The Ultimate Forward Rate: Implications for Dutch Pension Plans

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ABSTRACT: Since the global financial crisis, Dutch pension plans have faced a dual challenge of disappointing asset returns and low interest rates, resulting in a decline of their funding ratios. This has led regulators to consider revised pension funding rules, including the possible introduction of the ultimate forward rate (UFR) in the construction of the yield curve used to discount pensions' liabilities to their present value. In this Research Insight, we examine the implications for pension plans if regulators introduce the UFR and how it may impact stakeholders.

Introduction

Since the global financial crisis that began in 2007, defined-benefit plans around the world have faced a double challenge: lower asset returns that have been disappointing by historical standards, and interest rates that have fallen to unprecedented levels. As a result, the present value of liabilities has increased sharply while the value of assets has not kept up. Even with increased contributions from pension plan sponsors, funding ratios have declined to levels that have caused concern for stakeholders.

Various governments have responded differently to this common pension funding challenge. In this Research Insight, we examine the changes being proposed to Dutch pension regulations. In particular, we look at the implications of employing the ultimate forward rate (UFR) in the construction of the yield curve used to discount pensions' liabilities to their present value. If Dutch regulators do indeed introduce the UFR, our research shows three main findings:

- Pension plan reported funding ratios appear to improve

- Prior to any hedging strategy, pension plan surplus risk appears to decline

- Pension plans' hedging behavior may change in unintuitive ways

The Dutch Regulatory Framework

The Dutch Central Bank (De Nederlandsche Bank, DNB) regulates pension plans in the Netherlands, using its Financial Assessment Framework (Financieel Toetsingskader, FTK). The aim of FTK is to ensure that pension plans are fully funded, and the required funding levels it sets are demanding by international regulatory standards.

For our analysis, the relevant parts of the FTK are the following: [1]

- Liabilities should be discounted using the a curve set by DNB, which is based on the euro swap curve

- Pension plans are required to value their assets at market value, and are required to have a framework in place to price assets when no direct market values are observable

- If its funding ratio (the ratio of assets to liabilities) falls below 105 percent (risk-adjusted), a pension plan must agree to a short-term (three-year) recovery plan with the DNB

- A pension plan must agree to a long-term recovery plan if its funding ratio falls below its required level, based on the "standard test" [2]

- During a short-term recovery plan, risk cannot be increased

- If a pension plan's funding ratio falls below 105 percent, it is not allowed to apply index-inflation to its benefits and rights

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[1] Details are available on the DNB's web site: http://www.toezicht.dnb.nl/en/2/2/51-202556.jsp.

[2] The parameters for this test are an extension of the FTK.

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The Financial Crisis and Its Effects

Since the start of the global financial crisis, the funding ratios of Dutch pension plans have worsened. Figure 1 shows that, from a healthy level of about 150 percent in 2007, funding ratios declined to about 90 percent by the first quarter of 2009, and have failed to fully recover.

Figure 1: Assets, liabilities and the average funding status of Dutch pensions.
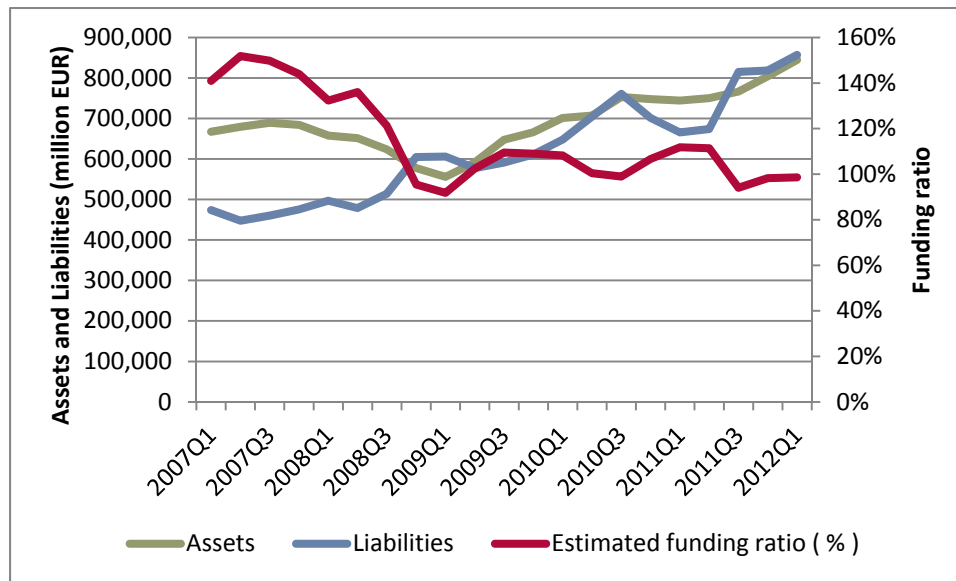

Data Source: Dutch Central Bank (DNB).

