PORTMAN Pricing Curves

How to get started

Vitec Aloc/MEGT
Version 2.0
This document is based on the underlying system PORTMAN 7.24

VITEC

Contents

1. Background

PORTMAN Pricing Curves are used for valuation and calculation of key figures for instruments and simulation of interest rate scenarios. The module offers the possibility of building advanced structures where a market curve is adjusted for e.g. Credit- and liquidity spread. However, you also have the option to load pre-generated Pricing Curves from external systems.

2. Overview

The following terms are used:

- Zero curve: zero coupon yield curve, which is either loaded or calculated by PORTMAN based on market data
- Spread curve, which is used to adjust for e.g. credit or liquidity risk and is loaded from an external source or created manually
- Pricing curve, which is one zero curve and an arbitrary number of spread curves.

It is Pricing Curves that are used in PORTMAN's other modules, while zero and spread curves only are used as the building blocks for constructing the Pricing Curves.

The principle is illustrated in the figure below, where a pricing curve (the purple line) is constructed as the sum of the zero curve (the blue line) and several spread curves (the red and green line).

The flow for constructing a price curve is as follows:

1. Create spread points to be used by the spread curve
2. Create a spread curve based on the newly created spread points
3. Create a composition based on the newly created spread curve
4. Create zero points to be used by the spread curve
5. Create a zero curve based on the newly created zero points
6. Create a composition based on the newly created zero curve
7. Create a pricing curve, by first adding a zero curve and thereafter add any number of spread curves (If the pricing curve only consists of a zero curve, the spread curve can be omitted)

