

# Longevity Risk Transfer activities by European insurers and pension funds

DeNederlandscheBank

EUROSYSTEEM



*Central bank and prudential supervisor of financial institutions*

©2015 De Nederlandsche Bank n.v.

*Authors*

Patty Duijm

The Occasional Studies aim to disseminate thinking on policy and analytical issues in areas relevant to De Nederlandsche Bank. Views expressed are those of the individual authors and do not necessarily reflect official positions of De Nederlandsche Bank.

*Editorial committee*

Jakob de Haan (chairman), Lieneke Jansen (secretary).

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form by any means, electronic, mechanical, photocopy, recording or otherwise, without the prior written permission of De Nederlandsche Bank.

Subscription orders for DNB Occasional Studies and requests for specimen copies should be sent to:

De Nederlandsche Bank n.v.

Communications

P.O. Box 98

1000 AB Amsterdam

Internet: [www.dnb.nl](http://www.dnb.nl)

# Longevity Risk Transfer activities by European insurers and pension funds<sup>1</sup>

---

<sup>1</sup> This study shows the outcomes from a survey distributed by the European Insurance and Occupational Pensions Authority (EIOPA) among European regulators for insurers and pension funds. This study has benefited greatly from discussions with colleagues at De Nederlandsche Bank and colleagues from other regulatory authorities, and from discussions within the Financial Stability Committee at EIOPA.



# Contents

1. Summary	7
2. Introduction	8
3. Longevity risk transfer (LRT)	9
3.1 Products	9
3.2 Previous studies on this market	11
4. LRT activities in Europe (survey outcomes)	13
4.1 Overview of the LRT market	13
4.2 Market prospects	18
4.3 Impact on Solvency II requirements	21
4.4 Potential risks	21
5. Conclusion and policy implications	24
6. References	25



# 1. Summary

Longevity risk, the risk that people live longer than expected, can have a significant financial effect on pension funds and insurance companies. To manage this risk, these parties can transfer such risks to other parties, such as (re)insurers, investment banks and capital markets. In this study, Longevity Risk Transfer (LRT) activities are defined as those activities where financial instruments are used to transfer longevity risk to third parties. This study presents the initial results of a survey on LRT activities by European insurance companies and pension funds and aims to better understand the developments in this market and the related risks. In total, 26 countries participated in this questionnaire. The outcomes show that the market for LRT products has grown rapidly, but is still concentrated in just a few countries. LRT activities are most developed in countries with private Defined Benefit (DB) pension schemes. Countries that mainly have state pensions have less LRT activities as governments do not tend to transfer longevity risk in this manner. From a policy perspective, attention should be given to where the longevity risk is transferred to. Especially in a growing market monitoring of the holders of longevity risk is important as (i) LRT deals between banks, (re)insurers etc. could lead to increased interconnectedness and hence to more contagion during times of stress and; (ii) further growth in the market for LRT instruments could lead to a build-up of large tail risk exposure (e.g. in case of a cure for cancer).

## 2. Introduction

8

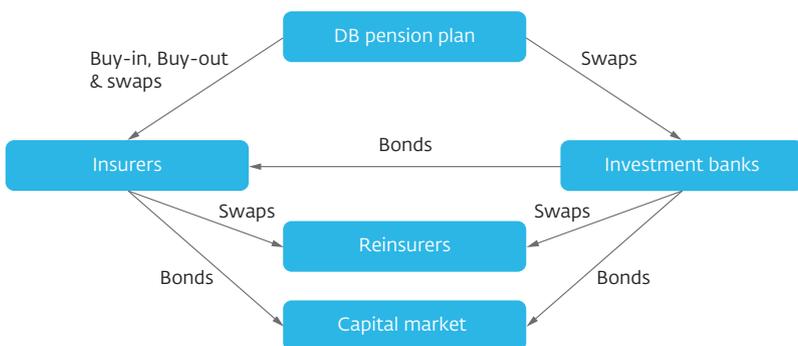
Longevity risk can be defined as the risk that people, in aggregate, live longer than expected. This can impact governments, individuals and corporates. For the latter, life insurers and pension funds could be exposed to higher-than-expected pay-outs when longevity increases. For pension funds, the ones that offer defined benefit (DB) schemes, and, where relevant, their sponsors, are directly impacted by an unexpected increase in longevity assumptions. Especially pension funds offering annuities are exposed to longevity risk and this risk is limited for DB schemes that pay out lump sums. For a defined contribution (DC) scheme, there is no promise of a particular payment upon retirement and hence the policyholder holds the risk of living longer, although it may be insured where the DC saver annuitizes. Also for insurance companies, the type of business they are providing determines the sensitivity of their portfolio to longevity risk. For example, life insurers that have written term assurance business (where benefits are only payable if death occurs in a specified time period) benefit when their policyholders live longer than expected.

