FX Spot Product Specification

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Chapter 1

FX Spot

1.1 Instrument Properties

An FX spot is an agreement to purchase a predetermined amount of one currency, the **receive currency** against another currency, the **pay currency** at an agreed fixed exchange rate, the **spot rate** on the **maturity date** (MD). Normally the **maturity date** is only a few days out and FX spot contracts are valued without discounting.

Figure 1.1 illustrates an FX spot that swaps $100,000 AUD for $60,000 GBP.

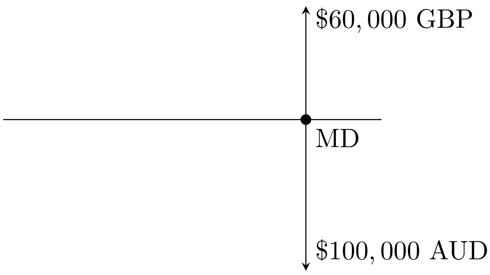

Figure 1.1: FX spot

1.2 Definitions

In this section, we define terms that are specific to FX spot.

maturity date is the date the contract expires.

pay currency is the currency one agreed to sell.

receive currency is the currency one agreed to purchase.

spot rate is the agreed exchange rate between **pay currency** and **receive currency**.

1.3 Representations

In the Risk Engine, products are specified by *representations*. In this section, we provide the representations of FX spot.

1.3.1 Default Representation

The *Default* representation consists of the mandatory trade fields in Table 1.1, with their restrictions in Table 1.2.

Field	*Description*	*Data Type*	*Symbol*
PayCurrency	The **pay currency**	string	p
RecCurrency	The **receive currency**	string	r
PayAmount	The amount to be paid in *PayCurrency*	double	N_{p}
RecAmount	The amount to be received in *RecCurrency*	double	N_{r}
MaturityDate	The **maturity date**	date	MD

Table 1.1: Mandatory trade fields for the Default representation of the FX Spot

Field	*Restriction*
RecCurrency	$\mathrm{r} \neq \mathrm{p}$
PayAmount	$N_{\mathrm{p}} > 0$
RecAmount	$N_{\mathrm{r}} > 0$

Table 1.2: Trade field restrictions for the Default representation of the FX Spot

1.3.1.1 Required Curves

The following curves are required by a cash balance:

- *PayCurrency FX spot curve*: FX Spot Curve — (FX.PRICE.PayCurrency.BaseCurrency), and
- *RecCurrency FX spot curve*: FX Spot Curve — (FX.PRICE.RecCurrency.BaseCurrency).

1.3.2 Strike Representation

The *Strike* representation consists of the mandatory trade fields in Table 1.3, with their restrictions in Table 1.4.

Field	*Description*	*Data Type*	*Symbol*
Currency	The primary currency	string	p
CrossCurrency	The cross currency	string	c
CrossCurrencyAmount	The deal amount in *CrossCurrency*	double	N_{c}
Spot	The **spot rate** as *Currency*/*CrossCurrency*	double	X
MaturityDate	The **maturity date**	date	MD
Direction	Pay and receive direction	string	direction

Table 1.3: Mandatory trade fields for the Strike representation of the FX Spot

Field	*Restriction*
CrossCurrency	$\mathrm{c} \neq \mathrm{p}$
CrossCurrencyAmount	$N_{\mathrm{c}} > 0$
Spot	$X > 0$
Direction	PayCurrencyReceiveCrossCurrency, ReceiveCurrencyPayCrossCurrency

Table 1.4: Trade field restrictions for the Strike representation of the FX Spot

1.3.2.1 Required Curves

The following curves are required by an FX forward:

- *Currency FX spot curve*: FX Spot Curve — (FX.PRICE.Currency.BaseCurrency), and
- *CrossCurrency FX spot curve*: FX Spot Curve — (FX.PRICE.CrossCurrency.BaseCurrency).

