

Package ‘creditr’

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Title Credit Default Swaps

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Imports utils, quantmod, devtools, methods, Rcpp (>= 0.10.6), RCurl,
XML, zoo, xts

LinkingTo Rcpp

Suggests testthat

License file LICENSE

URL <https://github.com/yanrong-stacy-song/creditr>

Description Price credit default swaps using
'C' code from the International Swaps and Derivatives
Association CDS Standard Model. See
<<https://www.cdsmodel.com/cdsmodel/documentation.html>>
for more information about the model and
<<https://www.cdsmodel.com/cdsmodel/cds-disclaimer.html>>
for license details for the 'C' code.

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add_conventions	<i>Return accounting conventions</i>
-----------------	--------------------------------------

Description

add_conventions takes a data frame with a currency.var column and returns the same data frame with eight other columns of accounting conventions added to it.

Usage

```
add_conventions(x, currency.var = "currency")
```

Arguments

x a data frame containing all necessary information
currency.var a character indicating the name of currency column

Value

a data frame with eight more columns of accounting conventions: badDayConvention (a character indicating how non-business days are converted), mmDCC (the day count convention of the instruments), mmCalendars (any calendar adjustment for the CDS), fixedDCC (the day count convention of the fixed leg), floatDCC (the day count convention of the floating leg), fixedFreq (the frequency of the fixed rate of swap being paid), floatFreq (the frequency of the floating rate of swap being paid) and swapCalendars (any calendar adjustment for swap rate)

References

<https://www.cdsmodel.com/cdsmodel/assets/cds-model/docs/c-code%20Key%20Functions-v1.pdf>

Examples

```
x <- data.frame(date = c(as.Date("2014-05-06"), as.Date("2014-05-07")),  
                  currency = c("USD", "JPY"))  
add_conventions(x)
```

add_dates	<i>Return CDS dates.</i>
-----------	--------------------------

Description

add_dates takes a data frame which contains dates, tenor (or maturity) and currency and returns appropriate dates for pricing a CDS contract.

Usage

```
add_dates(  
  x,  
  date.var = "date",  
  maturity.var = "maturity",  
  tenor.var = "tenor",  
  currency.var = "currency"  
)
```

Arguments

x	a data frame, containing all necessary information
date.var	character, column name of date variable
maturity.var	character, column name of maturity variable
tenor.var	character, column name of tenor variable
currency.var	character, column name of currency variable

Value

a date frame containing all the input columns, as well as eight more columns: stepinDate (T+1), valueDate (T+3 business days), startDate (accrual begin date), endDate (maturity), backstopDate (T-60 day look back from which 'protection' is effective), firstcouponDate (the date on which the first coupon is paid), pencouponDate (second to last coupon date), and baseDate (the starting date for the IR curve)

References

<https://www.cdsmodel.com/cdsmodel/assets/cds-model/docs/c-code%20Key%20Functions-v1.pdf>
<https://www.cdsmodel.com/assets/cds-model/docs/Standard%20CDS%20Examples.pdf>

Examples

```
x <- data.frame(date = c(as.Date("2014-05-06"), as.Date("2014-05-07")),
                tenor = rep(5, 2), currency = c("JPY", "USD"))
add_dates(x)
```

adj_next_bus_day *Adjust to next business day.*

Description

adj_next_bus_day gets the next business day following 5D bus day convention.

Usage

```
adj_next_bus_day(date)
```

Arguments

date	a Date type.
------	--------------

Value

Date adjusted to the following business day

`build_rates`*Build a data frame containing interest rates for CDS pricing*

Description

`build_rates` can create a data frame of interest rates from a start date to an end date, which are specified by the user. The interest rates will be later used in CDS pricing. `build_rates` also builds the `rates.RData` in the package. `build_rates` mainly consists `download_markit` and `download_FRED`. The two sources are Markit website and FRED website.

Usage

```
build_rates(start.date, end.date)
```

Arguments

<code>start.date</code>	is the start date of the data frame; it is the earliest CDS pricing date that the user concerns.
<code>end.date</code>	is the end date of the data frame; it is the latest CDS pricing date that the user concerns.

