Solvency II under review: Part 1

Extrapolation of the risk-free rate curve

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1.   Introduction

Solvency II came into force on 1 January 2016. The agreed Pillar 1 quantitative requirements set a market-consistent valuation framework for the valuation of assets and liabilities, as well as sufficient holdings of capital to withstand a combination of so-called '1-in-200-year' Standard Formula (SF) stresses. There is no doubt these fundamental principles are set in stone but nonetheless there have been ongoing changes to the detailed rules since their introduction. This was planned from the outset with certain powers given to the European Insurance and Occupational Pensions Authority (EIOPA) to review methodology and assumptions over time, as well as a specific milestone for the European Commission (EC) to review elements of the Standard Formula in 2018, followed by a more holistic review of the entire rulebook by 2021.

Any changes are intended to reflect developments in the insurance sector and the wider environment. This series of research papers charts some of the most material changes that have been made since the implementation of Solvency II as well as looking forward to potential changes that have already been highlighted by the EC and EIOPA. These changes could have significant impacts on individual companies and therefore firms may need to reassess their capital management strategies.

Our research seeks to assess the potential impact of the various changes on companies' capital positions across various European markets, and examine possible capital management solutions and strategic initiatives which could be adopted following the introduction of rule changes. Insights from this research should appeal to a broad range of undertakings across both direct-writing life insurers and life reinsurance business.

In this opening edition, we firstly revisit the rules in specifying the risk-free rate term structure, which forms a fundamental part of the calculation of Technical Provisions (TPs). We look in detail at changes to the Ultimate Forward Rate (UFR) in particular. In the second edition, we will look at another fundamental part of the specification of risk-free rates used in liability valuation, the Volatility Adjustment (VA). In the third and final edition, we will analyse elements of the Standard Formula review[1] that took place across 2018 with the EC publishing its final proposed amendments to the Delegated Regulations in November 2018. In March 2018 we issued a detailed briefing note[2] on EIOPA's advice provided to the EC as part of the 2018 review of the Delegated Regulations, much of which was taken onboard by the EC.

2.   Executive summary

The market-consistent valuation principle is fundamental to Solvency II. On this basis undertakings must value their liabilities using discount rates implied by market-based risk-free interest rates. Nonetheless, beyond a certain point (the 'last liquid point') the specification of the risk-free interest rate term structure is based on an extrapolation to an 'ultimate forward rate'.

EIOPA is charged with setting the risk-free interest rate term structure on an ongoing basis. The three main components of the extrapolation methodology are the last liquid point (LLP), the UFR and the speed of convergence to the UFR. Since the outset of Solvency II in 2016 for the euro currency, for example, the LLP has been set to a duration of 20 years, with convergence to an ultimate forward rate over the following 40 years.

For most currencies, the UFR reduced from 4.20% to 4.05% on 1 January 2018, and further reduced to 3.9% on 1 January 2019. If interest rates remain at their current levels for some time, then we could expect further decreases in the UFR over the coming years. For example, the UFR is likely to reduce to 3.75% in 2020 and 3.6% in 2021. These reductions in the UFR will have a material impact on the Solvency II balance sheets and capital positions of some companies.

With continued low long-term market interest rates further pressure is mounting to lower the impact of nonmarket elements in the risk-free interest rate term structure, i.e., to use discount rates more closely aligned to the underlying market-implied swap rates across the term structure. Consistent with such an approach, in the specification of EIOPA's 2018 Insurance Stress Test[3] exercise the UFR was set at 2.04%.

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[1] EIOPA. SCR Standard Formula Review. Retrieved 23 January 2019 from https://eiopa.europa.eu/regulation-supervision/insurance/scr-standard-formula-review.

[2] Milliman Briefing Note (March 2018). EIOPA Final Report on its second set of advice to the European Commission on the Solvency II Delegated Regulation. Retrieved 23 January 2019 from http://ie.milliman.com/uploadedFiles/insight/2018/EIOPA-Second-Set-Advice.pdf.

[3] EIOPA. Stress Test 2018. Retrieved 23 January 2019 from https://eiopa.europa.eu/Pages/Financial-stability-and-crisis-prevention/Stress-test-2018.aspx.

Additionally, the European Systemic Risk Board (ESRB) has called[4] for the following changes to be made for the euro currency:

- Increasing the last liquid point from 20 to 30 years.
- Extending the convergence period of the last liquid point to the ultimate forward rate from 40 years to 100 years.
- Blending the extrapolated part of the curve partly with market data.

Such changes would have a big financial effect on life insurance firms with exposure to long duration eurozone liabilities and make it more difficult for such firms to viably sell long-term insurance with guarantees at the market interest rate levels experienced in recent years.

We expect to see more attention being focussed by companies on such risks in their Own Risk and Solvency Assessments (ORSAs) and interactions with their supervisors.

On the other hand, such changes may bring about an increased focus on use of the VA and Matching Adjustment (MA) measures. Furthermore, for firms following asset-liability hedging strategies a move to a more market-consistent solvency valuation basis will also likely reduce some misalignment between their solvency reporting and other financial reporting accounting bases such as International Financial Reporting Standards (IFRS).

As extrapolation is a core component of the specification of the TPs methodology, it is not possible to directly observe the impact of extrapolation from public QRTs and SFCRs. As a result EIOPA has made specific information requests to firms to provide estimates of their TPs under differing calibrations of the extrapolation approach. We expect this area to become more of a point of focus, with the possibility that EIOPA may require firms to publish the impact of extrapolation on a regular basis.

The private Regular Supervisory Report (RSR) is already required to report on the assessment of the sensitivity of a firm's TPs and Own Funds to the extrapolation of the risk-free interest rate term structure. As part of its 2018 LTG Report EIOPA made an assessment in relation to the quality of RSRs concluding that there was room for improvement in relation to the level of detail presented by firms.

Overall, we expect that the area of extrapolation will be a key point of focus in the EC's Solvency II review by 2021.

# 3.   Recap on the Solvency II balance sheet

This section provides a brief overview of the Solvency II balance sheet.

Assets on the Solvency II balance sheet are generally based on market value.

On the liability side of the balance sheet TPs are broken down into Best Estimate Liabilities (BELs) plus the Risk Margin (RM). These elements have already been the focus of review to some extent since the introduction of Solvency II from 1 January 2016.

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[4] ESRB (August 2017). Regulatory Risk-Free Yield Curve Properties and Macroprudential Consequences. Retrieved 23 September 2018 from https://www.esrb.europa.eu/pub/pdf/reports/esrb.reports170817_regulatoryriskfreeyieltcurveproperties.en.pdf.

FIGURE 1: COMPONENTS OF PILLAR 1 REQUIREMENTS
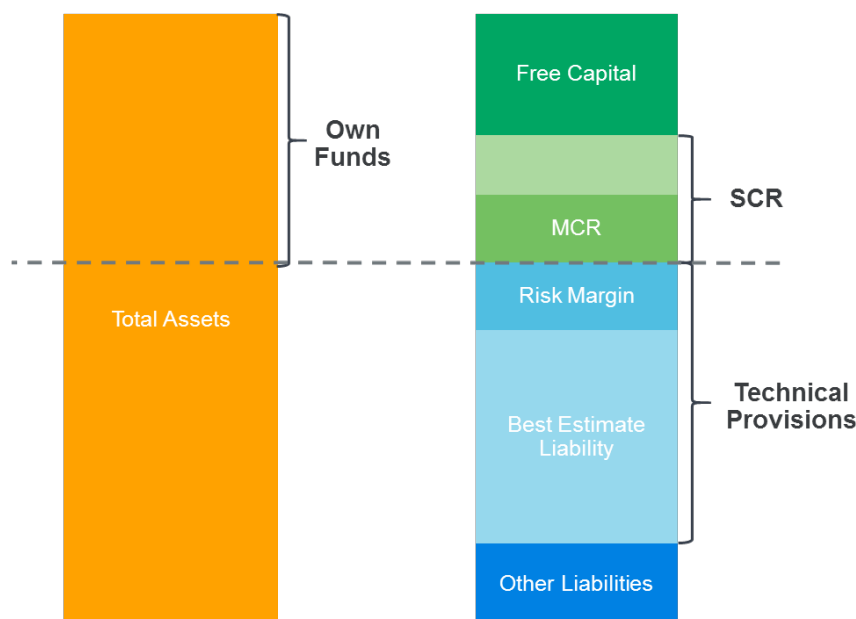
To date the primary component of the TPs that has undergone some change or review is the risk-free interest rate term structure specification, including the UFR and VA. The cost of capital inherent in the RM was also considered by EIOPA in its February 2018 advice[5] to the EC but it decided to advise maintaining the existing 6% cost of capital rate. Other components of the TPs calculation are not up for review until 2020, e.g., simplifications, approach to setting best estimate assumptions, contract boundaries, management actions etc.

As regards the EC's review of the SCR in 2018, EIOPA undertook a widespread examination of elements in response to the EC's requests for advice. We cover this aspect in detail from a quantitative perspective in a later edition of this series of research papers, which follows on from the general overview set out in our March 2018 briefing note referenced above.

4.   The risk-free interest rate term structure and extrapolation

The 2009 Solvency II Directive[6] specified that the TPs should be calculated using a risk-free interest rate term structure.

The 2014 Omnibus II Directive[7] went on to further specify that the risk-free interest rate term structure should be extrapolated beyond the point where relevant financial instruments are deemed to be insufficiently deep, liquid and transparent (the last liquid point or LLP). This directive also introduced the concept of the UFR, and the VA and MA.

A different term structure is determined for each currency using interest rate swaps (or government bonds where necessary) for that currency adjusted for credit risk.

EIOPA was charged with the detailed specifications of such arrangements on an ongoing basis. EIOPA set out its latest approach[8] to all elements of the risk-free interest rate term structure in August 2018.

The chart in Figure 2 illustrates the components of the EIOPA curve starting from purely market rates, then a deduction for credit risk—a Credit Risk Adjustment (CRA) of 10 basis points (bps) is assumed in this example— then the extrapolation of the curve from an assumed LLP of 20 years to a UFR of 4.2% at a duration of 60 years and finally the inclusion of a VA of 40 bps.

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[5] EIOPA (28 February 2018). EIOPA's Second Set of Advice to the European Commission on Specific Items in the Solvency II Delegated Regulation. Retrieved 23 January 2019 from https://eiopa.europa.eu/Publications/Consultations/EIOPA-18-075-EIOPA_Second_set_of_Advice_on_SII_DR_Review.pdf.

