



Nasdaq Calypso

FX Curves

Version 18

Revision 1.0

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Approved

1. FX Curves

From the Calypso Navigator, navigate to **Market Data > Foreign Exchange > FX Curve** (menu action `marketdata.CurveFXWindow`).

This topic describes creating an FX curve:

- [Generated from zero curves](#)
- [Generated using forward points - FXPoints or FXForward](#)
- [Calculated from cross-currency rates - FXCrossRate](#)
- [Pricer configuration](#)

For precious metals, an FX curve can be generated from underlying zero curves in the precious metal currency and the settlement currency.

 **[NOTE: Curves 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 FX Curve from Zero Curves

FX Curve from Zero Curves Quick Reference

Pricing Parameters

To use two underlying zero curves in pricing, set the following pricing parameters using **Market Data > Pricing Environment > Pricing Parameter Set** from the Calypso Navigator.

- » Set `USE_RT_FX_FWD_PTS` to false.
- » Set `FX_POINTS` to false.

Zero Yield Curves

Zero yield curves are required in the primary and secondary currencies. From the Calypso Navigator, navigate to **Market Data > Interest Rate Curves > Zero Yield Curve** to create the curves.

Spot Quote


A spot quote is required in the quote set associated with the selected pricing environment. For example, when generating a EUR/USD curve, set the `FX.EUR.USD` quote value. From the Calypso Navigator, navigate to **Market Data > Market Quotes > Quotes** to view or set the quote value.

Curve Generation

1. Click **New** to start a new curve.
2. The Current checkbox is selected by default, meaning that when you save the curve, the system timestamps the curve with the current date and time. Clear the Current checkbox to enter a back-dated curve. You can modify the date and time fields.
3. Definition Panel — Select the following to define the curve: primary currency, primary curve, secondary currency, secondary curve, “Generate from instruments” should NOT be checked, holiday calendars, pricing environment, interpolator.
4. Offsets Panel — Select the tenors and dates for which you want to generate points.
5. Points Panel — Click **Generate** to generate the points. You can modify the zero rates and spreads.
6. Click **Save**, enter a name for the curve, and click **OK**.

Pricer Configuration

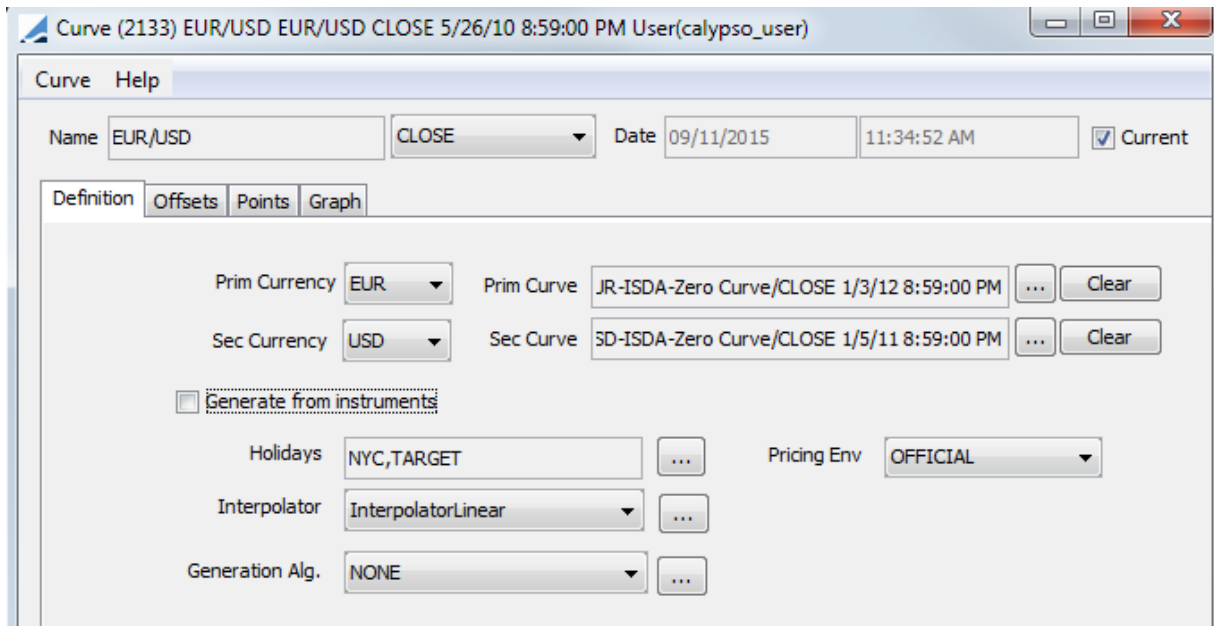
An FX curve can be associated with a pricing environment under the FX panel of the pricer configuration.