Liabilities have risen sharply, from under €500 billion to over €850 billion. This has been driven by the decline in interest rates used to discount the liabilities to their present value. Over the same period, the 15-year euro swap rate fell from close to 5 percent to around 2 percent (Figure 2).

Pension assets fell from close to €700 billion to around €550 billion in 2009. They have since recovered to about €850 billion, but this increase has been almost matched by the rise in the value of liabilities, leaving the funding ratio at close to 100 percent. Further, assets managed to keep up with liabilities only because of increased contributions.

Figure 2: 15-year Euro swap rates.
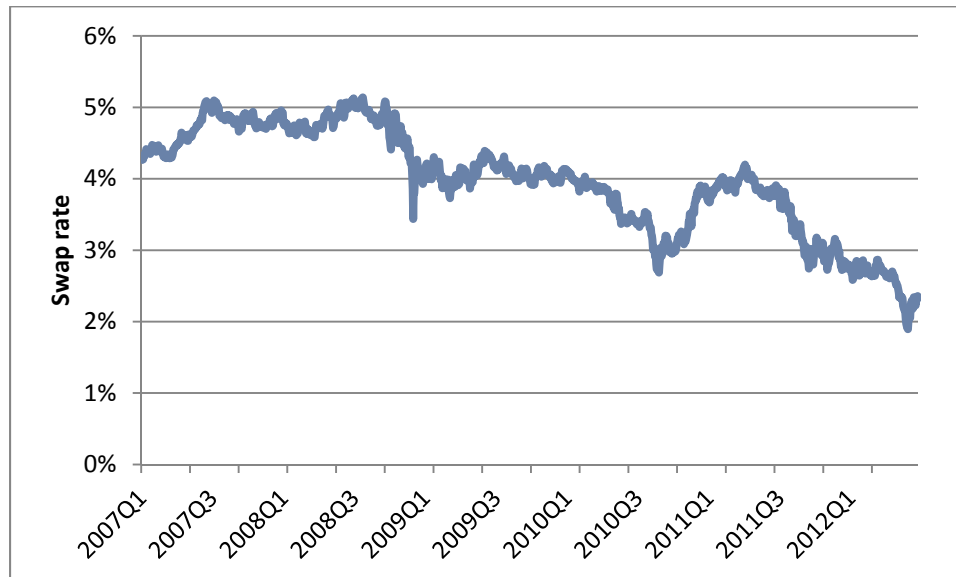
Data Source: MSCI.

The Regulatory Response to Date

Under the FTK, underfunding requires pension funds to implement recovery plans. If underfunding is not addressed, not only may inflation-indexation be removed, but nominal rights and benefits may also be reduced. In response to the deterioration of pension plans' funding status, some modifications have been made to the FTK. The modifications have allowed plans to defer decisions on changes to benefits.

First, in 2009 the period for short-term recovery plans (applying to pension plans with funding ratios of below 105 percent) was extended from three to five years. This allowed pension plans to avoid reducing benefits. However, as is seen in Figure 1, things have not improved: the average funding ratio fell below 105 percent in 2008, and four years later it remains below that threshold. The time to face the difficult situation was deferred, but the need for pension plans to make choices has not gone away.

An argument made by pension plans, among others, is that the very low level of interest rates is an anomaly, due at least in part to measures taken by central banks responding to the financial crisis. Pension plans, it is argued, should therefore be able to use an interest rate more representative of a normal economic environment.

The first change to discount rates was applied in late 2011, when the DNB allowed pension plans to use a three-month average of the euro swap rate, rather than the current period's. This initially helped: swap rates were falling, so using the three-month average pulled up the discount rate, thus reducing the present value of the liabilities. Swap rates have subsequently risen, however, as can be seen in Figure 2, so at the time of this writing the rule is not helpful.

The Proposed Introduction of the Ultimate Forward Rate

Consulting with the DNB and the pension sector, the Dutch Ministry of Social Affairs and Employment has recently been considering a more extensive change to the way that pension liabilities are valued.[3] Its main provision is that the long end of the curve used for discounting liabilities would change from using market rates to the use of an ultimate forward rate (UFR). The long end of the euro swap curve is very illiquid; instead of a market rate, the UFR would be set to reflect a long-term equilibrium level.