Details

since Markit website has the interest rates back to the 1990s, `download_markit` is responsible for building up all the USD interest rate data frame; for EUR and JPY, markit can only get from 2005-01-05 to now. But the biggest advantage of using `download_markit` is that, since Markit website only lists the rate expiries that are actually used for CDS pricing, `download_markit` can get the exact type of expiries of rates needed to price CDS. Also, it has expiry over 1Y to 30Y. In contrast, FRED is only complementary to markit data. Since `download_markit` can get any rates for USD, we don't use FRED for USD. Then we want to get data for EUR and JPY before 2005-01-04 (the limit of markit). FRED has almost all data for any date, which is its biggest advantage. But its biggest disadvantage is that it doesn't know which expiry type is suitable for which time, since FRED website has expiry of all types below a year; also it doesn't have expiry over 1Y. So we hardcoded the dates below, to combine markit and FRED in the most suitable way.

Another note is that, the rates on both Markit website and FRED website have not been adjusted to the previous business day. In other words, the rates from both website is the exact rate on that day, rather than on the previous business day. But `download_markit` and `download_FRED` have adjusted the days already for the convenience of CDS pricing, so we don't have to worry here.

Value

a data frame that contains the CDS pricing date, the currency, the interest rate expiry and the interest rate.

References

<https://www.spglobal.com/en> <https://fred.stlouisfed.org/docs/api/fred/>

See Also

[download_markit](#) [download_FRED](#) [rates](#)

Examples

```
## Not run:
## Running this example will take more than two hours.

build_rates(start.date = as.Date("2004-01-01"),
            end.date = as.Date("2014-08-23"))
## End(Not run)
```

call_ISDA	<i>call ISDA c function</i>
-----------	-----------------------------

Description

call_ISDA call ISDA function

Usage

```
call_ISDA(x, name, rates.info)
```

Arguments

x	dataframe which contains relevant dates and convention info
name	character function name within which call_ISDA is called
rates.info	dataframe which contains relevant rates data

Value

a numeric value which is the difference between the new upfront and the old one

CDS	<i>Build a CDS class object given the input about a CDS contract.</i>
-----	---

Description

Build a CDS class object given the input about a CDS contract.

Usage

```

CDS(
  name = NULL,
  contract = "SNAC",
  RED = NULL,
  date = Sys.Date(),
  spread = NULL,
  maturity = NULL,
  tenor = NULL,
  coupon = 100,
  recovery = 0.4,
  currency = "USD",
  notional = 1e+07
)

```

Arguments

name	is the name of the reference entity. Optional.
contract	is the contract type, default SNAC
RED	alphanumeric code assigned to the reference entity. Optional.
date	is when the trade is executed, denoted as T. Default is Sys.Date. The date format should be in "YYYY-MM-DD".
spread	CDS par spread in bps.
maturity	date of the CDS contract.
tenor	of contract. By default is set as 5
coupon	quoted in bps. It specifies the payment amount from the protection buyer to the seller on a regular basis. The default is 100 bps.
recovery	in decimal. Default is 0.4.
currency	in which CDS is denominated.
notional	is the amount of the underlying asset on which the payments are based. Default is 10000000, i.e. 10MM.

Value

a CDS class object including the input information on the contract as well as the valuation results of the contract.

Examples

```
x <- CDS(date = as.Date("2014-05-07"), tenor = 5, spread = 50, coupon = 100)
```

CDS, CDS-class

CDS Class

Description

Class definition for the CDS-Class

Slots

`name` is the name of the reference entity. Optional.

`contract` is the contract type, default SNAC

`RED` alphanumeric code assigned to the reference entity. Optional.

`date` is when the trade is executed, denoted as T. Default is Sys.Date.

`spread` CDS par spread in bps.

`maturity` date of the CDS contract.

`tenor` of contract in number of years - 5, 3

`coupon` quoted in bps. It specifies the payment amount from

`recovery` in decimal. Default is 0.4.

`currency` in which CDS is denominated.

`principal` is the dirty upfront less the accrual.

`accrual` is the accrued interest payment.

`pd` is the approximate the default probability at time t given the spread.