 **[NOTE: The selected zero curves must also be registered with the selected pricing environment]**

1.1.1 Definition Panel

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

Select the following to define the curve: primary currency, primary curve (click **...** to select the curve), secondary currency, secondary curve (click **...** to select the curve), “Generate from instruments” should NOT be checked, holiday calendars, pricing environment, interpolator.



Curve (2133) EUR/USD EUR/USD CLOSE 5/26/10 8:59:00 PM User(calypso_user)

Curve Help

Name: EUR/USD CLOSE Date: 09/11/2015 11:34:52 AM ☒ Current

Definition Offsets Points Graph

Prim Currency: EUR Prim Curve: JR-ISDA-Zero Curve/CLOSE 1/3/12 8:59:00 PM ... Clear

Sec Currency: USD Sec Curve: SD-ISDA-Zero Curve/CLOSE 1/5/11 8:59:00 PM ... Clear

☐ Generate from instruments

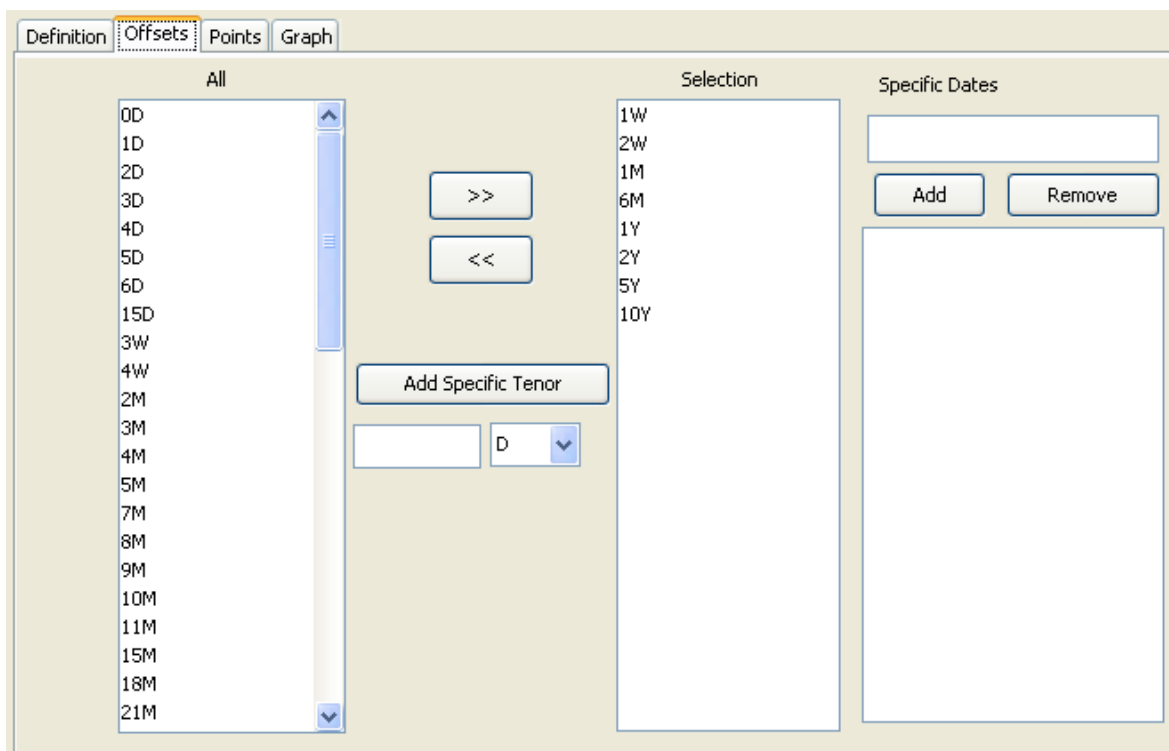
Holidays: NYC,TARGET ... Pricing Env: OFFICIAL

Interpolator: InterpolatorLinear ...

Generation Alg.: NONE ...

1.1.2 Offsets Panel

Click the Offsets tab. Select the tenors or dates.