In the remainder of this paper, we examine the implications of such a change. While neither the change nor the details of any implementation are agreed upon, it is useful to assess the potential impact on pension funds as decisions about rights to future benefits are looming.

Investment and Pensions Europe reports: "The €261 billion civil service scheme ABP expects rights cuts of up to 14 percent in 2014 if the current long-term interest rates remain low and *the discount rate for liabilities remains unchanged*."[4] Clearly, the introduction of the UFR would indeed change the discount rate for liabilities. Depending on its interpretation by the boards of directors of pension plans, the introduction of the UFR could directly influence any decisions on reductions in plan member rights.

Our analysis of the effect of the changes runs as follows:

1. We present a plausible version of how UFR would be implemented.
2. We look at the current funding and risk profile of a representative Dutch pension fund, focusing on its surplus risk, and look at the change in the optimal hedging of its term-structure risk.
3. We look at possible effects of a change on the euro swap market.
4. We look at the possible divergence between economic and regulatory views of the portfolio, and implications for plan management and intergenerational solidarity.

Ultimate Forward Rate Implementation Scenario

The UFR has already been implemented for Dutch insurance companies, and is now being considered for pension plans.[5] We assume that an implementation for pensions would be similar to that for insurance companies. The starting-point is to determine the "last liquid point" on the yield curve, which is the longest maturity for which the market rates are applied. We assume that the last liquid maturity is 20 years. The interest rate at the end of the yield curve (the UFR) is determined to be 4.2 percent, a possible level the DNB might select, reflecting a view of long-run inflation and real interest rates. Next, the curve must be extrapolated from the last liquid point to the UFR. There are several approaches to doing this, and we apply the Smith-Wilson technique.[6]

The resulting yield curve is shown in Figure 3, and the divergence from 20 years out is apparent. Note that the curve does not reach 4.2 percent in the figure by 60 years. For very long horizons, the yield curve converges to 4.2 percent due to its construction method. Variants of the UFR methodology apply a predefined convergence period where the forward yield curve essentially reaches the same level of the UFR. A shorter convergence period means faster convergence to the UFR rate. For our analysis, we did

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[3] The proposal is described by the DNB: http://www.toezicht.dnb.nl/en/7/51-226239.jsp.

[4] Our italics; IPE, 22 August 2012.

[5] http://www.toezicht.dnb.nl/en/7/51-226239.jsp

[6] This is described in a European Union consultative document, https://eiopa.europa.eu/fileadmin/tx_dam/files/consultations/QIS/QIS5/ceiops-paper-extrapolation-risk-free-rates_en-20100802.pdf). For our analysis, we used an alpha parameter of 0.1.

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not set any convergence period. Applying a convergence period would increase the effect of the UFR regulation on the yield curve. Our conclusions would be still valid in that case, but the size of the effects would be different.

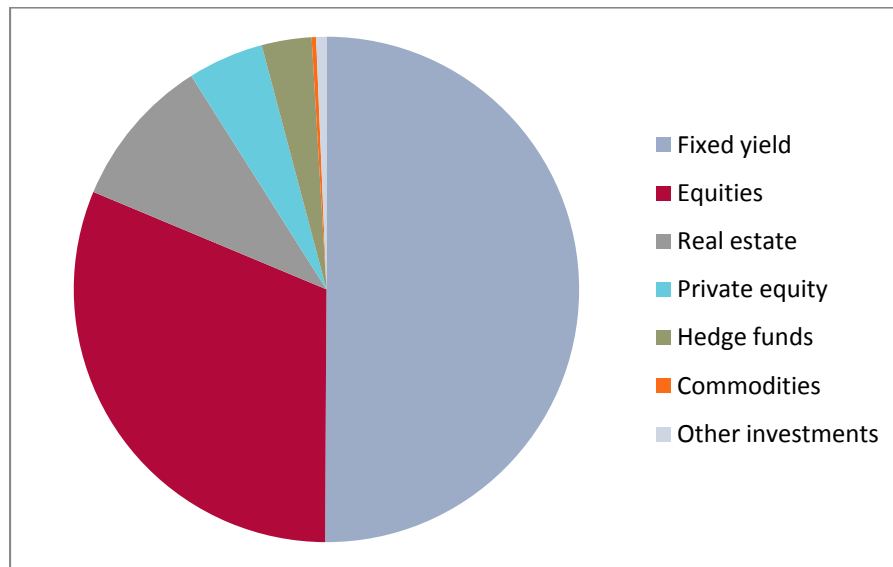**Figure 3: EUR swap curve with and without the use of UFR.**

Data Source: MSCI.