Flow
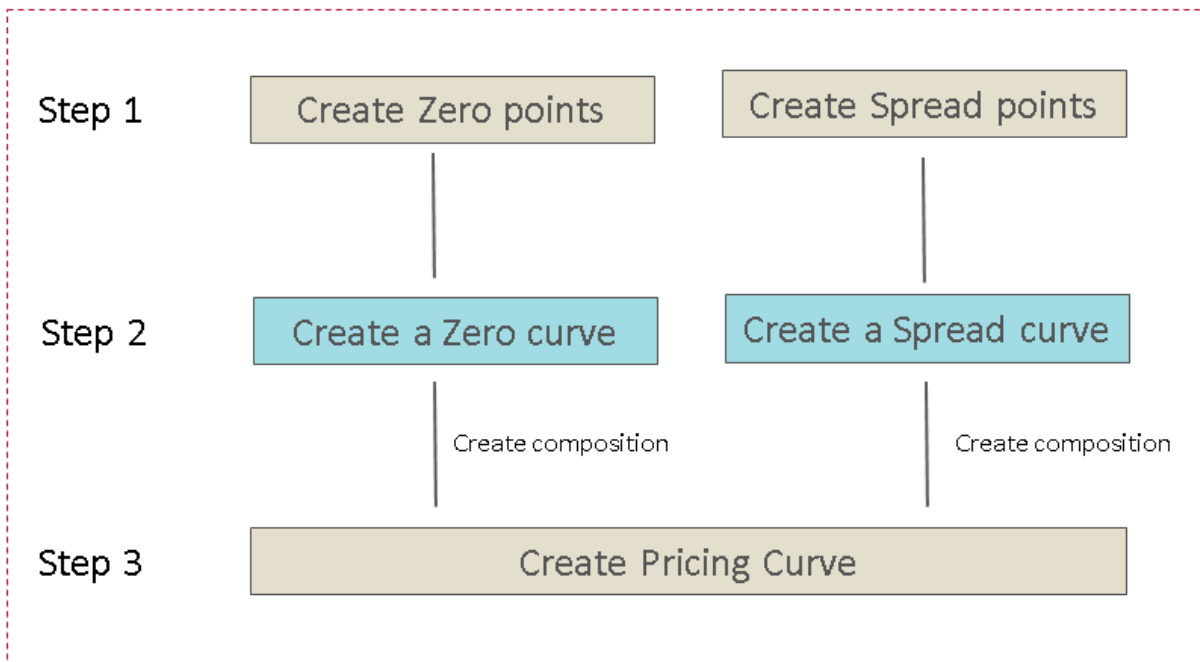
3. Enter basic data

The following section describes how a complete pricing curve can be registered using the PORTMAN user interface. However, basic data, interest rates and spreads can also be imported. The import is described in section 6.
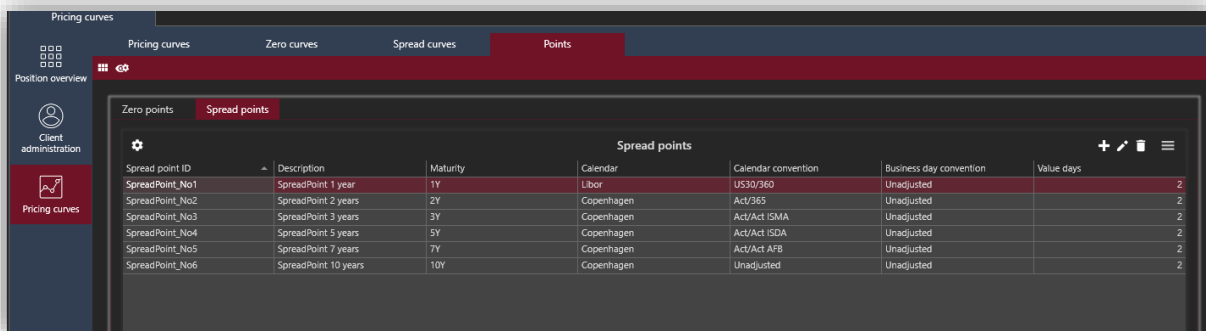
If you do not need to use a spread curve, this part can be skipped. Spread curves can always be added and modified later.
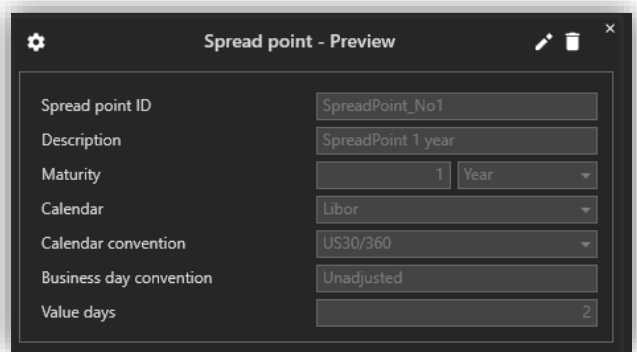
3.1. Spread curve

A spread curve is a collection of spread points, which together form a spread curve.

3.1.1. Spread point

The creation and maintenance of spread points are located in the context bar 'points' in the pricing curve module.

A spread point has basic data consisting of an ID, Description, Maturity, Calendar and day conventions, and Value days.

3.1.2. Spread curve

A spread curve consists partly of basic data and partly of historic data of which point the spread curve has been composed of. Thus, it is possible to adjust which spreads that should be included in the spread curve without having to create a new spread curve.

