotes Points Graph

Quote Name	Type	CLOSE
CommVolPLABCDATM.BRL.ATMVol.AUG18	Volatility	52.000000
CommVolPLABCDATM.BRL.ATMVol.SEP18	Volatility	52.000000
CommVolPLABCDATM.BRL.ATMVol.OCT18	Volatility	53.000000
CommVolPLABCDATM.BRL.ATMVol.NOV18	Volatility	54.000000
CommVolPLABCDATM.BRL.ATMVol.DEC18	Volatility	55.000000
CommVolPLABCDATM.BRL.ATMVol.JAN19	Volatility	53.000000
CommVolPLABCDATM.BRL.ATMVol.FEB19	Volatility	54.000000
CommVolPLABCDATM.BRL.ATMVol.MAR19	Volatility	55.000000
CommVolPLABCDATM.BRL.ATMVol.APR19	Volatility	55.000000

Save Quotes Refresh Quotes

Load... New Delet... Save Save... Close

VolatilitySurface3D USD/BRL Corn Proxy Vol Surface BRL CLOSE User(calypso_user)(PE OFFICIAL)

Surface Utilities Help

Name: RL Corn Proxy Vol Surface CLOSE Date: 13/08/2018 6:00:00 AM ☐ Current

Definition Underlyings Quotes Points Graph

☒ Tenor ☐ Expiry ☐ Strike Tenor: 0D VolatilityMod...: MID

Expiry/Strike	0.00915039	8,974.41826259	9,062.40275536	9,150.38724813
31/08/2018	52.00000	52.00000	52.00000	52.00000
30/09/2018	52.00000	52.00000	52.00000	52.00000
31/10/2018	53.00000	53.00000	53.00000	53.00000
30/11/2018	54.00000	54.00000	54.00000	54.00000
31/12/2018	55.00000	55.00000	55.00000	55.00000
31/01/2019	53.00000	53.00000	53.00000	53.00000
28/02/2019	54.00000	54.00000	54.00000	54.00000
31/03/2019	55.00000	55.00000	55.00000	55.00000
30/04/2019	55.00000	55.00000	55.00000	55.00000

Bid >> Ask
Ask >> Bid
Interpolate...
BU/252
Generate

Load... New Delet... Save Save... Close

On clicking **Generate**, the volatility points following the expiries and FX-adjusted strikes of the base(foreign) volatility surface are computed. USD is used in the example.

The volatility formula is as follows :

$$V_d^2 = V_f^2 + V_{fx}^2 - 2 \rho V_f V_{fx}$$

where,

V_d : The volatility of the commodity in domestic currency. The strike will be converted using FX rate.

V_f : The volatility of the commodity asset in foreign currency.

Vfx: The ATM volatility of FX with same maturity as the future option.