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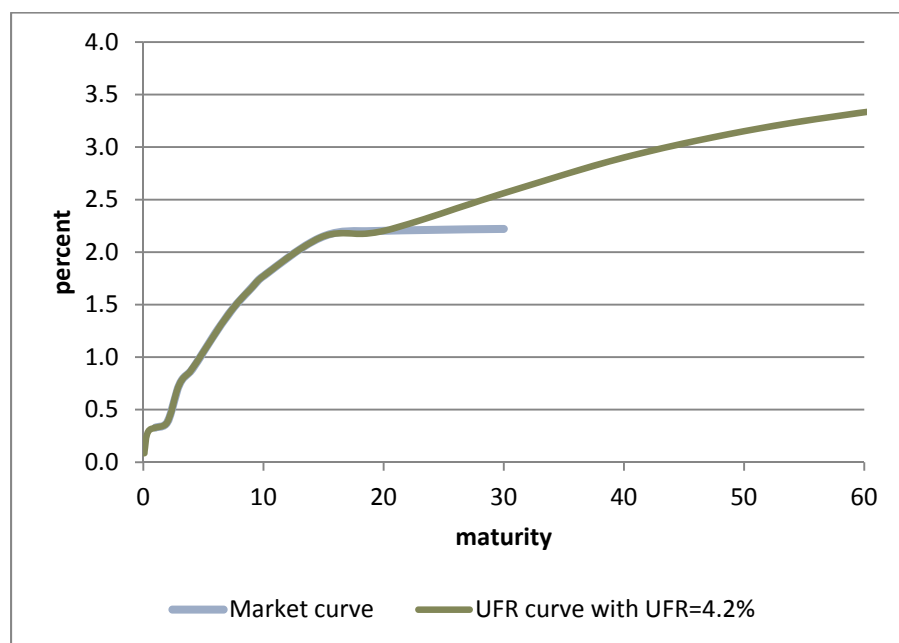
Implications for a Representative Pension Plan

The Representative Portfolio

We construct a representative portfolio of assets, using indices to match the asset-class weights published by the DNB.[7] The asset weights are as follows (Figure 4):

Figure 4: Representative asset portfolio holdings.

- Fixed yield
- Equities
- Real estate
- Private equity
- Hedge funds
- Commodities
- Other investments

Data Source: Dutch Central Bank (DNB).

We exclude any hedging at this stage in order to focus on the implications of the direct asset holdings; we consider what the change means for hedging policy later in the paper. The forecast risk of the asset portfolio is 9.3 percent (annualized one-standard deviation forecast).[8] This is heavily dominated by equity risk (92.2 percent).

We model the liabilities as nominal cashflows, with duration of 15.9 years, and discount them using the euro swap curve. We assume that the cashflows are known with certainty and are therefore ignoring any actuarial risk. The present values of the nominal cashflows are pictured in Figure 5. The risk of the liabilities side is 12.0 percent, and this is completely dominated by term structure risk (100 percent), reflecting the long duration of the liability portfolio.

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[7] The weights are published on the DNB web site, http://www.statistics.dnb.nl/index.cgi?lang=uk&todo=Pen, and the indices are listed in the appendix.

[8] We employ the Barra Integrated Model, our multiple-asset-class factor model:
http://www.msci.com/products/risk_management_analytics/barra_integrated_model/.

Funding Ratio Scenario

The reported funding ratio would increase with the adoption of UFR.

We start with a funding ratio of 98.58 percent.[9] The effect of the change in the yield curve, seen in the green line of Figure 5, is to reduce the value of the liability portfolio by 3 percent. This, in turn, increases the funding ratio by 3.1 percent to 101.63 percent.