[6] The full 2009 Solvency II Directive is available at https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:335:0001:0155:en:PDF.

[7] The full 2014 Omnibus II Directive is available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0051&from=EN.

[8] EIOPA (14 August 2018). Technical Documentation of the Methodology to Derive EIOPA's Risk-Free Interest Rate Term Structures. Retrieved 23 January 2019 from https://eiopa.europa.eu/Publications/Standards/20180813_Technical%20Documentation%20%28RP%20methodology%20update%29.pdf.
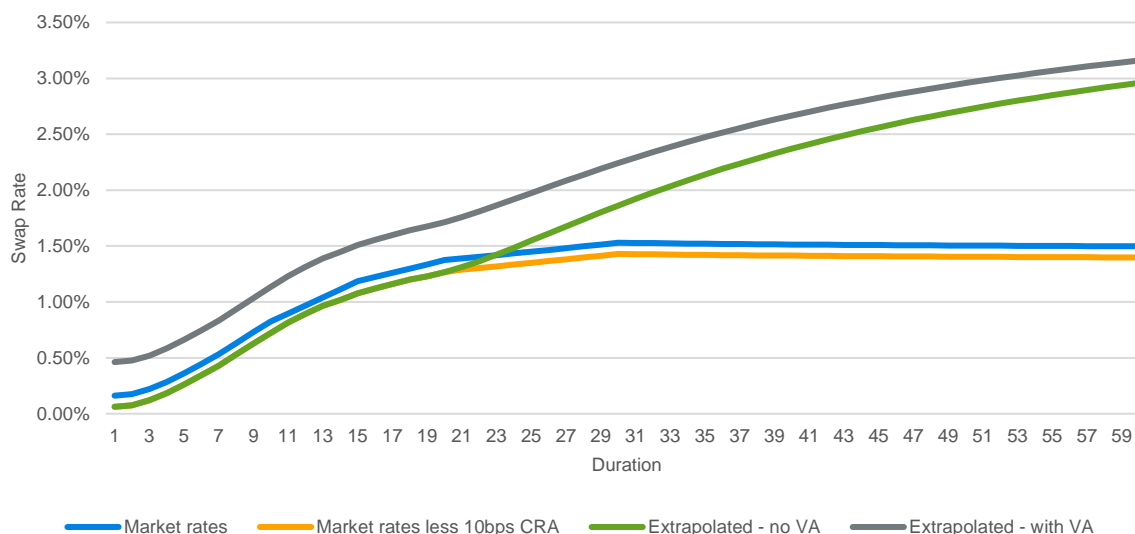
Collectively the extrapolation of the risk-free interest rate term structure (including the LLP and UFR), the VA, the MA the Transitional Measure on Technical Provisions (TTP) and the Transitional Measure on Risk-Free Rate (TRFR) are known as the Long-Term Guarantee (LTG) measures. This is because the measures were primarily aimed at products with embedded long-term interest rate guarantees. Nonetheless, as we will discuss later, it is important to note that the LTG measures can be very relevant to any insurance liabilities that are long-term in nature, not just those with interest rate guarantees. For example, the LTG measures are relevant to with-profits business, annuities and even unit-linked business expected to remain in-force for a long period.

For the remainder of this paper we focus on the extrapolation of the risk-free interest rate term structure. As stated earlier, in the next edition we will re-examine the VA.

5. Components of the extrapolation

EIOPA is required to publish the risk-free interest rate term structure on a monthly basis. Periodically EIOPA also publishes a technical document setting out its methodology for determining the risk-free rate structure, the most recent publication of which was in August 2018 as noted already.

The Omnibus II Directive introduced the extrapolation of risk-free rates beyond a LLP to a UFR for each currency. As stated in the recitals to the Omnibus II Directive, *'... the political intention of the provisions on the extrapolation is to avoid artificial volatility of technical provisions and eligible own funds and provide an incentive for good risk management.'*

The following items are the core elements that affect the application of the extrapolation of the risk-free interest rate term structure:

- LLP
- Market forward rate at the LLP
- 'Smith-Wilson' extrapolation method
- UFR
- Speed of convergence to the UFR

Whenever possible, data from deep, liquid and transparent financial markets is used to construct the risk-free interest rate term structure. The LLP is the longest maturity for which the market of the relevant financial instruments (swaps or government bonds) is deemed to be deep, liquid and transparent, in order to allow insurers to match their cash flows up to the LLP (the so-called 'DLT assessment').

There are no common thresholds with regard to indicators of depth and liquidity. EIOPA decides on the LLP based on criteria including trade volume, trade frequency and the bid-ask spread of the financial instruments.

However, the LLP for the euro is currently 20 years. For the euro LLP assessment on an ongoing basis, guidance is provided by Recital 21 of Commission Delegated Regulation (EU) 2015/35,[9] which specifies a volume-based threshold for the bond market as follows:

> *Under market conditions similar to those at the date of adoption of Directive 2014/51/EU, when determining the last maturity for which markets for bonds are not deep, liquid and transparent anymore in accordance with Article 77a of Directive 2009/138/EC, the market for bonds denominated in euro should not be regarded as deep and liquid where the cumulative volume of bonds with maturities larger than or equal to the last maturity is less than 6 percent of the volume of all bonds in that market.*

In its latest assessment, EIOPA concluded that the 25-year and 30-year swap maturities satisfy the DLT assessment for the euro. However, they still maintained the LLP at 20 years due to the residual volume of bonds analysis they carried out (although details of this analysis were not published).

The table in Figure 3 lists the LLP and UFR for some of the main currencies:

FIGURE 3: LLP AND UFR LEVELS

	LLP (YEARS)	UFR (FOR 2018)	UFR CONVERGENCE POINT (YEARS)
Euro	20	4.05%	60
Sterling	50	4.05%	90
Dollar	50	4.05%	90
Yen	30	3.35%	70
Swiss Franc	25	3.05%	65
Swedish Krone	10	4.05%	20
Danish Krone	20	4.05%	60

6.   Impact of the extrapolation

The impact of the extrapolation approach has been analysed in various reports prepared by EIOPA. For example, EIOPA prepares an annual report on the LTG measures, including extrapolation. In terms of Pillar 3 reporting, companies are not required to isolate the impact of extrapolation as mentioned later in this paper. However, as part of its work in preparing its latest LTG report[10] in 2018, EIOPA carried out an information request to undertakings. With regard to the extrapolation, undertakings assessed the impact of three scenarios to change parameters of the extrapolation—in particular, the UFR, the LLP and the speed of convergence. The data used by EIOPA related to the end of 2017. The scenario that turned out to be most severe in terms of its impact on the average SCR ratio was the increase of the starting point of the extrapolation for the euro from 20 to 30 years.

The specification of the three scenarios in detail was as follows:

- Scenario 1: Increase the euro LLP from 20 to 30 years.
- Scenario 2: Increase the point of convergence to the UFR from 60 to 90 years for all currencies except the Swedish krona. For the Swedish krona the convergence point changed from 20 years to 50 years.
- Scenario 3: Reduce the UFR by 1% for all currencies.

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[9] The full Delegated Regulation is available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015R0035&from=EN.

[10] EIOPA (18 December 2018). Report on Long-Term Guarantees Measures and Measures on Equity Risk, 2018. Retrieved 23 January 2019 from https://eiopa.europa.eu/Publications/Reports/2018-12-18%20_LTG%20AnnualReport2018.pdf.

FIGURE 4: EURO RISK-FREE INTEREST RATE TERM STRUCTURES WITHOUT VA UNDER 2017 LTG REPORT (SPOT RATES)
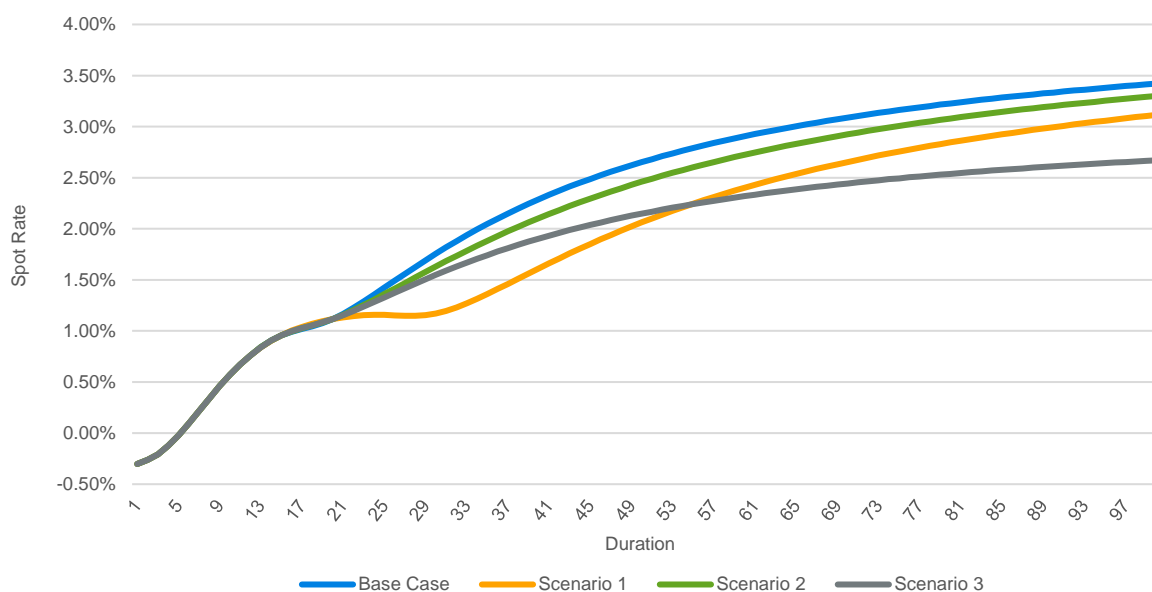
Roughly 50% of the market was included in EIOPA's sample relating to life and composite undertakings that have a material level of long-term liabilities beyond a duration of 20 years.

Key features of the results included the following:

- The scenarios increased the amount of TPs for those firms by EUR 36 billion, 9 billion and 21 billion, respectively.

- At the European Economic Area (EEA) level for life companies, Scenario 1 would result in a reduction of the SCR ratio by 24% (defined as the ratio of Own Funds to the SCR), Scenario 2 would result in a reduction of the SCR ratio by 5% and Scenario 3 would result in a reduction of the SCR ratio by 13%.

- The average change in SCR ratios was the highest for undertakings in Germany and the Netherlands.