`price` is the price

`upfront` is quoted in the currency amount. Since a standard contract is traded with fixed coupons, upfront payment is introduced to reconcile the difference in contract value due to the difference between the fixed coupon and the conventional par spread. There are two types of upfront, dirty and clean. Dirty upfront, a.k.a. Cash Settlement Amount, refers to the market value of a CDS contract. Clean upfront is dirty upfront less any accrued interest payment, and is also called the Principal.

`spread.DV01` measures the sensitivity of a CDS contract mark-to-market to a parallel shift in the term structure of the par spread.

`IR.DV01` is the change in value of a CDS contract for a 1 bp parallel increase in the interest rate curve. `IRDV01` is, typically, a much smaller dollar value than `spreadDV01` because moves in overall interest rates have a much smaller effect on the value of a CDS contract than does a move in the CDS spread itself.

`rec.risk.01` is the dollar value change in market value if the recovery rate used in the CDS valuation were increased by 1%.

check_inputs	<i>Check whether inputs from the data frame are valid.</i>
--------------	--

Description

check_inputs checks whether a data frame's inputs are valid. It is a minimum set of checks. Things such as recovery var are not checked, because some functions don't need them as input.

Usage

```
check_inputs(
  x,
  date.var = "date",
  currency.var = "currency",
  maturity.var = "maturity",
  tenor.var = "tenor",
  spread.var = "spread",
  coupon.var = "coupon",
  notional.var = "notional",
  notional = 1e+06,
  recovery.var = "recovery",
  recovery = 0.4
)
```

Arguments

x	data frame, contains all the relevant columns.
date.var	character, column in x containing date variable.
currency.var	character, column in x containing currency.
maturity.var	character, column in x containing maturity date.
tenor.var	character, column in x containing tenors.
spread.var	character, column in x containing spread in basis points.
coupon.var	character, column in x containing coupon rates in basis points. It specifies the payment amount from the protection buyer to the seller on an annual basis.
notional.var	character, column in x containing the amount of the underlying asset on which the payments are based.
notional	numeric, the notional amount for all pricing if there isn't a notional.var
recovery.var	character, column in x containing recovery rates. ISDA model standard recovery rate assumption is 0.4.
recovery	numeric, the recovery rate for all pricing if there isn't a recovery.var

Value

a data frame if not stopped by errors.

Examples

```
x <- data.frame(date = as.Date(c("2014-04-22", "2014-04-22")),
               currency = c("USD", "EUR"),
               tenor = c(5, 5),
               spread = c(120, 110),
               coupon = c(100, 100),
               recovery = c(0.4, 0.4),
               notional = c(1000000, 1000000))
x <- check_inputs(x)
```

creditr

The creditr package.

Description

creditr package prices credit default swaps (CDS). It enables CDS class object which has slots as name, contract, RED, date, spread, maturity, teno, coupon, recovery, currency, notional, principal, accrual, pd, price, upfront, spread.DV01, IR.DV01 and rec.risk.01, with S4 methods like update, show and summary. It also supports data frame input and is able to provide convenient calculation of key CDS statistics through functions like CS10, IR.DV01, rec_risk_01 and spread_DV01. Of other major functions, spread_to_upfront and upfront_to_spread are designed to compute one of spread and upfront given the other; spread_to_pd and pd_to_spread, similarly, can calculate one of spread and probability of default given the other; add_dates and add_conventions compute a series of dates information and accounting conventions related to CDS pricing. Finally, get_rates and build_rates facilitates direct fetching of relevant interest rates from online sources. Thanks to ISDA Standard Model's Open Source license, we are able to create this package for R users. You can find the Open Source licence of ISDA Standard Model at "<https://www.cdsmodel.com/cdsmodel/cds-disclaimer.html>"

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See Also

Useful links:

- <https://github.com/yanrong-stacy-song/creditr>

 CS10

 Calculate CS10

Description

CS10 calculates the change in upfront value when the spread rises by 10

Usage

```
CS10(
  x,
  date.var = "date",
  currency.var = "currency",
  maturity.var = "maturity",
  tenor.var = "tenor",
  spread.var = "spread",
  coupon.var = "coupon",
  recovery.var = "recovery",
  notional.var = "notional",
  notional = 1e+07,
  recovery = 0.4
)
```