# 3. Longevity risk transfer (LRT)

## 3.1 Products

Longevity risk can be significant in terms of the potential financial impact for insurance companies and pension funds. An IMF study (2012) suggests that pension funds' liabilities increase on average by 9 percent as longevity increases by three years. Moreover, the average underestimation of longevity in the past (over a period of rapidly increasing life expectancy) is three years. To manage these risks pension funds as well as insurance companies have started to transfer part of these risks to other parties, typically (re)insurers, investment banks and capital markets. The financial instruments used to transfer longevity risk largely depend on the type of counterparty. Insurers are buyers of pension buy-ins, buy-outs, and longevity swaps, whereas reinsurers and investment banks typically only buy longevity swaps (Joint Forum, 2013). Longevity bonds can be traded in capital markets (see also figure 1). The aforementioned financial instruments can be described as follows:

Figure 1 overview of LRT activities



- A buy-out transaction: a risk transfer where pension funds' assets and liabilities (or a specific part of the liabilities, for example for all pensions in payment) are transferred to the longevity risk protection seller (the insurance company) in return for an upfront premium. Hence, the insurer is provided with the complete ability to control and manage the underlying assets, but is also exposed to the risk. The insurance company is also responsible for the pension payment to the individual member, and the pension scheme no longer has any obligation or duty to the member and can be wound up.
- A buy-in transaction: the pension fund retains the legal liability to pay the pensions to the members but transfers the assets to the insurers in return for periodic payments from the insurance company that match the pension payments (i.e. the insurance contract becomes an asset of the pension scheme). Hence, a buy-in is very similar to a buy-out as far as the movement of money is concerned, and in practice, the insurer might even pay the pension directly to the member. However, contrary to a buy-out, for a buy-in formally the insurance company is responsible for paying the pension payment to the pension scheme, which is then responsible for paying the individual member. Hence, the policy is held by the pension scheme.
- Longevity swaps: the buyer of a longevity swap (can be a pension fund or insurance company) pays a fixed periodic premium based on mortality assumptions to the swap counterparty (often a (re)insurer). The swap counterparty in turn pays a floating premium to the buyer of longevity risk protection based on the difference between the actual and expected mortality rates.
- Longevity bonds: there are two types of longevity bonds: (i) 'principal at risk' longevity bonds, which are hedges against mortality risk; and (ii) 'coupon-based' longevity bonds, which link payments to the survival rate of a cohort. The buyer of a coupon-longevity bond receives

a higher coupon payment when survivorship in the population is high, thereby offsetting its higher pension obligation payments.

### 3.2 Previous studies on this market

The study by the Joint Forum (2013) on LRT activities points out that the current (global) market for LRT activities is large in volume but relatively small compared to the total pension base. In addition, the market is concentrated as only a few large participants are active in this market. For instance, a lot of the cash flows in relation to the LRT transactions are concentrated in a small number of quite large transactions (up to \$26 billion) and take place between large counterparties. Table 1 shows the four largest reported LRT transactions collected by Artemis<sup>2</sup>, a company that collects data on alternative risk transfers, over the last seven years. The activities mainly take place in the UK, US, Australia and the Netherlands, the countries with a relatively large pension market. However, as pointed out by BCBS as well, the LRT market is still relatively small compared to its market potential. For example, in the UK DB pension plans amount to about £2 trillion liabilities on a solvency basis as at December 2014, while there has only been de-risking by LRT transactions for about £50 billion (2.5% of the potential total market).