**Figure 5: Present values of liability cash flows with and without the UFR correction.**
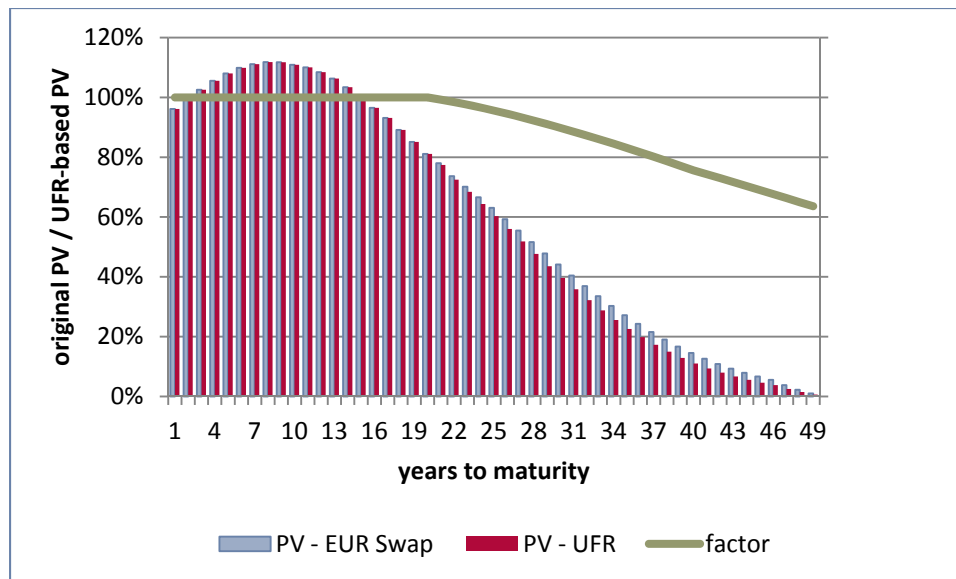
Data Source: MSCI.

As the UFR affects the long end of the curve, the effect on pension plans with longer-duration liabilities should be greater. We show in Figure 6 that, as the liabilities increase in duration by one year, the positive effect on the funding ratio increases by about 0.5 percent.

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[9] This is taken from the DNB: http://www.statistics.dnb.nl/index.cgi?lang=uk&todo=Pen

Figure 6: Effect of potential new regulation on funding ratios.
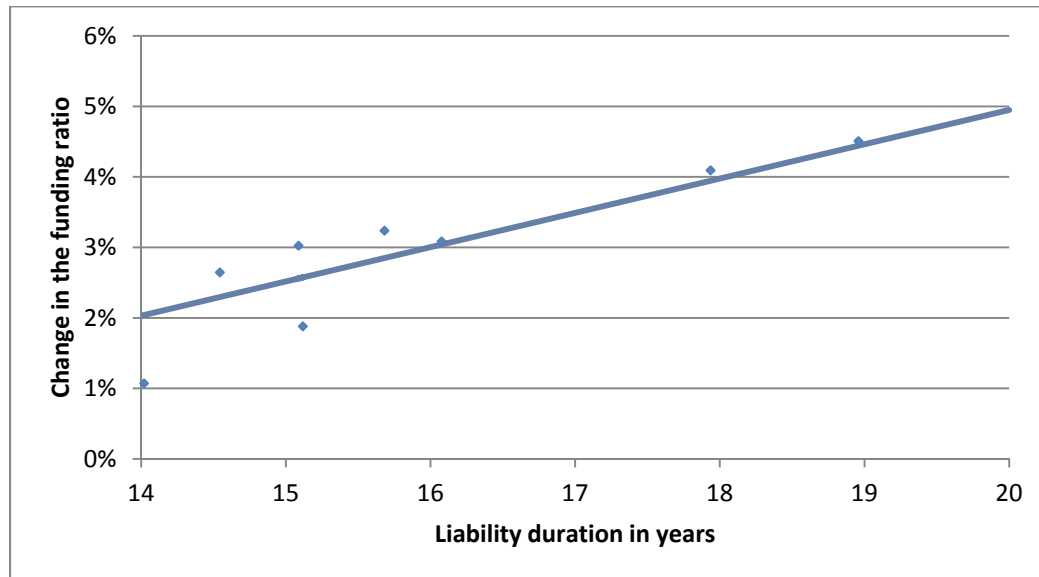
Data Source: MSCI.

Surplus Risk Scenario

The plan's risk would decrease with the adoption of UFR.

We focus on the surplus portfolio as it is the surplus (or deficit) that determines the pension plan's health. We construct a portfolio that is long assets and short liabilities, and again use the current average funding ratio of 98.58 percent.

The risk of the surplus portfolio, using the euro swap curve, is 15.6 percent relative to the liabilities, which is dominated by fixed-income risk that in turn is primarily term-structure risk, owing to the mismatch in duration between the asset and liability portfolios.[10] This is shown in Figure 7.