Definition Offsets Points Graph

All

0D
1D
2D
3D
4D
5D
6D
15D
3W
4W
2M
3M
4M
5M
7M
8M
9M
10M
11M
15M
18M
21M

>>
<<

Add Specific Tenor

1W
2W
1M
6M
1Y
2Y
5Y
10Y

Selection

Specific Dates

Add Remove

» Select the offsets in the left panel, and click >> to add them to the Selection panel.

- » Specific Tenors — you can add specific tenors to the list. Enter the number, select the type of tenor, and click **Add Specific Tenor**.
- » Specific Dates — alternatively, you can enter specific dates for the offsets and click **Add** to list them in the panel below.

1.1.3 Points Panel

Click the Points tab.

Definition	Underlying	Quotes	Points	Graph
Date	Offset	Bid	Mid	Ask
03/21/2009	1	0.710000	0.710000	0.710000
03/24/2009	4	0.150000	0.150000	0.150000
03/25/2009	5	0.000000	0.000000	0.000000
04/01/2009	12	-0.845000	-0.845000	-0.845000
04/25/2009	36	-1.900000	-1.900000	-1.900000
05/27/2009	68	-1.650000	-1.650000	-1.650000
06/25/2009	97	-1.300000	-1.300000	-1.300000
09/25/2009	189	6.600000	6.600000	6.600000
12/25/2009	280	16.000000	16.000000	16.000000
03/25/2010	370	25.600000	25.600000	25.600000
03/25/2011	735	63.200000	63.200000	63.200000
03/27/2012	1,103	81.025000	81.025000	81.025000
03/26/2013	1,467	145.000000	145.000000	145.000000
03/25/2014	1,831	143.500000	143.500000	143.500000

- » Select a daycount convention. From the Calypso Navigator, navigate to [Help > Day-Count Conventions](#) for descriptions.
- » Click **Generate** to generate the points.

1.1.4 Save Curve

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

1.2 FX Curve from Forward Points - FXPoints or FXForward

FX Curve from Forward Points Quick Reference

Pricing Parameters

To use forward points from an FX curve in pricing, set the following pricing parameters using [Market Data > Pricing Environment > Pricing Parameter Set](#) from the Calypso Navigator.

» Set USE_RT_FX_FWD_PTS to false.

» Set FX_POINTS to true.

Zero Curve in Secondary Currency

A zero curve in the secondary currency is required for discounting. This curve can be associated with a pricing environment under the Discount Curves panel of the pricer configuration.

Spot Quote

A spot quote is required in the quote set associated with the selected pricing environment. For example, when generating a EUR/USD curve, set the FX.EUR.USD quote value. From the Calypso Navigator, navigate to **Market Data > Market Quotes > Quotes** to view or set the quote value.

Underlying Instruments

You can use FX Forward Tenor, FX Forward Fixed and FX Forward Month End instruments in building the curve. From the Calypso Navigator, navigate to **Configuration > Market Data > Curve Underlyings**, or in the curve application's Underlying panel, click **New/Edit Underlying**.

Curve Generation

1. Click **New** to start a new curve.
2. The Current checkbox is selected by default, meaning that when you save the curve, the system timestamps the curve with the current date and time. Clear the Current checkbox to enter a back-dated curve. You can modify the date and time fields.
3. Definition Panel — select the following to define the curve: primary currency, secondary currency, "Generate from instruments" should be checked, holiday calendars, pricing environment, interpolator, generation algorithm "FXPoints" or "FXForward".
4. Underlyings panel — select the instruments.
5. Quotes Panel — click **Refresh Quotes**.
6. Points Panel — select a day-count convention. Click **Generate** to generate the points.
7. Click **Save**, enter a name for the curve, and click **OK**.