Most of the reported transactions are buy-ins, buy-outs and longevity swaps. Longevity bonds are rarely used yet as the capital markets are still short of potential investors in longevity risk. Reasons for this could be the lack of natural investors who would benefit from an unexpected rise in life expectancy, or the underlying characteristics that differ significantly from other types of financial instruments where the risk premium is determined on the basis of developments in the credit quality (Thomsen and Andersen,

---

2 Artemis collects data on LRT deals. However, the dataset is not complete. [http://www.artemis.bm/library/longevity\\_swaps\\_risk\\_transfers.html](http://www.artemis.bm/library/longevity_swaps_risk_transfers.html)

**Table 1 Largest reported LRT activities**

Date	Size	Fund (buyer)	Provider (seller)
Feb 2012	€12 billion	Aegon	Deutsche Bank
Jun 2012	\$26 billion	General Motors	Prudential (US)
Jul 2014	\$16 billion	BT Pension Scheme	Prudential (US)
Aug 2014	€12 billion	Delta Lloyd	RGA Re

Source: Artemis (2015)

2007). Another disadvantage of longevity bonds is that the buyer of the bond has to pay a large principal amount upfront. This immediately leads to increased counterparty credit risk (Hilbers and Gorter, 2013).

Nevertheless, the market for longevity risk transfer instruments has grown rapidly over the last years. In the UK, the LRT market experienced a record high in 2014. Furthermore, Aon Hewitt (2014) expects that also smaller pension schemes will get better access to the LRT market, so that also smaller longevity swap transactions are expected to take place.

# 4. LRT activities in Europe (survey outcomes)

Currently however, there isn't much information on the market prospects. Therefore, the European Insurance and Occupational Pensions Authority (EIOPA) sent out a questionnaire to European insurance and pension supervisors to get a better understanding of the LRT market in Europe. The goal of the questionnaire was to gather more information on the LRT activities conducted by insurers and pension funds in Europe, and to better understand the developments in this market and the potential related risks. The results of the questionnaire can be divided into 4 topics: (i) overview of the domestic LRT market; (ii) market prospects; (iii) impact on Solvency II requirements; (iv) potential risks. In total 26 out of 32 countries responded to the questionnaire.<sup>3</sup>

## 4.1 Overview of the LRT market

Every participating country was asked to list all LRT deals conducted by their (re)insurance companies and pension funds. In total 5 out of 26 countries reported sale (i.e. selling longevity risk/buying protection) of LRT instruments; France, Ireland, Liechtenstein, the Netherlands, and United Kingdom. Only 1 country does not have data on LRT activities, while the remaining countries indicated that there are no investments in LRT instruments yet.

As stated before, while the sellers of LRT instruments will mostly be pension funds and insurance companies, buyers will mostly be (re)insurance companies and investment funds. Hence, sales of LRT instruments are more likely to be known by the local supervisor. It is therefore no surprise that purchases are rarely reported by local supervisors that participated in the questionnaire. Only Ireland reports purchases of longevity risk by its

---

3 Participating countries: AT, BE, BG, CZ, DE, DK, EE, ES, FI, FR, HR, HU, IE, IS, LI, LT, LV, MT, NL, NO, PT, RO, SE, SI, SK, and UK.

supervised entities, and only one insurer purchased longevity risk in both 2011 and 2012, respectively amounting to a risk premium of EUR 15 million and EUR 65 million.

Table 2 shows the number of LRT sales per country, the total amount of LRT deals and a breakdown by type of LRT instrument used for the period 2011-2014. The UK and the Netherlands show by far the largest amounts of LRT deals, respectively EUR 52.7 billion and EUR 25.4 billion. Graph 1 and 2 show that these countries have a large market share in European pension's market, as together they represent the majority of the total European pension market for DB schemes.<sup>4</sup> Hence, it is not surprising that the UK and the Netherlands are the largest players in the market for LRT deals.