Spread curves are created and maintained under the quick menu 'Pricing Curves' - 'Spread curves'. The information linked to spread curves are basic data for the spread curve itself, alongside 'compositions' and 'spread curve points'.
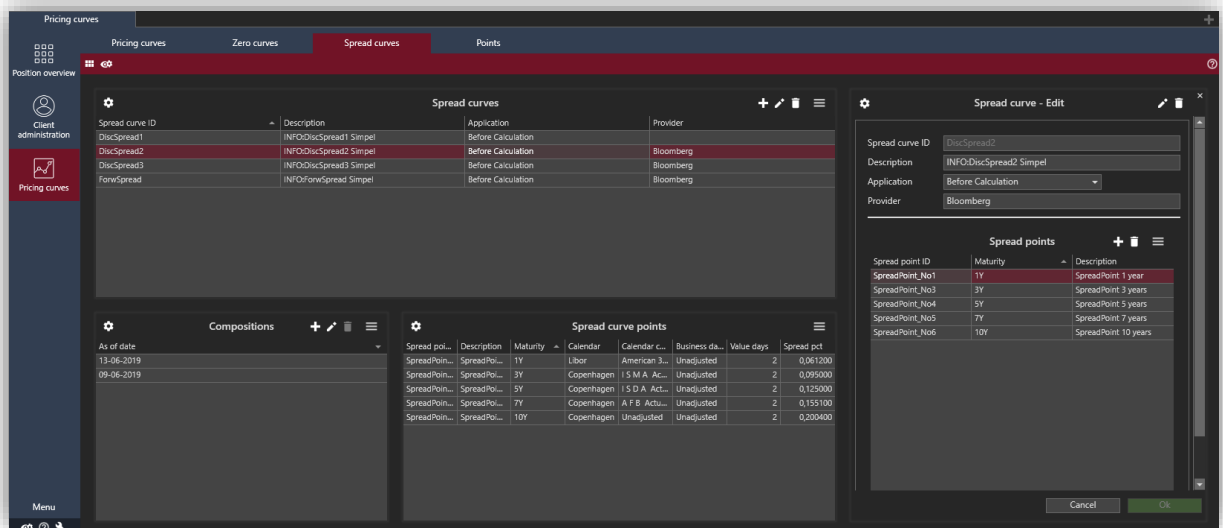
The spread curve consists of some basic data in the form of ID and whether the curve should be added before or after any bootstrapping of the zero curves it is linked to. Furthermore, several spread points can be specified on basic data.

The curve can then be edited by right-clicking and selecting 'Edit spread curve basic data' or by activating the 'pen' in the view panel.

Once the basic data for the curve is created, the spreads are added to the spread curve by using the 'plus' icon on a curve and selecting 'Add spread point'. A list of available spread point is shown – only spread points that have not already been attached is shown in the list.
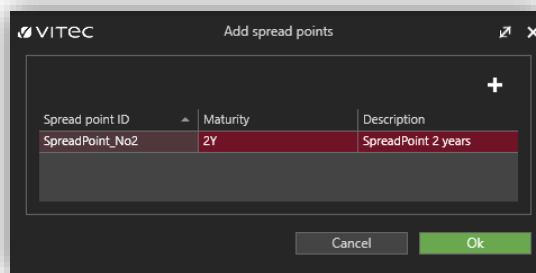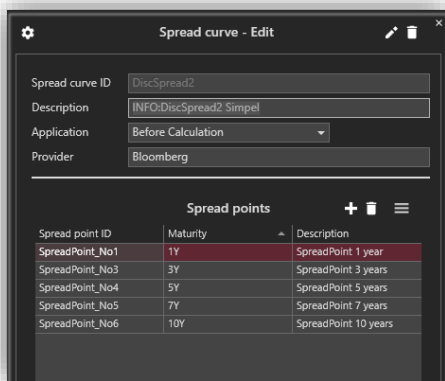
If the spread point does not exist, the user can add by clicking on the 'plus' sign. Then the user can fill out the basic data for the spread point:
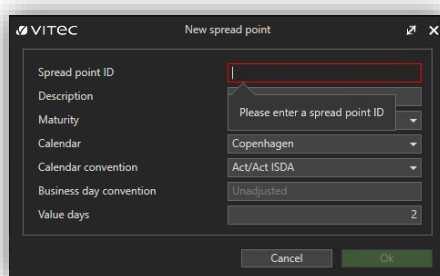
The 'composition' card records points associated with the curve at that date and the corresponding values for the spreads. Some spreads are updated on a daily basis, while others are only available on an ad hoc basis. When calculating a pricing curve, the latest spreads are used in relation to the calculation date.
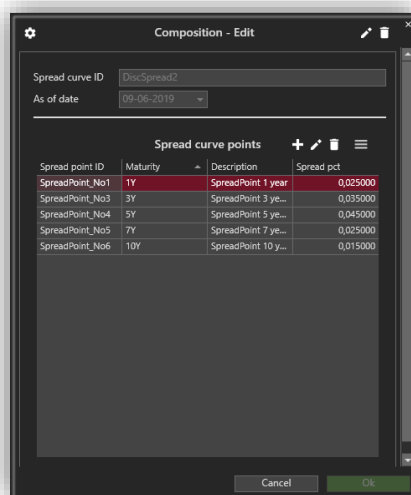
Note: When editing a spread curve, make sure to create a new composition in order for the changes to have effect from the desired date.

