

**Riksbanksfuture
in Quantlab**

<preliminary>

Algorithmica
Research AB

Introduction

This document is a short introduction on how to define and perform calculations of the new Riksbanksfuture (Riba-fut) in Database tool and Quantlab. All the procedures in this document explains a strictly temporary solution until a permanent and more user friendly solution is implemented. An important limitation of this temporary solution is that it is not possible to use the Riba-fut in curves for creating fit_results.

Database tool

All Riba-fut contracts as well as information about the repo rate fixings needs to be defined in the database via the application Database tool. Only the information relevant for the Riba-fut will be discussed here i.e. it is assumed that the reader have a general knowledge of Database tool.

Repo rates

The repo rate fixings are defined via the tag functionality in Database tool as seen in the dialog below. To access this dialog select the menu [Tables] and select [Tag...]. The tag table should be named 'repo_fixing' and have type number.

Tag

Tags:

- SYNT_CURVE
- alt_matur_code
- d_floating
- gics_code
- is_call
- isin
- isin_code
- option_strike
- rating
- rating_source
- repo_fixing
- reverse_ccy
- scale_ccy
- strike_order
- ul_matur_code
- valuation_curve

Current tag: repo_fixing

Tag type: number Key type:

Key	Value	From	To
1001	0.0425	11-Jun-08	18-Jun-08
1002	0.0425	18-Jun-08	25-Jun-08
1003	0.0425	25-Jun-08	02-Jul-08
1004	0.045	02-Jul-08	09-Jul-08
1005	0.045	09-Jul-08	16-Jul-08
1006	0.045	16-Jul-08	23-Jul-08
1007	0.045	23-Jul-08	30-Jul-08
1008	0.045	30-Jul-08	06-Aug-08
1009	0.045	06-Aug-08	13-Aug-08
1010	0.045	13-Aug-08	20-Aug-08
1011	0.045	20-Aug-08	27-Aug-08
1012	0.045	27-Aug-08	03-Sep-08
1013	0.0475	03-Sep-08	10-Sep-08

New tag... Delete Save

Fig.1 The Tag dialog

Column	Interpretation
Key	A number in consecutive order starting with 1001.
Value	The repo rate as a decimal number.
From	The announce date of the repo rate (normally one week before the start date of the repo period).
To	The start date of the repo rate (always a Wednesday).

All reporates are assumed to have a time to maturity of 7 days and consequently the end date is not necessary to define explicitly. The list of [From]-dates are should always be a consecutive list of dates 7 days apart. Note that the column names, From and To, are somewhat misleading.

Instruments

The Riba-fut is defined in the database as an instrument of type FRA. It is recommended to create an instrument class on which new instruments are based. In the example below we have created a class called 'SEK RIBAFUT' and the instrument names follows the format SEKRibaMMYY.

The screenshot shows the 'Instrument class' dialog box. The left pane has tabs for 'Index', 'Search', and 'Advanced'. The 'Index' tab is active, showing a list of instrument types. 'SEK RIBAFUT' is selected. The right pane shows the configuration for the 'SEK RIBAFUT' class. The 'Current instrument class' is 'SEK RIBAFUT' with ID #309. The 'General' tab is active. The 'Long name' field is empty. The 'Class' field is empty. The 'Type' is 'FRA'. The 'Issue date' is empty. The 'First coupon date' is empty. The 'Maturity' is 'Date'. The 'Settle' is 'Date'. The 'Coupon' is empty. The 'Ex-coupon code' is empty. The 'Face amount' is '100'. The 'Currency' is 'SEK'. The 'Issuer' is 'OM'. The 'Market' is 'SWEDEN'. The 'Calc type' is 'DEPD'. The 'Quote style' is 'Yield'. The 'Accrued day-count method' is 'ACT360'. The 'Coupon freq' is empty. The 'Code' is 'BD1'. The 'Edit...' button is next to the 'Code' field. The 'New class' and 'Delete' buttons are at the bottom left. The 'Undo' and 'Save' buttons are at the bottom right. A note at the bottom left says '* required field for Instrument'.

Instrument type	Issuer
All types	All issuers

Type keywords: SEK RIBAFUT

- PLN SWAP Dupli
- SEK DEPD
- SEK FRA
- SEK FRN
- SEK IMM FRA
- SEK RIBAFUT**
- SEK SWAP
- SWAPTIONS VOLA
- SWEDEN CORP CERT
- SWEDEN GOVERNMENT BILL
- SWEDEN GOVERNMENT BOND
- SWEDEN GOVERNMENT BOND ODD
- SWEDEN INFLATION-LINKED ZERO
- SWEDEN OMr FUTURE
- SWEDEN OMvx FUTURE
- UK GILT
- UK GILT OLD
- UK GOVERNMENT BILL
- UK INFLATION-LINKED BOND
- UK INFLATION-LINKED BOND 3M
- US AGENCY BOND
- US CORPORATE BOND

New class Delete

Current instrument class: *
SEK RIBAFUT
ID #309

General Extended Special FRN Rating adj. Tag

Long name:

Class: Type: * FRA

Issue date: First coupon date:

Maturity * Settle *

☒ Date

☐ Code Edit...