**Table 2 Overview of Sales of Longevity Risk over 2011-2014 (in EUR mln)\***

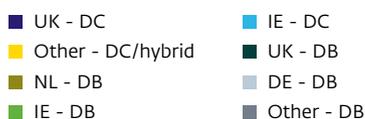
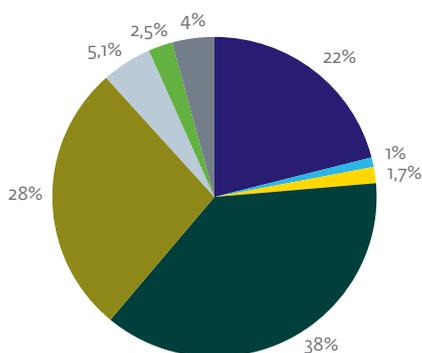
Country	# of deals	Total deal size € mln	Buy-in/Buy-out € mln	Swap € mln	Bond € mln
FR	1	750		750 (100%)	
IE	12	3.646	801 (22%)	1045 (29%)	1800 (49%)
LI	8		638 (100%)		
NL	3	25.400		25.400 (100%)	
UK	58	52.725	15.186 (29%)	37.539 (71%)	

\* Data includes LRT activities from 2011 until 2014, except for the UK where the LRT activities until August 2014 are reported. Also for the UK, only transactions from over €150m are reported. The original amounts (in pounds) for the UK are converted to euro using the end of the month exchange rate for the month in which the deal took place.

<sup>4</sup> Data is based on country-specific data of 17 countries that also participated in the questionnaire. CZ, EE, FR, GR, HU, LT, MT and RO are missing.

## Graph 1 European pensions market share

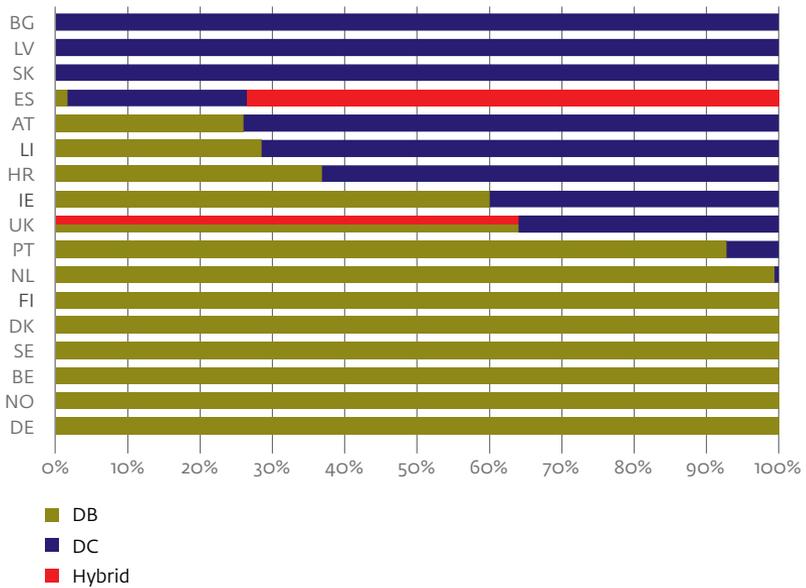
Blue = DC, Green = DB.



Source: EU/EEA occupational pension statistics (EIOPA).

Graph 3 shows the amount of LRT sales per country by year and indicates that the LRT market has grown over the last few years. The results also confirm that the market is still in its infancy as the participation in the market is generally limited to a few parties. For example, in the Netherlands only three insurance companies have conducted LRT deals. This stems from the fact that the insurance sector is offering a lot of pension products and is hence exposed to longevity risk. However, there have only been three transactions and these are all longevity swaps. In the UK, 51 out of 58 transactions reported are LRT deals between pension funds and insurers. The remaining 7 LRT deals are those which have taken place between reinsurers and insurers. In France, there is only one LRT transaction observed so far.