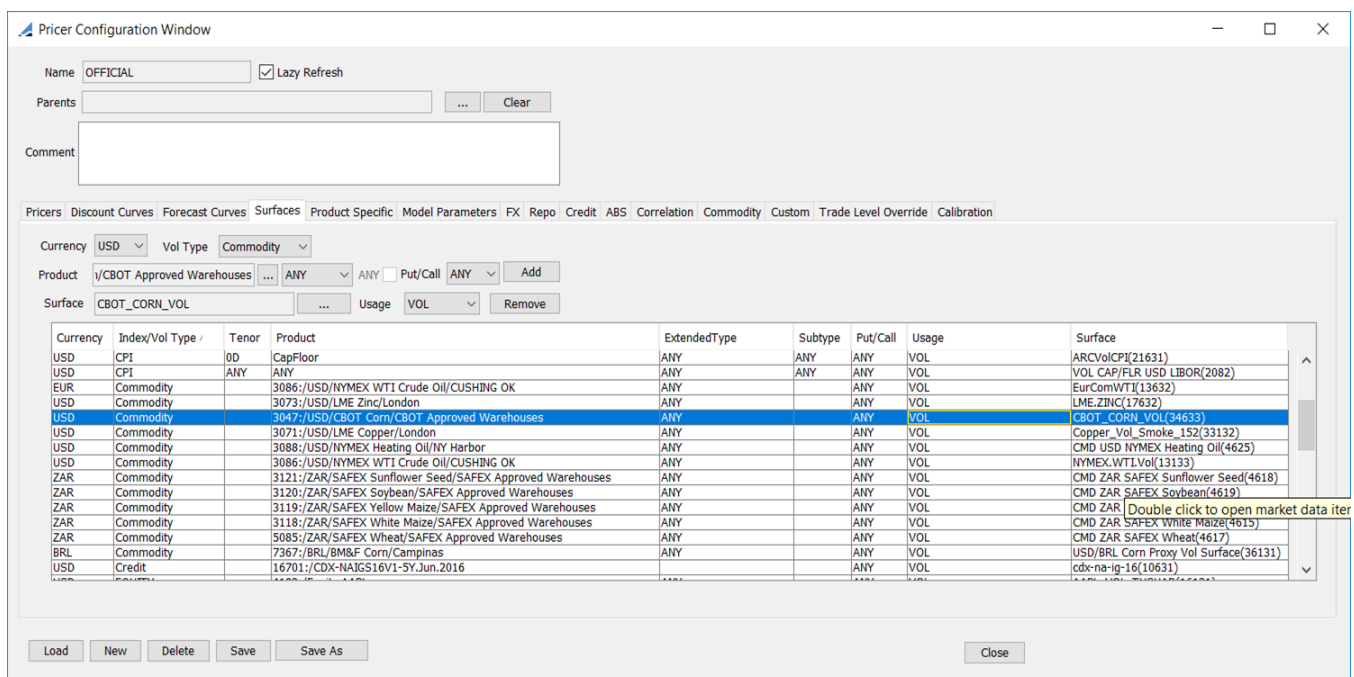
Rho: Correlation between foreign commodity and FX.

24.7 Pricer Configuration

Make sure all the vol surfaces and correlation matrix is defined correctly in the pricer configuration. You can bring up the Pricer Configuration window from the Pricing Environment window, or navigate to **Market Data > Pricing Environment > Pricer Configuration** from the Calypso Navigator.

► Refer to *Calypso Pricer Configuration Documentation* for more details.

Examples of configuring base vol, proxy vol, FX vol and correlation is shown below.



Pricer Configuration Window

Name: OFFICIAL ☒ Lazy Refresh

Parents: ... Clear

Comment:

Tabs: Pricers | Discount Curves | Forecast Curves | **Surfaces** | Product Specific | Model Parameters | FX | Repo | Credit | ABS | Correlation | Commodity | Custom | Trade Level Override | Calibration