Arguments

x	data frame, contains all the relevant columns.
date.var	character, column in x containing date variable.
currency.var	character, column in x containing currency.
maturity.var	character, column in x containing maturity date.
tenor.var	character, column in x containing tenors.
spread.var	character, column in x containing spread in basis points.
coupon.var	character, column in x containing coupon rates in basis points. It specifies the payment amount from the protection buyer to the seller on an annual basis.
recovery.var	character, column in x containing recovery rates. ISDA model standard recovery rate assumption is 0.4.
notional.var	character, column in x containing the amount of the underlying asset on which the payments are based.
notional	numeric, the notional amount for all pricing if there isn't a notional.var
recovery	numeric, the recovery rate for all pricing if there isn't a recovery.var

Value

a vector containing the change in upfront in units of currency.var when spread increase by 10

Examples

```
x <- data.frame(date = as.Date(c("2014-04-22", "2014-04-22")),
               currency = c("USD", "EUR"),
               tenor = c(5, 5),
               spread = c(120, 110),
               coupon = c(100, 100),
               recovery = c(0.4, 0.4),
               notional = c(10000000, 10000000),
               stringsAsFactors = FALSE)

CS10(x)
```

download_FRED

Get Rates from FRED

Description

download_FRED returns the deposits and swap rates for the day input, along with the date conventions for that specific currency. The source is FRED.

Usage

```
download_FRED(
  start = as.Date("2004-01-01"),
  end = as.Date("2005-01-04"),
  currency = "JPY"
)
```

Arguments

start	is the start date of the data frame we want
end	is the end date of the data frame we want
currency	is the three-letter currency code. As of now, it works for USD, EUR, and JPY. The default is JPY.

Value

a data frame that contains the rates based on the ISDA pecifications

See Also

[download_markit build_rates](#)

Examples

```
## Not run:
download_FRED(start = as.Date("2003-12-31"), end = as.Date("2005-01-04"),
              currency = "JPY")

## End(Not run)
```

download_markit	<i>Get rates from Markit</i>
-----------------	------------------------------

Description

download_markit takes a data frame of dates and returns a data frame with the yields for different maturities.

Usage

```
download_markit(start, end, currency = "USD")
```

Arguments

start	date for gathering interest rates. Must be a Date type
end	date for gathering interest rates. Must be a Date type
currency	for which rates are being retrieved

Value

data frame containing the rates from every day from start to end dates. Note: the date in the output data frame does not refer to the rates of that day but to the date on which the CDS is being priced. So the corresponding rate is actually the rate of the previous day. Example: if the column reads 2014-04-22, the corresponding rates are actually for 2014-04-21.

See Also

[download_FRED](#) [build_rates](#)

Examples

```
## Not run:
download_markit(start = as.Date("2005-12-31"), end = as.Date("2006-01-04"),
               currency = "JPY")

## End(Not run)
```

get_rates	<i>Get interest rates from rates.RData or the Markit website</i>
-----------	--

Description

get_rates returns the deposits and swap rates for the day input, along with the date conventions for that specific currency. The day input should be a weekday. If not, go to the most recent previous weekday.

Usage

```
get_rates(date, currency)
```

Arguments

date	Trade date. The rates for a trade date T are published on T-1 weekday. This date refers to the day on which we want the CDS to be priced, not the date for the interest rates as the interest rates will be used is the day before the trade date. Eg. If we are trying to find the rates used to price a CDS on 2014-04-22, it will return the rates of 2014-04-21
currency	the three-letter currency code. As of now, it works for USD, EUR, and JPY. The default is USD.

Value

a data frame that contains date (the CDS pricing date),

Examples

```
get_rates(as.Date("2014-05-07"), currency = "USD")
```

get_raw_markit	<i>Get raw data from Markit website.</i>
----------------	--

Description

get_raw_markit downloads the rates zip file from Markit website, unzips and parses the XML

Usage

```
get_raw_markit(date, currency)
```

Arguments

date	Date type, is the CDS pricing date.
currency	numeric, is the currency that the CDS is traded in.