3.2. Zero curve

A zero curve is a collection of points, which together form a zero curve.

3.2.1. Zero curve points

The creation and maintenance of zero points are located in the context bar 'points' inside the pricing curve module.

A zero point has basic data consisting of an ID, Description, Maturity, Calendar and day conventions, and Value days.

3.2.2. Zero curve

A zero curve consists partly of basic data and partly of historic data of which points the zero curve has been composed of. Therefore, it is possible to change which points that are included in the zero curve without having to create a new zero curve – This is done in the compositions card, which are described further below.

Basic data for the zero curve is found under the context bar 'Zero curves' in the pricing curve module. Basic data consists of, among other things, an ID, description, currency, which interpolation and extrapolation the curves has and an indication of whether the curve is calculated in an external system and imported to PORTMAN (Supplied[1]) or must be generated from market data (Bootstrap/market rate).

[1] PORTMAN is currently supporting integration with Bloomberg
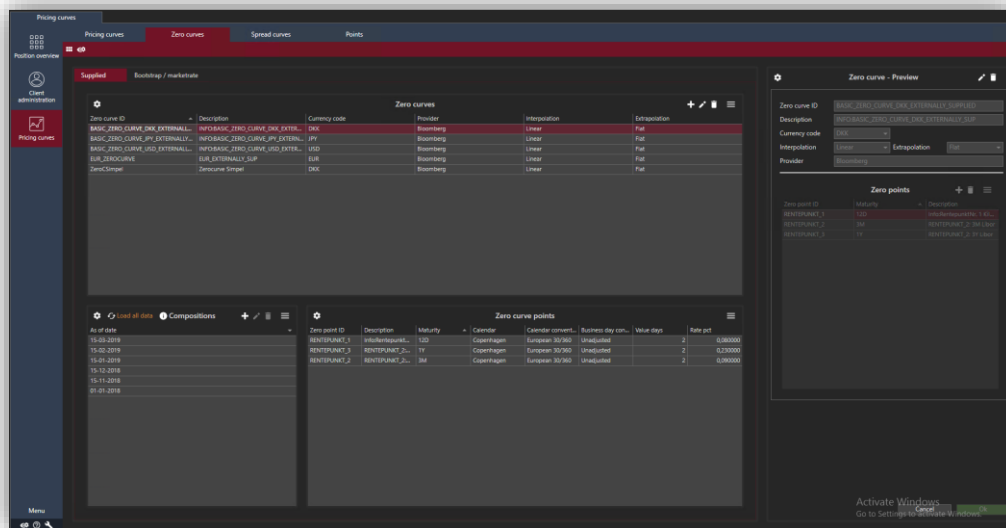
The basic data for the two zero curves (Supplied, Bootstrap/market rate) can be edited on their respective tab inside the zero curve tab.

