



Principal Exchange Cashflow Specification

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Chapter 1

Principal Exchange Cashflow

1.1 Properties of Cashflow

A principal exchange cashflow is a transfer of the **amount** of N in **currency** on the **flow date** (FD), as illustrated in Figure 1.1. Principal exchange payment on the maturity date of a cross currency swap is an example of principal exchange cashflow.



Figure 1.1: Principal Exchange cashflow

1.2 Definitions

In this section, we define terms that are specific to principal exchange cashflow.

amount is the amount in **currency** that one has to transfer on the **flow date**.

currency is the currency that the transfer is in.

flow date is the date that the cashflow transfer occurs.

1.3 Cashflow Inputs

A principal exchange cashflow is specified by the mandatory fields in Table 1.1, the optional field in Table 1.2, with their restrictions in Table 1.3.

| <i>Field</i> | <i>Description</i> | <i>Data Type</i> | <i>Symbol</i> |
|--------------|---|------------------|---------------|
| PayReceive | The pay/receive direction of the cashflow | string | direction |
| Currency | The currency | string | ccy |
| FlowDate | The date of the cashflow payment, i.e. the flow date | date | FD |
| Amount | The amount of the transfer | double | N |

Table 1.1: Mandatory fields for Principal Exchange Cashflow

| <i>Field</i> | <i>Description</i> | <i>Data Type</i> | <i>Symbol</i> | <i>Default Value</i> |
|-------------------|-------------------------------|------------------|---------------|----------------------|
| DiscountReference | Alternative discounting curve | string | | |
| LegID | The identifier of the leg | string | | |
| Description | The description of the flow | string | | |

Table 1.2: Optional field for Principal Exchange Cashflow

| <i>Field</i> | <i>Restriction</i> |
|----------------------|-------------------------------|
| PayReceive Amount | Pay, Receive, P, R $N > 0$ |

Table 1.3: Field restrictions for Principal Exchange Cashflow

1.3.1 Required Curves

The following curves are required by a principal exchange cashflow:

- *Currency FX spot curve*: FX Spot Curve — (FX.PRICE.Currency.BaseCurrency), and
- *Currency discounting curve*: Money Market Zero Curve: (MM.ZERO.SWAP.Currency) ¹.

When the optional field DiscountReference is provided, the reference curve is used as the Currency discounting curve.

1.4 Formula

A principal exchange cashflow gives a transfer of N in **currency** on the **flow date**.

If the Valuation Date is less than or equal to the **flow date**, the value of a principal exchange cashflow in Base Currency is

$$N \times E_{\text{ccy}} \times \mathbb{I}_{\text{pr}} \times Df_t,$$

where

- N is the **amount** of the transfer in **currency**,
- E_{ccy} is the spot exchange rate in units of Base Currency per **currency**, from the Currency FX spot curve,
- the discount factor from Valuation Date to **flow date** is

$$Df_t = e^{-r_{\text{ccy}} t},$$

- r_{ccy} is the continuous zero rate of **currency** from Valuation Date to **flow date** in Actual/365 (Fixed) day count convention, from the Currency discounting curve,
- t is the time in years from Valuation Date to **flow date** in Actual/365 (Fixed) day count convention, and
- the indicator for pay or receive direction is

$$\mathbb{I}_{\text{pr}} = \begin{cases} 1, & \text{if direction is 'R'}, \\ -1, & \text{if direction is 'P'}. \end{cases}$$

If the Valuation Date is greater than the **flow date**, then the principal exchange flow has expired and thus has a value of zero.

¹For certain products, e.g. FX Forward or Cross Currency Swap, FX ZERO curve is used for discounting.

1.5 Examples

This section provides some deal examples of principal exchange cashflow.

Example 1.1. A principal exchange cashflow:

- PayReceive: Pay
- Currency: GBP
- FlowDate: 2013-11-15
- Amount: 60,000,000

On 2013-11-15, there is a payment of \$60,000,000 GBP.

Example 1.2. A principal exchange cashflow:

- PayReceive: Receive
- Currency: AUD
- FlowDate: 2013-11-15
- Amount: 100,000,000

On 2013-11-15, one receives \$100,000,000 AUD.

Glossary

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

Valuation Date The date that we value the trades as.