In its 2018 Insurance Stress Test[11] specification, EIOPA specified a stress scenario involving a protracted period of extremely low interest rates including an adjustment of the UFR. The adjustment to the UFR was in line with the ESRB approach (described further below) with EIOPA stating, '... long term rates, including UFR, that are closer to market observed rates would be more appropriate for assessing vulnerabilities to financial stability stemming from such a scenario.' In particular, under the stress scenario it was assumed that the UFR is rebased to the then forward rate applicable at the LLP under the stressed market conditions.

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[11] EIOPA, Stress Test 2018, ibid.

Base EIOPA curve - no VA   Stressed curve - no VA
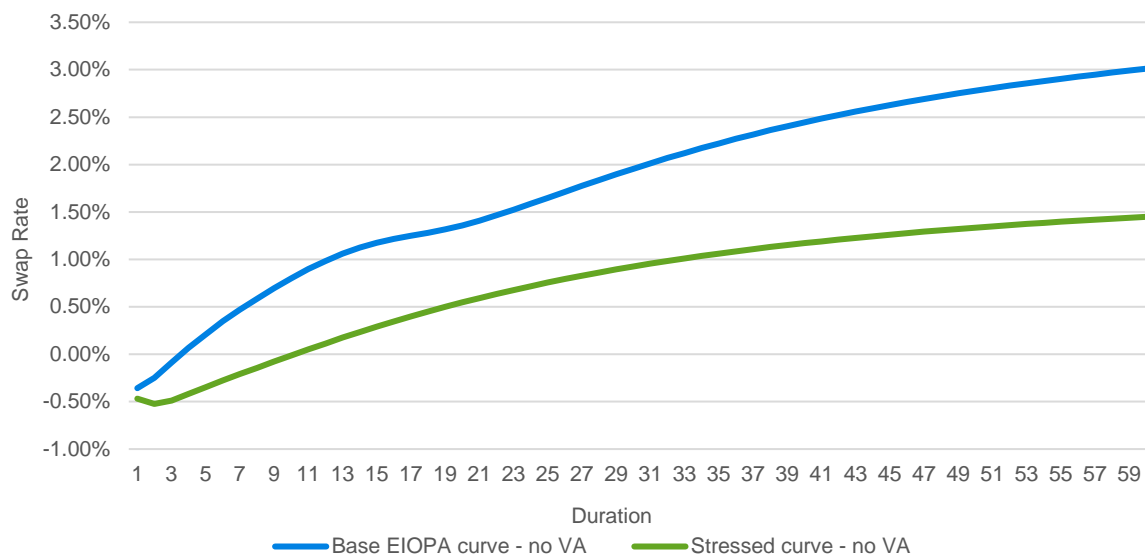
Source: EIOPA

It is also worth noting the impact of extrapolation relative to the impact of the MA and VA. The table in Figure 6, based on information in the 2018 LTG report, shows the relative impact of the measures at an aggregate level:

FIGURE 6: RELATIVE IMPACTS OF EXTRAPOLATION, VA AND MA (2018 LTG RESULTS)

	INCREASING THE LLP FROM 20 TO 30 YEARS FOR EURO	INCREASING THE CONVERGENCE POINT FROM 60 TO 90 YEARS	REDUCING THE UFR BY 1%	REMOVAL OF VA	REMOVAL OF MA
Change in TPs	0.8%	0.2%	0.4%	0.1%	0.5%
Change in Own Funds	-5.1%	-1.2%	-2.9%	-0.3%	-2.2%
Change in SCR	5.3%	1.1%	2.5%	3.6%	5.0%
Change in SCR ratio	-23.6%	-5.4%	-12.5%	-8.9%	-16.5%

Source: EIOPA

Of all the components above it is clear that, based on the information in the 2018 LTG Report, the setting of the LLP is the most crucial element in terms of impact on the insurance industry.

The following section considers the impact of extrapolation on certain long term contracts. The Appendix provides further illustrations of sample liability valuations across varying extrapolation assumptions and cashflow durations.

7. Case study – long term contracts

We investigated the impact of the three scenarios underlying EIOPA's 2018 LTG Report (described in Section 6 above) on the TPs of two simple life insurance contracts as follows:

- An immediate life-long annuity for a 65 year old
- A deferred life-long annuity for a 45 year old person. Annuity payments start at age 65 and premiums are already paid in.

The cash-flows were derived according to Irish male mortality tables. The life expectancy at age 65 in this case was 24 years.

We also carried out the same analysis for lump-sum liability cashflows payable in 30, 40 and 50 years' time.

As well as the individual impact of the three scenarios we present the combined impact of all three individual scenarios.

The analysis set out in this section is based on the EIOPA risk-free interest rates for end September 2018.

The following tables set out the impact of the scenarios on the present value of cash-outflows for the example contracts written in euro.

	IMMEDIATE ANNUITY	DEFERRED ANNUITY	30 YEAR CASHFLOW	40 YEAR CASHFLOW	50 YEAR CASHFLOW
LLP 20 to 30 years	+1.6%	+14.6%	+13.5%	+26.0%	+28.9%
Convergence by 90 years	+0.5%	+4.6%	+3.5%	+8.3%	+11.2%
UFR 4.05% to 3.05%	+0.6%	+8.1%	+4.8%	+14.3%	+25.2%
Combined scenario	+1.7%	+19.6%	+13.5%	+35.2%	+54.6%

For the immediate annuity the impact is small because a larger part of the cash-flows correspond to maturities before the last liquid point. For the deferred annuity the impact is much more severe because the cash-flows have a higher duration.

The calculated changes in TPs are not necessarily representative for the average change in life insurance TPs. However, the calculations are relevant to assess the impact on newly concluded contracts of the analysed type.

8.   Actual UFR changes

Since the fifth Solvency II quantitative impact study (QIS5), the UFR for euro, sterling and US dollar liabilities has been set at 4.2%, and 3.2% for Japanese yen liabilities. In 2015 EIOPA began a review of the UFR methodology and in 2016 issued a consultation paper[12] with a view to updating its approach.

On 4 April 2017, EIOPA published its final decision[13] on the methodology for the annual calculation of the UFR for each currency. The calculated UFR as determined by EIOPA is the sum of the expected real rate (which is the same for every currency) and a country-specific expected inflation rate.

The expected real rate of interest is a simple average of the annual real rates of interest observed since 1961 across Belgium, Germany, France, Italy, the Netherlands, the UK and the US.

The expected inflation rate is 2% for most major currencies, such as the euro, sterling, US dollar and Japanese yen. The expected inflation rate is based on the inflation target of central banks, and can only take one of the following values:

- 1%, target <= 1%
- 2%, 1% < target < 3%
- 3%, 3% <= target < 4%
- 4%, target >= 4%

The UFR can only move by 15 bps up or down each year. If the actual movement from the previous UFR to the newly calculated UFR is greater than 15 bps in either direction, it will move by 15 bps; if the movement is less than 15 bps in either direction, there will be no change to the UFR.

For most currencies, the UFR reduced from 4.20% to 4.05% on 1 January 2018, and reduced further from 4.05% to 3.9% effective 1 January 2019. The downwards trajectory of the UFR is reflective of the trends in market swap rates over the past number of years since the first calibration of the euro UFR at 4.2%, for example, in the 2010 QIS5 exercise.

If interest rates remain at their current levels for some time, then we could expect further decreases in the UFR over the coming years. For example, the UFR is likely to reduce to 3.75% in 2020 and 3.6% in 2021. The inflation rate may be expected to remain more stable as it is tied to central bank targets.

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[12] EIOPA (6 April 2016). Consultation Paper on the Methodology to Derive the UFR and Its Implementation. Retrieved 23 January 2019 from https://eiopa.europa.eu/Publications/Consultations/RFR%20CP%20on%20methodology%20to%20derive%20the%20UFR%20(after%20Bo S).pdf.
[13] EIOPA (30 March 2017). Risk-Free Interest Rate Term Structures: Specification of the Methodology to Derive the UFR. Retrieved 23 January 2019 from https://eiopa.europa.eu/Publications/Reports/Specification%20of%20the%20methodology%20to%20derive%20the%20UFR.pdf.

9.   Consequences of UFR changes

Mechanically a change of the UFR modifies the risk-free interest rate term structure used to calculate the TPs for obligations with long maturities. Consequently there is a direct effect of a UFR change on the amount of firms' TPs. The change in the amount of TPs can also affect other elements of the Solvency II balance sheet and capital requirements.

Typical indirect effects are:

- The change in TPs results in a change in deferred taxes. In that case, an increase of TPs would result in an increase of deferred tax assets or a reduction of deferred tax liabilities.
- The change in TPs results in a change of Own Funds. An increase of TPs would usually result in a decrease of Own Funds. The increase can be mitigated by the change of deferred taxes.
- The change in TPs results in a change of the SCR and Minimum Capital Requirement (MCR). An increase of TPs would usually lead to an increase in the SCR and the MCR.

As part of its consultations, in the lead-up to updating the UFR methodology, EIOPA published various impact analyses of potential changes to the UFR. The results presented by EIOPA showed, in particular:

- The impact of a UFR change on the term structures differs significantly by currency.
- The impact of a UFR change on the present value of an immediate annuity of a 65-year-old person is usually small, but may be more relevant for deferred annuities.
- The impact of a UFR change for the euro is not material for the present value of guaranteed benefits of most life insurance portfolios. However, there are insurance portfolios with long-term guarantees that could be significantly affected by a change of the UFR (as described in Section 10 below).

One such EIOPA analysis[14] was based on an industry information request in 2016 in respect of a valuation date at 1 January 2016. A total of 336 insurance and reinsurance undertakings assessed the impact of changing the UFRs by 20 bps and by 50 bps on their Solvency II balance sheets and on their solvency positions. The information request showed that the impact of these changes was very small. On average the SCR ratio decreased from 203% to 201% if the UFRs were changed by 20 bps and to 198% if the UFRs were changed by 50 bps.

One interesting potential impact of future UFR changes relates to the use of the MA, in particular by eurozone annuity writers. In simple terms, the MA allows annuity writers to take credit for some of the additional spread on assets (after applying a haircut to make some allowance for credit risk) relative to the Solvency II extrapolated risk-free rate term structure where they hold a portfolio of assets that are suitably matched to liability cash flows.

However, for eurozone insurers, the Solvency II risk-free rate term structure diverges significantly from the underlying observed risk-free rates in the market. As we have already seen, this means that after 20 years the euro risk-free curve is artificially high relative to the observed market risk-free rates.

