

Insurers concerned by a possible revision of the Ultimate Forward Rate

In October 2015, European Insurance and Occupational Pensions Authority (EIOPA) announced that the methodology used to define very long-term rates was being re-examined.

However the current method, including the level of the Ultimate Forward Rate (UFR), will apply at least until the end of 2016. EIOPA has also said that the conclusions on this revision will be communicated in September 2016.

What role does the Ultimate Forward Rate play in Pillar 1 of Solvency II?

Insurers' commitments can be spread over several decades. In order to estimate the amount of commitments and to be able to assess the insurer's net assets in accordance with the Solvency II directive, these commitments must be discounted. The discount rates used therefore have a significant impact and to ensure consistent treatment in the different countries, EIOPA has defined a very precise method in order to establish a so-called **"basic risk-free" interest rate structure**¹. Moreover, at each month-end, EIOPA publishes this structure, in the form of a zero-coupon curve of maturities from 1 to 150 years for the different currencies.

Basic risk-free interest rates are derived from the prices of financial instruments traded in the markets, but for very long time horizons, there is not a sufficiently deep, liquid and transparent market to calculate the level of rates in an appropriate manner.

For example, for the euro, the **Last Liquid Point (LLP)** has been set by EIOPA at the 20-year swap.

For each currency, very long-term rates are defined using:

- the rates or prices of liquid market instruments whose maturity is less than the LLP (for the majority of currencies, it is 6-month against fixed-rate swaps, but for some currencies, in the absence of a sufficiently liquid swap market government bonds can be used),

- an ultimate forward rate, the UFR, and
- a convergence point, where instantaneous rates converge towards the UFR

The convergence point is a function of the currency and corresponds to the maximum between 60 years and the LLP + 40 years. For the euro, these two values are therefore identical and the UFR is positioned on 60 years. However, for the Pound Sterling, since the LLP is 50 years, convergence takes place on a time horizon of 90 years.

Swap rates must be adjusted to take account of the credit risk

The application regulations of Solvency II define this adjustment based on "the difference between the rates including the credit risk reflected in the variable rates of interest rate swap contracts and the rates of swap contracts indexed to the overnight rate with the same maturity."

This adjustment may be neither less than 10 basis points (bp), nor more than 35 bp. Accordingly, for the euro, the floor of 10 bp has always been applied in 2015.

The current UFR has been calibrated by EIOPA using a "standard" historical real rate and a target inflation rate that may vary according to the currency. For the euro, the UFR has been set at 4.2%, by adding the ECB's target inflation rate which is equal to 2% and the historical real rate adopted by EIOPA (2.2%).

EIOPA has chosen the so-called **Smith-Wilson method to extrapolate the rate levels beyond the LLP** and make interpolations for maturities that are less than the LLP, for which the market instruments (swaps or government bonds) used as reference products are considered to be insufficiently liquid.

On 27 October, EIOPA published an update of its methodology mentioning, for the different currencies, all the maturities currently considered to be liquid.

The Smith-Wilson method presents numerous advantages

This method is in the public domain and is simple to implement, since it is based on the analytical resolution of a system of linear equations. It can be used to carry out both interpolations and extrapolations and it is adapted to different forms of data: bonds with or without coupons, swap rates.

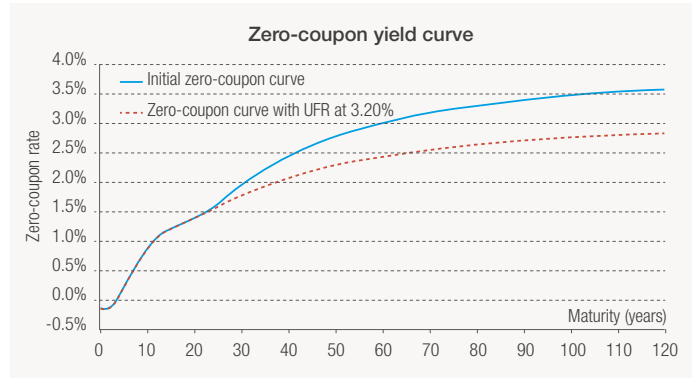
¹ In fact, prudential technical provisions are calculated with a risk-free yield curve to which a correction is applied for volatility. For each currency, this correction aims to reflect, in the valuation of commitments, part of the difference between the average rate of a reference portfolio assets (representative of insurers' investments) and the risk-free yield curve.