Coupon: % Coupon freq:

Ex-coupon code: Edit... Accrued day-count method: * ACT360

Face amount: 100 Issued amount:

Currency: SEK

Issuer: * OM Market: SWEDEN

Calc type: * DEPD Quote style: * Yield

* required field for Instrument

Undo Save

Fig 2. The instrument class dialog

The screenshot shows the 'Instrument' dialog box. On the left, there's a list of instrument types under 'Type keywords:'. The selected type is 'SEKRibaSep08'. On the right, the 'Current instrument: *' is 'SEKRibaSep08' with ID #32454. The 'General' tab is active, showing fields for 'Long name' (SEKRIBAU8), 'Class' (SEK RIBAFUT), 'Type: *' (FRA), 'Issue date' (18-Jun-08), 'First coupon date' (empty), 'Maturity *' (Date: 17-Sep-08), 'Settle *' (empty), 'Coupon' (0 %), 'Coupon freq' (empty), 'Ex-coupon code' (empty), 'Accrued day-count method: *' (ACT360), 'Face amount' (100), 'Issued amount' (empty), 'Currency' (SEK), 'Issuer: *' (DM), 'Market' (SWEDEN), 'Calc type: *' (DEPO), and 'Quote style: *' (Yield). There are buttons for 'New instrument...', 'Delete', 'Check quotes...', 'Undo', and 'Save'.

Fig3. The instrument dialog.

The fields below needs to be filled in exactly as specified for the instrument to calculate properly.

Column	Interpretation
Issue date	Start date (imm-date)
Maturity	End date (imm-date)
Settle Code	BD1 = 1 banking day
Accrued day count method	Act360
Calc type	Depo
Quote style	Yield

To setup the realtime links use the tab Realtime link. This tab works the same as for other instruments and it will not be discussed here.

Quantlab

When the appropriate dll is added to the Quantlab application the following functions will be available. See the accompanying workspace for more details on how they are used.

Instrument functions		Comment
issue_date	member function to instrument object	returns the start date of the imm-period.
maturity	member function to instrument object	returns the end date of the imm-period.
riba_settle_date	member function to instrument object	returns the settlement date i.e. 1 business day after trade date.
yield	member function to instrument object	returns the futures rate.
riba_price	member function to instrument object	a simple price function where price is defined as $100 - \text{futures rate} * 100$.
riba_pv	member function to instrument object	a simple present value calculated as the undiscounted difference between the market rate and contract rate appropriately scaled by the period and the nominal amount.
riba_pv_curve	member function to instrument object	a present value calculated as the undiscounted difference between the implied futures rate (calculated from the fit_result) and contract rate appropriately scaled by the period and the nominal amount.
riba_pvbp	member function to instrument object	pvpbp calculated as the undiscounted value of a basis point shift of the futures rate (risk_shift). This value is constant during the whole life of the contract.
riba_pvbp_curve	member function to instrument object	pvpbp calculated as the undiscounted difference between the implied futures rate (from a fit_result) and a “shifted” implied futures rate. The “shifted” implied futures rate is calculated by perturbing all unfixed weekly repo rates by the value entered as risk_shift. This value will decrease in value when we’re approaching maturity and the settlement date is within the imm-period.
riba_pvbp_implied	member function to instrument object	pvpbp calculated as the undiscounted difference between the market futures rate and a “shifted” futures rate. The “shifted” futures rate is calculated by perturbing the implied rate for the unfixed portion of the imm-period by the value entered as risk_shift. The implied rate is a simple Act360 rate. This value will decrease in value when we’re

		approaching maturity and the settlement date is within the imm-period.
riba_implied_curve_rate	member function to instrument object	calculates the implied rate for the non-fixed portion of the imm-period. The rate is a simple Act360 rate.
riba_implied_rate	member function to instrument object	the implied futures rate calculated from a fit_result.
riba_implied_rate_risk	member function to instrument object	the implied futures rate calculated from a perturbed fit_result. The perturbation is calculated by shifting all unfixed weekly repo rates by the value entered as risk_shift.
riba_repodata	member function to instrument object	returns the repo rates and the start and end dates for all repo periods. The unfixed repo rates are calculated from the fit_result.
riba_repodates	member function to instrument object	returns the start and end dates for all repo periods.

In addition to the instrument functions a function for converting a repo rate scenario to a discount function (fit_result) is available.

create_df_from_on	Finlib function	this function creates a fit_result from a scenario of overnight repo rates that can be used in some of the functions above.
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An example of a O/N rate scenario:

Start date	O/N rate	Spread
16-Jul-08	0.0300	0.001
23-Jul-08	0.0325	0.0015
20-Aug-08	0.0350	0.0010
10-Sep-08	0.0375	0.0010
16-Jul-09	0.0375	0.0010

Each O/N Rate is valid up to (but excluding) the next start date. The rate used is the O/N Rate plus the spread. Any number of rows can be defined. Note that all rates and spreads are input in decimal form.

This will result in the following overnight rate scenario

Start date	End date	O/N rate	Discount function (as of end date)
16-Jul-08	17-Jul-08	0.0310	0.999913896
17-Jul-08	18-Jul-08	0.0310	0.999827800
18-Jul-08	21-Jul-08	0.0310	0.999569578
21-Jul-08	22-Jul-08	0.0310	0.999483511
22-Jul-08	23-Jul-08	0.0310	0.999397452
23-Jul-08	24-Jul-08	0.0340	0.999303073
24-Jul-08	25-Jul-08	0.0340	0.999208704
25-Jul-08	28-Jul-08	0.0340	0.998925675
...			
16-Jul-09	17-Jul-09	0.0385	0.962235628

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