Towards a new UFR curve – or not?

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The “Commissie Parameters”, a committee of experts charged with investigating certain regulatory funding technicalities for Dutch pension funds, published its advice in June 2019. They propose to change the method for generating the ultimate forward rate (UFR) yield curve, used for valuing pension liabilities. We find that the proposed UFR curve remains much closer to a full market-consistent curve than the current UFR curve. As a consequence, it will become easier for pension funds to stabilize their UFR funding ratios and interest rate hedging ratios over time.

Introduction

Ultimate forward rates (UFRs) are intended to be stable estimates of long-term interest rates. They are used to allow investors to adopt alternative assumptions for long-term interest rates to those implied by the market. Long-term market rates may be skewed by shorter-term supply and demand issues, a lack of reliable data, or by central banks’ market interventions, e.g. quantitative easing. There may thus be a need for a model-based approach when deriving interest rates for long maturities.

A brief history of UFR usage

The use of UFR-adjusted interest rate curves is required by several regulators when determining the discounted value of liabilities. An important example is insurers following Solvency II regulation. Pension funds in certain countries also discount liabilities using a UFR-adjusted interest rate curve, Denmark and the Netherlands being two important examples. Dutch pension funds have used UFR-adjusted curves since 2012 and important reforms to the methodology were introduced in 2015 (see Langejan et al., 2013).
In June 2019, the “Commissie Parameters” (Dijsselbloem et al., 2019) has, among other things, proposed to change the current UFR method, leading to a more market-consistent valuation curve. Important aspects of their proposal are an adoption of market rates until a maturity of 30 years (instead of 20 years) and a slower convergence to a (currently) lower UFR for long maturities. The Dutch Central Bank (DNB) and the Dutch Cabinet have already endorsed this new approach, which is intended to be introduced on January 1, 2021. This has led to much opposition in the Dutch Parliament, Senate and unions, creating uncertainty about the broader support for this advice.

How is a UFR curve constructed?
UFR-adjusted curves begin to diverge from the market curve at a given maturity, known as the last liquid point (LLP). They then begin to converge towards the UFR, which is intended to be a stable estimate of long-term interest rates.

Ever since their introduction after the financial crisis, the level of the UFRs has been higher than long-term market interest rates. Under Solvency II, a level of 4.2% was originally set, although the method was amended in 2018 and the UFR is now lower. For Dutch pension funds the 4.2% was also initially adopted but was amended in 2015 to be a lower rate, calculated as the average of historic market-impacted forward rates over a 10-year period. The UFR curve for Dutch pension funds has nonetheless been significantly higher than market rates since this approach came into use, leading to a lower value being placed on pension liabilities than their minimum-risk market value.

Contents of this article
In this article we take a closer look at the proposed UFR method. We first make a decomposition of the proposed changes, by transitioning from the current UFR method to the proposed method in several steps. This analysis shows that all modifications of the current method lead to a UFR curve which is closer to the market curve. We then investigate the possible evolution of the UFR for two different future interest rate developments. Interestingly, a rising interest rate over time may lead to a UFR curve that is lower than the market curve. This difference is, however, much smaller for the proposed UFR method than the current method. We next study the impact on interest rate sensitivity. The current UFR method generates a large sensitivity to the 25-year market interest rate. This characteristic disappears under the newly proposed method, leading to more market-consistent sensitivities. To conclude, we analyze the stability of the UFR funding ratio over time when a risk-free hedging strategy is applied. Hedging the current UFR curve is difficult and will inevitably result in funding ratios and hedge ratios which change over time. The proposed UFR method leads to more stable and market-consistent results although differences with a fully market-consistent approach will remain.

Decomposing the proposed changes
The proposed changes to the UFR curve (see Dijsselbloem et al., 2019) can be decomposed into various components, some with a larger effect than others. Figure 1 demonstrates the relative cumulative effect of these changes as at 31 May 2019.

1. Change in UFR calculation
Under the new proposal, the UFR would become the 120-month average of the 1-year forward rate at the 30-year maturity point, rather than the currently used 20-year maturity point. As a consequence, The UFR decreases from 2.3% to 2.0% as at 31 May 2019. Figure 1 shows the impact of this change: compare the yellow line, for the current UFR method, with the dark-blue line, the proposed UFR method with a lower UFR.

2. Last liquid point from 20 years to 30 years
The proposed curve starts to diverge from the market curve at the 30-year maturity point (the LLP). It would then begin to gradually approach the UFR. Under the current methodology, the divergence begins from an LLP at 20 years. As part of this change, the calculation of the last liquid forward rate (LLFR) is amended, including introducing averaging over the last 5 trading days. This effect is shown in Figure 1 as well: compare the dark-blue and red lines. Obviously this change has a big impact, not only for the 20-30 year segment but
also for longer maturities, because the convergence to the UFR begins 10 years later.