What does this mean for the MA? In simple terms, eurozone annuity writers would compare the adjusted spreads on the portfolio of matching assets, with this artificially high average risk-free curve. The resulting MA tends to be low as a result, and for many insurers, would not justify the extra governance and logistical challenges of managing a matching portfolio as well as the loss of diversification in the SCR from required ring-fencing. Note that this is less of a challenge for UK insurers, where the last liquid point is 50 years, and the Solvency II risk-free curve therefore mirrors the observed market rates for a longer period.

As the UFR reduces over the coming years, the artificial increase that we see in the risk-free curve will gradually reduce. This is likely to increase the value of long-term annuity liabilities (all other things being equal) and therefore make the MA a more attractive option. An extension of the LLP to 30 years would have a similar impact thereby making the MA a more attractive option as well.

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[14] EIOPA (30 March 2017). Risk-Free Interest Rate Term Structures: Results of the Impact Analysis of Changes to the UFR. Retrieved 23 January 2019 from
https://eiopa.europa.eu/Publications/Reports/Results%20of%20the%20impact%20analysis%20of%20changes%20to%20the%20UFR.pdf.

10. UFR impact on longer-term guarantees

Prior to the 2016 study, in its 2014 Insurance Stress Test Report,[15] EIOPA also outlined an analysis to illustrate the impact that a change in the UFR for the euro would have, based on cash flows reported by solo undertakings which participated in the low-yield stress scenario. In particular, insurers were asked to provide projections of expected future cash flows for with-profits business, which contains the most significant and long-term part of guaranteed business in most European Union (EU) markets.

EIOPA's analysis was based only on the projection of fixed guarantees because they make up the largest part of best estimate liabilities, because they have the longest durations and because their projected cash flows are unlikely to change in response to a UFR adjustment.

While the aggregate results again indicated a rather muted impact of a lower UFR, this ignores the considerable heterogeneity across all 107 undertakings in the sample. For most undertakings, moving from a UFR of 4.2% to a UFR of 3.5%, for instance, would have had a minor impact on the present value of the fixed guarantees, with a median change in value of 0.25% and three-quarters of companies below a 0.68% change. There were, however, a few companies with greater increases (up to 2.4%) in the present value of the fixed guarantees.

A similar picture emerged in terms of Own Funds. While for three-quarters of the insurers a decrease in the UFR to 3.5% would have consumed less than 5% of Own Funds (with a median level of 1.15%), for a few insurers this figure made up more than 50% of Own Funds.

It should also be noted, that as part of its 2018 LTG Report specifications, EIOPA issued an additional information request[16] to assist it in enhancing the products and consumer sections of its report. The request covered quantitative information relating to product features and interest rate guarantees to supplement information contained in the S.14.01 QRT (the 'life obligations analysis'). Some highlights covered in EIOPA's subsequent report included:

- The proportion of products with guarantees differs by country. In 16 countries products with at least one guarantee make up over 95% of the life insurance market. In other countries the proportion of products with guarantees is much lower with a predominance of unit-linked business.
- Fewer products available for sale contain guarantees than products in run-off.
- The size and duration of interest rate guarantees have been generally trending downwards across the EEA.

11. Criticisms of extrapolation

Criticisms have been made of the current extrapolation approach. An influential stakeholder is the ESRB. In its 2016 report[17] 'Macroprudential policy issues arising from low interest rates and structural changes in the EU financial system' the ESRB stated:

A low interest rate environment has an impact on the level of the UFR (which should be reviewed given the probability of a prolonged period of low interest rates) as well as on real GDP growth which will be lower than currently assumed (given that the assumed level of long-term real interest rates used in the current UFR calculation implies real GDP growth of 2.2%, while the protracted low interest rate environment implies a significantly lower value.

This was followed by a 2017 report,[18] 'Regulatory risk-free yield curve properties and macroprudential consequences.' In this report the ESRB proposed changes to the Solvency II risk-free rate curve in particular, stating:

In April 2017, EIOPA developed a methodology to derive the UFR on an ongoing basis, which will be applied from 1 January 2018 onwards. Using this methodology, the UFR for the euro is calculated to be 3.65%. The methodology includes a limit on the annual change of the UFR of 15 basis points. The limit implies that the UFR will be changed from 4.2% to 4.05% in 2018 and, ceteris paribus, linearly onwards. A large majority of European Systemic Risk Board (ESRB) members favoured this reduction of the current level of the UFR, and

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[15] EIOPA (28 November 2014). EIOPA Insurance Stress Test 2014. Retrieved 23 January 2019 from https://eiopa.europa.eu/Publications/Surveys/Stress%20Test%20Report%202014.pdf.

[16] EIOPA (3 April 2018). Technical Specification of the Information Request on Products for the EIOPA LTG Report 2018. Retrieved 23 January 2019 from https://eiopa.europa.eu/Publications/Administrative/TS%20Info%20request%20on%20products.pdf.

[17] ESRB (November 2016). Macroprudential Policy Issues Arising From Low Interest Rates and Structural Changes in the EU Financial System. Retrieved 23 January 2019 from https://www.esrb.europa.eu/pub/pdf/reports/161128_low_interest_rate_report.en.pdf.

[18] ESRB (August 2017), Regulatory Risk-Free Yield Curve Properties, ibid.

made a policy observation that <u>the transition appears to be too slow</u>, should a "low-for-long" scenario prevail over the next decade.

This report makes three proposals, which, under current market conditions and together with the forthcoming reduction in the UFR, would result in a lower regulatory risk-free yield curve. The findings of this report suggest that the current curve may underestimate insurers' liabilities…

Specifically, the report proposes considering one or more of the points below, taking into account that their combined implementation may require more fundamental changes to the derivation of the regulatory risk-free yield curve:

- *A new method to derive the LLP and to extend the LLP for the euro regulatory risk-free yield curve from 20 to 30 years. According to common liquidity measures, there is little difference in liquidity between euro swap rates at 20-year and 30-year maturities. The same holds for liquidity in euro sovereign bond markets. On the basis of the liquidity of swap and bond markets, the LLP for the euro regulatory risk-free yield curve should be moved to 30 years.*

- *Extending the convergence period (from LLP to UFR) from 40 years to 100 years. This would reduce the weight of the UFR and increase the weight of the liquid part of the regulatory risk-free yield curve when deriving the illiquid part of the regulatory risk-free yield curve.*

- *Blending the extrapolated part of the curve partly with market data, provided that sufficiently reliable market data are available, as, for instance, is done in the regulation of Swedish and Dutch pension funds. The requirement to extrapolate the risk-free yield curve from an LLP that is set at a single maturity can lead to excessive risk exposure to interest rate risk around that maturity and, potentially, to procyclical hedging behaviour. Furthermore, based on the properties of the extrapolation method, it may necessitate a relatively short-term realisation of unrealised losses when maturity buckets of liabilities approach the LLP over time.*

In its 2017 LTG report, EIOPA quoted these concerns of the ESRB but did not specifically comment on them. In its specifications for the 2018 LTG exercise EIOPA maintained the same three stress scenarios as for its 2017 analysis, i.e., a reduction of the UFR by 1% rather than moving to a more market-consistent level of long-term interest rates. On the other hand, in its 2018 Insurance Stress Test specifications, EIOPA's approach was more aligned to the ESRB approach with a UFR based on the market forward rates at the LLP.

It will be interesting to see if pressure will mount on EIOPA to reduce the UFR yet further beyond its current glide path with the ESRB's statement that the downwards glide path is still too slow. According to the ESRB, the gap between the risk-free interest rates and current swap rates that is caused by the application of a high UFR may have negative consequences. For example, this difference may hide sector-wide losses, which could materialise in the near future. It may also incentivise the sale of insurance products with guarantees that are too high, induce insurers to pay out dividends rather than build up reserves (although this should be tempered by firms' requirements to consider their 'own solvency needs' within their ORSAs) and lead to suboptimal hedging strategies.

12.   ALM and strategic considerations

The regulatory risk-free yield curve has a direct impact on the behaviour of insurers. It affects their provisioning and may influence hedging and investment choices.

We expect to see insurers increasingly making contingency plans to deal with potential additional changes in the structure and level of the risk-free curve. As already noted, increasing the LLP for euro liabilities from 20 to 30 years would have a considerable impact on many insurers, whilst there is also the possibility that the speed of convergence to the UFR or the UFR level itself may change materially in the future.

As part of their asset-liability management (ALM), insurance and reinsurance undertakings need to regularly assess the sensitivity of their TPs and Own Funds to the assumptions underlying the extrapolation of the relevant risk-free interest rate term structure, as required under Article 44 (2a) of the Solvency II Directive. The results of such analysis must be reported in the private Regular Supervisory Report (RSR).

Often companies will aim to offset movements in their liabilities by choosing assets to match the impact of interest rate changes to a greater or lesser extent. Under Solvency II, generally speaking, a shorter LLP and a faster convergence period will mean less of a need for interest rate hedging as the interest curve is more stable as a

greater part of the liability discount curve is pegged to the UFR (if indeed a firm structures its hedging operations to consider its Solvency II position as opposed to a purely economic-based hedging strategy, for example).

Insurers can be heavily exposed to interest rate risk around the LLP. There are difficulties in carrying out ALM operations due to the following factors for example:

- After the LLP there is no sensitivity in the risk-free rate term structure to changes in the market curve, whereas a firm's asset values may be affected.

- The risk-free rate term structure has a large dependency on the 20-year point of the swap curve for the euro, potentially creating a market distortion around this point.

- EIOPA interpolates euro swap rates between the 15-year and 20-year points, given the lack of market instruments at intervening durations. This leads to the forward rate at the LLP being inversely related to the 15-year swap rate.

At the extreme, if a company's assets and liabilities have identical interest rate profiles, the company does not run an interest rate risk. Nonetheless, its SCR ratio may change in line with interest rate movements in the market if there are cash flows emerging beyond the LLP.

From a risk management perspective there are important arguments against hedging interest rate risks on the basis of the UFR. Insurers should hedge the risks they are exposed to in reality, not those on the regulatory balance sheet. However, insurers under financial strain may be forced to hedge their regulatory balance sheets in order to remain above regulatory required capital levels. In that case, with a single LLP of 20 years, all their liabilities with a remaining maturity of more than 20 years are dependent on the risk-free rate at 20 years.

In addition to being exposed to the level of interest rates, insurers are exposed to the difference between the swap rate at the maturity of the LLP and the swap rates for marginally shorter maturities, because these two rates determine the slope of the extrapolated part of the regulatory risk-free yield curve to a greater extent.