1.4 Formula

If the Valuation Date is less than or equal to the **maturity date**, the value of an FX spot in Base Currency is given by the *FX spot pricing function*[1],

$$\text{FXSpot}\left(E_{\text{p}}, E_{\text{r}}, N_{\text{p}}, N_{\text{r}}\right), \tag{1.1}$$

where

- E_{p} is the spot exchange rate in units of Base Currency per **pay currency**, from the PayCurrency FX spot curve,
- E_{r} is the spot exchange rate in units of Base Currency per **receive currency**, from the RecCurrency FX spot curve,
- N_{p} is the amount in **pay currency**, and
- N_{r} is the amount in **receive currency**.

If the Valuation Date is greater than the **maturity date**, then the FX spot has expired and thus has a value of zero.

1.4.1 Representation Reduction

Equation (1.1) is only defined for the Default representation. If the trade is specified by other representations, we need to reduce it to the Default representation.

1.4.1.1 Strike Representation

For the Strike representation, the trade fields are set according to the trade field Direction, as illustrated in Table 1.5, with the trade fields in column 1 take the values in either column 2 or 3, depending on the trade field Direction.

Direction	*PayCurrencyReceiveCrossCurrency*	*ReceiveCurrencyPayCrossCurrency*
PayCurreny	Currency	CrossCurrency
RecCurrency	CrossCurrency	Currency
PayAmount	Spot × CrossCurrencyAmount	CrossCurrencyAmount
RecAmount	CrossCurrencyAmount	Spot × CrossCurrencyAmount

Table 1.5: Representation reduction for the Strike representation of the FX Spot

1.5 Examples

This section provides some deal examples of FX spot.

Example 1.1. An FX spot in Default representation:
- PayCurrency: AUD
- ReceiveCurrency: GBP
- PayAmount: 100,000,000
- ReceiveAmount: 60,000,000
- MaturityDate: 2013-11-15

On 2013-11-15, one receives $60,000,000 GBP and pays $100,000,000 AUD.

Example 1.2. An FX spot in Strike representation:
- Currency: AUD
- CrossCurrency: USD
- CrossCurrencyAmount: 100,000,000
- Spot: 1.0500
- MaturityDate: 2013-11-15

[1]See FX Spot Pricing for details (p.9 of this document).

- Direction: PayCurrencyReceiveCrossCurrency

The deal amount in Currency is

$$N_{\mathrm{p}} = X \times N_{\mathrm{c}} = 1.05 \times 100,000,000 = 105,000,000.$$

Given the holder of the FX spot pays AUD and receives USD, on 2013-11-15, one receives $100,000,000 USD and pays $105,000,000 AUD.

Example 1.3. An FX spot in Strike representation:

- Currency: JPY
- CrossCurrency: AUD
- CrossCurrencyAmount: 100,000,000
- Spot: 98.1528
- MaturityDate: 2013-11-15
- Direction: ReceiveCurrencyPayCrossCurrency

The deal amount in Currency is

$$N_{\mathrm{p}} = X \times N_{\mathrm{c}} = 98.1528 \times 100,000,000 = 9,815,280,000.$$

Given the holder of the FX spot pays AUD and receives JPY, on 2013-11-15, one receives $9,815,280,000 JPY and pays $100,000,000 AUD.

Chapter 2

FX Spot Pricing

2.1 Inputs to Function

Description	*Symbol*	*min*	*max*	*Reasonable range*
Spot rate of pay currency	E_{p}	0^+	$+\infty$	
Spot rate of receive currency	E_{r}	0^+	$+\infty$	
Pay currency amount	N_{p}	0^+	$+\infty$	
Receive currency amount	N_{r}	0^+	$+\infty$	

Table 2.1: Inputs for FX Spot pricing function

2.2 Formula

The value of an FX spot in *base currency* is

$$N_{\mathrm{r}} \times E_{\mathrm{r}} - N_{\mathrm{p}} \times E_{\mathrm{p}}.$$

Glossary

Base Currency The currency that the risk engine is configured to return values in.

Risk Engine The Vector Risk market risk and credit risk system.

Valuation Date The date that we value the trades as.