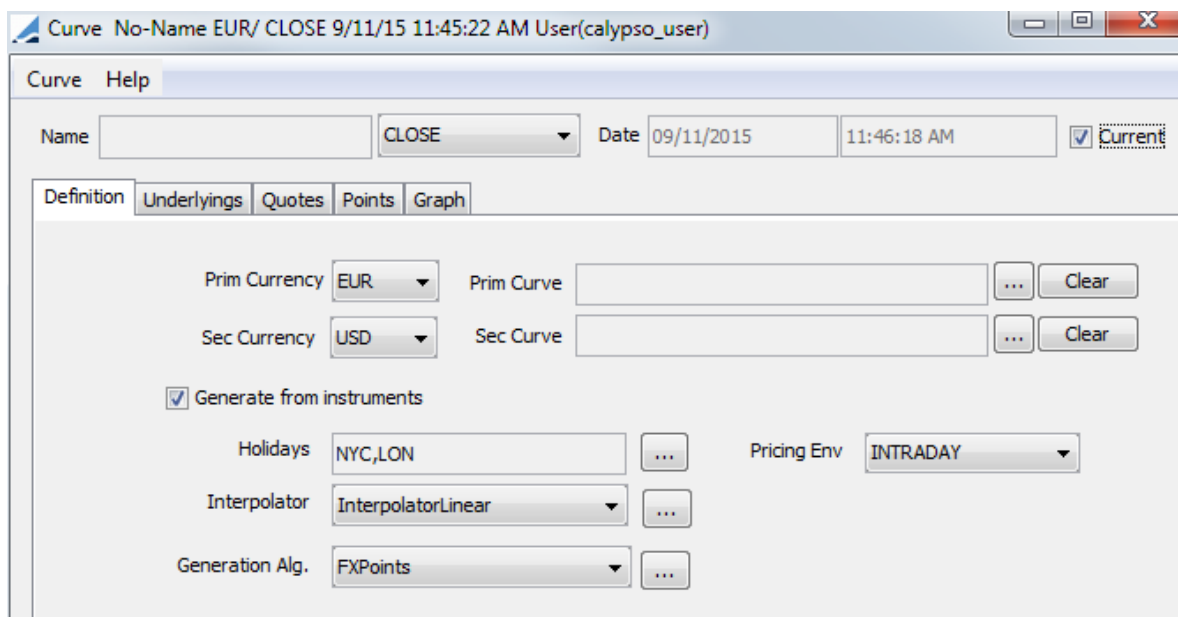
Pricer Configuration

An FX curve can be associated with a pricing environment under the FX panel of the pricer configuration.

1.2.1 Definition Panel

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

Select the following to define the curve: primary currency, secondary currency, "Generate from instruments" should be checked, holiday calendars, pricing environment, interpolator, generation algorithm "FXPoints" or "FXForward".



Generation Algorithms

FXForward - To generate FX forward curves from outright FX forward rates.

FXPoints - To generate FX Curves from FX swap ("forward") points.

The difference between spot and forward rates given market-standard tenors "O/N", "T/N", "1W", "1M", etc. defined with respect to spot.

The resulting curve gives the points to be added to the spot FX rate to obtain the FX rate for delivery on a given date.

The generation is simple for points forward of the spot date, for which it is simply a matter of computing the appropriate business date for the given tenor and assigning the market-quoted points.

For quotes prior to the spot date more care is needed. Both O/N and T/N are one-day rates; O/N is the difference between an FX rate for delivery today and an FX rate for delivery tomorrow (the next business day), and T/N is the difference between the rates for tomorrow and the next business day (the spot date). To obtain the points for tomorrow one uses the T/N rate directly, but to obtain the forward points for today with respect to spot one sums the O/N and T/N rates to get a two-day rate from today to spot. Moreover, to handle the market convention for these quotes, the bid and ask of O/N and T/N are exchanged and signs may be changed before adding to spot.

1.2.2 Underlying Panel

Click the Underlying tab. Select the underlying instruments to use in the curve.

Curve (2133) EUR/USD EUR/USD CLOSE 5/26/10 8:59:00 PM User(calypso_user)

Curve Help

Name EUR/USD CLOSE Date 05/26/2010 8:59:00 PM ☐ Current

Definition Underlyings Quotes Points Graph

Instrument type FXForwardMonthEnd New/Edit Underlying ... Underlying Instruments

Include Exclude

Id	Description
80213	FX.EUR.USD.MAY.1Y
80214	FX.EUR.USD.JUN.1Y
80216	FX.EUR.USD.AUG.1Y
80217	FX.EUR.USD.SEP.1Y
80219	FX.EUR.USD.NOV.1Y
80220	FX.EUR.USD.DEC.1Y
80209	FX.EUR.USD.JAN.1Y
80210	FX.EUR.USD.FEB.1Y
80212	FX.EUR.USD.APR.1Y
80225	FX.EUR.USD.MAY.2Y
80226	FX.EUR.USD.JUN.2Y
80228	FX.EUR.USD.AUG.2Y
80229	FX.EUR.USD.SEP.2Y
80231	FX.EUR.USD.NOV.2Y
80232	FX.EUR.USD.DEC.2Y
80221	FX.EUR.USD.JAN.2Y
80222	FX.EUR.USD.FEB.2Y
80224	FX.EUR.USD.APR.2Y
80237	FX.EUR.USD.MAY.3Y
80238	FX.EUR.USD.JUN.3Y
80239	FX.EUR.USD.JUL.3Y