Currency: USD Vol Type: Commodity

Product: /CBOT Approved Warehouses ... ANY Put/Call ANY Add

Surface: CBOT_CORN_VOL ... Usage VOL Remove

Currency	Index/Vol Type	Tenor	Product	ExtendedType	Subtype	Put/Call	Usage	Surface
USD	CPI	0D	CapFloor	ANY	ANY	ANY	VOL	ARCVolCPI(21631)
USD	CPI	ANY	ANY	ANY	ANY	ANY	VOL	VOL CAP/FLR USD LIBOR(2082)
EUR	Commodity		3086:/USD/NYMEX WTI Crude Oil/CUSHING OK	ANY		ANY	VOL	EurComWTI(13632)
USD	Commodity		3073:/USD/LME Zinc/London	ANY		ANY	VOL	LME.ZINC(17632)
USD	Commodity		3047:/USD/CBOT Corn/CBOT Approved Warehouses	ANY		ANY	VOL	CBOT_CORN_VOL(34633)
USD	Commodity		3071:/USD/LME Copper/London	ANY		ANY	VOL	Copper_Vol_Smoke_152(33132)
USD	Commodity		3088:/USD/NYMEX Heating Oil/NY Harbor	ANY		ANY	VOL	CMD USD NYMEX Heating Oil(4625)
USD	Commodity		3086:/USD/NYMEX WTI Crude Oil/CUSHING OK	ANY		ANY	VOL	NYMEX.WTI1Vol(13133)
ZAR	Commodity		3121:/ZAR/SAFEX Sunflower Seed/SAFEX Approved Warehouses	ANY		ANY	VOL	CMD ZAR SAFEX Sunflower Seed(4618)
ZAR	Commodity		3120:/ZAR/SAFEX Soybean/SAFEX Approved Warehouses	ANY		ANY	VOL	CMD ZAR SAFEX Soybean(4619)
ZAR	Commodity		3119:/ZAR/SAFEX Yellow Maize/SAFEX Approved Warehouses	ANY		ANY	VOL	CMD ZAR Double click to open market data iter
ZAR	Commodity		3118:/ZAR/SAFEX White Maize/SAFEX Approved Warehouses	ANY		ANY	VOL	CMD ZAR SAFEX White Maize(4615)
ZAR	Commodity		5085:/ZAR/SAFEX Wheat/SAFEX Approved Warehouses	ANY		ANY	VOL	CMD ZAR SAFEX Wheat(4617)
BRL	Commodity		7367:/BRL/BM&F Corn/Campinas	ANY		ANY	VOL	USD/BRL Corn Proxy Vol Surface(36131)
USD	Credit		16701:/CDX-NAIGS16V1-5Y Jun.2016	ANY		ANY	VOL	cdx-na-ig-16(10631)

Buttons: Load New Delete Save Save As Close

Base USD Vol in Pricer Config

Pricer Configuration Window

Name: OFFICIAL ☒ Lazy Refresh

Parents: ... Clear

Comment:

Prickers Discount Curves Forecast Curves Surfaces Product Specific Model Parameters FX Repo Credit ABS Correlation Commodity Custom Trade Level Override Calibration

Currency: BRL Vol Type: Commodity

Product: BRL/BM&F Corn/Campinas ... ANY Put/Call ANY Add

Surface: USD/BRL Corn Proxy Vol Surface ... Usage: VOL Remove

Currency	Index/Vol Type	Tenor	Product	ExtendedType	Subtype	Put/Call	Usage	Surface
USD	CP1	0D	CapFloor	ANY	ANY	ANY	VOL	ARCVolCP1(21631)
USD	CP1	ANY	ANY	ANY	ANY	ANY	VOL	VOL CAP/FLR USD LIBOR(2082)
EUR	Commodity		3086:/USD/NYMEX WTI Crude Oil/CUSHING OK	ANY		ANY	VOL	EurComWTI(13632)
USD	Commodity		3073:/USD/LME Zinc/London	ANY		ANY	VOL	LME_ZINC(17632)
USD	Commodity		3047:/USD/CBOT Corn/CBOT Approved Warehouses	ANY		ANY	VOL	CBOT_CORN_VOL(34633)
USD	Commodity		3071:/USD/LME Copper/London	ANY		ANY	VOL	Copper_Vol_Smoke_152(33132)
USD	Commodity		3088:/USD/NYMEX Heating Oil/MY Harbor	ANY		ANY	VOL	CMD USD NYMEX Heating Oil(4625)
USD	Commodity		3086:/USD/NYMEX WTI Crude Oil/CUSHING OK	ANY		ANY	VOL	NYMEX.WTI.Vol(13133)
ZAR	Commodity		3121:/ZAR/SAFEX Sunflower Seed/SAFEX Approved Warehouses	ANY		ANY	VOL	CMD ZAR SAFEX Sunflower Seed(4618)
ZAR	Commodity		3120:/ZAR/SAFEX Soybean/SAFEX Approved Warehouses	ANY		ANY	VOL	CMD ZAR SAFEX Soybean(4619)
ZAR	Commodity		3119:/ZAR/SAFEX Yellow Maize/SAFEX Approved Warehouses	ANY		ANY	VOL	CMD ZAR SAFEX Yellow Maize(4616)
ZAR	Commodity		3118:/ZAR/SAFEX White Maize/SAFEX Approved Warehouses	ANY		ANY	VOL	CMD ZAR SAFEX White Maize(4615)
ZAR	Commodity		5085:/ZAR/SAFEX Wheat/SAFEX Approved Warehouses	ANY		ANY	VOL	CMD ZAR SAFEX Wheat(4617)
BRL	Commodity		7367:/BRL/BM&F Corn/Campinas	ANY		ANY	VOL	USD/BRL Corn Proxy Vol Surface(36131)
USD	Credit		16701:/CDX-NAIGS16V1-5Y.Jun.2016	ANY		ANY	VOL	cdx-na-ig-16(10631)

