



EIOPA-RFR-19/002
7 October 2019

User's Manual

Risk Free Rate monthly production process

Introduction

Scope

This manual outlines the main steps of the RFR production process. The parallel production process is based on the attached RFR coding version 07_10_2019 and is currently carried out by EIOPA on a monthly basis.

Purpose

To explain the steps which are performed for the RFR monthly calculation.

Steps

Step	DESCRIPTION
1	Download Transition Matrices market data from Capital IQ™ CreditPro®
2	Request market data and import to MATLAB
3	Verify currency specific adjustments
4	Batch RFR History
5	Running calculations
6	Analyse the results and generate reports

Step 1 - Download Transition Matrices market data from S&P Capital IQ™ CreditPro®

Description

This step refers to the download of transition matrices using Standard & Poor's S&P Capital IQ™ CreditPro® database (credit risk analyses tool). This information is used for PD (probability of default) and CoD (cost of downgrade) calculations.

The download from the above application should be carried out using .xls file(s). The subfolder VA in the folder for data includes the structure of transitional matrices for financials and non-financials.

Step 2 – Request market data and import to MATLAB

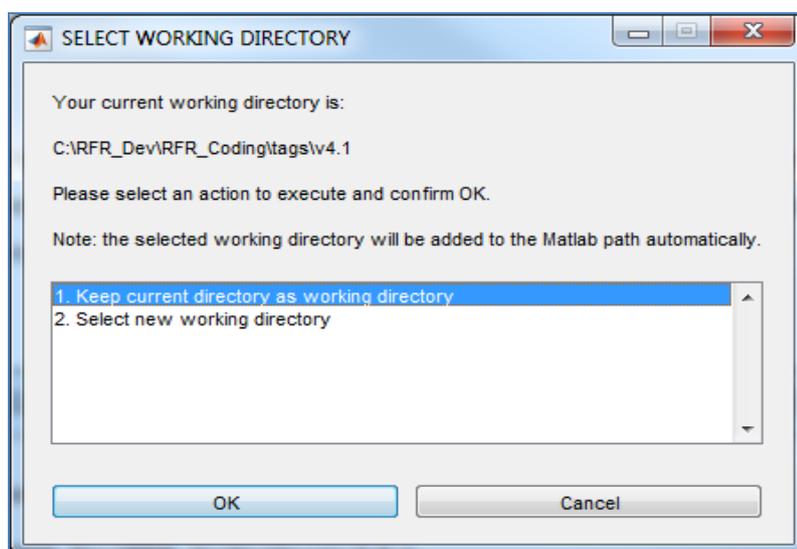
2.2. Summary

This step refers to the request of necessary input data from Refinitv, IHS Markit and ECB

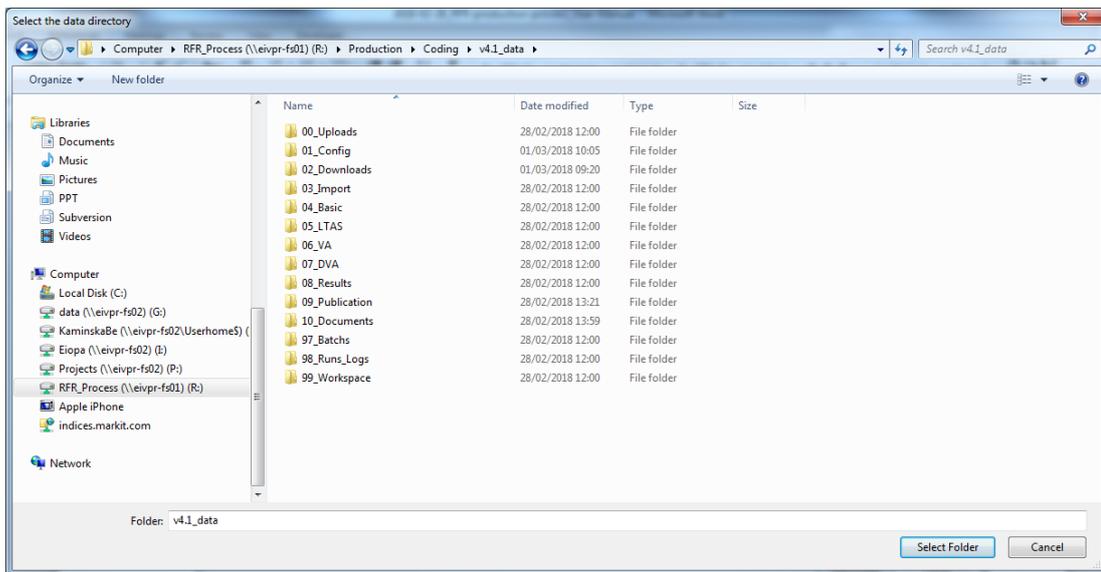
2.2. Actions

1. Start the RFR software by entering "RFR" in the MATLAB Command Window. If the current working directory points to the correct code version (RFR_coding), press the "OK" button. Otherwise, select option 2, press the "OK" button and continue accordingly.

