Fixed Cashflow Specification

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Fixed Cashflow

1.1 Properties of Cashflow

A fixed cashflow is a transfer of the interest component of a transfer schedule on the **flow date** (FD) where the interest payment is determined by a **fixed rate** R on an **amount** of N in **currency** for the **accrual period**. The **accrual period** is specified by **accrual start date** (ASD) and **accrual end date** (AED). An example of fixed cashflow is illustrated in Figure 1.1. The coupon payment of bond where the coupon rate is fixed is an example of fixed cashflows.

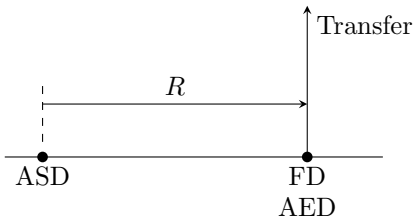

Figure 1.1: Fixed cahflow

1.2 Definitions

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

accrual day count fraction is the day count fraction of the **accrual period**.

accrual end date is the end date of the **accrual period**.

accrual period is the tenor period over which the **fixed rate** applies.

accrual start date is the start date of the **accrual period**.

amount is the notional amount in **currency** of the cashflow.

currency is currency that the transfer is in.

fixed rate is the per annum fixed interest rate that applies to the cashflow.

flow date is the date that the cashflow transfer occurs.

1.3 Cashflow Inputs

A fixed 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.

Field	*Description*	*Data Type*	*Symbol*
PayReceive	The pay/receive direction of the cashflow	string	direction
Currency	The **currency**	string	ccy
InterestStyle	The interest style of the cashflow	string	style
AccrualDayCount	The day count convention for the **accrual period**	string	dcc
FlowDate	The date of the cashflow payment, i.e. the **flow date**	date	FD
Amount	The notional **amount**	double	N
FixedRate	The fixed interest rate, i.e. the **fixed rate**	double	R
AccrualStartDate	The **accrual start date**	date	ASD
AccrualEndDate	The **accrual end date**	date	AED

Table 1.1: Mandatory fields for Fixed Cashflow

Field	*Description*	*Data Type*	*Symbol*	*Default Value*
DiscountReference	Alternative discounting curve	string		
DiscountRate	For Discount flow, standard discounting method applies. This specifies the discount rate. If not specified, the flow will be discounted with the **fixed rate**.	string	D	R
DiscountRateDayCount	For Discount flow, standard discounting method applies. This specifies the day count convention for the discount rate. If not specified, it takes the value of the **accrual day count fraction**.	string	dcc_D	dcc
LegID	The identifier of the leg	string		
Description	The description of the flow	string		

Table 1.2: Optional field for Fixed Cashflow

Field	*Restriction*
PayReceive	Pay, Receive, P, R
InterestStyle	Simple, Discount
Amount	$N > 0$
AccrualEndDate	AED > ASD

Table 1.3: Field restrictions for Fixed Cashflow

1.3.1 Required Curves

The following curves are required by a fixed 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].

In the case of the optional field DiscountReference is provided, the reference curve is used as the Currency discounting curve instead.

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

1.4 Formula

The transfer in **currency** on the **flow date** of a fixed cashflow is

$$\begin{cases} N \times \mathbb{I}_{\text{pr}} \times R\tau, & \text{if style is 'Simple',} \\ N \times \mathbb{I}_{\text{pr}} \times \dfrac{R\tau}{1 + D\tau_D}, & \text{if style is 'Discount',} \end{cases} \tag{1.1}$$

where

- N is the notional **amount** in **currency**,
- R is the **fixed rate**,
- τ is the **accrual day count fraction**, from **accrual start date** to **accrual end date**, according to the day count convention for the **accrual period** (dcc),
- D is the discount rate,
- τ_D is the day count fraction from **accrual start date** to **accrual end date**, according to the discount day count convention (dcc_D), and
- the indicator for pay or receive direction is

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

1.5 Examples

This section provides some deal examples of fixed cashflow.

Example 1.1 (Simple interest)**.** A fixed cashflow:

- PayReceive: Pay
- Currrency: GBP
- InterestStyle: Simple
- AccrualDayCount: ACT365(FIXED)
- FlowDate: 2013-11-15
- Amount: 60,000,000
- FixedRate: 0.0315
- AccrualStartDate: 2013-08-15
- AccrualEndDate: 2013-11-15

There are 92 days from the **accrual start date** (2013-08-15) to the **accrual end date** (2013-11-15). The **accrual day count fraction** of the cashflow is calculated using the Actual/365 (Fixed) day count convention to give

$$\tau = \frac{92}{365}.$$

Using (1.1), on 2013-11-15, there is a payment of

$$N \times R\tau = 60,000,000 \times 0.0315 \times \frac{92}{365} = \$476,383.56 \text{ GBP}.$$

Example 1.2 (Discount interest)**.** A fixed cashflow:

- PayReceive: Receive
- Currrency: USD
- InterestStyle: Discount
- AccrualDayCount: 30360
- FlowDate: 2013-11-15
- Amount: 100,000,000
- FixedRate: 0.0145
- AccrualStartDate: 2013-08-15
- AccrualEndDate: 2013-11-15

Using 30/360 day count convention, there are 90 days from the **accrual start date** (2013-08-15) to the **accrual end date** (2013-11-15). The **accrual day count fraction** of the cashflow is

$$\tau = \frac{90}{360} = 0.25.$$

Using (1.1), on 2013-11-15, one receives

$$N \times \frac{R\tau}{1 + D\tau_D} = 100,000,000 \times \frac{0.0145 \times 0.25}{1 + 0.0145 \times 0.25} = \$361,190.68 \text{ USD}.$$

Example 1.3 (Discount interest with discount rate provided)**.** A fixed cashflow:

- PayReceive: Receive
- Currrency: USD
- InterestStyle: Discount
- AccrualDayCount: 30360
- FlowDate: 2013-11-15
- Amount: 100,000,000
- FixedRate: 0.0145
- AccrualStartDate: 2013-08-15
- AccrualEndDate: 2013-11-15
- DiscountRate: 0.0125
- DiscountRateDayCount: ACT360

Using 30/360 day count convention, there are 90 days from the **accrual start date** (2013-08-15) to the **accrual end date** (2013-11-15). The **accrual day count fraction** of the cashflow is

$$\tau = \frac{90}{360} = 0.25.$$

There are 92 days from the **accrual start date** (2013-08-15) to the **accrual end date** (2013-11-15). The discount rate day count fraction of the cashflow is calculated using the Actual/360 (Fixed) day count convention to give

$$\tau_D = \frac{92}{360}.$$

Using (1.1), on 2013-11-15, one receives

$$N \times \frac{R\tau}{1 + D\tau_D} = 100,000,000 \times \frac{0.0145 \times 0.25}{1 + 0.0125 \times \frac{92}{365}} = \$361,361.46 \text{ USD}.$$

Glossary

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