3. Slower rate of convergence to the UFR
The convergence factor determines how quickly the UFR curve diverges from the market curve and converges towards the UFR. Because this factor is set to a lower value, the proposed UFR curve stays closer to the market curve than the current UFR curve. This means that even at the 100-year maturity point, the curve is still a long way off approaching the new UFR.

So, to summarize, all three proposed changes to the UFR curve bring this curve (green line) closer to the market curve (light-blue line). Together, this leads to a very different discount curve for the liabilities, as the difference between the yellow and green line in Figure 1 shows.

In Figure 2, we take an average Dutch pension fund’s liability profile to see the relative effect on liabilities valued with these various yield curves. From this point of view, the largest effect is from moving the last liquid point of the market curve from the 20-year to the 30-year maturity point. This represents around one half of the increase in liability value. Notice also that the remaining difference with the full market value is only 0.4% for the proposed UFR method, compared to around 4% for the current UFR.

Possible evolution of the UFR
In both the current and proposed UFR methodologies, the UFR is an average of a 1-year forward rate over the last 120 month-ends. In the former case, at the 20-year maturity point and, in the latter case, at the 30-year maturity point. This average will clearly react to the development of market rates but it is a slow process and changes in the general level of interest rates will have a long lag before they become fully apparent.

We investigate two scenarios for future interest rate developments and look at how the UFR under the current and proposed methods will react over time.

Static interest rate scenario
In this scenario we assume that the current market curve, as shown in Figure 1 (the light-blue line), remains the same going forward. Figure 3 shows how the UFR then evolves under the current and proposed methods. We see both UFRs decreasing over time but the current method leads to a UFR of 1.2% in the long term versus one of 0.9% using the proposed method.
In Figure 4 we show the resulting UFR curves in 15 years’ time if the current market curve remains as it is.

The curve under the current UFR method drops considerably as a result of the much lower UFR. Under the proposed UFR method the UFR curve closely follows the market curve although slightly higher. This shows that UFR under the new method broadly reflects the long-term market interest rate and, in this scenario, the 10-years averaging is redundant when the market curve has remained the same for 15 years. The difference with the current method highlights that the proposed method is more market-consistent at the longer end of the curve.

**Rising interest rate scenario**

In this scenario we assume that interest rates linearly increase over time, so that the 10-year market rate is 3% after 15 years.

In this scenario we can see from Figure 5 that both UFRs reduce over time as the higher interest rates of 5-10 years ago gradually disappear from the 10-years average. They then begin to increase as higher interest rates become of increasing weight in the average. The proposed UFR remains below the current UFR.

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Figure 6 shows the market curve and UFR curve for the current and proposed methods in 15 years’ time under this increasing rate scenario. In this case, the market curve eventually becomes higher than the curve under the current UFR method. This is due to the lag effect of the 10-years averaging. The newly-proposed UFR curve stays closer to the market curve and therefore would lead to a lower value being placed on the liabilities in this future scenario, albeit higher than if the market curve were adopted.
Impact on interest rate sensitivity

The UFR method has a major impact on the interest rate sensitivity of the liabilities of a pension fund. Assume, for example, that the market interest rate as at 31 May 2019 increases by 0.5% points. Figure 7 then shows the effect on the current UFR curve.

Figure 7: Impact of a market rate shock under current UFR method

Because the last liquid point moves from 20 to 30 years, only maturities longer than 30 years are affected now. The difference between the market curve and the proposed UFR curve also remains small for long maturities due to the slower convergence to the UFR. Only for maturities of 45 years and more does the difference between the market and proposed UFR curve becomes significant.

The impact of the current UFR curve on the interest rate sensitivity of the liabilities is shown in Figure 9 for an average Dutch pension fund. This figure clearly shows that the current UFR method leads to a much lower interest rate sensitivity for the long-term liabilities (from 30 years on). What is also striking is that the current UFR method has a very high interest rate sensitivity at the 25-year maturity. This effect occurs because the starting point of the current UFR extrapolation (the last liquid forward rate) is determined to a large extent by the forward rate from year 20 to year 25. When the 25-year market rate
increases, the 20 to 25-year forward rate also increases, leading to a higher starting point of the UFR extrapolation.

Figure 9: Interest rate sensitivities
For an average Dutch pension fund

![Interest rate sensitivity graph](image)

Source: Aegon Asset Management, as at 31 May 2019.

Differences between the interest rate sensitivities for the market curve and the proposed UFR curve are much smaller. By construction, results are the same until a maturity of 30 year. For longer maturities, differences occur, but to a limited extent. The interest rate sensitivity is for instance slightly higher at the 40 year point, due to the large contribution of the forward rate from year 30 to 40 to the last liquid forward rate. This forward rate contributes with a factor of 2/3 to the last liquid forward rate, compared to 1/3 for the 30 to 50 year forward. For this reason, the interest rate sensitivity of the 50 year point is relatively small.