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2. In the next dialogue window, Select the correct location of the data directory by confirming with the "Select Folder" button:



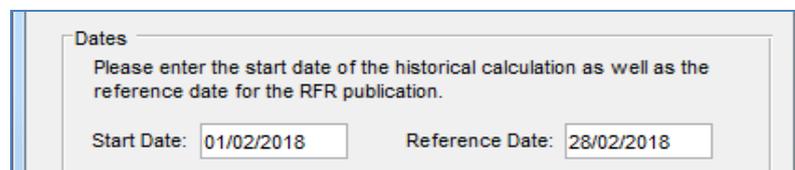
3. In the Main Menu window, verify that the code and data directories are pointing to the correct paths. In addition, check the GUI for the “Last imported date” and “Last historical RFR” fields refer to the month-end reference date of the previous RFR production process:

**



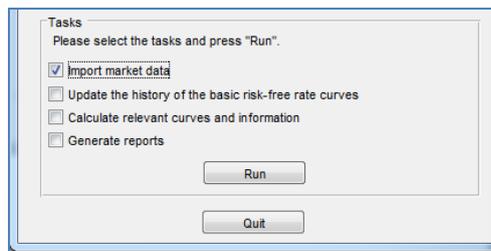
4. Then, verify and correct if necessary the “Start Date” and “Reference Date” fields so that they would correctly refer to relevant month’s start and end dates:

**



5. Finally, select the first task **“Import market data”** and press the **“Run”** button in order to obtain market data from external providers:

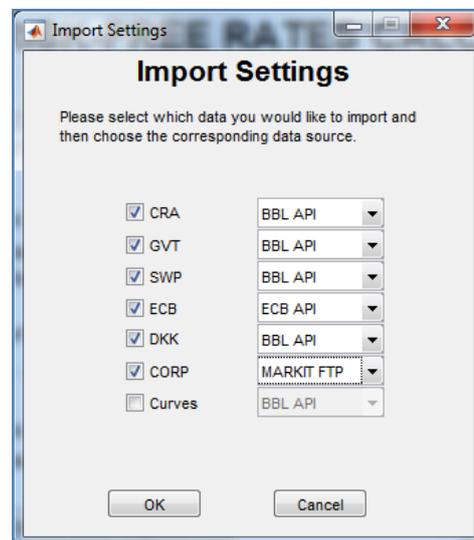
**



6. In the next dialogue window, select the data to import and choose the corresponding data sources. For the monthly RFR production process those are:
- CRA, GVT, SWP and DKK market data from Refinitiv using DSS API
 - ECB government bonds data using ECB API
 - CORP corporate iBoxx indices data from IHS Markit using MARKIT FTP.

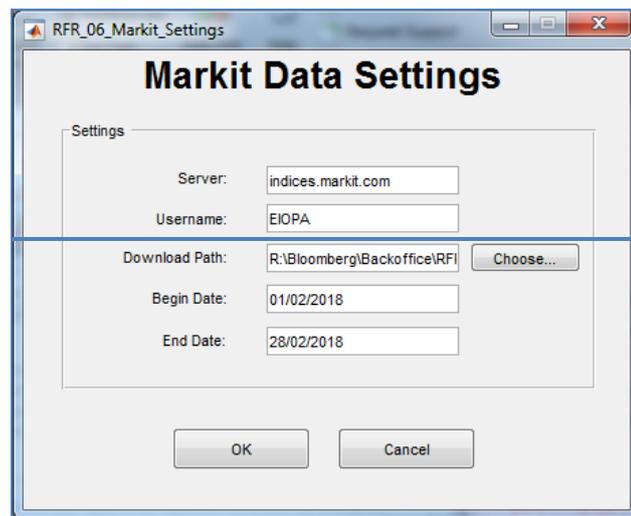
Afterwards, **press the "OK" button.**

**



7. **Import of Markit data is fully automated.** However, if an older version of the code is used a pop-window may show-up where connection details would need to be inserted, download path verified and begin (=start) and end dates inserted:

**



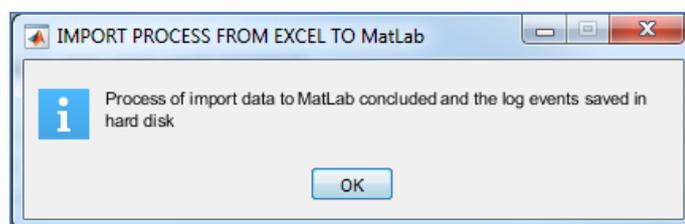
For this download, we are following Markit iBoxx FTP Guide available at:

<http://www.markit.com/Company/Files/DownloadFiles?CMSID=b654cb678f1c41ea882a28635781c184>

8. **ECB data import** is also fully automated. In case it is not possible to obtain the data, immediately contact the RFR Production PM.

After the import is finished a following message shows up:

**



9. **Analyse the imported data via internal controls file and visual checks of Excel files** located in the Data directory by checking for completeness, repetitions and number of outliers:
- **03_Import\ RFR_Downloads_controls.** Here carry out three internal controls with regard to SWP, GOV and CORP market data:
 - Control 1.- Dates without market rates i.e. no. of dates with no market data during last 28 calendar days previous to calculation date
 - Control 2.- Days with same market rates as previous i.e. no. of dates with the same market rates as the previous date (during last 28 calendar days previous to calculation date)
 - Control 3.- Maximum number of outliers i.e. no. of differences out of 3 IQR from the first and third quartile (during last 28 calendar days previous to the calculation date)
 - **02_Downloads\ Download_basic_Govts, Swaps, CRA; ECB_data, DKK_Nykredits_index.** During this visual check whether there is any missing data at the last date of the month and if so record such instances.

10. Check the "Log" csv file located in the Data directory \98_Runs_Logs for any errors and warnings. If such occur, investigate and record. Some typical warnings that should not hold the production would be e.g. include different hash values for some files which could be often explained by code improvements or methodological changes. In case of errors those need to be thoroughly investigated as in theory there should not be any.

Step 3 - Verify currency specific adjustments

3.1. Summary

This step describes the way to for introduce specific adjustments to the Icelandic Krona (ISK) sovereign curve. Minor adjustments need to be manually introduced in ML every month during the production phase.

For it you should follow the next steps in summary:

- a) obtain ISK GOV market data
- b) manually incorporate the obtained and interpolated values in the ML data file.

3.2. Actions

1. Obtain Icelandic government curve (I328 CMPL Index) rates for 2, 4, 6, 8 and 10y
2. In case of not obtaining all these maturities, calculate the missing values via interpolation (according to the RFR Technical Documentation)
3. Insert all rates directly in the 02_Downloads data directory under: "RFR_download_BBL_Mid.ISK_RAW_GVT_BBL" of RFR_basic_curves.mat:

**

	1	2	3	4	5	6	7	8	9	10	11
4994	737113	0	0	0	0	0	0	0	0	0	0
4995	737114	0	0	0	0	0	0	0	0	0	0
4996	737117	0	0	0	0	0	0	0	0	0	0
4997	737118	0	0	0	0	0	0	0	0	0	0
4998	737119	0	4.7400	4.8250	4.9100	4.9400	4.9700	5	5.0470	5.0930	5.1400
4999											
5000											
5001											
5002											

4. Remember to save the changes in the data directory

Step 4 - Batch RFR History

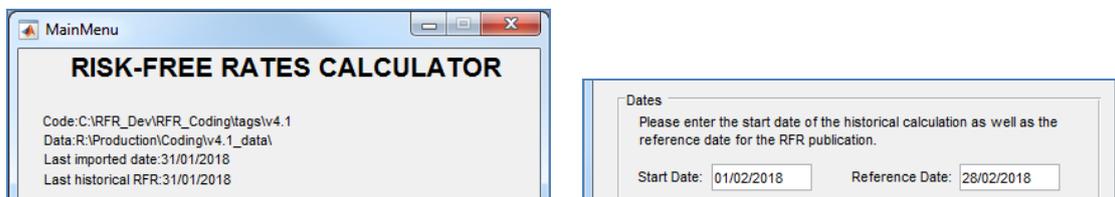
4.1. Summary

This step is designed to ensure that the historical database of basic risk-free rates is updated by calculating the basic risk-free rates for all newly added dates of a relevant month.