3.2.3. Zero curve – Supplied

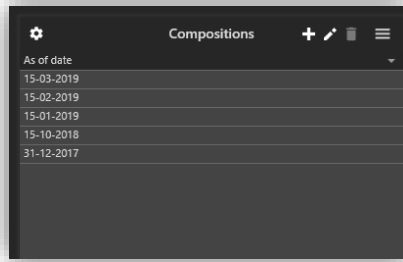If the curve was created under the tab 'Supplied' it will have the following characteristics.
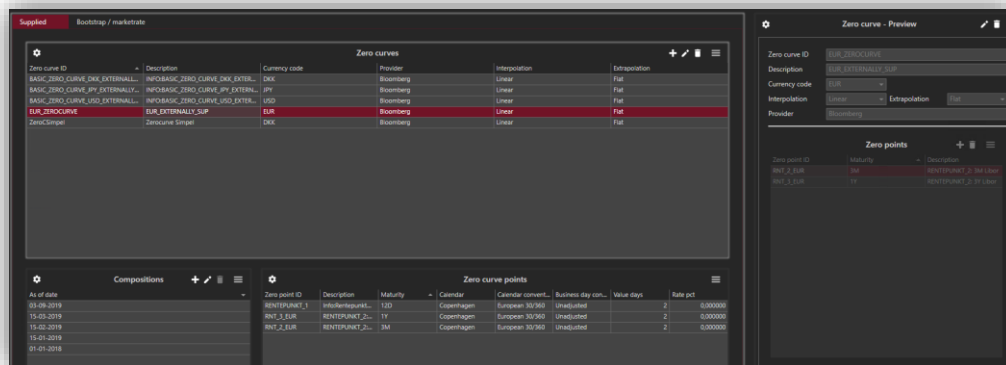
Several zero points are linked to a zero curve by right-clicking and selecting Edit zero curve. This dialogue shows items linked to the curve, as well as interest rates for the maturities. Normally, interest rates will be registered on a daily basis, but if this is not the case - for example during weekends - it is ok with gaps in the time series. When a pricing curve is calculated, the latest interest rates are used in relation to the calculation date.
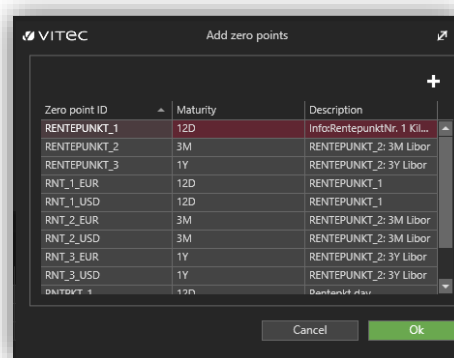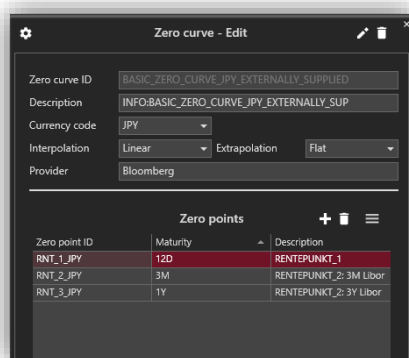
The 'composition' card shows the points associated with the curve at a specific date and the corresponding values for the zero point at that time.

If changes occur to the compositions of the zero curve, it is important to register the changes as new compositions, in order for the changes to have an effect.