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[10] The asset side is 50.1% in fixed income, with duration of 6.1 years, and the liability side has duration of 15.9 years

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Figure 7: Surplus risk decomposition.
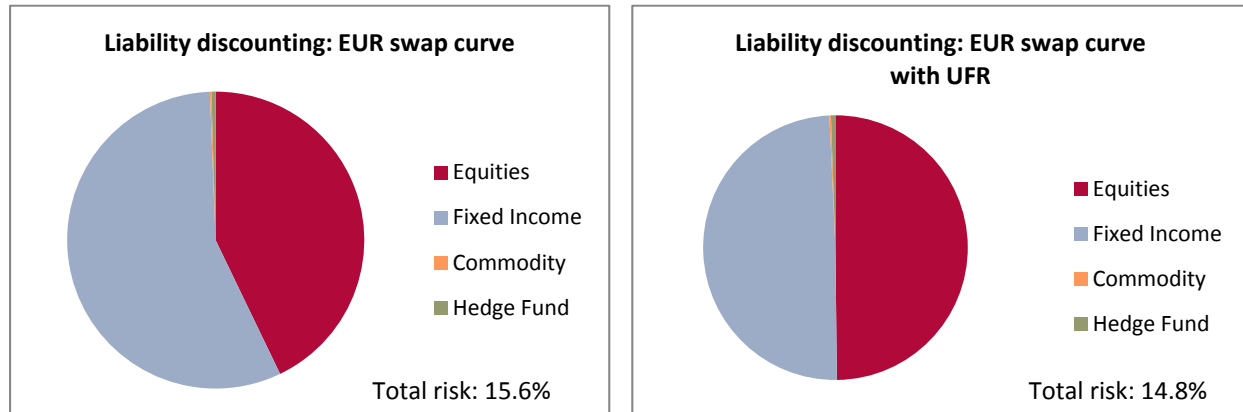
Data Source: MSCI.

With the introduction of the UFR, the yield curve beyond 20 years is less affected by market movements, since the end of the curve is fixed and it is not subject to market movements (but is subject to political decisions, which we will discuss later). We see in Figure 8 that the effect on the yield curve of a 25 bp shock in the price of zero-coupon bonds lessens beyond 20 years, and that the cashflows beyond 20 years are less rate-sensitive.

Figure 8: Interest rate sensitivity of zero coupon bonds to a yield curve shift.
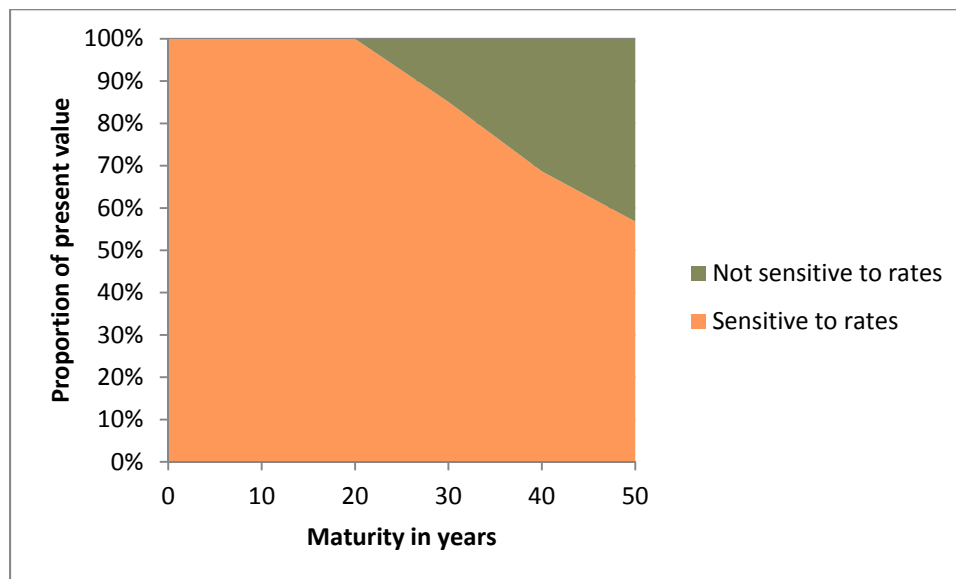
Data Source: MSCI.

The effect of this scenario is to reduce the riskiness of the duration mismatch: there is now less market risk caused by the plan holding a lower proportion of high-duration assets relative to the duration of its liabilities. We find that the fall in fixed-income risk leads market risk of the surplus to fall to 14.8 percent relative to the liabilities and the share of risk due to fixed income falls (Figure 7).

The reduction in reported risk may have implications for the behavior of plans. Plans might, for example, take more risk in their asset mix, while leaving their surplus risk unchanged.

Hedging Scenario

Plans may hedge interest rate risk less with the adoption of UFR. There may also be unintuitive hedging actions.