The main drawback of the Smith-Wilson method is that the UFR level has a significant impact for insurers with very long-term commitments.

The graph opposite illustrates the impact, on the euro zero-coupon yield curve, of a decline in the UFR from 4.2% to 3.2% (keeping identical rates up to the LLP).

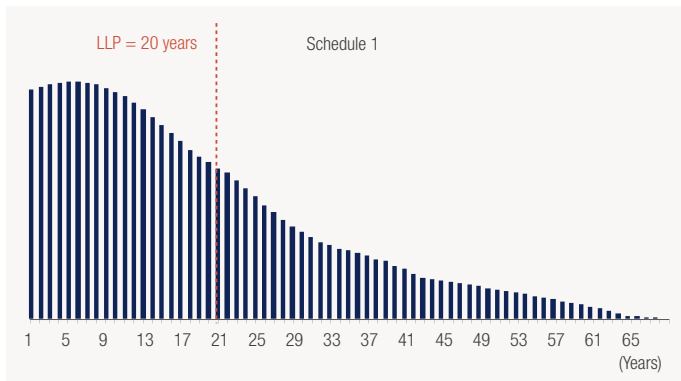
The UFR level has very little impact before the LLP due to the curve's construction method.

Since the method for setting the UFR is defined by EIOPA, it is not possible to hedge against the regulator's decision to change the UFR, with market products.



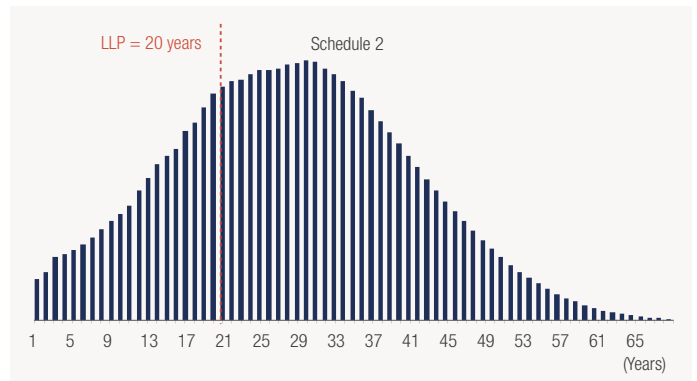
Source: EIOPA , Amundi

Examples of long-term liability schedules



For schedule 1, where half the duration derives from flows beyond the LLP, the present value of flows increases by 1.9% if the UFR declines from 4.2% to 3.2% with unchanged market conditions. However, the actual sensitivity to market rates with an unchanged UFR is lower at 12.7.

In both cases, the decline in the UFR implies an increase in the duration.



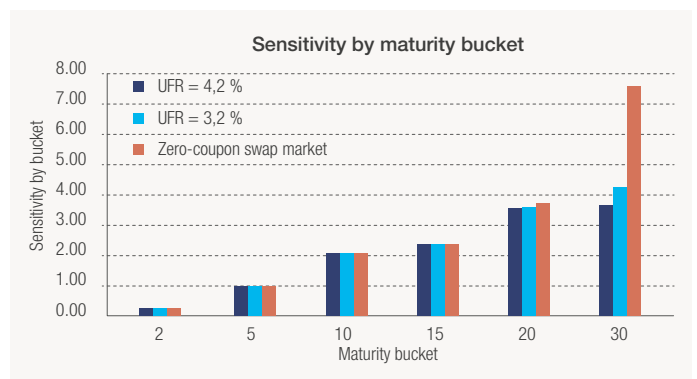
With schedule 2, whose relative share beyond the LLP is larger, the sensitivity to the UFR is 5.2% and the sensitivity to market rates is 19.4%, significantly lower than the duration.