Value

a data frame that contains CDS pricing date, currency, interest rate expiry and interest rate. The data frame is created with data from Markit website

implied_RR	<i>Calculates Implied Recovery Rate</i>
------------	---

Description

implied_RR that calculates the recovery rate implied by the CDS spread and probability of default (pd) by using the ISDA model. This takes a data frame of inputs and returns a vector of the same length.

Usage

```
implied_RR(  
  x,  
  date.var = "date",  
  tenor.var = "tenor",  
  maturity.var = "maturity",  
  spread.var = "spread",  
  pd.var = "pd"  
)
```

Arguments

x	data frame, contains all the relevant columns.
date.var	character, column in x containing date variable.
tenor.var	character, column in x containing tenors.
maturity.var	character, column in x containing maturity date.
spread.var	character, column in x containing spread in basis points.
pd.var	name of the column containing the probability of default rates.

Value

implied recovery rate in percentage based on the general approximation for a probability of default in the Bloomberg manual. The actual calculation uses a complicated bootstrapping process, so the results may be marginally different.

 IR_DV01

 Calculate IR.DV01

Description

IR_DV01 calculate the amount of change in upfront when there is a 1/1e4 increase in interest rate for a data frame of CDS contracts.

Usage

```
IR_DV01(
  x,
  date.var = "date",
  currency.var = "currency",
  maturity.var = "maturity",
  tenor.var = "tenor",
  spread.var = "spread",
  coupon.var = "coupon",
  recovery.var = "recovery",
  notional.var = "notional",
  notional = 1e+07,
  recovery = 0.4
)
```

Arguments

x	data frame, contains all the relevant columns.
date.var	character, column in x containing date variable.
currency.var	character, column in x containing currency.
maturity.var	character, column in x containing maturity date.
tenor.var	character, column in x containing tenors.
spread.var	character, column in x containing spread in basis points.
coupon.var	character, column in x containing coupon rates in basis points. It specifies the payment amount from the protection buyer to the seller on an annual basis.
recovery.var	character, column in x containing recovery rates. ISDA model standard recovery rate assumption is 0.4.
notional.var	character, column in x containing the amount of the underlying asset on which the payments are based.
notional	numeric, the notional amount for all pricing if there isn't a notional.var
recovery	numeric, the recovery rate for all pricing if there isn't a recovery.var

Value

a vector containing the change in upfront when there is a 1/1e4 increase in interest rate, for each corresponding CDS contract.

Examples

```
x <- data.frame(date = c(as.Date("2014-04-22"), as.Date("2014-04-22")),
                currency = c("USD", "EUR"),
                tenor = c(5, 5),
                spread = c(120, 110),
                coupon = c(100, 100),
                recovery = c(0.4, 0.4),
                notional = c(10000000, 10000000),
                stringsAsFactors = FALSE)

IR_DV01(x)
```

pd_to_spread

*Calculate spread with Default Probability***Description**

pd_to_spread to calculate spread using the probability of default, tenor and recovery rate.

Usage

```
pd_to_spread(
  x,
  recovery.var = "recovery",
  currency.var = "currency",
  tenor.var = "tenor",
  date.var = "date",
  pd.var = "pd"
)
```

Arguments

x	data frame, contains all the relevant columns.
recovery.var	character, column in x containing recovery rates. ISDA model standard recovery rate assumption is 0.4.
currency.var	character, column in x containing currency.
tenor.var	character, column in x containing tenors.
date.var	character, column in x containing date variable.
pd.var	name of the column containing the probability of default in decimals.

Value

vector containing the spread values in basis points, calculated by inverting the formula for probability of default given in the Bloomberg Manual

See Also

[spread_to_pd](#)

 PV01

Calculate PV01

Description

PV01 to calculate present value 01 or present value of a stream of 1bp payments

Usage

```
PV01(
  x,
  principal.var = "principal",
  spread.var = "spread",
  coupon.var = "coupon",
  notional.var = "notional"
)
```

Arguments

<code>x</code>	data frame, contains all the relevant columns.
<code>principal.var</code>	name of the column containing the principal or clean upfront values of the CDS
<code>spread.var</code>	character, column in <code>x</code> containing spread in basis points.
<code>coupon.var</code>	character, column in <code>x</code> containing coupon rates in basis points. It specifies the payment amount from the protection buyer to the seller on an annual basis.
<code>notional.var</code>	character, column in <code>x</code> containing the amount of the underlying asset on which the payments are based.