>> <<

Id	Type	Description	Included	Priority
80203	FXForwardMonthEnd	FX.EUR.USD.JUL	<input checked="" type="checkbox"/>	0
80206	FXForwardMonthEnd	FX.EUR.USD.OCT	<input checked="" type="checkbox"/>	0
80199	FXForwardMonthEnd	FX.EUR.USD.MAR	<input checked="" type="checkbox"/>	0
80215	FXForwardMonthEnd	FX.EUR.USD.JUL.1Y	<input checked="" type="checkbox"/>	0
80218	FXForwardMonthEnd	FX.EUR.USD.OCT.1Y	<input checked="" type="checkbox"/>	0
80211	FXForwardMonthEnd	FX.EUR.USD.MAR.1Y	<input checked="" type="checkbox"/>	0
80227	FXForwardMonthEnd	FX.EUR.USD.JUL.2Y	<input checked="" type="checkbox"/>	0
80230	FXForwardMonthEnd	FX.EUR.USD.OCT.2Y	<input checked="" type="checkbox"/>	0
80223	FXForwardMonthEnd	FX.EUR.USD.MAR.2Y	<input checked="" type="checkbox"/>	0

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

- » Select the instrument type, and the panel below displays the list of available instruments. Instrument Types include FX Forward, FX Forward Fixed and FX Forward Month End. The panel is blank if you have not set up any instruments.
- » Click **New/Edit Underlying** to create new instruments. Clicking this button takes you to the panel of the chosen Instrument Type in the Curve Underlying Instruments window.

Curve Underlying Window

Cash	Future	Bond Future	FRA	Spread	Swap	Turn Rate	Basis Swap	Bond	Generic CDS	CDS	FixedCoupon CDS
Commodity Fwd Points	Inflation Spread	Commodity Spot	Commodity Spread	Commodity Swap	Basis Two Swap	FX Future					
CDS Index	FX Fwd Tenor	FX Fwd Fixed	FX Fwd Month End	Equity Index	ETO	Future Equity Index	Future Commodity				

Prim Currency

Sec Currency

Year Max

Id	Prim Currency	Sec Currency	Description
80205	EUR	USD	FX.EUR.USD.SEP
80206	EUR	USD	FX.EUR.USD.OCT
80207	EUR	USD	FX.EUR.USD.NOV
80208	EUR	USD	FX.EUR.USD.DEC
80197	EUR	USD	FX.EUR.USD.JAN
80198	EUR	USD	FX.EUR.USD.FEB
80199	EUR	USD	FX.EUR.USD.MAR
80200	EUR	USD	FX.EUR.USD.APR
80201	EUR	USD	FX.EUR.USD.MAY
80202	EUR	USD	FX.EUR.USD.JUN
80203	EUR	USD	FX.EUR.USD.JUL
80204	EUR	USD	FX.EUR.USD.AUG
80217	EUR	USD	FX.EUR.USD.SEP.1Y
80218	EUR	USD	FX.EUR.USD.OCT.1Y

Id

Currency

- » Select instruments and click >> to add them to the instrument list in the right panel. The Instruments will be automatically added in date order.

1.2.3 Quotes Panel

Click the Quotes tab. You can enter quotes and **Save Quotes** to the quote set associated with the selected pricing environment.

The quotes may be automatically populated if you are running a real-time feed, or they may be populated from the quote set associated with the selected pricing environment.

Definition Underlying Quotes Points Graph		
Pricing Env	default	Refresh Quotes Save Quotes Bid >> Ask Bid << Ask
Quote Name	Type	CLOSE
FX.EUR.USD.ON	Price	0.690000
FX.EUR.USD.TN	Price	0.690000
FX.EUR.USD.1W	Price	4.800000
FX.EUR.USD.1M	Price	19.300000
FX.EUR.USD.2M	Price	41.700000
FX.EUR.USD.3M	Price	63.100000
FX.EUR.USD.6M	Price	126.400000
FX.EUR.USD.1Y	Price	242.000000
FX.EUR.USD.2Y	Price	431.000000
FX.EUR.USD.3Y	Price	726.000000
FX.EUR.USD.4Y	Price	968.000000
FX.EUR.USD.5Y	Price	1,210.000000

1.2.4 Points Panel

Click the Points tab.

