Package ‘tvm’

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adjust_disc

Adjusts the discount factors by a spread

Description

Adjusts the discount factors by a spread

Usage

adjust_disc(fd, spread)

Arguments

fd vector of discount factors used to discount cashflows in 1:length(fd) periods
spread effective spread

Examples

adjust_disc(fd = c(0.99, 0.98), spread = 0.01)

cashflow

Get the cashflow for a loan

Description

Returns the cashflow for the loan, excluding the initial inflow for the loan taker

Usage

cashflow(l)

Arguments

l The loan
**cft**

*Calculates the Total Financial Cost (CFT)*

**Description**

This is the IRR of the loan’s cashflow, after adding all the extra costs

**Usage**

cft(amt, maturity, rate, up_fee = 0, per_fee = 0)

**Arguments**

- **amt**: The amount of the loan
- **maturity**: The maturity of the loan
- **rate**: The loan rate, in effective rate
- **up_fee**: The fee that the loan taker pays upfront
- **per_fee**: The fee that the loan payer pays every period

**Details**

It is assumed that the loan has monthly payments The CFT is returned as an effective rate of periodicity equal to that of the maturity and the rate The interest is calculated over amt + fee

**Examples**

cft(amt = 100, maturity = 10, rate = 0.05, up_fee = 1, per_fee = 0.1)

---

**disc_cf**

*Value of a discounted cashflow*

**Description**

Value of a discounted cashflow

**Usage**

disc_cf(fd, cf)
disc_value

Arguments

fd  The discount factor vector

cf  The cashflow

Examples

disc_cf(fd = c(1, 0.99, 0.98, 0.97), cf = c(1, -0.3, -0.4, -0.6))

Description

Calculates the present value of a cashflow

Usage

disc_value(r, cf, d = 1:length(cf))

Arguments

r  A rate curve

cf  The vector of values corresponding to the cashflow

d  The periods on which the cashflow occurs. If missing, it is assumed that cf[i] occurs on period i

Value

The present value of the cashflow

Examples

r <- rate_curve(rates = c(0.1, 0.2, 0.3), rate_type = "zero_eff")
disc_value(r, cf = c(-1, 1.10), d = c(0,1))
disc_value(r, cf = c(-1, 1.15*1.15), d = c(0,2))
**find_rate**  
*Find the rate for a loan given the discount factors*

**Description**
Thru a root finding process, this function finds the rate that corresponds to a given set of discount factors, as for the loan to have the same present value discounted with the discount factors or with that constant rate.

**Usage**

```r
find_rate(m, d, loan_type, interval = c(1e-06, 2), tol = 1e-08)
```

**Arguments**
- **m**: The maturity of the loan
- **d**: The discount factor vector
- **loan_type**: One of the loan types
- **interval**: The interval for the root finding process
- **tol**: The tolerance for the root finding process

**Examples**

```r
find_rate(m = 3, d = c(0.99, 0.98, 0.97), loan_type = "bullet")
```

---

**irr**  
*The IRR is returned as an effective rate with periodicity equal to that of the cashflow*

**Description**
Internal Rate of Return of a periodic cashflow (IRR)

**Usage**

```r
irr(cf, ts = seq(from = 0, by = 1, along.with = cf), interval = c(-1, 10), ...)
```

**Arguments**
- **cf**: The cashflow
- **ts**: The times on which the cashflow occurs. It is assumed that cf[idx] happens at moment ts[idx]
- **interval**: A length 2 vector that indicates the root finding algorithm where to search for the irr
- **...**: Other arguments to be passed on to uniroot
Examples

\[ \text{irr}(\text{cf} = c(-1, 0.5, 0.9), \text{ts} = c(0, 1, 3)) \]

---

**loan**

*Creates an instance of a loan class*

---

**Description**

Creates an instance of a loan class

**Usage**

\[ \text{loan}(\text{rate}, \text{maturity}, \text{amt}, \text{type}, \text{grace_int} = 0, \text{grace_amort} = \text{grace_int}) \]

**Arguments**

- **rate**
  - The periodic effective rate of the loan
- **maturity**
  - The maturity of the loan, measured in the same units as the periodicity of the rate
- **amt**
  - The amount loaned
- **type**
  - The type of loan. Available types are c("bullet", "french", "german")
- **grace_int**
  - The number of periods that the loan doesn’t pay interest and capitalizes it. Leave in 0 for zero loans
- **grace_amort**
  - The number of periods that the loan doesn’t amortize