This exposure may lead to unintended hedging behaviour. The LLP set at one date and used to extrapolate from that date incentivises simultaneous large long and short positions in swaps around the LLP, as insurers under financial strain may want to hedge not only the level of the risk-free rate at the maturity of the LLP, but also the slope of the risk-free curve around the LLP. To maintain an effective hedge, these positions need to be rebalanced continually. Rebalancing large hedge portfolios implies high transaction costs for insurers and potential procyclical effects.

This potential procyclicality around the LLP has been remarked upon by the ESRB and leads to its suggestion to base the extrapolated part of the curve on weighted market observations for several maturities so as to alleviate the cliff edge effect stemming from the use of a single LLP. In a similar way, the Swedish financial supervisory authority has already adopted a modified model for pension funds with much smaller rebalancing needs due to an extrapolation method that attributes gradually decreasing importance to market data beyond the LLP. The Netherlands also uses a smoothing approach for the valuation of pension fund liabilities.

If insurers' hedging activities affect the market price of interest rate swaps, then the solvency positions of other insurers will be affected as a consequence. To date, such hedging rebalancing has not yet been observed in practice, according to the ESRB. This can partly be explained by the solvency of the European insurance sector, which has improved significantly during the years since the global financial crisis. Insurers with stronger solvency positions have less need to hedge interest rate risk. Under a situation of financial strain, the need to do so may grow larger. The incentives for hedge positions implied by the current risk-free rate methodology may thus materialise in a financial scenario that would negatively impact the solvency of the European insurance sector, causing unintended procyclical behaviour.

All in all, closer alignment between the regulatory risk-free yield curve and the market swap curve would make it easier for firms with long term liabilities to manage their business from an ALM perspective. For example, another key factor that can be a point of focus for firms is the stability of their financial statements profits which will often be reported on an IFRS basis with more close to full market-consistent economic assumptions. Where reporting bases diverge for regulatory and financial statements purposes, ALM is more difficult in terms of simultaneously trying to manage the level of regulatory Own Funds versus shareholder equity.

13.   Pillar 3 reporting and disclosure

As extrapolation is a core component of the specification of the TPs methodology, it is not possible to directly observe the impact of extrapolation from public QRTs and SFCRs (unlike other components of the LTG measures). As a result EIOPA has made specific information requests to firms to provide estimates of their TPs under differing calibrations of the extrapolation approach. We expect this area to become more of a point of focus, with the possibility that EIOPA may require firms to publish the impact of extrapolation on a regular basis.

As part of its 2017 LTG Report EIOPA assessed the relevance, comprehensibility and completeness of the disclosed information on LTG measures and whether it is useful for comparison across undertakings. It is noteworthy that EIOPA indicated that some firms have volunteered information in their SFCRs regarding the impact of components of the extrapolation.

EIOPA also asked stakeholders such as investors and rating agencies about their perceptions of the presentation of LTG measures in SFCRs. Stakeholders expressed an interest in information on the impact of the extrapolation like calculating the impact of variations of the UFR on the solvency position.

The private RSR to regulators is already required to report on the assessment of the sensitivity of a firm's TPs and Own Funds to the extrapolation of the risk-free interest rate term structure. As part of its 2018 LTG Report EIOPA made an assessment in relation to the quality of RSRs concluding that there was room for improvement in relation to the level of detail presented by firms. EIOPA made this assessment by analysing responses it received from National Supervisory Authorities (NSAs) to a questionnaire. Some of its key findings included:

- Only 41% of undertakings sampled provided information in their RSR on a sensitivity analysis with respect to the assumptions underlying the extrapolation. Less again gave details of the actual sensitivities analysed. Only 26% of undertakings sampled explicitly quantified the impact of sensitivities on TPs and Own Funds.

- Typically undertakings consider the UFR, the LLP and the speed of convergence. Some considered the Smith-Wilson methodology. Some also considered variations to the interest rate term structure.

- Only 5% of firms actually comment on the relationship between their actual ALM practices and the extrapolation. A number of insufficiencies in coverage were mentioned by NSAs including:

  o Undertakings did sensitivities on the interest rate or spread level but not on the key parameters of the interest rate term structure.

  o Information provided tends to be rather general whereas NSAs expect more detailed and quantitative information.

  o Where information is provided, judgement on the relevance of assumptions or the sensitivities calculated is often missing.

  o Details are generally not reported on how ALM management is performed in practice.

We would also expect that extrapolation should be a key element of a firm's ORSA where liabilities are long-term in nature. Nonetheless, from our analysis of some sample ORSAs there can be limited coverage of extrapolation.

Appendix: Sample liability valuations

In a 2016 consultation[19] regarding the methodology to derive the UFR, EIOPA set out an analysis of the impact of various assumptions underlying the extrapolation of the risk-free term structure. Their analysis was included in Section 4 of the EIOPA consultation paper based on the risk-free interest rates for end December 2015.

We have updated their analysis to reflect market conditions at the end of September 2018. Across sensitivities to the LLP, the rate of convergence to the UFR and the UFR level itself, we look at the resulting extrapolated term structures for Euro as well as the impact on the time value of money.

Impact on term structures

Figures 8 to 10 show the basic risk-free interest rate term structures for the Euro, calculated for a range of assumptions for the LLP, the rate of convergence to the UFR and the UFR level itself (shown for both spot rates and forward rates).

FIGURE 8: EURO RISK-FREE TERM STRUCTURE AT 30 SEPTEMBER 2018 (VARYING LLP)

UFR = 4.05%; CONVERGENCE TO UFR WITHIN 40 YEARS OF LLP
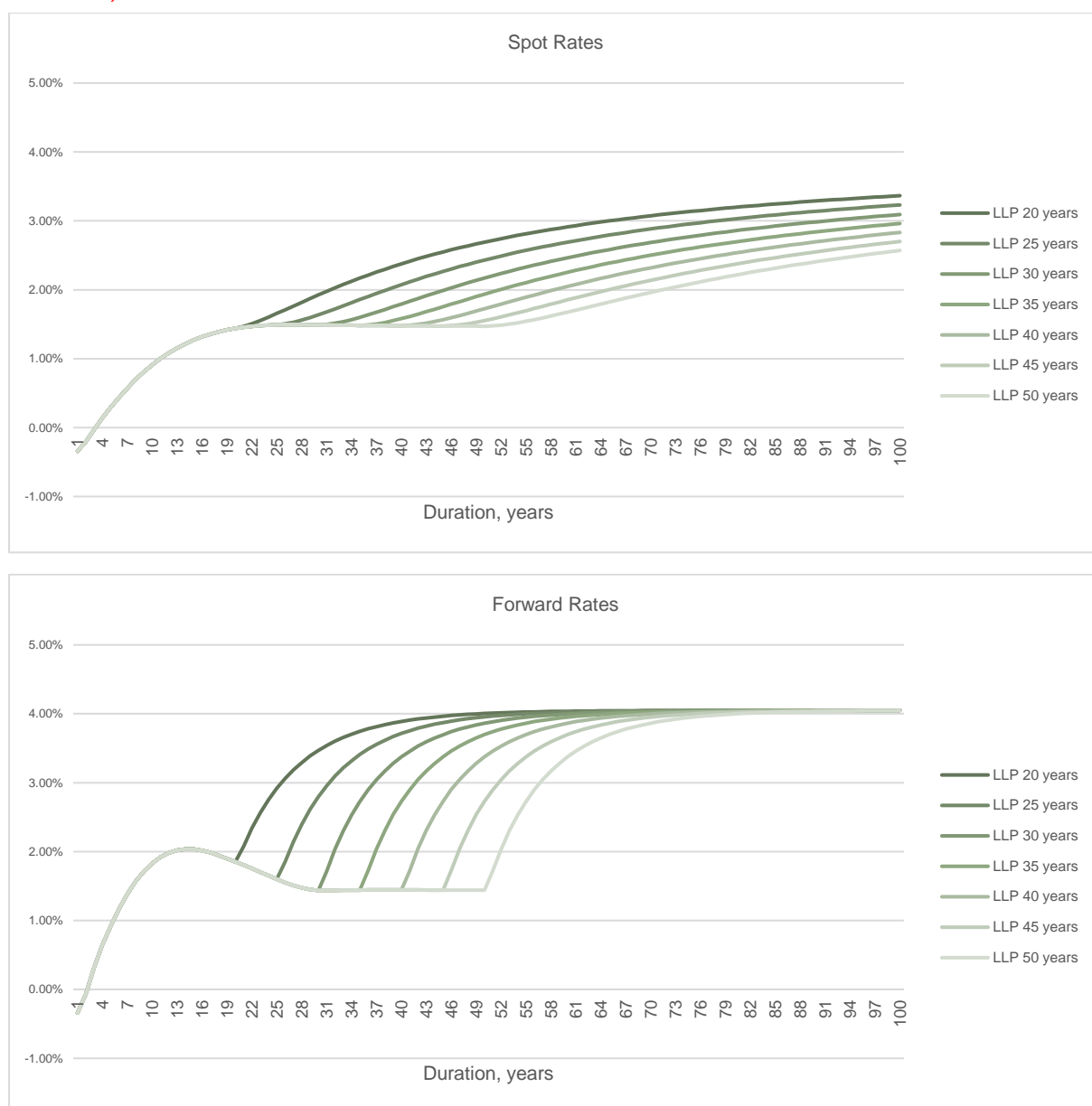
[19] EIOPA (6 April 2016). Consultation Paper on the Methodology to Derive the UFR and Its Implementation, ibid.