Adopting the UFR would reduce the sensitivity of the long end of the yield curve to changes in market rates; therefore, the portfolio of liabilities will similarly be less sensitive to a parallel shift in interest rates. In that case, the duration will be lower and plans will need to hedge less, as seen in Figure 8.

Furthermore, the introduction of UFR might lead to unintuitive hedging behavior—an artifact of the yield curve's construction. Figure 9 gives the key-rate durations (KRDs) of the representative liability portfolio.[11] The 19- and 20-year points are unusual, with a very high KRD at 20 years and a low KRD at 19 years. These KRDs are a striking and strange byproduct of using the UFR.

Figure 9: Key-rate durations of the representative liability portfolio.
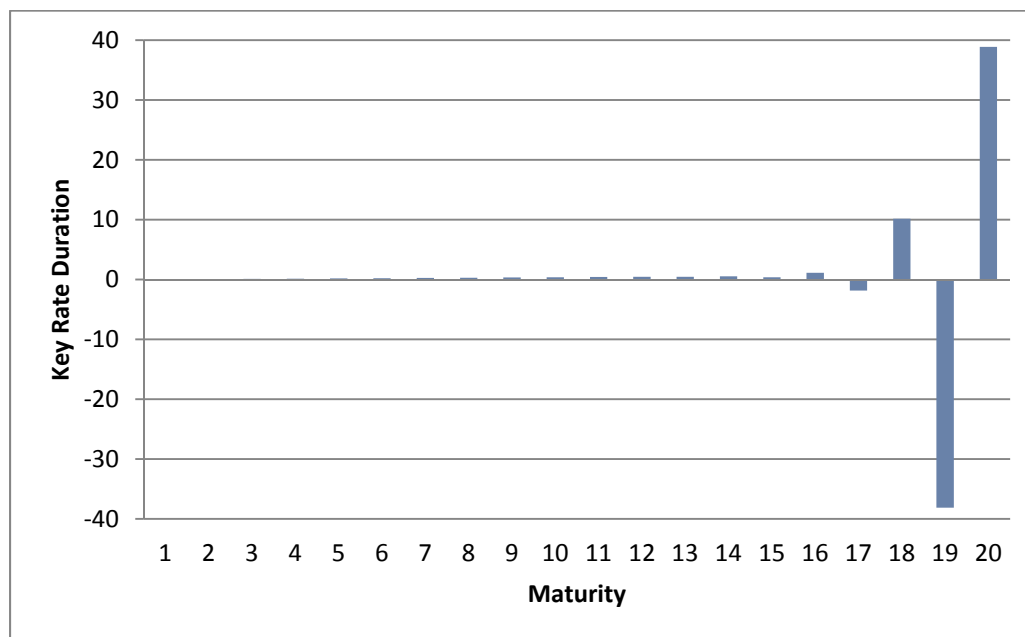
Data Source: MSCI.

If we shock the 20-year point, the rest of the curve outward from 20 years moves because we redo the extrapolation to the UFR from 20 years. This has an effect on the present value of cashflows from 20 years out. If there is a downward movement in the 20-year rate, therefore, there is a significant increase in the value of liabilities—the whole yield curve from the 20-year point is moving. (The longer the duration of the portfolio, the greater this effect.) To hedge this risk, plans might buy 20-year bonds.

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[11] KRDs measure the sensitivity of a bond or a bond portfolio to an independent movement of a particular point in the yield curve.

The 19-year KRD, on the other hand, is highly negative. Again, this is a byproduct of the use of the UFR. If the 19-year spot rate moves higher, but the 20-year spot rate is unchanged, then the 20-year forward rate must decline.[12] With a lower 20-year forward rate, the yield curve from 20 years to the UFR (which is unchanged) now starts from a lower point. The curve is therefore lower beyond 20 years, which increases the present value of liabilities. The effect of the upward move in the 19-year spot rate, then, is to increase the present value of liabilities. This means that the 19-year KRD is negative. This, in turn, suggests that pension plans in this scenario should <u>sell</u> 19-year bonds to hedge their interest risk. This is unintuitive since liabilities are cash outflows and the 19-year KRD would suggest that peniosn plans <u>increase</u> their obligations for year 19.

Putting these together, pension plans may go long 20-year bonds and short 19-year bonds because of the UFR.

Market Effects

The introduction of the UFR, as we describe it, may have unintended market consequences caused by the change in the optimal hedging strategy that we described above, with pension plans selling 19-year bonds and buying 20-year bonds.