**Examples**

\[ \text{loan}(\text{rate} = 0.05, \text{maturity} = 10, \text{amt} = 100, \text{type} = \text{"bullet"}) \]

---

**npv**

*Net Present Value of a periodic cashflow (NPV)*

---

**Description**

Net Present Value of a periodic cashflow (NPV)

**Usage**

\[ \text{npv}(i, \text{cf}, \text{ts} = \text{seq(from = 0, by = 1, along.with = cf)}) \]
plot.rate_curve

Arguments

\[
\begin{align*}
\text{i} & \quad \text{The rate used to discount the cashflow. It must be effective and with a periodicity that matches that of the cashflow} \\
\text{cf} & \quad \text{The cashflow} \\
\text{ts} & \quad \text{The times on which the cashflow occurs. It is assumed that \( cf[idx] \) happens at moment \( ts[idx] \). If empty, assumes that \( cf[idx] \) happens at period \( idx - 1 \)}
\end{align*}
\]

Value

The net present value at

Examples

\[
npv(i = 0.01, cf = c(-1, 0.5, 0.9), ts = c(0, 1, 3))
\]

plot.rate_curve

Plots a rate curve

Description

Plots a rate curve

Usage

## S3 method for class 'rate_curve'
plot(x, rate_type = NULL, ...)

Arguments

\[
\begin{align*}
\text{x} & \quad \text{The rate curve} \\
\text{rate_type} & \quad \text{The rate types to plot, in c("french","fut","german","zero_eff","zero_nom","swap")} \\
\text{...} & \quad \text{Other arguments (unused)}
\end{align*}
\]

Examples

\[
r <- rate_curve(rates = c(0.1, 0.2, 0.3), rate_type = "zero_eff")
plot(r)
\]

## Not run:
\[
plot(r, rate_type = "german")
plot(r, rate_type = c("french", "german"))
\]

## End(Not run)
**pmt**

*The value of the payment of a loan with constant payments (french type amortization)*

**Description**

The value of the payment of a loan with constant payments (french type amortization)

**Usage**

```
pmt(amt, maturity, rate)
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>amt</td>
<td>The amount of the loan</td>
</tr>
<tr>
<td>maturity</td>
<td>The maturity of the loan</td>
</tr>
<tr>
<td>rate</td>
<td>The rate of the loan</td>
</tr>
</tbody>
</table>

**Details**

The periodicity of the maturity and the rate must match, and this will be the periodicity of the payments

**Examples**

```
pmt(amt = 100, maturity = 10, rate = 0.05)
```

---

**rate**

*The rate of a loan with constant payments (french type amortization)*

**Description**

The rate of a loan with constant payments (french type amortization)

**Usage**

```
rate(amt, maturity, pmt, extrema = c(1e-04, 1e+09), tol = 1e-04)
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>amt</td>
<td>The amount of the loan</td>
</tr>
<tr>
<td>maturity</td>
<td>The maturity of the loan</td>
</tr>
<tr>
<td>pmt</td>
<td>The payments of the loan</td>
</tr>
<tr>
<td>extrema</td>
<td>Vector of length 2 that has the minimum and maximum value to search for the rate</td>
</tr>
<tr>
<td>tol</td>
<td>The tolerance to use in the root finding algorithm</td>
</tr>
</tbody>
</table>
Details

The periodicity of the maturity and the payment must match, and this will be the periodicity of the rate (which is returned as an effective rate).

Examples

\[ \text{rate}(\text{amt} = 100, \text{maturity} = 10, \text{pmt} = 15) \]

rate_curve (\textit{Creates a rate curve instance})

Description

Creates a rate curve instance.