FIGURE 9: EURO RISK-FREE TERM STRUCTURE AT 30 SEPTEMBER 2018 (VARYING CONVERGENCE PERIOD TO UFR BEYOND LLP)
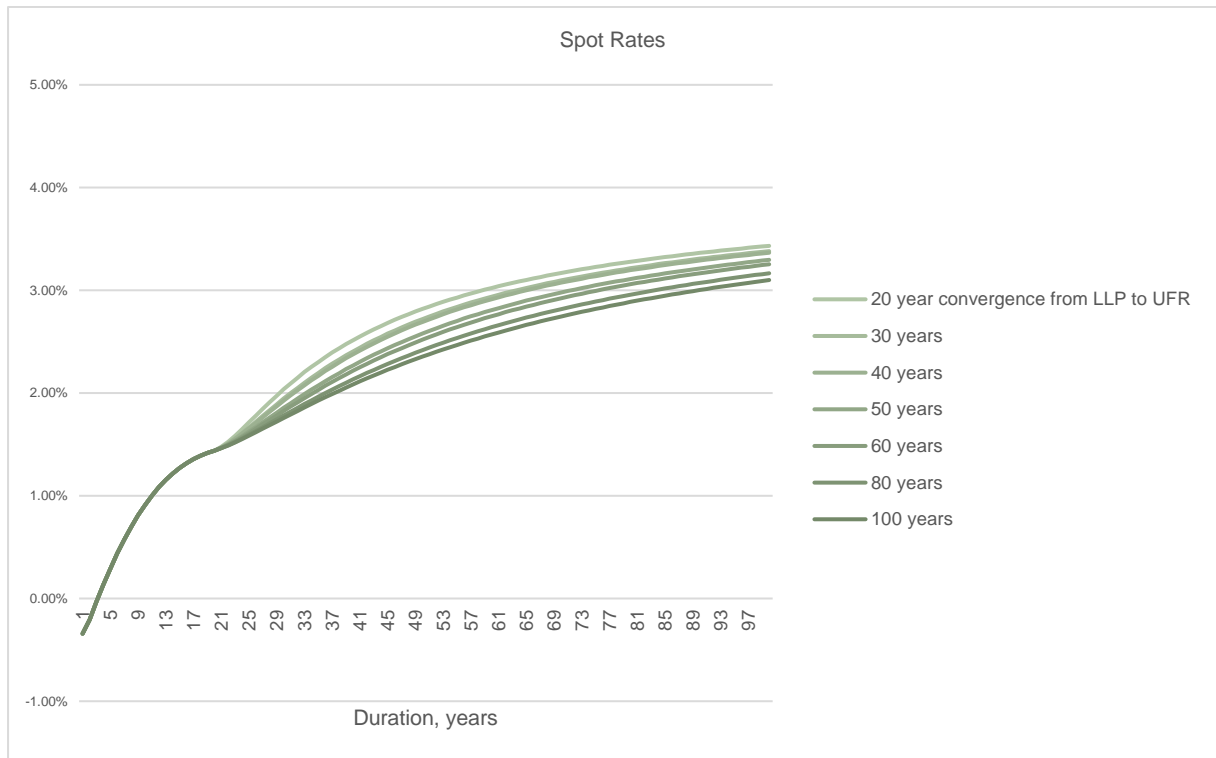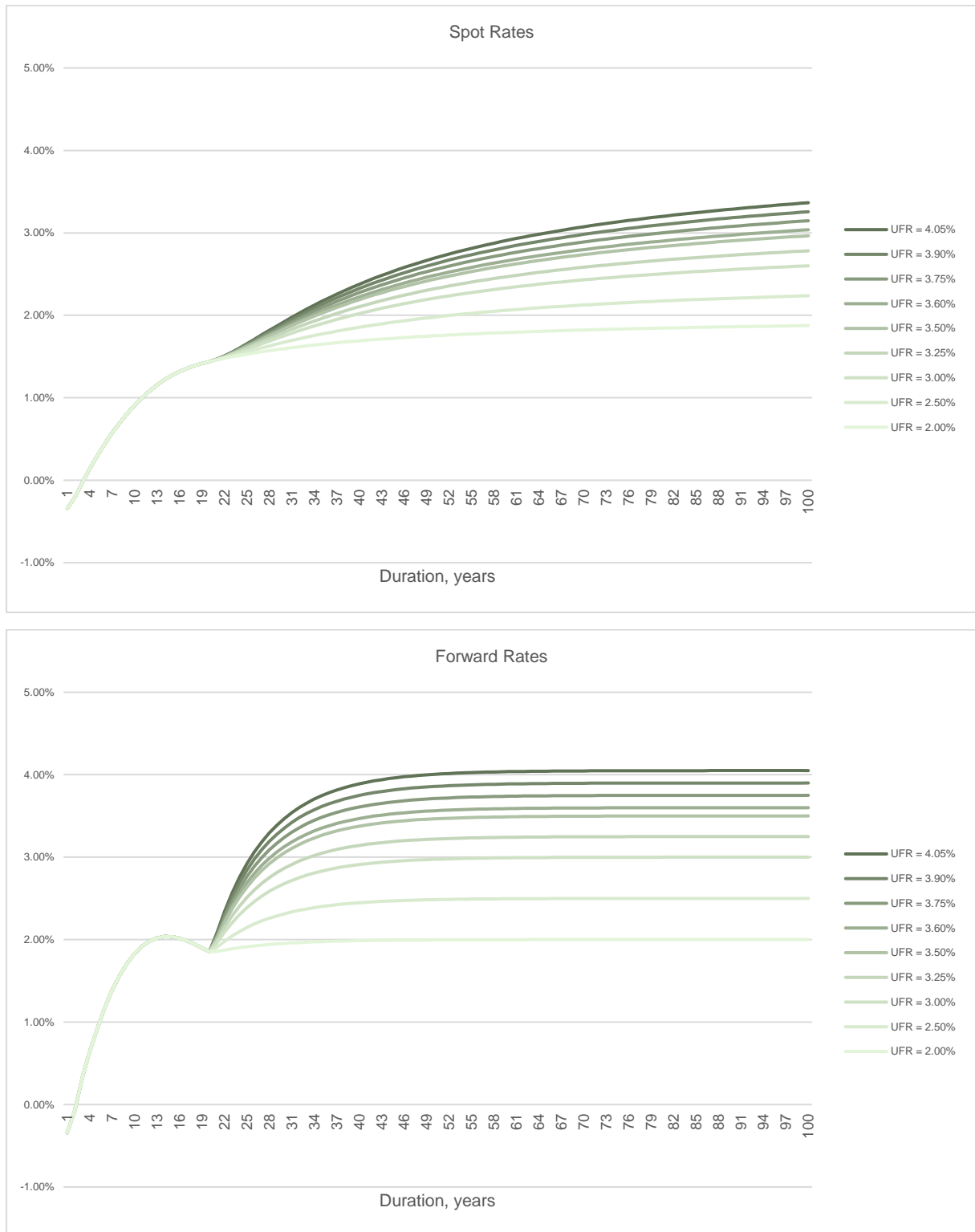
UFR = 4.05%; LLP = 20 YEARS
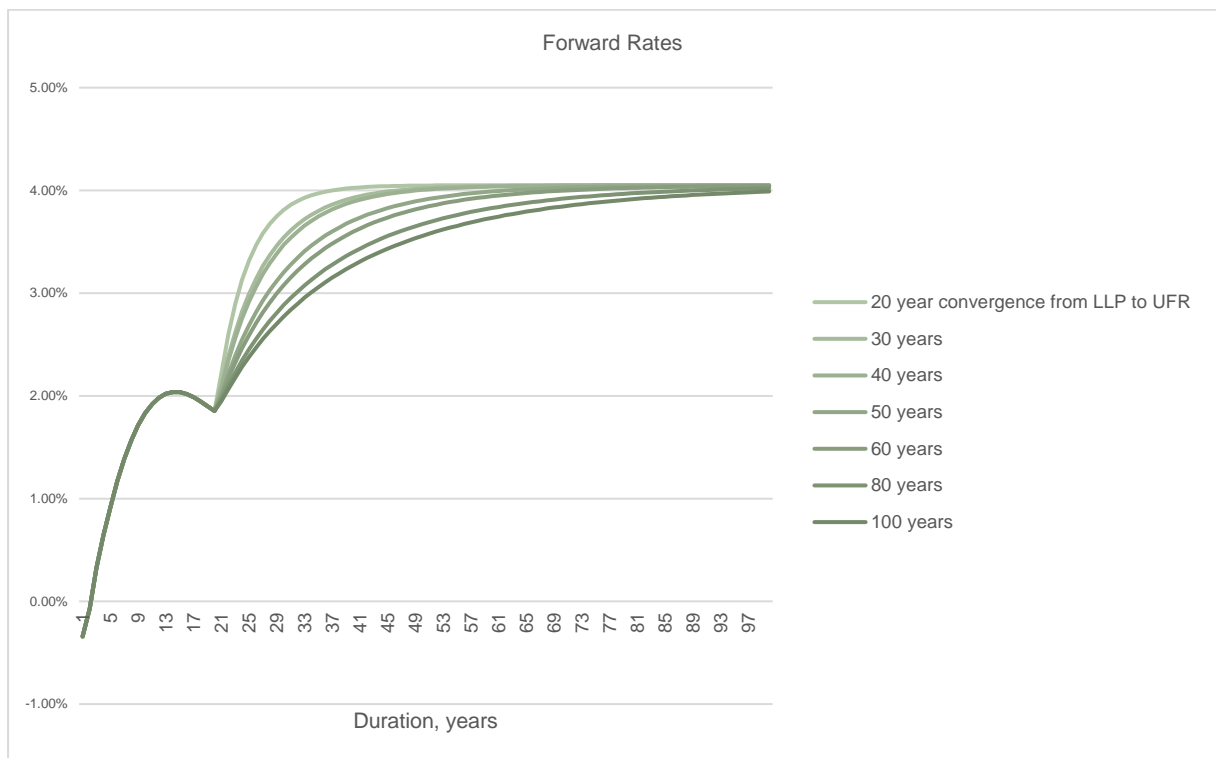
FIGURE 10: EURO RISK-FREE TERM STRUCTURE AT 30 SEPTEMBER 2018 (VARYING UFR LEVEL)

LLP = 20 YEARS; CONVERGENCE TO UFR WITHIN 40 YEARS OF LLP

Significant observations on the results include:

▪ A change to the UFR affects the risk-free interest rates beyond the LLP. The impact increases with the duration of the risk-free interest rates. The risk-free interest rates (in terms of spot rates) converge slowly to the UFR level.

- Increasing the LLP from 20 years would have a large impact on the risk-free interest rates beyond 20 years. Over a certain range of durations the impact increases with the duration of the risk-free interest rates but over the very long term the impact is shown to narrow with a fixed UFR level.
- The impact of changing the rate of convergence to the UFR is less pronounced than either the impact of increasing the LLP or changing the UFR level.

Impact on time value of money

Figures 11 to 13 show the discounted value of a future payment of €100 at different durations (time value of money) across the same sensitivities as above.