Value

Vector containing the PV01 values

 rates

LIBOR rates from 2004-01-01 to 2015-08-03

Description

This data frame is created by `build_rates` in `creditr` package to calculate the CDS pricing. It covers three currencies: USD, EUR, and JPY. The interest rates date from 2004-01-01 to 2014-08-23. Rates on holidays and weekends are available as well as business days.

Format

A data frame with 194378 observations on the following 4 variables.

- `date` = a date (Date object)
- `currency` = a character containing USD EUR JPY
- `expiry` = a character containing 1M 2M 3M 6M 9M 1Y 2Y 3Y 4Y 5Y 6Y 7Y 8Y 9Y 10Y 12Y 15Y 20Y 30Y
- `rate` = a numeric vector. The LIBOR rate.

Details

The source of the interest rates in `rates.RData` is from <https://www.spglobal.com/en> and <https://fred.stlouisfed.org/>. When a user is calculating CDS using the CDS package, the package calls `get_rates` to get the needed interest rates; `get_rates` then calls the `rates.RData` for these interest rates. If a date is unavailable in `rates.RData`, then the package calls other functions to get the needed interest rates from the internet. The `rates.RData` is created and stored in the package for the users' convenience: getting interest rates from the Internet may fail due to the internet connection problem and may be very slow. Also, the user can build its own updated local `rates.RData` by using `build_rates`. For more explanation on the usage of `build_rates`, please see **See Also**.

Also, please notice that in the `rates.RData`, the `rate` is not the interest rate on the date listed in the same row as the `rate`. For example, in the first row, the `rate` is 0.001550; the date in that row is 2014-08-21. But this does not mean that on 2014-08-21, the interest rate is 0.001550; instead, 0.001550 is the interest rate on 2014-08-20. This regulation of using the interest rate on the previous business day of CDS trading date is set by ISDA Standard Model. The Model says that, if a trader buy a CDS on 2014-08-21, then when calculating the pricing of the CDS, she should use the interest rate of 2014-08-20, which is 0.001550. This may be confusing for people who are yet unfamiliar with CDS. We design `rates.RData` in this way because it is easier for other functions in the CDS package to use this data frame for calculation.

`rates.RData` covers holidays, weekend and business days. As is set by ISDA Standard Model and introduced above, we use the previous business day's interest rate for CDS pricing on a certain trading date. Therefore, if the user is buying a CDS on Saturday, she should use the interest rate of last Friday; if she is buying a CDS on Sunday or Monday, she should still use the interest rate of last Friday, because last Friday is the previous business day of the CDS trading date. When it comes to holidays, we still choose the previous business day for interest rate. For example, if a trader is buying a CDS on 2014-07-05, then she should use the interest rate of 2014-07-03, because 2014-07-04 is a national holiday and 2014-07-03 is the previous business day of trading date.

Also, please notice that in `rates.RData`, a currency's type of expiries generally stays the same along the time, but not always. For example, we check the expiry type of USD in `rates.RData`: for 2004-01-01, there are two types of expiry: 1M, 3Y; for 2006-01-01, there are five types of expiry: 1M, 2M, 3M, 6M, 1Y; for 2007-01-01, there are 18 types of expiry; for 2014-01-01, there are 19 types of expiry. Therefore, for a trader, she should always keep in mind to update her knowledge of the expiry types of her trading currency. For different currencies, the types of expiries are often different.

Finally, please notice that some of the data are missing for a certain expiry of a currency in a short time. For example, some dates in `rates.RData` do not have a expiry of 3Y for USD. This is not

likely to be caused by data error, since all these data are got from Markit and FRED. Users, however, should be aware of that some data seem "missing".

