

elements



FX Rates Package - Introduction

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1. Purpose of Document

The purpose of this document is to introduce the 'FX Rates' package in the elements object model. This document will provide sufficient background to the business problem to explain and motivate the subsequent description of the model. It will also give an overview of the model, outlining the 'mental picture' that drove the development of the object model, and then summarize the key features of the model, as documented in UML.

The readers of these documents will be:

- Anyone assessing the usefulness of the elements object model for their purpose.
- People preparing to study the associated package in detail.
- Anyone who wants an outline picture of a particular package because it is used in another package.

2. The Business Problems

The following business issues are addressed by this package:

2.1. What are FX Rates?

FX Rates are exchange rates, which specify a conversion factor for converting an amount of money in one currency into an amount in another currency. For example, an FX rate may be identified as an exchange rate between USD and DEM, applying on 1 June 2001.

2.2. Rates, Quotes and Margins.

An FX Rate is made up of a set of quotes – bid, mid, ask. Each quote is made up of a base value and a set of margins that is applied to that base value. Each quote and bid can have its own quotation method – a base value is defined as a ratio of the commodity currency/counter currency (but may be quoted as the inverse counter currency/commodity currency) and margins could be specified as points, percent, etc. For example, an FX Spot Rate could be USD/CHF ((bid = 1.6565, Corporate Margin of 0.0010, Profit Margin 1%), (ask = 1.6575, Profit Margin 1%)).

2.3. Special Rules for Currency Conversion

Generally converting from one currency to another involves multiplication (or division) of a currency value by an exchange rate to arrive at the new value. There is a complication, however, for currencies that are within the EMU. Converting between these *in* currencies involves using special rounding rules that do not apply to other currencies.

2.4. Methods for Quoting FX Rates

FX Rates are quoted in a variety of ways e.g. Direct = Commodity/Counter currency, Indirect (inverse of direct) = Counter Currency/Commodity. Margins can be quoted in a number of ways, for example as a fractional value (e.g. 0.0015) or as points (e.g. 15) that get added to the base rate.

2.5. Currency Ordering

There are internationally recognized conventions for quoting currencies (EUR first, then Commonwealth, then USD then other currencies), however local currencies are usually quoted first (e.g. In Norway a quote may be NOK/NLG = 4.000 but in Denmark it might be quoted as NLG/NOK=0.2500). The software must support the generation of the conventional quotation structures as well as allowing a site to override that convention.

2.6. FX Rate Curves

A way must be provided to calculate FX rate values at future dates. Generally this will be based on a value for a Spot date and then a series of margins that are added to that value to obtain

future values. These rate curves can then be used to calculate rate values for intermediate dates (via interpolating between known values) or projected dates (by extrapolating past know data).

3. Overview of the Conceptual Model

This package extends the functionality introduced in the ‘Basic Rates’ package and should be read in conjunction with that package. This package provides a set of classes and interfaces to support the modeling of FX Rates.

3.1. FX Rate Structures

As outlined in the Basic Rates Package, Rates (and therefore FXRates) are structured objects. An FX Rate consists of a *buy* and a *sell* quote. Each of these quotes is composed of smaller rate *pieces*, a base piece and a set of margins that are added to that base piece (some margins can be negative, e.g. a discount). Associated with each component of the rate can have a quotation method that determines how the quote is stored and displayed and converted to other forms.

3.2. Currency Ordering

A group of interfaces and classes are specified for controlling the ordering for currency pairs in FX quotation, the form the quotation method takes, the number of decimal places, etc. for the quote.

3.3. FX Rate Specifier

FX Rate Specifiers are used in conjunction with the Curve classes to generate FX Rate curves. They specify the quoted currency pair, the rate of the exchange, a date for the exchange (generally spot date) and the date basis.

3.4. FX Curves

There are two types of FX curve defined in this package, a Basic FX Curve and a Cross Rate Curve. A Basic FX Curve is an FX curve that is derived from a curve for a series of forward points that can be added to a spot rate to produce another FX Curve. Then a curve can be generated to map these Forward Points; the current Spot Rate can be added to this curve to generate a new FX curve.

A Cross-Rate Curve is needed when there is no direct exchange rate between two currencies. FX Rate Curves for a common currency are combined to produce a new curve. For example a curve is required for JPY/NLG but none exists; combine the USD/JPY curve and the USD/NLG curve.

4. Use of the Object Model

4.1. Curves

For example, if an FX curve could be constructed from the following Spot value and series of forward points:

USD/CHF

Date	Value
Spot	1.6320
Spot + 1W	0.0005
Spot + 1M	0.0020
Spot + 2M	0.0040
Spot + 3M	0.0060

(a Cross Rate curve would have data for two sets of FX Data across a common currency)

4.2. BasicFXRate and FXRateQuote

For example:

Rate Piece	Value
bid	0.6390
risk	0.0010
corporate margin	0.0005
profit margin	0.0020

From this example the rate quote is 0.6425