Usage

\[
\text{rate\_curve}(\text{rates} = \text{NULL}, \text{rate\_type} = \text{"zero\_eff"}, \\
\text{pers} = 1:\text{length}(\text{rates}), \text{rate\_scale} = 1, \text{fun\_d} = \text{NULL}, \\
\text{fun\_r} = \text{NULL}, \text{knots} = \text{seq}\_\text{int}(\text{from} = 1, \text{to} = \max(\text{pers}), \text{by} = 1), \\
\text{functor} = \text{function}(x, y) \text{splinefun}(x = x, y = y, \text{method} = \text{"monoH.FC"}))
\]

Arguments

- \text{rates} A rate vector
- \text{rate\_type} The rate type. Must be one of \text{c("fut", "zero\_nom", "zero\_eff", "swap")}
- \text{pers} The periods the rates correspond to
- \text{rate\_scale} In how many periods is the rate expressed. For example, when measuring periods in days, and using annual rates, you should use 365. When measuring periods in months, and using annual rates, you should use 12. If no scaling, use 1.
- \text{fun\_d} A discount factor function. \text{fun\_d}(x) returns the discount factor for time \(x\), vectorized on \(x\)
- \text{fun\_r} A rate function. \text{fun\_r}(x) returns the EPR for time \(x\), vectorized on \(x\)
- \text{knots} The nodes used to bootstrap the rates. This is a mandatory argument if a rate function or discount function is provided
- \text{functor} A function with parameters \(x\) and \(y\), that returns a function used to interpolate

Note

Currently a rate curve can only be built from one of the following sources:

1. A discount factor function
2. A rate function and a rate type from the following types: "fut", "zero\_nom", "zero\_eff" or "swap"
3. A rate vector, a pers vector and a rate type as before
Example

rate_curve(rates = c(0.1, 0.2, 0.3), rate_type = "zero_eff")
rate_curve(fun_r = function(x) rep_len(0.1, length(x)), rate_type = "swap", knots = 1:12)
rate_curve(fun_d = function(x) 1 / (1 + x), knots = 1:12)

---

**rem**

*Remaining capital in a loan*

**Description**

The amount that has to be repayed at each moment in a loan, at the end of the period

**Usage**

rem(cf, amt, r)

**Arguments**

- **cf**: The cashflow of the loan, not including the initial inflow for the loan taker
- **amt**: The original amount of the loan
- **r**: The periodic rate of the loan

**Examples**

rem(cf = rep_len(0.4, 4), amt = 1, r = 0.2)

---

**tvm**

*Functions for managing cashflows and interest rate curves.*
**xirr**

The IRR is returned as an effective annual rate

**Description**

Internal Rate of Return of an irregular cashflow (IRR)

**Usage**

```
xirr(cf, d, tau = NULL, comp_freq = 1, interval = c(-1, 10), ...)
```

**Arguments**

- `cf`: The cashflow
- `d`: The dates when each cashflow occurs. Same length as the cashflow. Only used if `tau` is NULL. Assumes act/365 fractions
- `tau`: The year fractions when each cashflow occurs. Same length as the cashflow
- `comp_freq`: The compounding frequency used. Most relevant cases are 1 for yearly, 2 twice a year, 4 quarterly, 12 monthly, 0 no compounding, Inf continuous
- `interval`: A length 2 vector that indicates the root finding algorithm where to search for the irr
- `...`: Other arguments to be passed on to uniroot

**Examples**

```
xirr(cf = c(-1, 1.5), d = Sys.Date() + c(0, 365))
```

---

**xnpv**

Net Present Value of an irregular cashflow (NPV)

**Description**

Net Present Value of an irregular cashflow (NPV)

**Usage**

```
xnpv(i, cf, d, tau = NULL, comp_freq = 1)
```
Arguments

- **i**  The rate used to discount the cashflow
- **cf**  The cashflow
- **d**  The dates when each cashflow occurs. Same length as the cashflow. Only used if tau is NULL. Assumes act/365 fractions
- **tau**  The year fractions when each cashflow occurs. Same length as the cashflow
- **comp_freq**  The compounding frequency used. Most relevant cases are 1 for yearly, 2 twice a year, 4 quarterly, 12 monthly, 0 no compounding, Inf continuous

Examples

```r
xnpv(i = 0.01, cf = c(-1, 0.5, 0.9), d = as.Date(c("2015-01-01", "2015-02-15", "2015-04-10")))
```

Description

Returns a particular rate or rates from a curve

Usage

```r
## S3 method for class 'rate_curve'
r[rate_type = "zero_eff", x = NULL]
```

Arguments

- **r**  The rate_curve object
- **rate_type**  The rate type
- **x**  The points in time to return

Value

If x is NULL, then returns a rate function of rate_type type. Else, it returns the rates of rate_type type and corresponding to time x

Examples

```r
r <- rate_curve(rates = c(0.1, 0.2, 0.3), rate_type = "zero_eff")
r["zero_eff"]
r["swap",c(1.5, 2)]
```
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