Source

<https://www.spglobal.com/en> <https://fred.stlouisfed.org/>

See Also

[download_FRED](#) [download_markit](#) [build_rates](#)

Examples

```
data(rates)

## for JPY rates:
rates[rates$currency == "JPY",]

## for rates on a specific date, of a specific currency:
rates[rates$currency == "USD" & rates$date == "2005-10-01",]
```

rec_risk_01

Calculate Recovery Rate Changes

Description

rec_risk_01 calculates the amount of change in upfront when there is a 1

Usage

```
rec_risk_01(
  x,
  date.var = "date",
  currency.var = "currency",
  maturity.var = "maturity",
  tenor.var = "tenor",
  spread.var = "spread",
  coupon.var = "coupon",
  recovery.var = "recovery",
  notional.var = "notional",
  recovery = 0.4,
  notional = 1e+07
)
```

Arguments

x	data frame, contains all the relevant columns.
date.var	character, column in x containing date variable.
currency.var	character, column in x containing currency.
maturity.var	character, column in x containing maturity date.
tenor.var	character, column in x containing tenors.
spread.var	character, column in x containing spread in basis points.
coupon.var	character, column in x containing coupon rates in basis points. It specifies the payment amount from the protection buyer to the seller on an annual basis.
recovery.var	character, column in x containing recovery rates. ISDA model standard recovery rate assumption is 0.4.
notional.var	character, column in x containing the amount of the underlying asset on which the payments are based.
recovery	numeric, the recovery rate for all pricing if there isn't a recovery.var
notional	numeric, the notional amount for all pricing if there isn't a notional.var

Value

a vector containing the change in upfront when there is a 1 percent increase in recovery rate, for each corresponding CDS contract.

Examples

```
x <- data.frame(date = c(as.Date("2014-04-22"), as.Date("2014-04-22")),
                currency = c("USD", "EUR"),
                tenor = c(5, 5),
                spread = c(120, 110),
                coupon = c(100, 100),
                recovery = c(0.4, 0.4),
                notional = c(10000000, 10000000),
                stringsAsFactors = FALSE)
rec_risk_01(x)
```

separate_YMD

Separate Year/Month/Day

Description

separate_YMD contains helper functions to separate an input date into year, month, and day.

Usage

```
separate_YMD(d)
```

Arguments

d is an input date.

Value

an array contains year, month, date of the input date d.

show	<i>Show Method</i>
------	--------------------

Description

show shows a CDS class object.

Usage

```
## S4 method for signature 'CDS'
show(object)
```

Arguments

object the input CDS object

spread_DV01	<i>Calculate Spread Change</i>
-------------	--------------------------------

Description

spread_DV01 calculates the spread DV01 or change in upfront value when the spread rises by 1 basis point

Usage

```
spread_DV01(
  x,
  date.var = "date",
  currency.var = "currency",
  maturity.var = "maturity",
  tenor.var = "tenor",
  spread.var = "spread",
  coupon.var = "coupon",
  recovery.var = "recovery",
  notional.var = "notional",
  notional = 1e+07,
  recovery = 0.4
)
```

Arguments

x	data frame, contains all the relevant columns.
date.var	character, column in x containing date variable.
currency.var	character, column in x containing currency.
maturity.var	character, column in x containing maturity date.
tenor.var	character, column in x containing tenors.
spread.var	character, column in x containing spread in basis points.
coupon.var	character, column in x containing coupon rates in basis points. It specifies the payment amount from the protection buyer to the seller on an annual basis.
recovery.var	character, column in x containing recovery rates. ISDA model standard recovery rate assumption is 0.4.
notional.var	character, column in x containing the amount of the underlying asset on which the payments are based.
notional	numeric, the notional amount for all pricing if there isn't a notional.var
recovery	numeric, the recovery rate for all pricing if there isn't a recovery.var

Value

a vector containing the change in upfront when there is a 1 basis point increase in spread, for each corresponding CDS contract.