- » Select a daycount convention. From the Calypso Navigator, navigate to [Help > Day-Count Conventions](#) for descriptions.
- » Click **Generate** to generate the points.

1.2.5 Save Curve

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

1.3 Cross-Currency FX Curve - FXCrossRate

Cross-Currency FX Curve Quick Reference

Pricing Parameters

To use forward points from an FX curve in pricing, set the following pricing parameters using [Market Data > Pricing Environment > Pricing Parameter Set](#) from the Calypso Navigator.

- » Set USE_RT_FX_FWD_PTS to false.
- » Set FX_POINTS to true.

Straight Pair FX Curves

FX curves are required for the two straight pairs. For example, in a EUR/JPY cross-currency FX curve, EUR/USD and USD/JPY FX curves are required. The primary curve and the secondary curve can be created using forward points. These curves can be associated with

a pricing environment under the FX panel of the pricer configuration.

Spot Quotes

Spot quotes are required for the two straight pairs. For example, when generating a EUR/JPY curve from EUR/USD and USD/JPY FX curves, the quotes FX.EUR.USD and FX.USD.JPY are required. From the Calypso Navigator, navigate to **Market Data > Market Quotes > Quotes** to view or set the quote value.

Curve Generation

1. Click **New** to start a new curve.
2. The Current checkbox is selected by default, meaning that when you save the curve, the system timestamps the curve with the current date and time. Clear the Current checkbox to enter a back-dated curve. You can modify the date and time fields.
3. Definition Panel — select the following to define the curve: primary currency, primary curve, secondary currency, secondary curve, “Generate from instruments” should be checked, holiday calendars, pricing environment, interpolator, generation algorithm “FXCrossRate”.
4. Quotes Panel — click **Refresh Quotes**.
5. Points Panel — select a day-count convention. Click **Generate** to generate the points.
6. Click **Save**, enter a name for the curve, and click **OK**.

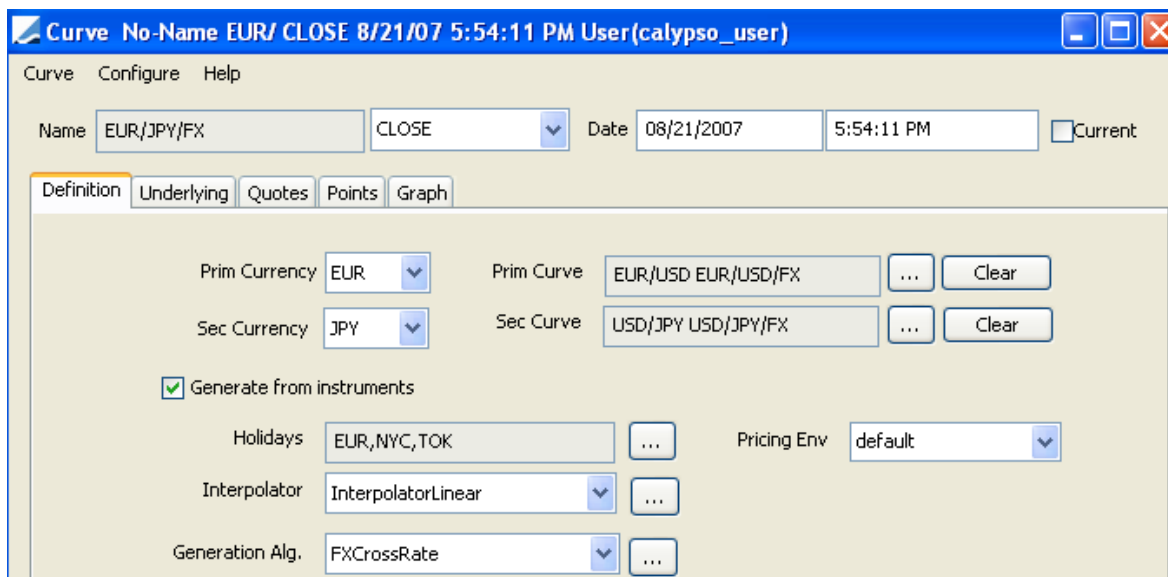
Pricer Configuration

The cross-currency, primary, and secondary FX curves can be associated with a pricing environment under the FX panel of the pricer configuration.