Graph 2 Break-down DC/DB/Hybrid schemes\*



Source: EU/EEA occupational pension statistics (EIOPA).

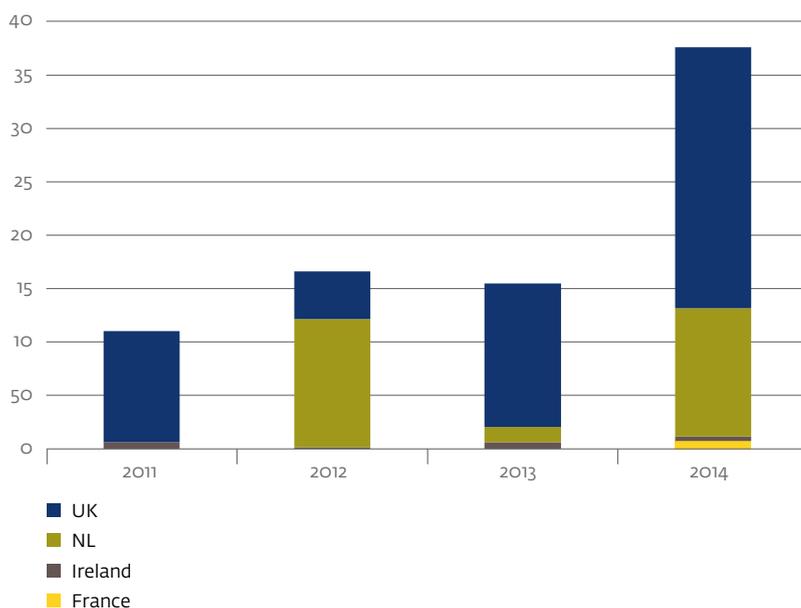
\* DB and DC respectively represent Defined Benefit and Defined Contribution schemes. A Hybrid scheme has some characteristics of each.

By contrast, Liechtenstein reports 8 LRT deals which are all buy-outs, while the total amount of transferred longevity risk is much smaller than for other countries that reported LRT activities. Besides that, the reported deals are all offshore transactions so that the longevity risk is actually in other countries. For all LRT deals, the risk takers are insurance companies in Switzerland, and the original business has been in existence for a long time already.<sup>5</sup>

<sup>5</sup> The 8 transactions stem from different years; 1970, 1982, 1986, 1988 (2x), 2000, 2005 (2x).

### Graph 3 Overview of Sales of Longevity Risk by year\*

In billion euro

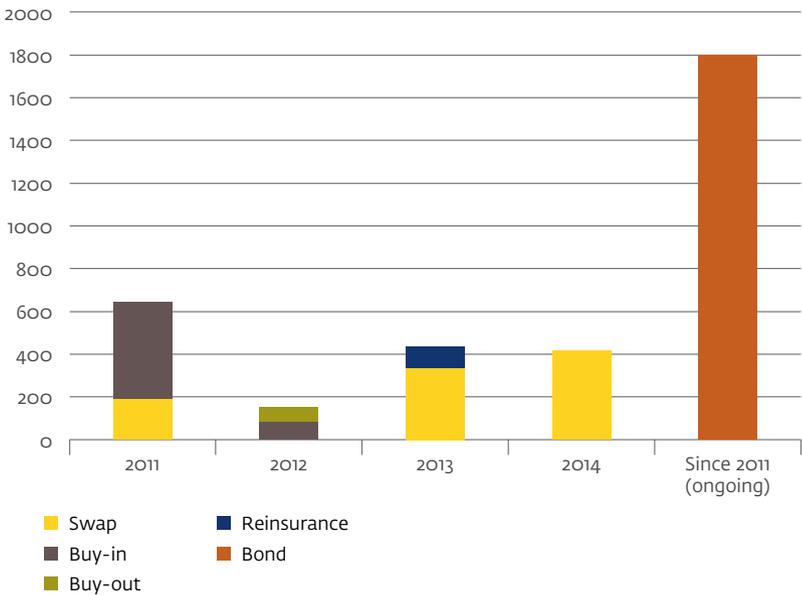


\* Data for Liechtenstein is not included in this graph as the LRT deals are running for a long time already (1970 – 2005), i.e. they were settled in the past.

