The UnRisk PRICING ENGINE for *Mathematica* Release Notes Version 2.2 (July 2005)

1. Introduction

This document gives an overview of the changes in the UnRisk PRICING ENGINE for *Mathematica* from Version 2.1 to Version 2.2

See the following sections for a detailed overview.

For installing the software (new installation or update form an older version), follow the steps in the installation instructions.

The documentation of Version 2.2 of the UnRisk PRICING ENGINE can be found online in the *Mathematica* Help Browser, or in the files contained in **UnRiskPE22Docu.zip**.

2. New Utilities

2.1. Digital Range Accrual Schedules

In Version 2.2 of the UnRisk PRICING ENGINE we introduce Digital Range Accrual Schedules, which allow to construct callable / putable digital range accruals - i.e. financial instruments with coupons depending on the number of business days at which a certain rate (like the EURIBOR6m or the CMS10y) lies in a given interval.

For details see **section 4.6** in **Chapter4_Version2_2.pdf** in **UnRiskPE22Docu.zip**.

2.2. Digital Spread Range Accrual Schedules

In Version 2.2 of the UnRisk PRICING ENGINE we introduce Digital Spread Range Accrual Schedules, which allow to construct callable / putable digital spread range accruals - i.e. financial instruments with coupons depending on the number of business days at which a certain spread (like CMS10y minus CMS2y) lies in a given interval.

For details see **section 4.6** in **Chapter4_Version2_2.pdf** in **UnRiskPE22Docu.zip**.

2.3. General Steepener Type 2 Schedules

In Version 2.2 of the UnRisk PRICING ENGINE we introduce General Steepener Type 2 Schedules, which allow to construct callable / putable general steepeners type 2 - i.e. financial instruments with coupons which are defined as follows: if a certain condition, which depends on two reference rates (like CMS10y minus CMS2y greater than 0.5%), is fulfilled at the corresponding coupon set date, then the coupon is defined by function F1, otherwise it is defined by function F2. Both functions, F1 and F2, may also depend on the same two reference rates.

For details see **section 4.6** in **Chapter4_Version2_2.pdf** in **UnRiskPE22Docu.zip**.

2.4. New Function for the Calibration of a Generalized Hull & White Model

In Version 2.2 of the UnRisk PRICING ENGINE we introduce a new function, which calibrates the deterministic drifts and the volatilities of a generalized 1 factor Hull & White model according to a given constant mean reversion speed, Black76 volatilities of swaptions or swaptions and caps and according to a given interest rate curve.

For details see **section 4.11** in **Chapter4_Version2_2.pdf** in **UnRiskPE22Docu.zip**.

3. New Features

3.1. Swaption Expiries may also be given in Months

In Version 2.1 of the UnRisk PRICING ENGINE it was just possible to calibrate a generalized Hull & White model according to swaptions with expiry dates, which were given as the difference in years (integer) from the reference date. In version 2.2 we introduce the possibility to enter these dates as differences in years AND months.

For details see **section 4.11** in **Chapter4_Version2_2.pdf** in **UnRiskPE22Docu.zip**.

3.2. Known Rates may also be given as 2 Dimensional Ranges

In Version 2.1 of the UnRisk PRICING ENGINE it has just been possible to enter the next known rates (i.e. the coupons which are already known at the valuation date) of floating instruments in one dimensional ranges in Excel, which always had to be readjusted as soon as a coupon date or a coupon fixing date has been reached. In Version 2.2 we introduce the possibility to enter these known rates in two dimensional ranges containing the coupon dates and the corresponding known rates - if a coupon rate is not known at the valuation date the user has to enter an N in the corresponding coupon rate field. So the number of rows of this range has not to be changed any more.

For details see the sections on floating instruments in **UnRiskPE22Docu.zip**.

3.3. Redesign of the Excel Template Structure

In Version 2.2 of the UnRisk PRICING ENGINE the structure of the UnRisk_for_Excel \ Examples directory has changed. The templates are linked to a file called MarketData.xls. The user may enter the actual market data into this workbook and may perform mark-to-market valuations immediately.

For details see **Chapter10_Version2_2.pdf** in **UnRiskPE22Docu.zip**.

3.4. Next Known Rates may also be Negative

In Version 2.1 of the UnRisk PRICING ENGINE it has just been possible to enter no-negative next known rates (i.e. coupons which are already known at the valuation date) of floating instruments. Version 2.2 allows now also the input of negative next known rates.

For details see the sections on floating instruments in **UnRiskPE22Docu.zip**.

3.5. Correlations of a Hull & White 2 factor model may also be -1 and +1

In Version 2.1 of the UnRisk PRICING ENGINE it has just been possible to enter correlations between the two factors of the Hull & White 2 factor model, which have been inside the interval]-1,1[. Version 2.2 allows now also the input of -1 and +1.

4. New Financial Instruments

4.1. Callable / Putable Digital Range Accruals

Version 2.2 of the UnRisk PRICING ENGINE allows the treatment of callable / putable digital range accruals, i.e. financial instruments which are callable and / or putable and which pay coupons depending on the number of business days at which a certain rate (like the EURIBOR6m or the CMS10y) lies in a given interval.

For details see **section 8.26** in **Chapter8_Version2_2.pdf** in **UnRiskPE22Docu.zip**.

4.2. Callable / Putable Digital Spread Range Accruals

Version 2.2 of the UnRisk PRICING ENGINE allows the treatment of callable / putable digital spread range accruals, i.e. financial instruments which are callable and / or putable and which pay coupons depending on the number of business days at which a certain spread (like CMS10y minus CMS2y) lies in a given interval.

For details see **section 9.13** in **Chapter9_Version2_2.pdf** in **UnRiskPE22Docu.zip**.

4.3. Callable / Putable General Steepeners of Type 2

Version 2.2 of the UnRisk PRICING ENGINE allows the treatment of callable / putable general steepeners of type 2, i.e. financial instruments which are callable and / or putable and which pay coupons which are defined as follows: if a certain condition, which depends on two reference rates (like CMS10y minus CMS2y greater than 0.5%), is fulfilled at the corresponding coupon set date, then the coupon is defined by function F1, otherwise it is defined by function F2. Both functions, F1 and F2, may also depend on the same two reference rates.

For details see **section 9.14** in **Chapter9_Version2_2.pdf** in **UnRiskPE22Docu.zip**.

4.4. Target Redemption Quantos

Version 2.2 of the UnRisk PRICING ENGINE allows the treatment of target redemption quanto, i.e. quantos which are automatically called as soon as the sum of the coupon rates reaches a certain level (the target level).

For details see **section 9.15** in **Chapter9_Version2_2.pdf** in **UnRiskPE22Docu.zip**.

4.5. Callable / Putable General Steepener Zeros

Version 2.2 of the UnRisk PRICING ENGINE allows the treatment of callable / putable general steepener zeros, i.e. callable / putable general steepeners which pay no coupons but with a nominal amount, which becomes

new nominal amount = old nominal amount * (1+coupon rate[i])

at the i-th coupon date. The coupon rate is generated in the same way as the coupon rate of a general steepener, e.g. , 3.5 * (CMS10y-CMS2y).

For details see **section 9.16** in **Chapter9_Version2_2.pdf** in **UnRiskPE22Docu.zip**.