3.2.4. Zero curve – Bootstrap/market rate

If the curve was created under the tab 'Bootstrap/market rate' it will have the following characteristics. Market rates are linked to a zero curve by creating a composition at a desired date. The following market rates type can be used: *Money market rate, swap rate, IMM OFF.*
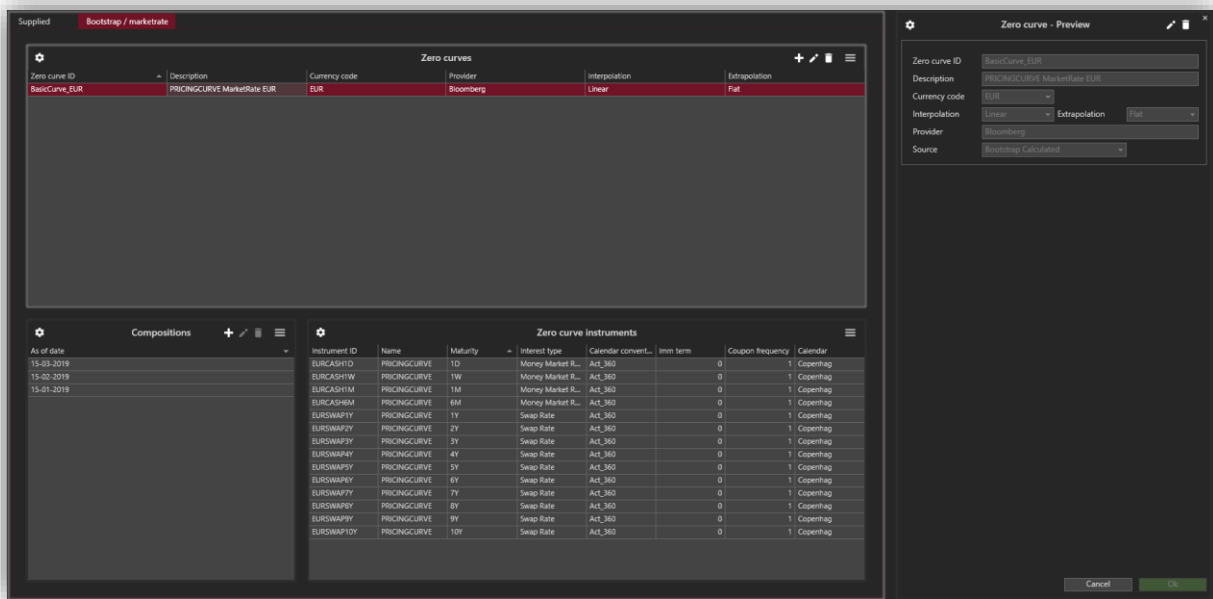
When calculating a pricing curve, PORTMAN uses the latest set of market rates linked to the zero curve relative to the calculation date. Thus, it is only necessary to link market interest rates to a zero curve when there are changes in the composition of the interest rates included in the curve.
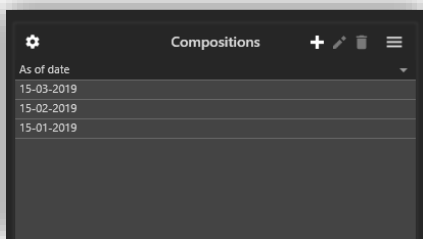
When adding a new composition, the user is presented with a date in which the composition is valid from, and which market rates that are linked to the composition:
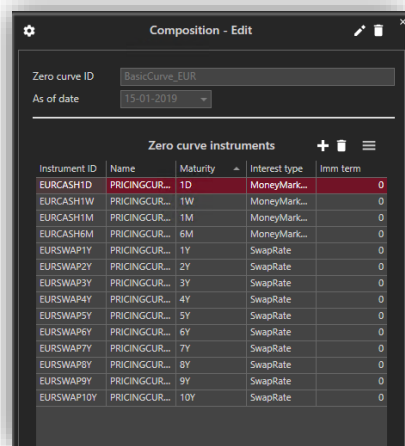
3.3. Pricing curve

With the underlying data in place, it remains only to link them to a pricing curve. This is done under the context bar 'pricing curve'. Basic data consists of, among other things, an ID, description, currency, default markings, the attached zero curve and spread curves. For spread curves, the user has the option to specify whether the spread curve should be added or subtracted to the zero curve. The default markings apply per currency, and therefore a Default forward curve per currency and a Default discounting curve per currency can be specified. The same pricing curve may well be the default for both.
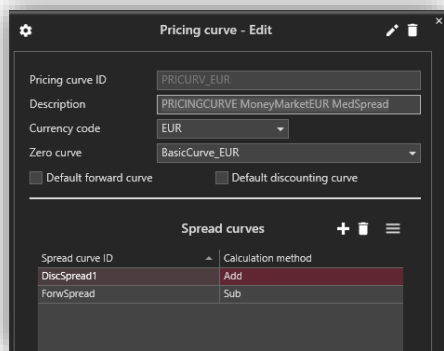
3.4. Daily Maintenance

Once the Pricing Curves and the underlying data are registered, the daily maintenance simply consists of ensuring updated values for spread and zero curves:

- If zero curve source: Supplied
  Add interest rates for each of the curves
- If zero curve source: Bootstrap / market rate
  Add interest rate in PORTMAN's rate register for each market rate linked to the curve
- If spread curves are used
  Update values for spreads to the extent they have changed.