The results show that there is wide diversity in the LRT instruments used. Graph 4 shows the LRT activities in Ireland over time, and since 2011 the yearly amount of deals is about EUR 500 million, except for 2012 in which there were two relatively small deals summing up to about EUR 150 million. Based on a different data source. Graph 5 shows that for the UK a pattern of increasing LRT activity can be observed. The market for LRT activities grew from £2.9 billion in 2007 towards £27.9 billion in 2014H1 (half year number). Results can however be skewed by single large transactions.

## Graph 4 LRT activities Ireland\*

In EUR mln.



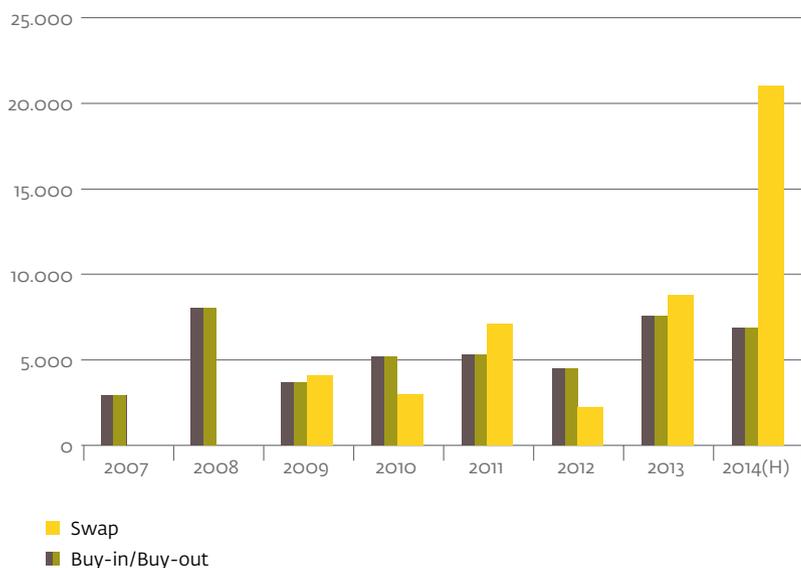
\* The amount of longevity bonds shows the sum of longevity bond deals over the years 2011-2014.

## 4.2 Market prospects

As stated before, the market for LRT activities is relatively small when compared to the total longevity exposure in the pension market for DB products (Graph 2-3). Respondents were asked to provide their impression on the market prospects, based on the signalled interest from supervised institutions. Graph 6 shows that out of the five countries that currently report LRT activities, three countries expect the LRT market to grow further during

## Graph 5 LRT activities UK\*

In £ mln.

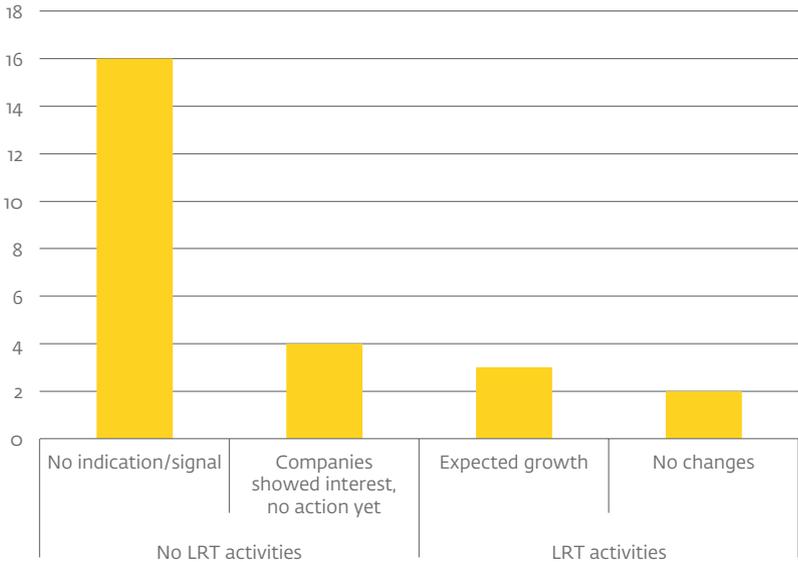


\* For this graph data from Hymans Robertson is used as this dataset contains data from 2007. In this dataset there is no breakdown between buy-in and buy-out instruments.  
<http://www.hymans.co.uk/knowledge-centre/surveys-reports/our-research/buy-outs-buy-ins-and-longevity-hedging-q2-2014.aspx>