FIGURE 11: TIME VALUE OF MONEY AT 30 SEPTEMBER 2018 (VARYING LLP)

UFR = 4.05%; CONVERGENCE TO UFR WITHIN 40 YEARS OF LLP
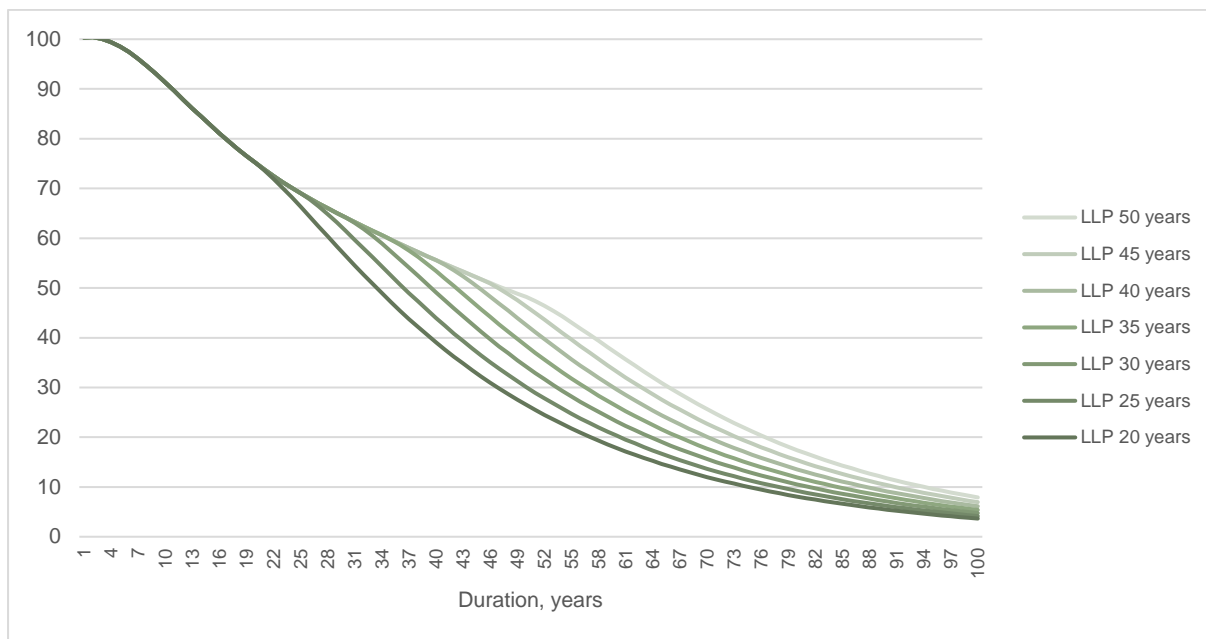
FIGURE 12: TIME VALUE OF MONEY AT 30 SEPTEMBER 2018 (VARYING CONVERGENCE PERIOD TO UFR BEYOND LLP)
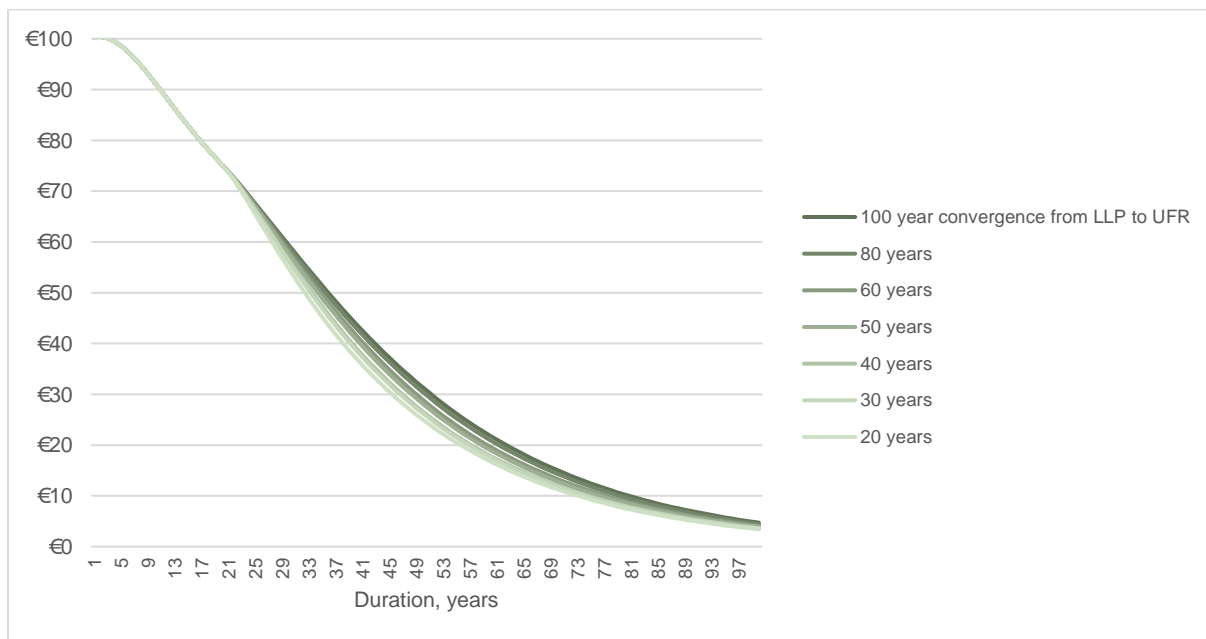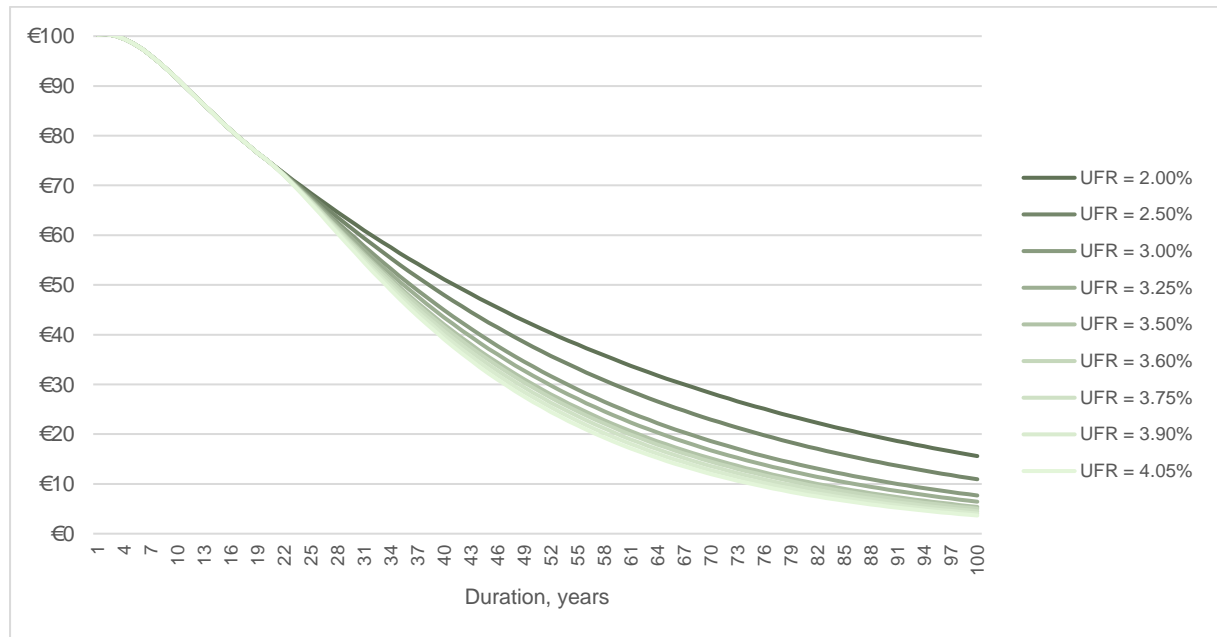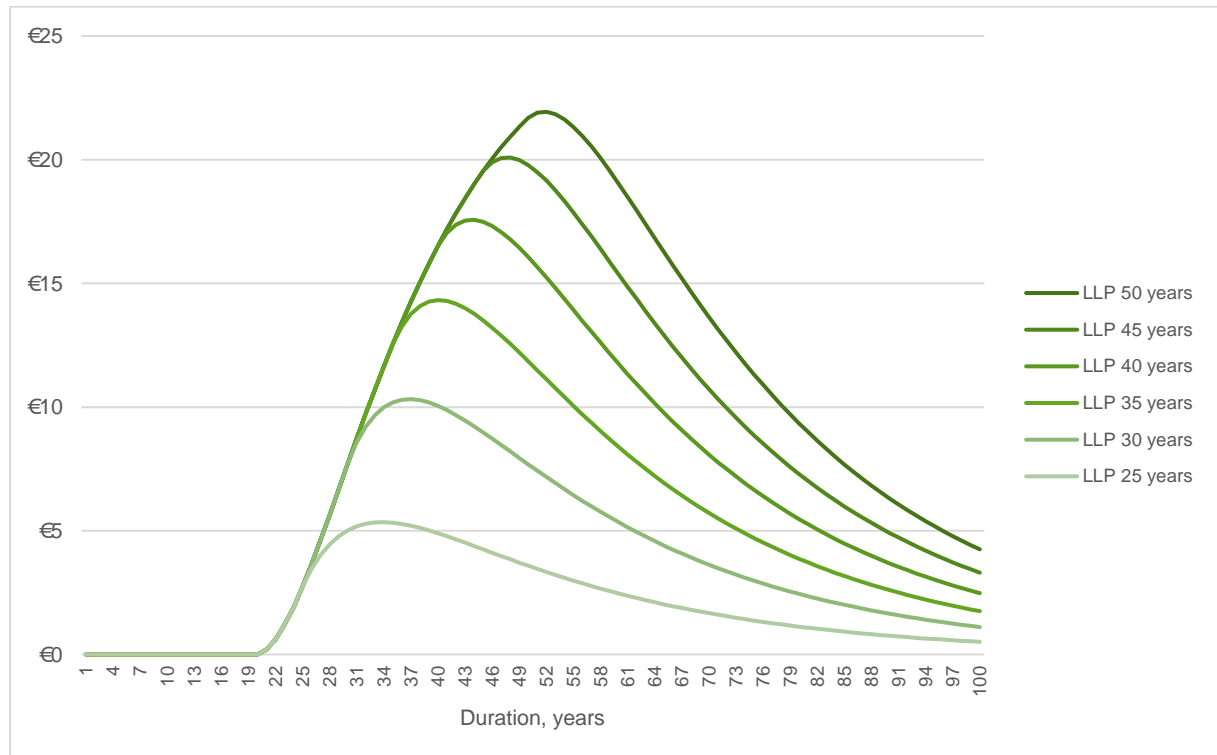
UFR = 4.05%; LLP = 20 YEARS

FIGURE 13: TIME VALUE OF MONEY AT 30 SEPTEMBER 2018 (VARYING UFR LEVEL)

LLP = 20 YEARS; CONVERGENCE TO UFR WITHIN 40 YEARS OF LLP

Figures 14 to 15 show the absolute change in the time value of money. We exclude variations in the rate of convergence to the UFR due to its limited impact.