Double click to open market data item

Load New Delete Save Save As Close

Proxy Vol in Pricer Config

Pricer Configuration Window

Name: OFFICIAL ☒ Lazy Refresh

Parents: ... Clear

Comment:

Prickers Discount Curves Forecast Curves Surfaces Product Specific Model Parameters FX Repo Credit ABS Correlation Commodity Custom Trade Level Override Calibration

Primary: USD Quoting: BRL Domiciliation: ANY

Product Type: ANY ExtendedType: ANY Subtype: ANY

Usage: FX Vol Market Data: USD/BRL Vol surface ... Add Remove

Ccy1	Ccy2	Domiciliation	Prod Type	Extended Type	Subtype	Usage	Market Data Item
NZD	USD	ANY	ANY	ANY	ANY	FX_VOL	NZD/USD Vol Strategies(4489)
NZD	USD	ANY	ANY	ANY	ANY	FX	NZD/USD(2156)
USD	BRL	ANY	ANY	ANY	ANY	FX_VOL	USD/BRL Vol surface(34131)
USD	CAD	ANY	ANY	ANY	ANY	FX_VOL	USD/CAD Vol Strategies(4490)
USD	CAD	ANY	ANY	ANY	ANY	FX	USD/CAD(2131)
USD	CHF	ANY	ANY	ANY	ANY	FX_VOL	USD/CHF Vol Strategies(4491)
USD	CHF	ANY	ANY	ANY	ANY	FX	USD/CHF(2170)
USD	DKK	ANY	ANY	ANY	ANY	FX_VOL	USD/DKK Vol Strategies(4593)
USD	DKK	ANY	ANY	ANY	ANY	FX	USD/DKK(2159)
USD	HKD	ANY	ANY	ANY	ANY	FX_VOL	USD/HKD Vol Strategies(4592)
USD	CNY	ANY	ANY	ANY	ANY	FX	USD/HKD(2157)
USD	JPY	ANY	ANY	ANY	ANY	FX	USD/JPY Vol Strategies(4513)
USD	JPY	ANY	ANY	ANY	ANY	FX	USD/JPY(2129)
USD	MXN	ANY	ANY	ANY	ANY	FX_VOL	USD/MXN Vol Strategies(4592)

Double click to open market d

Load New Delete Save Save As Close

FX USD/BRL Vol in Pricer Config

Pricer Configuration Window

Name: OFFICIAL ☒ Lazy Refresh

Parents: ... Clear

Comment:

Pricers Discount Curves Forecast Curves Surfaces Product Specific Model Parameters FX Repo Credit ABS Correlation Commodity Custom Trade Level Override Calibration

Axis Types: Commodity FX Add

Correlation Matrix: CBOT Corn USD/BRL ... Remove

First Axis Type	Second Axis Type	Correlation Matrix
Commodity	FX	CBOT Corn USD/BRL

Correlation Matrix in Pricer Config