the coming years. Only Liechtenstein and France report that the market was stable over recent years and that they don't expect significant changes.

The majority of the countries without LRT activities has not observed any interest in the market by their supervised institutions and hence do not expect a development of this market in the future. Four countries report requests from supervised institutions for more information on this market,

Graph 6 Market prospects



although this has not resulted in any LRT activity by those institutions yet. Some countries have doubts about whether the market for LRT products will come into existence in their country. Reasons for this might be that (i) the selection bias by pension funds/longevity risk sellers as these parties may have a better idea of how healthy their pension holders are likely to be and; (ii) the illiquid character of the market as the LRT market is characterized by only a few large players; (iii) the longevity risk is low when pension benefits are mainly paid as lump sums.

### 4.3 Impact on Solvency II requirements

The sale of LRT instruments by an insurance company could, subject to conditions and restrictions, lower insurer's Solvency Capital Requirement (SCR) under the Solvency II framework. Respondents were asked whether insurance companies have requested information on this subject and what their opinion on this is, especially in the context of an internal model framework.

Two countries indicated that some undertakings asked about the solvency requirements and specifically how longevity risk transfer should be accounted for in the risk margin. Aspects discussed in the context of an internal model were (i) the use-test<sup>6</sup>; (ii) the mitigation of longevity risk in an internal model; (iii) the consistency of this methodology with the market value of technical provisions and mitigation techniques on the balance sheet. Other topics of discussion were how to address basis risk and counterparty default risk when LRT is used. In addition, during a working group meeting among Nordic countries, additional potential risks stemming from LRT activities were discussed.

### 4.4 Potential risks

Multiple countries, especially those with an active LRT market in place, point to the potential risks stemming from LRT instruments.

A first risk is the occurrence of basis risk, i.e. imperfect hedging. The sources of basis risk in LRT instruments can be many, for example (i) the base mortality table can be inappropriate; (ii) the risk that the predefined

---

<sup>6</sup> The 'use-test' will require firms to demonstrate that the internal model is widely used in and plays an important role in their system of governance, risk management systems, decision making processes and the Own Risk and Solvency Assessment (ORSA).

stochastic models in place do not fit the underlying data and; (iii) a term mismatch can occur as short-term longevity swaps are used to hedge long-term liabilities. With regard to the latter, this could come with an additional risk; rollover risk. When the swap matures the LRT protection seller is no longer protected and might not be able to enter into a longevity swap with similar terms. Under Solvency II, risk transfers might be used as long as they are effective and do not contain material basis risk. However, the definition, and hence the recognition, of material basis risk is difficult to interpret.

Second, counterparty default risk plays a role. Counterparty default risk is present with buy-ins, longevity swaps and longevity bonds.<sup>7</sup> The Joint Forum study (2013) points out that counterparty default risk can be mitigated through collateral arrangements, but as the new information on mortality rates come with substantial lags the exposure might still become sizeable.

Third, there is a risk that the longevity risk is moved from undertakings that are supervised as pension funds or insurance undertakings to undertakings that have no insurance/pension fund supervision. For example, in most jurisdictions banks are not allowed to issue or take longevity risk in the form of annuities, but can take it indirectly via swaps. Hence, longevity risks might end up at parties that do not understand those risks appropriately. Additionally, it can also lead to more contagion risk during times of stress as LRT deals between pension funds, insurers, banks etc. lead to increased interconnectedness. None of the countries that participated in the survey formally requires reporting of LRT activities by their supervised entities. Only the UK points out that they review LRT deals between pension funds and insurers on an insurer by insurer basis.