	Schedule 1	Schedule 2
Duration (with UFR = 4.2%)	14.5	23.8
Sensitivity to rates	12.7%	19.4%
Sensitivity to the UFR	1.9%	5.2%
Duration (with UFR = 3.2%)	15.0	24.5

The Smith-Wilson method reduces the sensitivity of flows beyond the LLP.

The graph opposite illustrates the sensitivity of liability flows to a parallel movement in the market swap yield curve. We have compared 2 Smith-Wilson methods, one with UFR=4.2%, the other with UFR=3.2% and a traditional bootstrap method for the swap yield curve with linear interpolation of zero coupons. We have applied these 3 methods to schedule 1. In the bootstrap method, we include the euro 30-year swap.

We observe that on the tranches of maturities that are less than the LLP, the 3 methods provide identical results. However, flows beyond the LLP have a higher sensitivity using the bootstrap method for market rates than the sensitivity calculated by the Smith-Wilson method. Reducing the UFR is not sufficient to fill the gap. This can be explained by the fact that since the UFR is fixed, it does not generate any sensitivity to the market rate.



Source: EIOPA , Amundi

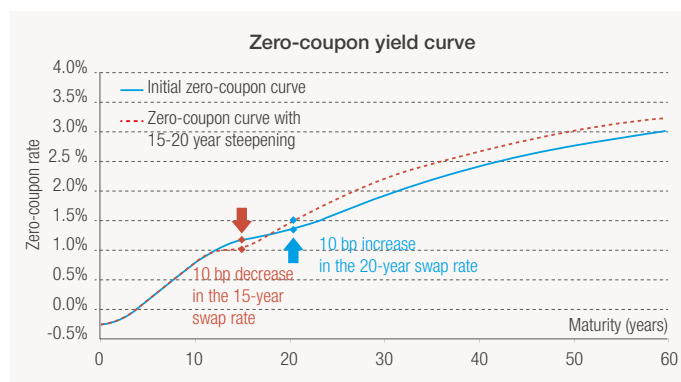
For the euro, the longest instruments used to supply the interpolation and extrapolation calculations according to the Smith-Wilson method are the 15-year swap and the 20-year swap. Because of the method used, the 15-20 year yield spread has a significant impact on the extrapolation of the curve beyond 20 years.

Accordingly, liabilities of more than 20 years prove to be very sensitive to the difference between the 15-year and 20-year swap rates (the last 2 swaps observed used).

In the example opposite, the structure of zero-coupon rates has been re-defined, after making two arbitrary modifications in the reference swap rates observed at end-October 2015:

- reduction of 10 basis points (bps) in the 15-year swap rate and
- increase of 10 bps in the 20-year swap rate.

In the rate structure re-calculated by applying the Smith-Wilson method to the references modified accordingly, the 30-year zero-coupon rate increases by 27 bps.



Source: EIOPA, Amundi

Principle of the Smith-Wilson method

- The Smith-Wilson zero-coupon function is a linear combination of N functions (called core functions), N being the number of instruments contained in the calibration basket. The calibration instruments must have a separate maturity as each of these core functions takes one of these maturities as a parameter.
- The other parameters are common to all the core functions and are the UFR and the Alpha convergence factor.
- For a given Alpha convergence factor, the N coefficients to be attributed to the N core functions are attributed so as to obtain exactly the prices of the N calibration instruments.
- Alpha must be defined outside the model. A high value (close to 1) gives more weight to the UFR whereas a low value (close to 0) gives more weight to the liquid maturities used. Alpha is calibrated using a recurring process, by initialising it at 0.05 and gradually increasing it so that the instantaneous forward rate at the point of convergence approaches the UFR by less than 1 bp.

Parameter for the euro

- N = 13
- Maturities: from 1 to 10 years, 12, 15 and 20 years
- Prices of the N calibration instruments = prices of the fixed legs of the 13 calibration swaps

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