Package ‘tvm’

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Type Package

Title Time Value of Money Functions

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Description Functions for managing cashflows and interest rate curves.

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R topics documented:

`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

Examples

```
l <- loan(rate = 0.05, maturity = 10, amt = 100, type = "bullet")
cashflow(l)
```

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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)
```

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disc_cf — *Value of a discounted cashflow*

Description

Value of a discounted cashflow

Usage

```
disc_cf(fd, cf)
```

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))
```

`disc_value` *Calculates the present value of a cashflow*

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

```
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

```
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

```
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

```
irr(cf = c(-1, 0.5, 0.9), ts = c(0, 1, 3))
```

---

loan *Creates an instance of a loan class*

Description

Creates an instance of a loan class

Usage

```
loan(rate, maturity, amt, type, grace_int = 0, grace_amort = 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

```
loan(rate = 0.05, maturity = 10, amt = 100, type = "bullet")
```

---

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

Description

Net Present Value of a periodic cashflow (NPV)

Usage

```
npv(i, cf, ts = seq(from = 0, by = 1, along.with = cf))
```

Arguments

`i`	The rate used to discount the cashflow. It must be effective and with a periodicity that matches that of the cashflow
`cf`	The cashflow
`ts`	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`

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, y_labs_perc = TRUE, y_labs_acc = NULL, ...)
```

Arguments

`x`	The rate curve
`rate_type`	The rate types to plot, in c("french", "fut", "german", "zero_eff", "zero_nom", "swap", "zero_cont")
`y_labs_perc`	If TRUE, the y axe is labeled with percentages
`y_labs_acc`	If y_labs_perc is TRUE, the accuracy for the percentages (i.e., 1 for xx%, 0.1 for xx.x%, 0.01 for xx.xx%, etc)
`...`	Other arguments (unused)

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

`amt`	The amount of the loan
`maturity`	The maturity of the loan
`rate`	The rate of the loan

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

`amt`	The amount of the loan
`maturity`	The maturity of the loan
`pmt`	The payments of the loan
`extrema`	Vector of length 2 that has the minimum and maximum value to search for the rate
`tol`	The tolerance to use in the root finding algorithm

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

```
rate(amt = 100, maturity = 10, pmt = 15)
```

`rate_curve` *Creates a rate curve instance*

Description

Creates a rate curve instance

Usage

```
rate_curve(
  rates = NULL,
  rate_type = "zero_eff",
  pers = 1:length(rates),
  rate_scale = 1,
  fun_d = NULL,
  fun_r = NULL,
  knots = seq.int(from = 1, to = max(pers), by = 1),
  functor = function(x, y) splinefun(x = x, y = y, method = "monoH.FC")
)
```

Arguments

`rates`	A rate vector
`rate_type`	The rate type. Must be on of c("fut", "zero_nom", "zero_eff", "swap", "zero_cont)
`pers`	The periods the rates correspond to
`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.
`fun_d`	A discount factor function. fun_d(x) returns the discount factor for time x, vectorized on x
`fun_r`	A rate function. fun_r(x) returns the EPR for time x, vectorized on x
`knots`	The nodes used to bootstrap the rates. This is a mandatory argument if a rate function or discount function is provided
`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", "swap" or "zero_cont
3. A rate vector, a pers vector and a rate type as before

Examples

```
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)
```

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tvm — *tvm*

Description

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(-0.99999, 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

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

`[.rate_curve` *Returns a particular rate or rates from a curve*

Description

Returns a particular rate or rates from a curve

Usage

```
## 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 <- 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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