FIGURE 14: ABSOLUTE CHANGE IN TIME VALUE OF MONEY AT 30 SEPTEMBER 2018 (VARYING LLP)

BASELINE: LLP = 20 YEARS; CONVERGENCE TO UFR WITHIN 40 YEARS OF LLP; UFR = 4.05%
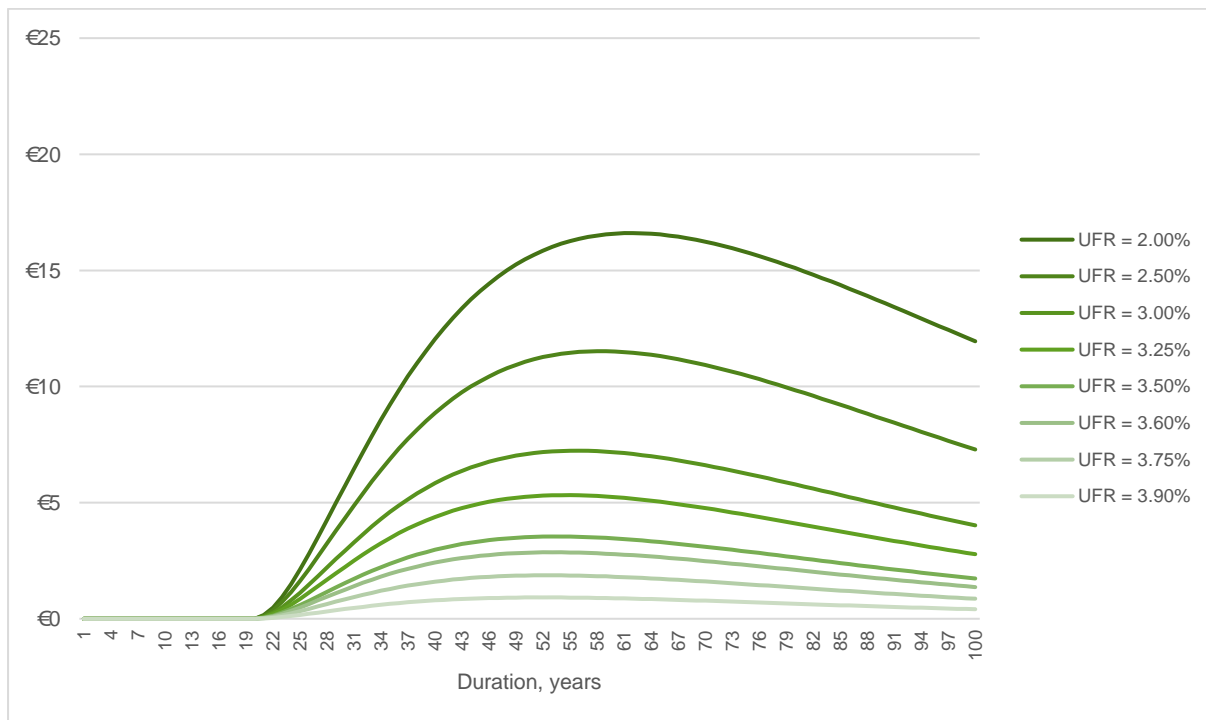
FIGURE 15: ABSOLUTE CHANGE IN TIME VALUE OF MONEY AT 30 SEPTEMBER 2018 (VARYING UFR)

BASELINE: LLP = 20 YEARS; CONVERGENCE TO UFR WITHIN 40 YEARS OF LLP; UFR = 4.05%

Figures 16 to 17 also show the relative change (percent) in the time value of money. Again we exclude variations in the rate of convergence to the UFR due to its limited impact.

FIGURE 16: RELATIVE CHANGE IN TIME VALUE OF MONEY AT 30 SEPTEMBER 2018 (VARYING LLP)

BASELINE: LLP = 20 YEARS; CONVERGENCE TO UFR WITHIN 40 YEARS OF LLP; UFR = 4.05%
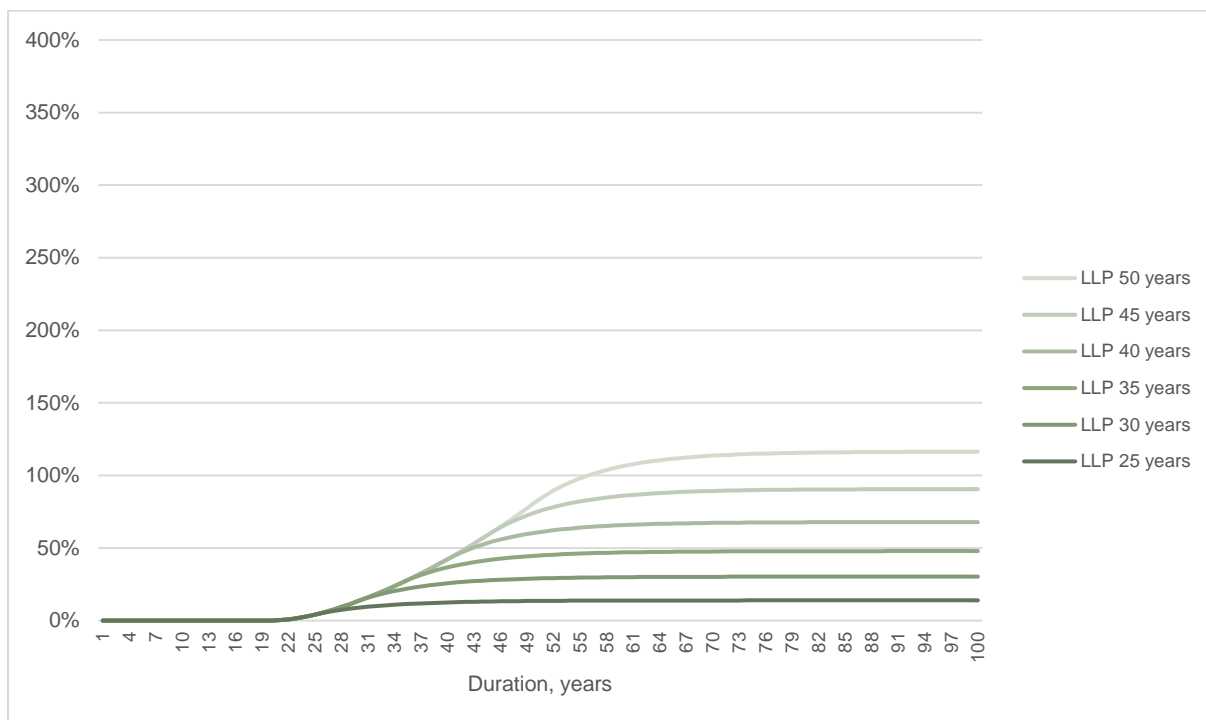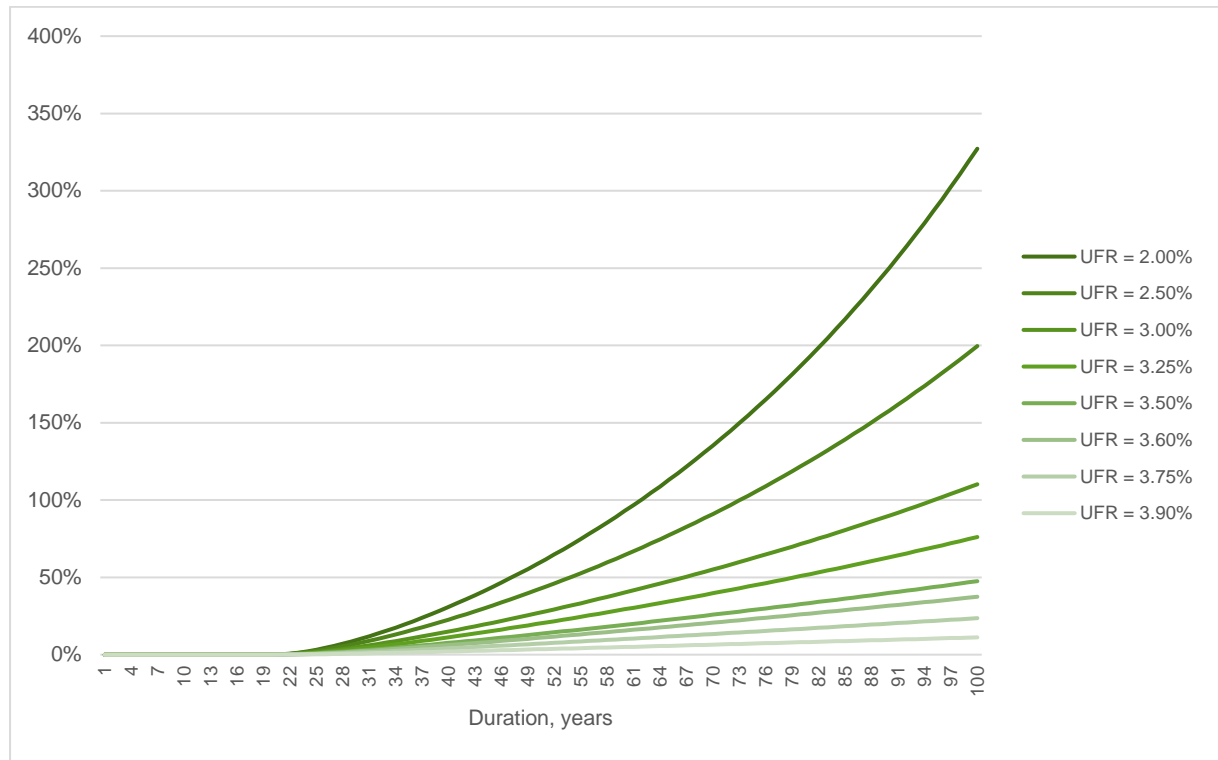
FIGURE 17: RELATIVE CHANGE IN TIME VALUE OF MONEY AT 30 SEPTEMBER 2018 (VARYING UFR)

BASELINE: LLP = 20 YEARS; CONVERGENCE TO UFR WITHIN 40 YEARS OF LLP; UFR = 4.05%

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