1.3.1 Definition Panel

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

Select the following to define the curve: primary currency, primary curve (click **...** to select the curve), secondary currency, secondary curve (click **...** to select the curve), “Generate from instruments” should be checked, holiday calendars, pricing environment, interpolator, generation algorithm “FXCrossRate”.



Generation Algorithm

FXCrossRate - To generate FX forward curves for cross ccy pairs from two straight ccy pairs.

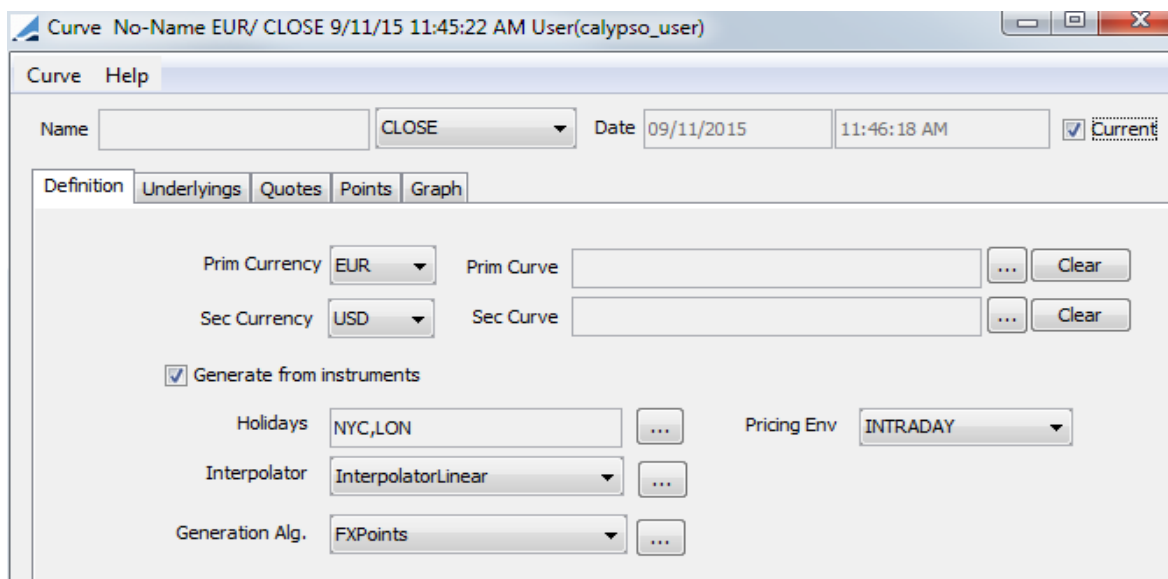
For each point after curve date on base Curve and quote Curve, it gets forward rates for those dates and calculates cross rates. The result curve then will be a collection of points that is a union of the base curve and quote curve.

1.3.2 Underlying Panel

Nothing is required in this panel as the underlying instruments are selected in the primary and secondary curves.

1.3.3 Quotes Panel

Click the **Refresh Quotes** button so that the curve loads the quotes. Nothing appears in this panel.



1.3.4 Points Panel

Click the Points tab.

- » Click **Generate** to generate the points.

1.3.5 Save Curve

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

1.4 Pricer Configuration

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

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

Click the FX tab to bring it to the front.

Product Specific
Model Parameters
FX
Repo
Credit
Correlation
Commodity
Custom

Primary EUR Quoting USD

Product Type ANY ExtendedType ANY Subtype ANY

FX Surface ... Add

FX Curve EUR/USD/FX/ZeroCurves ... Remove

Ccy1	Ccy2	Prod Type	Extended Type	Subtype	Volatility Surface	FX Curve
EUR	USD	ANY	ANY	ANY		EUR/USD/FX/ZeroCurves(1801)

Load New Delete Save Save As Close

- » Click ... to select the FX curve.
- » Select the primary and quoting currencies, product type or ANY, extended type or ANY, subtype or ANY.
- » Click ... to select the FX Curve.
- » Select the curve in the Selection window and click **Load** to display the curve name in the pricer configuration.
- » Click **Add** to add the curve to the list.
- » Click **Save** to save the pricer configuration.

[NOTE: If you are using zero curves, primary curves, secondary curves, etc to build the FX curves, they also need to be registered with the pricing environment]