Examples

```
x <- data.frame(date = c(as.Date("2014-04-22"), as.Date("2014-04-22")),
  currency = c("USD", "EUR"),
  tenor = c(5, 5),
  spread = c(120, 110),
  coupon = c(100, 100),
  recovery = c(0.4, 0.4),
  notional = c(10000000, 10000000),
  stringsAsFactors = FALSE)
spread_DV01(x)
```

 spread_to_pd

Calculate Default Probability with Spread

Description

spread_to_pd approximates the default probability at time given the spread

Usage

```
spread_to_pd(  
  x,  
  recovery.var = "recovery",  
  currency.var = "currency",  
  tenor.var = "tenor",  
  maturity.var = "maturity",  
  date.var = "date",  
  spread.var = "spread"  
)
```

Arguments

x	data frame, contains all the relevant columns.
recovery.var	character, column in x containing recovery rates. ISDA model standard recovery rate assumption is 0.4.
currency.var	character, column in x containing currency.
tenor.var	character, column in x containing tenors.
maturity.var	character, column in x containing maturity date.
date.var	character, column in x containing date variable.
spread.var	character, column in x containing spread in basis points.

Value

vector containing the probability of default, calculated by using the formula for probability of default given in the Bloomberg Manual

See Also

[pd_to_spread](#)

spread_to_upfront	<i>Calculate Upfront Payments</i>
-------------------	-----------------------------------

Description

spread_to_upfront takes a dataframe of variables on CDSs to return a vector of upfront values. Note that all CDS in the data frame must be denominated in the same currency.

Usage

```
spread_to_upfront(
  x,
  currency.var = "currency",
  notional = 1e+07,
  date.var = "date",
  spread.var = "spread",
  coupon.var = "coupon",
  tenor.var = "tenor",
  maturity.var = "maturity",
  recovery.var = "recovery",
  isPriceClean = FALSE
)
```

Arguments

x	data frame, contains all the relevant columns.
currency.var	character, column in x containing currency.
notional	is the amount of the underlying asset on which the payments are based. Default is 10000000, i.e. 10MM.
date.var	character, column in x containing date variable.
spread.var	character, column in x containing spread in basis points.
coupon.var	character, column in x containing coupon rates in basis points. It specifies the payment amount from the protection buyer to the seller on an annual basis.
tenor.var	character, column in x containing tenors.
maturity.var	character, column in x containing maturity date.
recovery.var	character, column in x containing recovery rates. ISDA model standard recovery rate assumption is 0.4.
isPriceClean	refers to the type of upfront calculated. It is boolean. When TRUE, calculate principal only. When FALSE, calculate principal + accrual.

Value

vector of upfront values (with accrual) in the same order

summary

Summary Method

Description

summary method displays only the essential info about the CDS class object.

Usage

```
## S4 method for signature 'CDS'
summary(object, ...)
```

Arguments

object	the input CDS object
...	additional arguments to pass in

upfront_to_spread	<i>Calculate Spread with a Given Upfront</i>
-------------------	--

Description

upfront_to_spread calculates conventional spread using the upfront or ptsUpfront values.

Usage

```
upfront_to_spread(
  x,
  currency.var = "currency",
  date.var = "date",
  coupon.var = "coupon",
  tenor.var = "tenor",
  maturity.var = "maturity",
  recovery.var = "recovery",
  upfront.var = "upfront",
  points.var = "ptsUpfront",
  isPriceClean = FALSE,
  notional = 1e+07,
  payAccruedAtStart = FALSE,
  payAccruedOnDefault = TRUE
)
```

Arguments

x	data frame, contains all the relevant columns.
currency.var	character, column in x containing currency.
date.var	character, column in x containing date variable.
coupon.var	character, column in x containing coupon rates in basis points. It specifies the payment amount from the protection buyer to the seller on an annual basis.
tenor.var	character, column in x containing tenors.
maturity.var	character, column in x containing maturity date.
recovery.var	character, column in x containing recovery rates. ISDA model standard recovery rate assumption is 0.4.

<code>upfront.var</code>	is the character name of upfront column
<code>points.var</code>	character name of points Upfront column
<code>isPriceClean</code>	a boolean variable indicating whether the upfront is clean or dirty
<code>notional</code>	numeric variable indicating the notional value of the CDS contract
<code>payAccruedAtStart</code>	whether pay at start date the accrual amount
<code>payAccruedOnDefault</code>	whether pay in default scenario the accrual amount
<code>recovery</code>	numeric, the recovery rate for all pricing if there isn't a <code>recovery.var</code>

Value

a numeric indicating the spread.

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