---

<sup>7</sup> For buy-outs, the risk has been moved from the pension scheme to the individual. Hence, pensioners become exposed to the risk of an insurer's failure. Therefore, it is not called counterparty risk.

Fourth, LRT activities can have broader macroprudential implications. As the insurance risk is still present somewhere, one should be worried if the risk is hidden. This is in line with what the Joint Forum (2013) points out as well. Yet, the market for LRT activities is concentrated and is seen as too small for systemic concerns. However, the market potential is large and the market is growing. And as was the case with credit risk transfer products, with LRT products there is also a danger of the risk being built up and concentrated where it is least understood. Moreover, it could lead to a built-up of tail risk as, for example, a cure for cancer will significantly increase the longevity risk. In addition, DB pension arrangements differ quite substantially across Europe and between the two main players, the UK and the Netherlands. For example, in the UK there is a formal sponsor liability to finance any deficit in the pension fund.<sup>8</sup> In contrast, in the Netherlands the pension fund will be subject to a recovery plan, in which sponsor support is limited. And in case of a large deficit, participants may have to bear benefit cuts so that the pension fund's position can recover. From a financial stability perspective, the impact of a failure in a LRT deal would lead to a different transmission to the real economy.

Finally, as there is no deep and liquid market for LRT instruments, there is also the risk of mispricing. And considering the large deals, mispricing could be very expensive for individual parties.

---

<sup>8</sup> In addition, in the event of a sponsor becoming insolvent, there is a Pension Protection Fund (PPF) that provides compensation if the scheme is unable to provide a specified level related to the scheme benefit, usually somewhat less than the scheme would have provided.

## 5. Conclusion and policy implications

24

Pension funds offering defined benefit products and insurance companies offering pension products are automatically exposed to longevity risk. In recent years, the market for transfer of this longevity risk has emerged and grown rapidly, although data are heavily influenced by a small number of very large transactions.

From a microprudential point of view, these products can be beneficial for holders of longevity risk as it allows them to transfer these risks. Therefore, one can support the use of LRT products as means of internal risk management. However, LRT instruments also exhibit risks, such as basis risk and counterparty credit risk. These should be taken into account, especially when LRT instruments are used to lower capital requirements under Solvency II. Therefore, attention has to be paid to the use of LRT instruments and their impact on capital requirements.

But also from a macroprudential point of view, potential risks arise from LRT activities. Although currently the LRT market is relatively small and concentrated in just a few countries, one cannot ignore the potential risk. In the LRT market the risk is in hands of just a few parties. Therefore from a policy perspective, attention should be given to where the longevity risk is transferred to. Especially in a growing market monitoring of the holders of longevity risk is important for at least two reasons. First, LRT deals between banks, corporates, insurers etc. could lead to increased interconnectedness and hence to more contagion during times of stress within certain sectors. Second, as the market for LRT instruments becomes larger this could lead to a build-up of large tail risk.

# 6. References

Aon Hewitt (2014). UK Risk Settlement. Quarterly newsletter, June 2014.

25

Hilbers, P.L.C. & Gorter, J.K. (2013). 'Langlevenrisico: dragen of overdragen?' *Verzekeringsarchief* 2013 (4), p. 202-206.

International Monetary Fund (April 2012). 'The financial impact of longevity risk.' Chapter 4 in *Global Financial Stability Report*.

Joint Forum (December 2013). 'Longevity risk transfer markets: market structure, growth drivers and impediments, and potential risks.' Available at BIS: <http://www.bis.org/publ/joint34.html>

Thomsen, G. J., & Andersen, J. V. (2007). 'Longevity Bonds—a Financial Market Instrument to Manage Longevity Risk.' *Danmarks Nationalbank Monetary Review 4th Quarter*, 2.



DeNederlandscheBank

EUROSYSTEEM

De Nederlandsche Bank n.v.  
P.O. box 98, 1000 AB Amsterdam  
+31 (0) 20 524 91 11  
dnb.nl