4.2. Actions

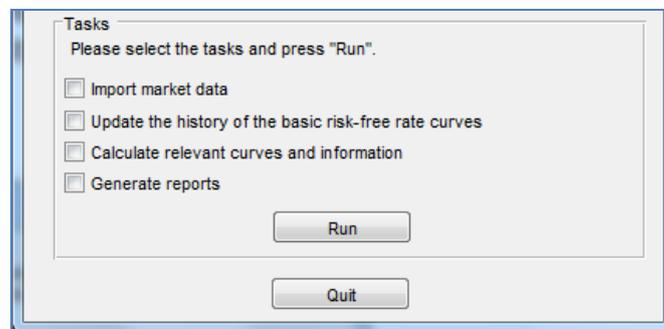
1. As in step 2: **type RFR** in the "Command Window" in MATLAB, **select the correct code and data directories, check that the last imported date and the last RFR calculation date** are correct and **ensure the Start and Reference Dates** are referring to the relevant production month:

**



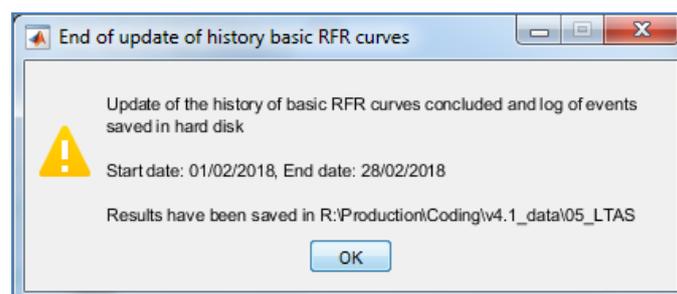
2. Select the second task "Update the history of the basic risk-free rate curves" and press the "Run" button:

**



After the history batch is finished the following pop-up window shows up:

**



3. Press the "OK" button and **Check the "Log" csv file located in \98_Runs_Logs data directory** to see whether the update of the history of basic RFR curves was concluded without any warnings or errors and if there are any: analyse, validate and provide a brief summary in the "Comments" section of the RFR WF. Typical warnings during this step may refer to e.g. ISK GVT missing data points which are to be expected considering limited market data inputs.

Step 5 - Running calculations

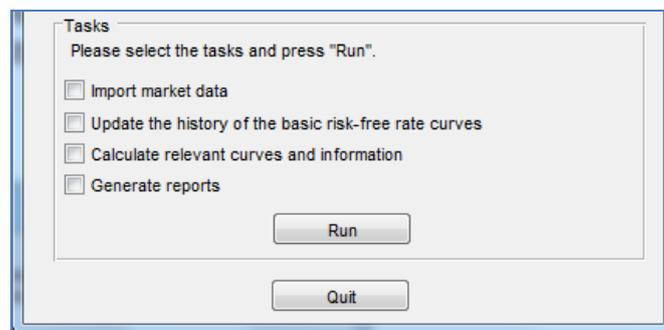
5.1. Summary

During this step calculations of the basic RFR, volatility adjustments and relevant info for matching adjustment are performed. This is the most important step resulting in several Excel output files incl. files for publication on EIOPA's website.

5.2. Actions

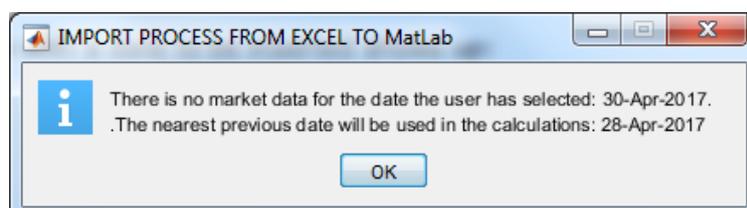
0. As in steps 2 and 4: **type RFR** in the "Command Window" in MATLAB, **select correct code and data directories**, **check** that the **last imported date and the last RFR calculation date** are correct and **ensure the Start and Reference Dates** are referring to the relevant production month.
1. **Select** the third **task "Calculate relevant curves and information"** and **press the "Run" button**:

**



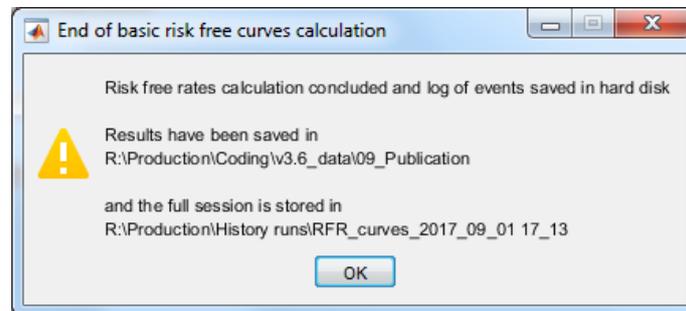
In case there is no market data at a selected reference date the nearest previous date will be used and a pop-window (as below) will show up:

**



2. **Press the "OK" button.** After the RFR calculations is finished a pop-up window will show up informing about this and where the History Run back-up session is stored:

**



3. **Check** whether the following files are produced:
 - Module 06_VA Four .xls testing files;
 - Module 08_Results .xls Validation file and COM report;
 - Module 09_Publication four .xls files for publication on EIOPA's website;
4. **Check the "Log" csv file** located in \98_Runs_Logs data directory to see whether the update of the history of basic RFR curves was concluded without any warnings or errors. Typical warnings during this step may refer to e.g. ISK GVT missing data points which are to be expected considering limited market data inputs.

Step 6 – Analyse the results and generate reports

6.1. Summary

During this step the results calculated in step 5 are being analysed by i.a. using specifically generated reports in MATLAB.

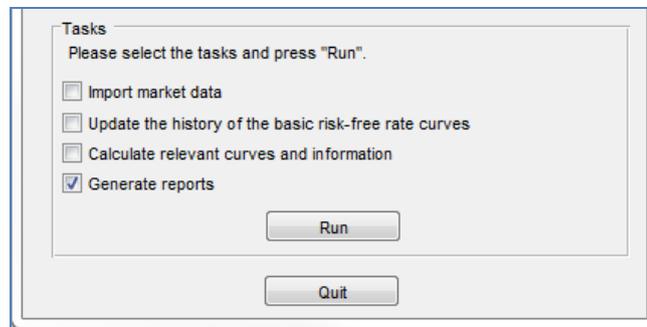
6.2. Actions

0. **Check the "Log" csv file** (\98_Runs_Logs) for any warnings or errors and in case there are any. If there are none, the validation of the difference between calculated rates and input rates for DLT points was finished without any findings.
1. "RFR_validation_file" (\08_Results) can be used to further investigate the results. **Go to tab "Chart_single"** where you can **verify** that **cell D11** (convergence criteria) and that **column F** (liquid part of the curve) are valid (green) for several currencies (cell B7). For that, you need to **select "spot_rates" and "rates_net_CRA" in cells C3 and D3**. In case some cells are red, use again the S-W tool to perform further validation:

	A	B	C	D	E
2					
3		Spot_rates	Rates_net_CRA		
4					
5		Spot_rates	Rates_net_CRA	DLTIB10	
6					
7		Euro			
8					
9		GVT?		FALSE	
10		Convergence year:		60	
11		Convergence criteria:		0.075%	
12					
13			1		Validation of the SW liquid part
14		0	0.06%	0.06%	0.00%
15		1	0.06%	0.06%	0.00%
16		2	0.08%	0.08%	0.00%
17		3	0.12%	0.12%	0.00%
18		4	0.18%	0.18%	0.00%
19		5	0.26%	0.26%	0.00%
20		6	0.34%	0.34%	0.00%
21		7	0.43%	0.43%	0.00%
22		8	0.53%	0.52%	0.00%
23		9	0.63%	0.62%	0.01%

2. As in previous steps (2, 4 and 5) **run the RFR software again** and this time **select the last fourth task from the menu "Generate reports"** and **press the "Run" button**:

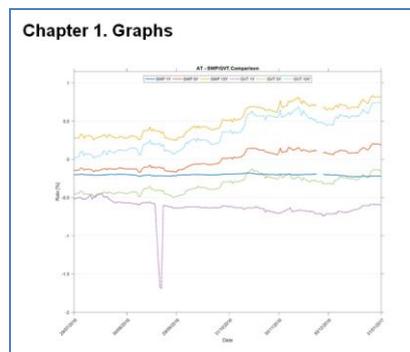
**



3. **Analyse three internal output validation files** located in the directory "10_Documents":

- "Technical_Notesyyyyymmdd_HHMM.docx"
- "GVT_SWP_Comparison.docx"
- "ResultOverview_yyyymmdd_HHMM.docx".

Those files show i.a. the evolution of the risk-free rate term structures; the components of the Volatility Adjustment (VA) as well as the development of the zero coupon bond (GVT) and swap (SWP) rates:



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