4. Calculations

Once all the data are registered for a pricing curve, it can be calculated and linked to instruments in PORTMAN. Note that PORTMAN calculates Pricing Curves *on the fly*. Thus, there is no pre-calculation in batch. Thus, a change in the underlying data will immediately make an impact on a pricing curve without invalidating it.

The calculation flow for generating a pricing curve (Source: Bootstrap / market rate calculated):

- Calculate the associated spread curves
- Calculate maturities for market rates
- If there are spread curves to be added / subtracted before bootstrapping, market interest rates are corrected with interpolated spreads
- Interest rate curves is bootstrapped at adjusted interest rates
- If there are spread curves to add / subtract after bootstrapping, interest rates are corrected with interpolated spreads
- The pricing curve is now ready!

The calculation flow for generating a pricing curve (Source: Externally supplied):

- Calculate the associated spread curves
- Calculate maturities of interest rates that are delivered
- If there are spread curves to be added / subtracted from the interest rates, the interest rates are corrected with interpolated spreads
- The pricing curve is now ready!

5. Application and documentation

Before using a pricing curve, you can advantageously check it under Pricing Curves - Pricing Curves. Here you will be able to see a graphical illustration of the curve and the underlying data. If the checkbox is set to Show zero and spread curves, the individual components (spread curves, zero curve, pricing curve) are shown as independent lines. By hovering over the graph, the underlying data values are displayed. Furthermore, it is possible to change the 'as of date' for which the Pricing Curves are shown.
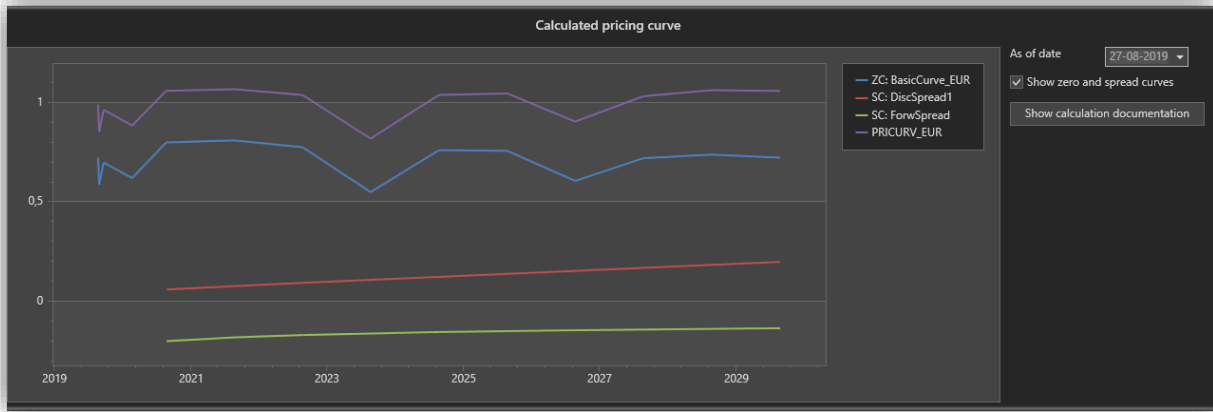
Detailed *calculation documentation* is displayed by selecting the 'Show calculation documentation' button.

6. Import

Basic Data regarding Pricing Curves can be imported with PORTMAN's XML import. Import help can be found directly in the schema file located at .. \ PORTMAN \ PM \ import \ xsd \ marketdata_curves.xsd or in PORTMAN's online help.