We highlight this effect in the Figure 10, where we consider a single liability cash flow at 40 years. In the proposed UFR method, the last liquid forward rate is affected by the 30, 40 and 50 year interest rates. We see that these maturities indeed affect the valuation of this cash flow, whereas for the market curve we get a sharp interest rate sensitivity at the 40 year maturity. The current UFR method again generates most interest rate sensitivity at the 25-year point, despite the liability being at 40 years. The proposed UFR method thus remains closer to market-consistent results for long-dated liabilities.

Figure 10: Interest rate sensitivities
For a 40-year liability cashflow

![Interest rate sensitivity graph](image)

Source: Aegon Asset Management, as at 31 May 2019.

Finally, Table 1 summarizes the effect of the current and proposed UFR method on a number of key figures for an average Dutch pension fund.

<table>
<thead>
<tr>
<th>Table 1: Impact on an average Dutch pension fund</th>
<th>Market curve</th>
<th>Current UFR method</th>
<th>Proposed UFR method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value liabilities</td>
<td>100.0%</td>
<td>96.0%</td>
<td>99.6%</td>
</tr>
<tr>
<td>Interest rate sensitivity liabilities</td>
<td>100.0%</td>
<td>80.0%</td>
<td>97.6%</td>
</tr>
<tr>
<td>Funding ratio</td>
<td>100.0%</td>
<td>104.1%</td>
<td>100.4%</td>
</tr>
<tr>
<td>Interest rate hedge ratio</td>
<td>50.0%</td>
<td>62.5%</td>
<td>51.3%</td>
</tr>
</tbody>
</table>

Source: Aegon Asset Management, as at 31 May 2019.

Note that the results for the proposed UFR method are quite close to the results based on the market interest rate. Differences are much more pronounced for the current UFR method.
Stability of the UFR funding ratio
Many pension funds want to limit unexpected movements of the UFR funding ratio as much as possible. We therefore examine in this section whether the current and proposed UFR funding ratio can be stabilized in practice.

Impact of interest rate changes
Figure 11 shows the effect of interest rate changes on the funding and hedge ratio for the current UFR method, assuming (for simplicity) that all interest rate risk is hedged.

Figure 11: Impact of a market rate shock on current UFR funding ratio and hedge ratio
For an average Dutch pension fund

This figure shows that the current UFR hedge percentage differs significantly from the target 100% for larger interest rate changes. For example, an interest rate rise means a reduction in the UFR hedging percentage. This has a positive effect on the UFR funding ratio because a lower hedge ratio in the event of an interest rate rise leads to an increase in the funding ratio. In the event of a fall in interest rates, the reverse occurs, which also works out favorably on the UFR funding ratio. We could thus argue that it is best not to adjust the UFR interest rate hedge in case of interest rate changes.

If, however, the objective remains to stabilize the current UFR hedge ratio, one must adjust the hedge in case of interest rate changes. Such a dynamic interest rate hedge can of course be implemented, but requires more maintenance and may thus lead to extra costs. This effect will be larger for pension funds with long-term liabilities because, in that case, the difference between the market interest rate and the UFR interest rate will be more significant.

The proposed UFR method is analyzed in Figure 12.

Figure 12: Impact of a market rate shock on proposed UFR funding ratio and hedge ratio
For an average Dutch pension fund

Note that this approach leads to more stable results compared to the current UFR method: the funding ratio remains almost constant and the hedge ratio only changes slightly in case of a large movement of the market interest rate. We observed earlier that the proposed UFR curve remains much closer to the market interest rate curve. As a consequence, changes in the market curve, which affect the hedge instrument, are reflected better in the proposed UFR curve, which affects the liability, leading to smaller changes in the funding and hedge ratio (all other things being equal).

The UFR in terms of required investment returns
In general, it is not possible to set up a UFR interest rate hedge with risk-free instruments that will yield the same return as the UFR curve. This is illustrated in Figure 13, which shows the forward UFR and market curve.
Note that the forward market curve lies very low, especially for long maturities. The situation is different for the current UFR curve: here the forward interest rate quickly rises to the UFR value of 2.3% after the 20-year point.

The difference between these curves, also depicted in Figure 13, is approximately equal to the decrease in funding ratio per year. For a 40-year liability this loss of funding ratio is thus roughly 1.3%-point per year. The UFR funding ratio will thus automatically fall over time when an interest rate hedge is set up with investments which are coupled to the market curve.

Figure 14 shows that this effect is, again, much smaller for the proposed UFR method. Until a maturity of 30 years the difference in forward rates is zero in this case. For longer maturities, the difference in forward rates remains limited. For example, the difference is only 0.5%-point for a maturity of 40 years, much lower than the 1.3%-point for the current UFR method. We thus, again, see that the proposed UFR method leads to results which are much closer to the market interest rate curve.

Conclusions
The proposed UFR method has already led to much debate, due to its negative impact on pension funds’ funding ratios. This article analyzes the UFR proposals and finds more agreement with a fully market-consistent valuation than the current method. Whilst the introduction of the new method would currently lead to lower funding ratios, it should also make it easier for pension funds to stabilize the UFR funding ratio and interest rate hedge ratio over time.

References

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