After one year, the 20-year bonds would become 19-year bonds, and so—if they follow this strategy— managers would have to sell them and go short 19-year bonds to maintain their hedge. There would, therefore, be constant downward pressure on the 20-year rates and upward pressure on 19-year rates. If the pressure is large enough to move the market, the KRD changes would push the long end of the yield curve down, thereby increasing the present value of liabilities, worsening funding ratios. As a consequence, the improvement in funding status due to in adoption of KRDs would be less than expected.

A Divergence of Regulatory and Economic Risk Management?

At a given point in time, a pension plan has a portfolio of assets and a population of retirees— present and future—to whom it has obligations. A change in regulation, such as moving to UFR, does not change a plan's ability to meet these obligations. It may, however, change the perceptions and behavior of participants and decision makers. These may have effects on important questions, such as those of intergenerational solidarity. In this case, if the funding ratio appears to be higher, retirees and older workers may have a basis to make greater claims, possibly at the expense of younger workers.

A further effect is to introduce a new type of risk, and one that may not easily be hedged: we may label it political risk. The yield curve is now determined not by markets but by regulators. If the UFR is set at 4.2 percent, the immediate effect is, as we saw above, to reduce risk and the long end of the curve is now much less affected by markets. In market terms, the ultimate point is risk-free (and intermediate points are of lower risk than without UFR). However, 4.2 percent may at some point become 3.2percent (possibly if we move into a long-term environment of low inflation and real yields) or 5.2 percent (should inflation or real yields rise). A sudden and discrete change in the reported funding ratio would follow, possibly necessitating changes in contributions or rights and benefits. There are no financial instruments currently available to address this.

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[12] The 20-year spot rate has to reflect the 19-year spot rate and the forward rate for year 20. If the 19-year spot rate increases, the 20-year spot rate can be unaffected only if the forward rate for year 20 decreases.

A pension plan's fiduciary manager, aware of this political risk, may choose to manage its assets and liabilities with both compliance with regulation and sensitivity to economic risk in mind. This could complicate the manager's task, as he would need to maintain and monitor two sets of risk forecasts.

Conclusion

Compared with pension plans in other markets, Dutch plans are relatively well-funded. They have not, however, been immune to the dual challenge of falling interest rates and disappointing asset returns. In the face of the funding challenge, the DNB is consulting with stakeholders about a proposed change to the yield curve that is used to discount pension plan liabilities. In this paper, we explored the implications of adopting the ultimate forward rate:

- The reported funding ratios of pension plans appear to improve

- Prior to any hedging, the surplus risk of pension funds appears to decrease

- Pension plans may reduce their hedging of interest-rate risk

Furthermore, because the long end of yield curve would no longer be based on actual market rates, but on regulatory decisions, some of the risks faced by pension plans would not be driven by market forces. Currently, there are no market instruments that allow pension plans to hedge this new type of political risk. At the same time, there may be a divergence between economic and regulatory risk management. The underlying ability of pension plans to honor their obligations to current and future members is not changed by introducing the UFR in regulatory reporting requirements. The introduction of UFR may, however, change stakeholders' perceptions of the health of pension plans and therefore influence their decisions about possible changes to benefits.

Appendix: Representative Asset Portfolio

31.21% Equities

17.74% MSCI EMU IMI Index

62.32% MSCI World ex EMU IMI Index

19.94% MSCI EM IMI Index

50.09% Fixed Yield

44.72% BoA Merrill Lynch European Union Government Bond Index

22.30% BoA Merrill Lynch EMU Corporate Index

3.80% BoA Merrill Lynch Euro Government Bill Index

8.62% BoA Merrill Lynch U.S. Treasury Master Index

7.57% BoA Merrill Lynch US Domestic MBS Master

4.05% BoA Merrill Lynch U.K. Gilts Index

8.95% BoA Merrill Lynch Global Governments Inflation-Linked Index

9.71% Real Estate

50.88% FTSE EPRA-NAREIT Europe EUR Index

39.29 % FTSE EPRA-NAREIT USA USD Index

4.91% FTSE EPRA-NAREIT UK GBP Index

4.91% FTSE EPRA-NAREIT Asia USD Index

4.85% Private Equity

33.86% MSCI Euroblock Small Cap Index

66.14% MSCI Small Cap Index

3.19% Hedge Funds

100% Hedge fund model portfolio

0.29% Commodities

100% S&P GSCI Index

0.65% Other Investments

73.33% Cash - Euro

5.33% Cash – GBP

21.33% Cash - USD

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[1]As of June 30, 2011, based on eVestment, Lipper and Bloomberg data.